UNCLASSIFIED

AD NUMBER
AD876737
NEW LIMITATION CHANGE
TO Approved for public release, distribution unlimited
FROM Distribution authorized to U.S. Gov't. agencies and their contractors; Critical Technology; OCT 1970. Other requests shall be referred to Air Force Aero Propulsion Laboratory, Attn: APF, Fuel, Lubrication, and Hazards Division, Wright-Patterson AFB, OH 45433.
AUTHORITY
AFAPL ltr, 25 May 1973

THIS PAGE IS UNCLASSIFIED

AD876737

AFAPL-TR-70-59
VOLUME II

EVALUATION STUDY OF THE OXIDATION-CORROSION-DEPOSITION CHARACTERISTICS OF AIRCRAFT TURBINE ENGINE LUBRICANTS

AD No. ____
DDC FILE COPY

J. P. Cuellar
B. B. Baber

Southwest Research Institute

TECHNICAL REPORT AFAPL-TR-70-59, VOLUME II

October 1970

THIS DOCUMENT IS SUBJECT TO SPECIAL EXPORT CONTROLS AND EACH TRANSMITTAL TO FOREIGN GOVERNMENTS OR FOREIGN NATIONALS MAY BE MADE ONLY WITH PRIOR APPROVAL OF THE FUEL, LUBRICATION, AND HAZARDS DIVISION (APF), AIR FORCE AERO PROPULSION LABORATORY WRIGHT-PATTERSON AIR FORCE BASE, OHIO 45433.

Air Force Aero Propulsion Laboratory
Air Force Systems Command
Wright-Patterson Air Force Base, Ohio

DDC
RECEIVED
NOV 20 1970
149

NOTICE

When Government drawings, specifications, or other data are used for any purpose other than in connection with a definitely related Government procurement operation, the United States Government thereby incurs no responsibility nor any obligation whatsoever; and the fact that the Government may have formulated, furnished, or in any way supplied the said drawings, specifications, or other data, is not to be regarded by implication or otherwise as in any manner licensing the holder or any other person or corporation, or conveying any rights or permission to manufacture, use, or sell any patented invention that may in any way be related thereto.

ACCESSION for

CFSTI WHITE SECTION ☐

DDC BUFF SECTION ☑

UNANNOUNCED ☐

JUSTIFICATION .....

.....

BY .....

DISTRIBUTION/AVAILABILITY CODES

DIST.	AVAIL. and/or SPECIAL
2	

Copies of this report should not be returned unless return is required by security considerations, contractual obligations, or notice on a specific document.

EVALUATION STUDY OF THE OXIDATION-CORROSION-DEPOSITION CHARACTERISTICS OF AIRCRAFT TURBINE ENGINE LUBRICANTS

J. P. Cuellar
B. B. Baber

THIS DOCUMENT IS SUBJECT TO SPECIAL EXPORT CONTROLS AND EACH TRANSMITTAL TO FOREIGN GOVERNMENTS OR FOREIGN NATIONALS MAY BE MADE ONLY WITH PRIOR APPROVAL OF THE FUEL, LUBRICATION, AND HAZARDS DIVISION (APF), AIR FORCE AERO PROPULSION LABORATORY, WRIGHT-PATTERSON AIR FORCE BASE, OHIO 45433

FOREWORD

This report was prepared by Southwest Research Institute, 8500 Culebra Road, San Antonio, Texas, under Contract F33615-69-C-1295, Project No. 3048. The work was administered by the Lubrication Branch, Air Force Aero Propulsion Laboratory (AFAPL), Air Force Systems Command, Wright-Patterson Air Force Base, Ohio. The project engineers were Messrs. G. A. Beane, L. J. DeBrohun, and H. A. Smith (APFL).

This report covers one phase of work performed under the subject contract. This report was submitted by the authors in June 1970.

This technical report has been reviewed and is approved.

H. F. JONES
Chief, Lubrication Branch,
Fuel, Lubrication, and
Hazards Division
Air Force Aero Propulsion
Laboratory

ABSTRACT

Volume II of this report contains a compilation of the individual test data sheets for all tests included in Volume I. The data sheets are presented in order of test number.

This abstract is subject to special export controls and each transmittal to foreign governments or foreign nationals may be made only with prior approval of the Fuel, Lubrication, and Hazards Division (APF), Air Force Aero Propulsion Laboratory, Wright-Patterson Air Force Base, Ohio 45433.

TEST NO. 336-1. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-67-7 AT 347°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	17.34	–	4.58	0.26	
7 days	16.96	–2.2	4.47	1.14	
14 days	15.87	–8.5	4.13	2.76	
21 days	215.1	+1140	29.83	49.6	
26 days	(a)	–	–	59.7	9

Metal Specimen Data

Weight change, mg/cm²:	Al	–0.04
	Ti	–0.34
	Ag	–0.10
	Steel	–0.66
	Cu	–3.24
	Mg	–2.02
Metal discoloration, deposits, pitting, or etching:	Al	Yellow
	Ti	L pitting
	Ag	Yellow
	Steel	L pitting
	Cu	H etching
	Mg	H etching

Test Cell Data

Sludge in oil:	200-mesh filter	(a)
	Centrifuge, vol %	80
Tube deposits:	Total demerits	334

Breakpoint Data

Neut. no., days to 1 mg KOH/g/4 days	12
100°F vis, days to 1 cs/4 days	16

Test Conditions

Sample temperature, °F	347
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

(a) Semisolid – analysis not possible.

TEST NO. 336-2. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-67-24 AT 347°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.04	–	3.47	0.24	
7 days	13.23	1.5	3.47	1.77	
14 days	13.23	1.5	3.42	3.40	
21 days	22.92	75.8	4.83	37.9	
26 days	55.97	329	10.43	55.2	2

Metal Specimen Data

Weight change, mg/cm²:	Al	0.04
	Ti	–0.76
	Ag	0.10
	Steel	0.00
	Cu	1.00
	Mg	0.66
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	M pitting
	Ag	L yellow
	Steel	L brown
	Cu	L etching
	Mg	M etching

Test Cell Data

Sludge in oil:	200-mesh filter	Trace
	Centrifuge, vol %	2
Tube deposits:	Total demerits	114

Breakpoint Data

Neut. no., days to 1 mg KOH/g/4 days	13
100°F vis, days to 1 cs/4 days	17

Test Conditions

Sample temperature, °F	347
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 336-3. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-67-9 AT 347°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	14.87	--	3.69	0.04	
7 days	15.10	1.5	3.73	1.13	
14 days	14.97	0.7	3.69	1.42	
21 days	14.97	0.7	3.67	2.02	
26 days	15.08	1.4	3.69	2.13	1

Metal Specimen Data

Weight change, mg/cm²:	Al	0.00
	Ti	-0.08
	Ag	-0.28
	Steel	-0.04
	Cu	-0.24
	Mg	-1.82
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	Green
	Ag	L pitting
	Steel	Green
	Cu	L pitting
	Mg	L pitting

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	Trace
Tube deposits:	Total demerits	28

Breakpoint Data

Neut. no., days to 1 mg KOH/g/4 days	26+
100°F vis, days to 1 cs/4 days	26+

Test Conditions

Sample temperature, °F	347
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 337-1. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-60-18 AT 392°F

	Vis cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	12.13	--	3.17	0.19	
16 hr	12.82	5.7	3.29	1.61	
24 hr	12.90	6.3	3.30	1.95	
40 hr	13.08	7.8	3.33	3.16	
48 hr	13.31	9.7	3.36	6.90	1

Metal Specimen Data

Weight change, mg/cm²:	Al	+0.22
	Ti	+0.30
	Ag	+0.22
	Steel	+0.12
	Cu	-0.14
	Mg	+0.20
Metal discoloration, deposits, pitting, or etching:	Al	Brown deposit
	Ti	Black deposit
	Ag	Brown deposit
	Steel	L brown
	Cu	No change
	Mg	Black deposit

Test Cell Data

Sludge in oil:	200-mesh filter	Trace
	Centrifuge, vol %	0.2
Tube deposits:	Total demerits	314

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	40
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions

Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 337-2. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-67-3 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	12.77	–	3.13	0.24	
16 hr	13.60	6.5	3.26	0.92	
24 hr	13.77	7.8	3.29	1.05	
40 hr	13.96	9.3	3.32	1.23	
48 hr	14.01	9.7	3.33	1.55	3

Metal Specimen Data		
Weight change, mg/cm²:	Al	0.00
	Ti	0.00
	Ag	+0.02
	Steel	+0.04
	Cu	+0.18
	Mg	+0.28
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	No change
	Steel	L yellow
	Cu	Gold
	Mg	Black deposit

Test Cell Data		
Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	8

Breakpoint Data	
Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis., hr to 1 cs/8 hr	48+

Test Conditions	
Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 337-3. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-67-7 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	17.34		4.58	0.26	
16 hr	16.57	4.4	4.34	1.28	
24 hr	16.17	-6.7	4.23	1.68	
40 hr	16.72	3.6	4.03	13.25	
48 hr	18.51	6.7	4.31	18.47	6

Metal Specimen Data		
Weight change, mg/cm²:	Al	+0.06
	Ti	+0.04
	Ag	+0.06
	Steel	+0.04
	Cu	0.90
	Mg	7.26
Metal discoloration, deposits, pitting, or etching.	Al	L brown
	Ti	L brown
	Ag	L yellow
	Steel	L yellow
	Cu	M pitting
	Mg	H etching

Test Cell Data		
Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	Trace
Tube deposits:	Total demerits	86

Breakpoint Data	
Neut. no., hr to 1 mg KOH/g/8 hr	26
160°F vis, hr to 1 cs/8 hr	43

Test Conditions	
Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 337-4. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-67-9 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	14.87	–	3.69	0.04	
16 hr	14.84	−0.2	3.71	1.10	
24 hr	14.80	−0.5	3.67	1.28	
40 hr	14.64	−1.5	3.61	.97	
48 hr	15.09	+1.5	3.61	6.37	2

Metal Specimen Data

Weight change, mg/cm²:	Al	+0.06
	Ti	0.00
	Ag	+0.04
	Steel	+0.08
	Cu	−0.14
	Mg	+0.10
Metal discoloration, deposits, pitting, or etching:	Al	L brown
	Ti	L brown
	Ag	L yellow
	Steel	No change
	Cu	Brown
	Mg	No change

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	Trace
Tube deposits:	Total demerits	47

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	39
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions

Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 337-5. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-67-11 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.26	–	3.21	0.05	
16 hr	14.14	6.6	3.36	0.76	
24 hr	14.30	7.8	3.35	0.94	
40 hr	14.58	10.0	3.42	1.23	
48 hr	15.09	13.8	3.44	1.48	3

Metal Specimen Data

Weight change, mg/cm²:	Al	+0.06
	Ti	+0.08
	Ag	+0.06
	Steel	+0.08
	Cu	+0.06
	Mg	+0.06
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	No change
	Steel	No change
	Cu	Yellow
	Mg	No change

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	3

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions

Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 337-6. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-67-20 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.48	--	3.25	0.21	
16 hr	14.37	6.6	3.41	0.71	
24 hr	14.51	7.6	3.43	0.85	
40 hr	14.75	9.4	3.47	1.12	
48 hr	14.87	10.3	3.49	1.26	3

Metal Specimen Data

Weight change, mg/cm²:	Al	+0.04
	Ti	0.00
	Ag	+0.08
	Steel	0.04
	Cu	-0.06
	Mg	+0.04
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	L yellow
	Ag	L yellow
	Steel	L yellow
	Cu	Brown
	Mg	No change

Test Cell Data

Sludge in oil:	200-mesh filter	Trace
	Centrifuge, vol %	None
Tube deposits:	Total demerits	32

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions

Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 337-7. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-67-24 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.04		3.47	0.24	
16 hr	13.14	0.8	3.44	3.39	
24 hr	13.19	1.2	3.44	2.20	
40 hr	13.23	1.5	3.43	3.02	
48 hr	14.52	11.3	3.58	12.33	4

Metal Specimen Data

Weight change, mg/cm²:	Al	0.04
	Ti	0.00
	Ag	0.08
	Steel	+0.12
	Cu	0.12
	Mg	0.06
Metal discoloration, deposits, pitting, or etching	Al	No change
	Ti	No change
	Ag	Tan
	Steel	L yellow
	Cu	No change
	Mg	L brown

Test Cell Data

Sludge in oil	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits	Total demerits	4

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	37
100°F vis, hr to 1 cs/8 hr	46

Test Conditions

Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 337-8. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-68-1 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.29	–	3.21	0.00	
16 hr	14.13	6.3	3.34	0.88	
24 hr	14.29	7.5	3.37	0.63	
40 hr	14.48	9.0	3.40	0.84	
48 hr	14.56	9.6	3.44	1.10	6

Metal Specimen Data		
Weight change, mg/cm²:	Al	+0.14
	Ti	+0.14
	Ag	+0.16
	Steel	+0.06
	Cu	0.00
	Mg	+0.08
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	L brown
	Ag	L yellow
	Steel	Brown
	Cu	Gold
	Mg	No change

Test Cell Data		
Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	20
Breakpoint Data		
Neut. no., hr to 1 mg KOH/g/8 hr		48+
100°F vis, hr to 1 cs/8 hr		48+
Test Conditions		
Sample temperature, °F		392
Sample volume, ml		200
Air rate, liters/hr		10
Condensate return		Yes

TEST NO. 338-1. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON M-1082[a] AT 385°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	15.11	–	3.85	0.20	
16 hr	15.09	–0.1	3.76	0.63	
24 hr	15.15	+0.3	3.77	0.74	
40 hr	15.07	–0.3	3.69	2.47	
48 hr	17.18	+13.7	3.94	9.89	4

Metal Specimen Data		
Weight change, mg/cm²:	Al	0.00
	Ti	+0.02
	Ag	+0.02
	Steel	–0.02
	Cu	–0.16
	Mg	–0.04
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	No change
	Steel	Gold
	Cu	L brown
	Mg	No change

Test Cell Data		
Sludge in oil:	200-mesh filter	Trace
	Centrifuge, vol %	Trace
Tube deposits:	Total demerits	17
Breakpoint Data		
Neut. no., hr to 1 mg KOH/g/8 hr		37
100°F vis, hr to 1 cs/8 hr		40
Test Conditions		
Sample temperature, °F		385
Sample volume, ml		200
Air rate, liters/hr		10
Condensate return		Yes

(a) Blend (1:1) of O-67-7 and O-67-20.

TEST NO. 339-1. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-65-31 AT 401°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.40	–	3.23	0.08	
24 hr	14.58	8.8	3.38	1.13	
40 hr	14.93	11.4	3.48	1.20	
48 hr	15.08	12.5	3.51	1.29	
64 hr	15.49	15.6	3.60	1.65	
72 hr	15.72	17.3	3.60	2.20	4

Metal Specimen Data

Weight change, mg/cm²:	Al	−0.02
	Ti	0.00
	Ag	−0.14
	Steel	+0.16
	Cu	+0.12
	Mg	−11.26
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	L brown
	Steel	Brown
	Cu	Brown
	Mg	M etching

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	Trace
Tube deposits:	Total demerits	6

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	72+
100°F vis, hr to 1 cs/8 hr	72+

Test Conditions

Sample temperature, °F	401
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 339-2. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-67-20 AT 401°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.48	–	3.25	0.21	
24 hr	14.63	8.5	3.44	1.20	
40 hr	15.05	11.6	3.51	1.36	
48 hr	15.33	13.7	3.54	1.69	
64 hr	17.70	31.3	3.88	5.68	
72 hr	20.67	53.3	4.29	10.52	5

Metal Specimen Data

Weight change, mg/cm²:	Al	0.00
	Ti	+0.06
	Ag	+0.02
	Steel	+0.02
	Cu	−0.36
	Mg	0.00
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	L yellow
	Steel	No change
	Cu	L pitting
	Mg	No change

Test Cell Data

Sludge in oil:	200-mesh filter	Trace
	Centrifuge, vol %	Trace
Tube deposits:	Total demerits	18

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	50
100°F vis, hr to 1 cs/8 hr	56

Test Conditions

Sample temperature, °F	401
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 340-1. RESULTS OF OXIDATION-CORROSION TEST ON O-68-8 AT 385°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	17.86	–	4.61	0.19	
16 hr	17.86	0.0	4.53	1.48	
24 hr	No sample[a]	–		2.07	
40 hr	17.70	–0.9	4.49	3.50	
48 hr	17.80	–0.3	4.33	9.92	3

Metal Specimen Data		
Weight change, mg/cm² :	Al	+0.14
	Ti	+0.14
	Ag	+0.18
	Steel	+0.04
	Cu	–0.18
	Mg	+0.12
Metal discoloration, deposits, pitting, or etching:	Al	Brown
	Ti	Green
	Ag	L yellow
	Steel	Green
	Cu	Brown
	Mg	L brown

Test Cell Data		
Sludge in oil:	200-mesh filter	Trace
	Centrifuge, vol %	14
Tube deposits:	Total demerits	116

Breakpoint Data	
Neut. no., hr to 1 mg KOH/g/8 hr	36
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions	
Sample temperature, °F	385
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

(a) Sample lost in handling.

TEST NO. 341-1. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON M-1082[a] AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	15.11	–	3.85	0.20	
16 hr	15.04	–0.5	3.75	0.77	
24 hr	14.98	–0.9	3.7[illegible]	1.05	
40 hr	17.72	+17.3	4.03	10.66	
48 hr	19.80	+31.0	4.33	15.00	5

Metal Specimen Data		
Weight change, mg/cm² :	Al	+0.10
	Ti	+0.04
	Ag	+0.06
	Steel	0.00
	Cu	–0.32
	Mg	–0.24
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	No change
	Steel	Blue
	Cu	M pitting
	Mg	L pitting

Test Cell Data		
Sludge in oil:	200-mesh filter	Trace
	Centrifuge, vol %	Trace
Tube deposits:	Total demerits	32

Breakpoint Data	
Neut. no., hr to 1 mg KOH/g/8 hr	28
100°F vis, hr to 1 cs/8 hr	30

Test Conditions	
Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

(a) Blend (1:1) of O-67-7 and O-67-20.

TEST NO. 342-1. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON ATL-829 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.88	–	3.47	0.27	
16 hr	14.26	2.7	3.53	0.90	
24 hr	14.31	3.1	3.53	1.19	
40 hr	14.38	3.6	3.54	1.64	
48 hr	14.73	6.1	3.57	4.56	2

Metal Specimen Data

Weight change, mg/cm²:	Al	−0.04
	Ti	0.00
	Ag	−0.04
	Steel	−0.02
	Cu	−0.18
	Mg	+0.04
Metal discoloration, deposits, pitting, or etching:	Al	L yellow
	Ti	Brown
	Ag	Yellow
	Steel	Blue
	Cu	Brown & orange
	Mg	L yellow

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	Trace
Tube deposits:	Total demerits	19

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	41
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions

Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 342-2. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON ATL-830 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.62	–	3.39	0.80	
16 hr	13.99	2.7	3.46	1.12	
24 hr	14.16	4.0	3.50	1.34	
40 hr	17.62	29.4	4.06	9.31	
48 hr	19.33	41.9	4.24	14.45	1

Metal Specimen Data

Weight change, mg/cm²:	Al	−0.02
	Ti	−0.04
	Ag	−0.10
	Steel	0.00
	Cu	−0.14
	Mg	+0.02
Metal discoloration, deposits, pitting, or etching:	Al	L yellow
	Ti	Brown
	Ag	Yellow
	Steel	Blue
	Cu	Brown & orange
	Mg	L yellow

Test Cell Data

Sludge in oil:	200-mesh filter	3.7 g
	Centrifuge, vol %	0.6
Tube deposits:	Total demerits	100

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	29
100°F vis, hr to 1 cs/8 hr	26

Test Conditions

Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 342-3. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON ATL-831 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	14.52	–	3.48	0.28	
16 hr	15.60	7.4	3.68	0.56	
24 hr	15.74	8.4	3.68	0.79	
40 hr	15.94	9.8	3.71	1.08	
48 hr	16.04	10.5	3.72	3.27	3

Metal Specimen Data		
Weight change, mg/cm²:	Al	−0.02
	Ti	−0.08
	Ag	−0.06
	Steel	−0.04
	Cu	−0.16
	Mg	+0.06
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	L yellow
	Steel	Dark blue
	Cu	Brown & orange
	Mg	No change

Test Cell Data		
Sludge in oil:	200-mesh filter	Trace
	Centrifuge, vol %	0.6
Tube deposits:	Total demerits	39

Breakpoint Data	
Neut. no., hr to 1 mg KOH/g/8 hr	42
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions	
Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 342-4. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON ATL-832 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.76	–	3.37	0.31	
16 hr	14.66	6.5	3.52	0.48	
24 hr	14.83	7.8	3.52	0.76	
40 hr	15.03	9.2	3.57	1.23	
48 hr	15.36	11.6	3.61	2.18	3

Metal Specimen Data		
Weight change, mg/cm²:	Al	−0.02
	Ti	−0.08
	Ag	−0.10
	Steel	−0.06
	Cu	−0.14
	Mg	+0.14
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	L yellow
	Steel	Dark blue
	Cu	Brown & orange
	Mg	L blue

Test Cell Data		
Sludge in oil:	200-mesh filter	Trace
	Centrifuge, vol %	0.4
Tube deposits:	Total demerits	53

Breakpoint Data	
Neut. no., hr to 1 mg KOH/g/8 hr	44
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions	
Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 343-1. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-60-18 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt. %
Initial	12.12	–	3.19	0.20	
16 hr	12.87	6.2	3.30	1.48	
24 hr	12.91	6.5	3.31	1.80	
40 hr	12.97	7.0	3.34	2.65	
48 hr	12.89	6.4	3.30	3.40	2

Metal Specimen Data

Weight change, mg/cm²:	Al	+0.16
	Ti	+0.20
	Ag	+0.12
	Steel	+0.12
	Cu	–0.28
	Mg	+0.10
Metal discoloration, deposits, pitting, or etching:	Al	Dark brown
	Ti	Black deposit
	Ag	Dark brown
	Steel	Black
	Cu	L pitting
	Mg	Black

Test Cell Data

Sludge in oil:	200-mesh filter	Trace
	Centrifuge, vol %	Trace
Tube deposits:	Total demerits	362

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	47
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions

Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 343-2. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-67-3 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt. %
Initial	12.77	--	3.13	0.24	
16 hr	13.52	5.9	3.24	0.71	
24 hr	13.67	7.0	3.27	0.91	
40 hr	13.92	9.0	3.31	1.16	
48 hr	13.95	9.2	3.32	1.39	2

Metal Specimen Data

Weight change, mg/cm²:	Al	–0.06
	Ti	0.00
	Ag	–0.10
	Steel	–0.02
	Cu	+0.10
	Mg	0.00
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	No change
	Steel	Blue-green
	Cu	Gold
	Mg	No change

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	2

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions

Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 343-3. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-67-7 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	17.34	–	4.58	0.26	
16 hr	16.80	–3.1	4.40	1.12	
24 hr	16.56	–4.5	4.33	1.41	
40 hr	15.44	–11.0	3.89	8.16	
48 hr	16.66	–3.9	4.01	15.39	5

Metal Specimen Data

Weight change, mg/cm²:	Al	0.00
	Ti	+0.02
	Ag	–0.04
	Steel	0.00
	Cu	–0.76
	Mg	–1.20
Metal discoloration deposits, pitting, or etching:	Al	L yellow
	Ti	Purple
	Ag	L yellow
	Steel	Green
	Cu	L etching
	Mg	M etching

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	116

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	28
100°F vis, hr to 1 cs/8 hr	45

Test Conditions

Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 343-4. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-67-9 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	14.87	–	3.69	0.04	
16 hr	14.97	+0.7	3.70	0.85	
24 hr	14.91	+0.3	3.69	1.05	
40 hr	14.75	–0.8	3.63	1.57	
48 hr	14.70	–1.1	3.58	2.79	3

Metal Specimen Data

Weight change, mg/cm²:	Al	0.00
	Ti	+0.02
	Ag	–0.06
	Steel	+0.02
	Cu	–0.04
	Mg	–0.04
Metal discoloration, deposits, pitting, or etching:	Al	L yellow
	Ti	Yellow
	Ag	Yellow
	Steel	Blue
	Cu	Green
	Mg	L yellow

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	58

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	43
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions

Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 343-5. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-67-11 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.26	–	3.21	0.05	
16 hr	14.02	5.7	3.34	0.63	
24 hr	14.19	7.0	3.37	0.86	
40 hr	14.48	9.2	3.41	1.19	
48 hr	14.59	10.0	3.43	1.37	3

Metal Specimen Data			Test Cell Data		
Weight change, mg/cm²:	Al	–0.02	Sludge in oil:	200-mesh filter	None
	Ti	–0.04		Centrifuge, vol %	None
	Ag	–0.02			
	Steel	0.00	Tube deposits:	Total demerits	0
	Cu	–0.02			
	Mg	0.00			
			Breakpoint Data		
Metal discoloration, deposits, pitting, or etching:			Neut. no., hr to 1 mg KOH/g/8 hr		48+
			100°F vis, hr to 1 cs/8 hr		48+
	Al	No change			
	Ti	No change	**Test Conditions**		
	Ag	No change			
	Steel	Blue-green	Sample temperature, °F	392	
	Cu	Yellow	Sample volume, ml	200	
	Mg	No change	Air rate, liters/hr	10	
			Condensate return	Yes	

TEST NO. 343-6. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-67-20 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.63	–	3.30	0.22	
16 hr	14.30	4.9	3.38	0.52	
24 hr	14.47	6.2	3.42	0.70	
40 hr	14.73	8.1	3.45	0.89	
48 hr	14.84	8.9	3.47	1.11	3

Metal Specimen Data			Test Cell Data		
Weight change, mg/cm²:	Al	–0.02	Sludge in oil:	200-mesh filter	Trace
	Ti	–0.04		Centrifuge, vol %	None
	Ag	0.00			
	Steel	–0.02	Tube deposits:	Total demerits	16
	Cu	–0.06			
	Mg	0.00			
			Breakpoint Data		
Metal discoloration, deposits, pitting, or etching:			Neut. no., hr to 1 mg KOH/g/8 hr		48+
			100°F vis, hr to 1 cs/8 hr		48+
	Al	No change			
	Ti	L yellow	**Test Conditions**		
	Ag	Gray			
	Steel	Blue-green	Sample temperature, °F	392	
	Cu	Brown	Sample volume, ml	200	
	Mg	No change	Air rate, liters/hr	10	
			Condensate return	Yes	

TEST NO. 343-7. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-67-24 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.04	–	3.47	0.24	
16 hr	13.18	1.1	3.46	1.94	
24 hr	13.20	1.2	3.45	2.17	
40 hr	13.25	1.6	3.44	3.01	
48 hr	14.07	7.9	3.51	10.12	5

Metal Specimen Data

Weight change, mg/cm²:	Al	−0.02
	Ti	−0.10
	Ag	−0.06
	Steel	−0.04
	Cu	−0.10
	Mg	−0.24
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	Gray
	Steel	Brown
	Cu	Black
	Mg	H etching & L pitting

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	0

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	39
100°F vis, hr to 1 cs/8 hr	46

Test Conditions

Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 343-8. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-68-1 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.29	–	3.21	0.00	
16 hr	13.99	5.3	3.34	0.29	
24 hr	14.21	6.9	3.36	0.50	
40 hr	14.41	8.4	3.40	0.71	
48 hr	14.52	9.3	3.41	0.85	3

Metal Specimen Data

Weight change, mg/cm²:	Al	−0.02
	Ti	−0.08
	Ag	0.00
	Steel	−0.02
	Cu	−0.02
	Mg	−0.02
Metal discoloration, deposits, pitting, or etching:	Al	L yellow
	Ti	L green
	Ag	L yellow
	Steel	Blue-green
	Cu	Orange & green
	Mg	No change

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	8

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions

Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 344-1. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON ATL-841 AT 401°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	12.44	–	3.22	0.18	
16 hr	13.16	5.8	3.33	1.72	
24 hr	13.35	7.3	3.37	2.40	
40 hr	13.67	9.9	3.42	3.79	
48 hr	13.81	11.0	3.44	3.18	4

Metal Specimen Data

Weight change, mg/cm²:	Al	–0.02
	Ti	0.00
	Ag	0.00
	Steel	0.00
	Cu	+0.06
	Mg	0.00
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	L yellow
	Steel	Purple
	Cu	Gold
	Mg	No change

Test Cell Data

Sludge in oil:	200-mesh filter	Trace
	Centrifuge, vol %	Trace
Tube deposits:	Total demerits	43

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	24
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions

Sample temperature, °F	401
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 344-2. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON ATL-842 AT 401°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	12.47	–	3.22	0.08	
16 hr	13.14	5.4	3.33	1.59	
24 hr	13.36	7.1	3.37	2.47	
40 hr	13.68	9.7	3.42	3.41	
8 hr	13.74	10.2	3.43	4.17	3

Metal Specimen Data

Weight change, mg/cm²:	Al	0.00
	Ti	0.00
	Ag	+0.02
	Steel	0.00
	Cu	+0.02
	Mg	–0.1[illegible]
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	L yellow
	Steel	Purple
	Cu	Gold
	Mg	No change

Test Cell Data

Sludge in oil:	200-mesh filter	Trace
	Centrifuge, vol %	Trace
Tube deposits:	Total demerits	21

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions

Sample temperature, °F	401
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 344-3. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON ATL-843 AT 401°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	12.47	–	3.22	0.08	
16 hr	13.13	5.3	3.33	1.66	
24 hr	13.36	7.1	3.37	2.60	
40 hr	13.75	10.3	3.42	3.66	
48 hr	13.78	10.5	3.44	4.09	3

Metal Specimen Data

Weight change, mg/cm²:	Al	–0.02
	Ti	–0.02
	Ag	0.00
	Steel	0.00
	Cu	+0.04
	Mg	–0.06
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	L yellow
	Steel	Blue & yellow
	Cu	Gold
	Mg	No change

Test Cell Data

Sludge in oil:	200-mesh filter	Trace
	Centrifuge, vol %	Trace
Tube deposits:	Total demerits	29

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions

Sample temperature, °F	401
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 345-1. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-60-18 AT 401°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	12.12	–	3.19	0.20	
16 hr	12.91	6.5	3.31	1.84	
24 hr	13.01	7.3	3.32	2.65	
40 hr	14.07	16.1	3.48	10.06	
48 hr	15.95	31.6	3.78	16.84	4

Metal Specimen Data

Weight change, mg/cm²:	Al	+0.20
	Ti	+0.32
	Ag	+0.26
	Steel	+0.24
	Cu	–0.36
	Mg	+0.22
Metal discoloration, deposits, pitting, or etching:	Al	Black deposit
	Ti	Black deposit
	Ag	Black deposit
	Steel	Black deposit
	Cu	1 pitting
	Mg	Black deposit

Test Cell Data

Sludge in oil:	200-mesh filter	Trace
	Centrifuge, vol %	None
Tube deposits:	Total demerits	396

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	22
100°F vis, hr to 1 cs/8 hr	36

Test Conditions

Sample temperature, °F	401
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 345-2. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-67-3 AT 401°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	12.77	–	3.13	0.24	
16 hr	13.66	7.0	3.27	0.92	
24 hr	13.83	8.3	3.30	1.19	
40 hr	14.10	10.4	3.34	1.55	
48 hr	14.23	11.4	3.36	2.02	1

Metal Specimen Data

Weight change, mg/cm²:	Al	−0.02
	Ti	+0.06
	Ag	−0.04
	Steel	+0.04
	Cu	+0.12
	Mg	0.00
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	L yellow
	Steel	Green
	Cu	Orange
	Mg	No change

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	8

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions

Sample temperature, °F	401
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 345-3. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-67-7 AT 401°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	17.34		4.58	0.26	
16 hr	16.29	6.1	4.25	1.64	
24 hr	15.60	10.0	3.88	7.92	
40 hr	21.27	+22.7	4.93	17.26	
48 hr	132.3	+663	25.50	20.2	8

Metal Specimen Data

Weight change, mg/cm²:	Al	0.02
	Ti	+0.04
	Ag	0.04
	Steel	+0.04
	Cu	1.52
	Mg	41.9
Metal discoloration, deposits, pitting, or etching:	Al	L brown
	Ti	Tan
	Ag	Yellow
	Steel	Green
	Cu	L & M pitting
	Mg	H etching

Test Cell Data

Sludge in oil:	200-mesh filter	Trace
	Centrifuge, vol %	Trace
Tube deposits:	Total demerits	191

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	12
100°F vis, hr to 1 cs/8 hr	32

Test Conditions

Sample temperature, °F	401
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 345-4. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-67-9 AT 401°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt. %
Initial	14.87	–	3.69	0.04	
16 hr	14.89	+0.1	3.67	1.12	
24 hr	14.81	–0.4	3.64	1.41	
40 hr	15.55	+4.6	3.67	7.49	
48 hr	17.29	+16.3	3.94	12.21	4

Metal Specimen Data		
Weight change, mg/cm²:	Al	–0.04
	Ti	+0.04
	Ag	–0.04
	Steel	0.00
	Cu	–0.32
	Mg	–0.04
Metal discoloration, deposits, pitting, or etching:	Al	L brown
	Ti	Gold
	Ag	Yellow
	Steel	Blue-green
	Cu	L pitting
	Mg	L brown

Test Cell Data		
Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	Trace
Tube deposits:	Total demerits	64

Breakpoint Data	
Neut. no., hr to 1 mg KOH/g/8 hr	28
100°F vis, hr to 1 cs/8 hr	45

Test Conditions	
Sample temperature, °F	401
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 345-5. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-67-11 AT 401°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt. %
Initial	13.25	–	3.24	0.06	
16 hr	14.17	6.9	3.36	0.92	
24 hr	14.39	8.6	3.40	1.19	
40 hr	14.82	11.8	3.46	1.80	
48 hr	15.89	19.9	3.60	4.38	3

Metal Specimen Data		
Weight change, mg/cm²:	Al	+0.02
	Ti	0.00
	Ag	–0.06
	Steel	+0.02
	Cu	–0.04
	Mg	0.00
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	No change
	Steel	L green
	Cu	Gold
	Mg	No change

Test Cell Data		
Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	2

Breakpoint Data	
Neut. no., hr to 1 mg KOH/g/8 hr	40
100°F vis hr to 1 cs/8 hr	43

Test Conditions	
Sample temperature, °F	401
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 345-6. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-67-20 AT 401°F

	Vis. cs/100°F	100°F Vis Increase, %	Vis. cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt. %
Initial	13.48	–	3.25	0.21	
16 hr	14.42	7.0	3.40	0.74	
24 hr	14.63	8.5	3.44	0.90	
40 hr	15.03	11.5	3.50	1.31	
48 hr	15.23	13.0	3.53	1.75	2

Metal Specimen Data

Weight change, mg/cm²:	Al	0.00
	Ti	0.00
	Ag	0.00
	Steel	+0.04
	Cu	–0.14
	Mg	0.00
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	Gray
	Steel	Blue-green
	Cu	Brown
	Mg	No change

Test Cell Data

Sludge in oil:	200-mesh filter	Trace
	Centrifuge, vol %	Trace
Tube deposits:	Total demerits	26

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions

Sample temperature, °F	401
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 345-7. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-67-24 AT 401°F

	Vis. cs/100°F	100°F Vis Increase, %	Vis. cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt. %
Initial	13.04	–	3.47	0.24	
16 hr	13.29	1.9	3.46	2.93	
24 hr	13.34	2.3	3.46	3.57	
40 hr	15.51	18.9	3.73	14.66	
48 hr	17.94	37.6	4.09	25.3	6

Metal Specimen Data

Weight change, mg/cm²:	Al	+0.04
	Ti	–0.02
	Ag	–0.06
	Steel	0.00
	Cu	–0.30
	Mg	–2.42
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	Gray
	Steel	Blue-green
	Cu	L etching
	Mg	M & H pitting

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	Trace
Tube deposits:	Total demerits	3

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	11
100°F vis, hr to 1 cs/8 hr	32

Test Conditions

Sample temperature, °F	401
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 345-8. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-68-1 AT 401°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.29	–	3.21	0.00	
16 hr	14.16	6.5	3.35	0.55	
24 hr	14.37	8.1	3.38	0.74	
40 hr	14.67	10.4	3.43	1.08	
48 hr	14.81	11.4	3.44	1.45	2

Metal Specimen Data

Weight change, mg/cm²:	Al	+0.04
	Ti	0.00
	Ag	–0.06
	Steel	+0.02
	Cu	–0.04
	Mg	+0.02
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	No change
	Steel	Gold
	Cu	Orange
	Mg	No change

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	19

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions

Sample temperature, °F	401
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 346-1. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON ATL-839 AT 385°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.66	–	3.34	0.23	
16 hr	13.91	1.8	3.32	0.38	
24 hr	14.07	3.0	3.35	0.57	
40 hr	14.35	5.1	3.39	0.94	
48 hr	14.45	5.8	3.41	1.08	3

Metal Specimen Data

Weight change, mg/cm².	Al	+0.06
	Ti	+0.18
	Ag	+0.08
	Steel	+0.02
	Cu	+0.08
	Mg	+0.04
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	No change
	Steel	Blue-green
	Cu	Yellow
	Mg	No change

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	0

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions

Sample temperature, °F	385
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 346-2. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON ATL-840 AT 385°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.29	–	3.22	0.08	
16 hr	14.69	10.5	3.52	1.02	
24 hr	14.86	11.8	3.55	1.16	
40 hr	15.15	14.0	3.60	1.36	
48 hr	15.25	14.7	3.62	1.63	2

Metal Specimen Data

Weight change, mg/cm²:	Al	+0.12
	Ti	+0.10
	Ag	+0.12
	Steel	+0.08
	Cu	-0.18
	Mg	+0.10
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	No change
	Steel	Purple
	Cu	Blue & yellow
	Mg	Gray

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	2

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions

Sample temperature, °F	385
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 347-1. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON ATL-840 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.29	–	3.22	0.08	
16 hr	14.04	5.6	3.34	0.68	
24 hr	14.21	6.9	3.37	0.84	
40 hr	14.46	8.8	3.41	1.20	
48 hr	14.57	9.6	3.43	1.49	2

Metal Specimen Data

Weight change, mg/cm²:	Al	-0.02
	Ti	-0.06
	Ag	-0.02
	Steel	-0.02
	Cu	+0.02
	Mg	+0.06
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	L yellow
	Steel	Blue-green
	Cu	Yellow
	Mg	No change

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	1

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions

Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 347-2. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON ATL-850 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	15.19	–	3.54	0.11	
16 hr	15.72	3.5	3.62	0.44	
24 hr	15.94	4.9	3.66	0.58	
40 hr	16.17	6.5	3.70	0.75	
48 hr	16.33	7.5	3.72	0.98	2

Metal Specimen Data		
Weight change, mg/cm²:	Al	−0.10
	Ti	−0.06
	Ag	−0.02
	Steel	−0.02
	Cu	−0.06
	Mg	+0.02
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	L yellow
	Steel	Blue-green
	Cu	Orange
	Mg	Gray

Test Cell Data		
Sludge in oil:	200-mesh filter	Trace
	Centrifuge, vol %	Trace
Tube deposits:	Total demerits	46

Breakpoint Data	
Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions	
Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 347-3. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON ATL-851 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	15.43	–	3.60	0.13	
16 hr	15.96	3.4	3.67	0.50	
24 hr	16.14	4.6	3.71	0.49	
40 hr	16.45	6.6	3.76	0.77	
48 hr	16.63	7.8	3.80	1.00	2

Metal Specimen Data		
Weight change, mg/cm²:	Al	−0.02
	Ti	−0.02
	Ag	0.00
	Steel	−0.04
	Cu	+0.02
	Mg	+0.08
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	No change
	Steel	Blue-green
	Cu	Orange
	Mg	L brown

Test Cell Data		
Sludge in oil:	200-mesh filter	Trace
	Centrifuge, vol %	0.8
Tube deposits:	Total demerits	34

Breakpoint Data	
Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions	
Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 347-4. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON ATL-852 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt. %
Initial	16.75	–	3.81	0.10	
16 hr	17.30	3.3	3.91	0.49	
24 hr	17.59	5.0	3.92	0.63	
40 hr	17.76	6.0	3.94	0.90	
48 hr	18.05	7.8	3.98	1.12	4

Metal Specimen Data

Weight change, mg/cm²:	Al	+0.02
	Ti	–0.08
	Ag	–0.04
	Steel	0.00
	Cu	–0.06
	Mg	0.00
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	Brown
	Steel	Blue-green
	Cu	Gold
	Mg	Yellow

Test Cell Data

Sludge in oil:	200-mesh filter	Trace
	Centrifuge, vol %	0.4
Tube deposits:	Total demerits	37

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions

Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 347-5. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON ATL-853 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt. %
Initial	16.18	–	3.70	0.21	
16 hr	16.73	3.4	3.78	0.74	
24 hr	16.94	4.7	3.83	0.94	
40 hr	17.48	8.0	3.90	1.80	
48 hr	20.76	28.3	4.32	7.21	3

Metal Specimen Data

Weight change, mg/cm²:	Al	–0.02
	Ti	+0.02
	Ag	0.00
	Steel	+0.08
	Cu	–0.24
	Mg	+0.06
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	L brown
	Ag	L yellow
	Steel	Blue-green
	Cu	L pitting
	Mg	L yellow

Test Cell Data

Sludge in oil:	200-mesh filter	Trace
	Centrifuge, vol %	Trace
Tube deposits:	Total demerits	34

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	40
100°F vis, hr to 1 cs/8 hr	41

Test Conditions

Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 347-6. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON ATL-854 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.69	–	3.33	0.13	
16 hr	14.40	5.2	3.45	0.47	
24 hr	14.83	8.3	3.48	0.65	
40 hr	14.99	9.5	3.51	0.82	
48 hr	15.14	10.6	3.52	0.95	3

Metal Specimen Data

Weight change, mg/cm²:	Al	–0.02
	Ti	+0.04
	Ag	+0.08
	Steel	+0.16
	Cu	+0.06
	Mg	+0.18
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	L yellow
	Steel	Dark blue
	Cu	Brown
	Mg	L yellow

Test Cell Data

Sludge in oil:	200-mesh filter	Trace
	Centrifuge, vol %	Trace
Tube deposits:	Total demerits	51

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions

Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 347-7. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON ATL-859 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.46	–	3.40	0.57	
16 hr	15.16	12.6	3.68	3.82	
24 hr	17.11	27.1	3.94	9.44	
40 hr	21.17	57.3	4.60	18.30	
48 hr	24.15	79.4	5.02	22.4	6

Metal Specimen Data

Weight change, mg/cm²:	Al	–0.02
	Ti	+0.04
	Ag	+0.04
	Steel	+0.10
	Cu	–1.08
	Mg	–1.52
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	L brown
	Ag	L yellow
	Steel	Blue
	Cu	L pitting & M etching
	Mg	H pitting

Test Cell Data

Sludge in oil:	200-mesh filter	Trace
	Centrifuge, vol %	1.2
Tube deposits:	Total demerits	154

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	7
100°F vis, hr to 1 cs/8 hr	11

Test Conditions

Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 347-8. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-68-7 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt. %
Initial	13.69		3.38	0.08	
16 hr	14.44	5.5	3.50	0.85	
24 hr	14.65	7.0	3.54	1.25	
40 hr	14.91	8.9	3.59	1.92	
48 hr	15.06	10.0	3.61	2.22	4

Metal Specimen Data

Weight change, mg/cm²:	Al	-0.06
	Ti	+0.04
	Ag	+0.04
	Steel	+0.12
	Cu	+0.12
	Mg	+0.10
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	L yellow
	Steel	Blue-green
	Cu	Gold
	Mg	No change

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	2

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions

Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 348-1. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-60-18 AT 419°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt. %
Initial	12.12	–	3.19	0.20	
16 hr	13.20	8.9	3.37	5.03	
24 hr	14.41	18.9	3.56	10.48	
40 hr	20.23	66.9	4.80	20.8	
48 hr	44.74	269	8.91	25.7	8

Metal Specimen Data

Weight change, mg/cm²:	Al	+0.22
	Ti	+0.28
	Ag	+0.22
	Steel	+0.30
	Cu	-0.60
	Mg	-1.02
Metal discoloration, deposits, pitting, or etching:	Al	Brown deposit
	Ti	Brown deposit
	Ag	Brown deposit
	Steel	Gray deposit
	Cu	L pitting
	Mg	M pitting

Test Cell Data

Sludge in oil:	200-mesh filter	7.2 g
	Centrifuge, vol %	24
Tube deposits:	Total demerits	365

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	3
100°F vis, hr to 1 cs/8 hr	18

Test Conditions

Sample temperature, °F	419
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 348-2. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-67-3 AT 419°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	12.77	–	3.13	0.24	
16 hr	13.95	9.2	3.31	1.37	
24 hr	14.23	11.4	3.35	1.82	
40 hr	17.23	34.9	3.79	7.31	
48 hr	19.37	51.7	4.13	10.82	4

Metal Specimen Data

Weight change, mg/cm²:	Al	−0.02
	Ti	−0.02
	Ag	−0.02
	Steel	0.00
	Cu	+0.16
	Mg	−0.92
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	L brown
	Steel	L green
	Cu	Orange
	Mg	L pitting

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	7

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	26
100°F vis, hr to 1 cs/8 hr	29

Test Conditions

Sample temperature, °F	419
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 348-3. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-67-7 AT 419°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	17.34	–	4.58	0.26	
16 hr	15.57	−10.2	3.88	4.43	
24 hr	17.98	+3.7	4.33	12.89	
40 hr	383.1	+1209	53.12	18.92	
48 hr	1219	+6930	74.58	21.6	10

Metal Specimen Data

Weight change, mg/cm²:	Al	0.00
	Ti	0.00
	Ag	0.00
	Steel	0.00
	Cu	−1.28
	Mg	−56.2
Metal discoloration, deposits, pitting, or etching:	Al	L brown
	Ti	Brown
	Ag	L yellow
	Steel	Green
	Cu	L pitting & etching
	Mg	90% destroyed

Test Cell Data

Sludge in oil:	200-mesh filter	Trace
	Centrifuge, vol %	20
Tube deposits:	Total demerits	260

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	5
100°F vis, hr to 1 cs/8 hr	17

Test Conditions

Sample temperature, °F	419
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 348-4. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-67-9 AT 419°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	14.87	–	3.69	0.04	
16 hr	14.67	−1.3	3.60	3.83	
24 hr	15.46	+4.0	3.65	7.11	
40 hr	19.58	+31.7	4.31	15.46	
48 hr	22.32	+50.1	4.75	18.91	6

Metal Specimen Data

Weight change, mg/cm²:	Al	+0.02
	Ti	−0.02
	Ag	+0.02
	Steel	0.00
	Cu	−0.82
	Mg	−0.14
Metal discoloration, deposits, pitting, or etching:	Al	L brown
	Ti	Blue
	Ag	Brown
	Steel	Green
	Cu	L pitting
	Mg	Brown

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	104

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	6
100°F vis, hr to 1 cs/8 hr	28

Test Conditions

Sample temperature, °F	419
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 348-5. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-67-11 AT 419°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.25	–	3.24	0.06	
16 hr	14.59	10.1	3.42	1.81	
24 hr	15.79	19.2	3.59	4.29	
40 hr	20.94	58.0	4.28	9.71	
48 hr	24.04	81.4	4.71	11.91	7

Metal Specimen Data

Weight change, mg/cm²:	Al	0.00
	Ti	0.00
	Ag	−0.02
	Steel	+0.02
	Cu	0.00
	Mg	−0.76
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	L brown
	Steel	Pink
	Cu	Gold
	Mg	L pitting

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	3

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	10
100°F vis, hr to 1 cs/8 hr	30

Test Conditions

Sample temperature, °F	419
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 348-6. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-67-20 AT 419°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt %
Initial	13.48	–	3.25	0.21	
16 hr	14.79	9.7	3.46	1.32	
24 hr	15.23	13.0	3.53	1.89	
40 hr	18.16	34.7	3.94	7.23	
48 hr	20.66	53.3	4.31	11.19	5

Metal Specimen Data

Weight change, mg/cm²:	Al	0.00
	Ti	+0.02
	Ag	+0.04
	Steel	+0.02
	Cu	–0.24
	Mg	–0.96
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	L brown
	Ag	L yellow
	Steel	Blue-green
	Cu	L etching
	Mg	M pitting

Test Cell Data

Sludge in oil:	200-mesh filter	Trace
	Centrifuge, vol %	None
Tube deposits:	Total demerits	17

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	29
100°F vis, hr to 1 cs/8 hr	29

Test Conditions

Sample temperature, °F	419
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 348-7. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-67-24 AT 419°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.04	–	3.47	0.24	
16 hr	13.59	4.2	3.46	6.88	
24 hr	15.31	17.4	3.70	15.45	
40 hr	21.14	62.1	4.61	31.2	
48 hr	28.05	115	5.73	37.8	11

Metal Specimen Data

Weight change, mg/cm²:	Al	+0.02
	Ti	+0.02
	Ag	0.00
	Steel	0.00
	Cu	–0.66
	Mg	–6.14
Metal discoloration, deposits, pitting, or etching:	Al	L yellow
	Ti	No change
	Ag	Gray
	Steel	Blue-green
	Cu	L pitting
	Mg	H pitting & M etching

Test Cell Data

Sludge in oil:	200-mesh filter	Trace
	Centrifuge, vol %	Trace
Tube deposits:	Total demerits	20

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	<8
100°F vis, hr to 1 cs/8 hr	16

Test Conditions

Sample temperature, °F	419
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 348-8. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-68-1 AT 419°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.29	–	3.21	0.00	
16 hr	14.49	9.0	3.39	1.02	
24 hr	14.83	11.6	3.45	1.48	
40 hr	16.46	23.9	3.68	4.42	
48 hr	18.38	38.3	3.98	9.07	5

Metal Specimen Data

Weight change, mg/cm²:	Al	+0.02
	Ti	+0.02
	Ag	+0.02
	Steel	0.00
	Cu	–0.40
	Mg	–0.50
Metal discoloration, deposits, pitting, or etching:	Al	L brown
	Ti	Brown
	Ag	L yellow
	Steel	Gold
	Cu	L etching
	Mg	L pitting

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	6

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	32
100°F vis, hr to 1 cs/8 hr	35

Test Conditions

Sample temperature, °F	419
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 349-1. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON M-1082[(a)] AT 385°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	15.20	–	3.86	0.23	
16 hr	15.09	–0.7	3.77	0.57	
24 hr	15.15	–0.3	3.89	0.70	
40 hr	15.08	–0.8	3.74	1.14	
48 hr	15.92	+4.7	3.76	6.64	3

Metal Specimen Data

Weight change, mg/cm²:	Al	0.00
	Ti	0.00
	Ag	–0.02
	Steel	–0.02
	Cu	–0.02
	Mg	–0.06
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	L brown
	Steel	Blue
	Cu	Orange
	Mg	No change

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	Trace
Tube deposits:	Total demerits	28

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	39
100°F vis, hr to 1 cs/8 hr	46

Test Conditions

Sample temperature, °F	385
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

(A) Blend (1:1) of O-67-7 and O-67-20.

TEST NO. 349-2. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON ATL-868 AT 385°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	12.93	–	3.46	0.26	
16 hr	13.04	0.9	3.45	1.53	
24 hr	13.07	1.1	3.46	1.77	
40 hr	13.15	1.7	3.44	2.27	
48 hr	13.15	1.7	3.43	2.51	2

Metal Specimen Data

Weight change, mg/cm²:	Al	0.00
	Ti	0.00
	Ag	−0.04
	Steel	−0.02
	Cu	0.0[illegible]
	Mg	+0.02
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	Gray
	Steel	No change
	Cu	Brown
	Mg	L green

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	2

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions

Sample temperature, °F	385
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 349-3. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON M-1103[a] AT 385°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	14.09	–	3.48	0.20	
16 hr	14.57	3.4	3.53	0.47	
24 hr	14.69	4.3	3.55	0.60	
40 hr	14.79	5.0	3.55	0.76	
48 hr	14.82	5.2	3.56	1.00	2

Metal Specimen Data

Weight change, mg/cm²:	Al	−0.02
	Ti	+0.02
	Ag	−0.02
	Steel	−0.02
	Cu	−0.02
	Mg	−0.02
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	Gray
	Steel	Blue
	Cu	Yellow
	Mg	No change

Test Cell Data

Sludge in oil:	200-mesh filter	Trace
	Centrifuge, vol %	None
Tube deposits:	Total demerits	26

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions

Sample temperature, °F	385
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

(a) Blend (4:1) of O-67-20 and O-67-7.

TEST NO. 350-1. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-67-7 AT 347°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt. %
Initial	17.34	–	4.58	0.26	
7 days	16.89	-2.6	4.43	1.14	
14 days	15.86	-8.5	4.17	2.56	
21 days	26.01	+50.0	5.68	34.8	
26 days	(a)	–	(a)	44.9	14

Metal Specimen Data			Test Cell Data		
Weight change, mg/cm²:	Al	0.00	Sludge in oil:	200-mesh filter	(a)
	Ti	+0.12		Centrifuge, vol %	72
	Ag	–0.02			
	Steel	+0.06	Tube deposits:	Total demerits	387
	Cu	–3.18			
	Mg	–1.22	**Breakpoint Data**		
Metal discoloration, deposits, pitting, or etching:			Neut. no., days to 1 mg KOH/g/4 days		15
			100°F vis, days to 1 cs/4 days		19
	Al	L yellow	**Test Conditions**		
	Ti	Yellow			
	Ag	Brown	Sample temperature, °F		347
	Steel	Purple	Sample volume, ml		200
	Cu	L etching	Air rate, liters/hr		10
	Mg	H pitting	Condensate return		Yes

(a) Semisolid–analysis not possible.

TEST NO. 350-2. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-67-7 AT 347°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	17.34	–	4.58	0.26	
7 days	16.87	–2.7	4.44	1.14	
14 days	15.97	–7.9	4.18	2.26	
21 days	25.36	+46.3	4.86	29.2	
26 days	(a)	–	(a)	51.4	12

Metal Specimen Data			Test Cell Data		
Weight change, mg/cm²:	Al	–0.02	Sludge in oil:	200-mesh filter	(a)
	Ti	+0.12		Centrifuge, vol %	68
	Ag	–0.02			
	Steel	+0.06	Tube deposits:	Total demerits	365
	Cu	–2.76			
	Mg	–0.58	**Breakpoint Data**		
Metal discoloration, deposits, pitting, or etching:			Neut. no., days to 1 mg KOH/g/4 days		15
			100°F vis, days to 1 cs/4 days		16
	Al	L yellow	**Test Conditions**		
	Ti	Yellow			
	Ag	L brown	Sample temperature, °F		347
	Steel	Purple	Sample volume, ml		200
	Cu	L pitting & L etching	Air rate, liters/hr		10
	Mg	M pitting	Condensate return		Yes

(a) Semisolid–analysis not possible.

TEST NO. 350-3. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-67-9 AT 347°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	14.87	–	3.69	0.04	
7 days	15.14	1.8	3.73	0.89	
14 days	14.98	0.7	3.69	1.28	
21 days	15.16	2.0	3.70	1.69	
26 days	15.21	2.3	3.71	1.84	6

Metal Specimen Data

Weight change, mg/cm²:	Al	–0.04
	Ti	+0.10
	Ag	–0.10
	Steel	+0.06
	Cu	–0.18
	Mg	+0.06
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	Blue
	Ag	L purple
	Steel	Blue-green
	Cu	Brown
	Mg	No change

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	66

Breakpoint Data

Neut. no., days to 1 mg KOH/g/4 days	26+
100°F vis, days to 1 cs/4 days	26+

Test Conditions

Sample temperature, °F	347
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 350-4. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-67-9 AT 347°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	14.87	–	3.69	0.04	
7 days	15.12	1.7	3.74	0.83	
14 days	15.02	1.0	3.69	1.22	
21 days	15.11	1.6	3.68	1.86	
26 days	15.22	2.4	3.70	2.11	4

Metal Specimen Data

Weight change, mg/cm²:	Al	0.00
	Ti	+0.02
	Ag	–0.08
	Steel	–0.02
	Cu	–0.18
	Mg	0.00
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	Blue
	Ag	L purple
	Steel	Blue-green
	Cu	Brown
	Mg	No change

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	70

Breakpoint Data

Neut. no., days to 1 mg KOH/g/4 days	26+
100°F vis, days to 1 cs/4 days	26+

Test Conditions

Sample temperature, °F	347
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 350-5. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-67-24 AT 347°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.04	–	3.47	0.24	
7 days	13.29	1.9	3.48	1.68	
14 days	13.28	1.8	3.43	3.37	
21 days	27.51	111	5.44	45.7	
26 days	125.9	865	20.32	59.1	26

Metal Specimen Data

Weight change, mg/cm²:	Al	−0.04
	Ti	−0.02
	Ag	−0.20
	Steel	−0.04
	Cu	−4.86
	Mg	−1.38
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	L pitting
	Steel	No change
	Cu	L pitting & M etching
	Mg	M pitting

Test Cell Data

Sludge in oil:	200-mesh filter	(a)
	Centrifuge, vol %	24
Tube deposits:	Total demerits	428

Breakpoint Data

Neut. no., days to 1 mg KOH/g/4 days	11
100°F vis, days to 1 cs/4 days	16

Test Conditions

Sample temperature, °F	347
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

(a) Sample would not pass filter.

TEST NO. 350-6. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-67-24 AT 347°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.04	–	3.47	0.24	
7 days	13.29	1.9	3.47	1.64	
14 days	13.35	2.4	3.43	4.19	
21 days	39.73	205	7.00	60.6	
26 days	40.48	210	8.84	50.9	26

Metal Specimen Data

Weight change, mg/cm²:	Al	−0.06
	Ti	+0.06
	Ag	−0.20
	Steel	0.00
	Cu	−5.06
	Mg	+0.04
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	L pitting
	Steel	No change
	Cu	L pitting & M etching
	Mg	L yellow

Test Cell Data

Sludge in oil:	200-mesh filter	(a)
	Centrifuge, vol %	16
Tube deposits:	Total demerits	419

Breakpoint Data

Neut. no., days to 1 mg KOH/g/4 days	10
100°F vis, days to 1 cs/4 days	16

Test Conditions

Sample temperature, °F	347
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

(a) Sample would not pass filter.

TEST NO. 351-1. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON M-1082[a] AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	15.20	–	3.85	0.23	
16 hr	15.10	–0.7	3.77	0.67	
24 hr	15.14	–0.4	3.76	0.85	
40 hr	16.52	+8.7	3.85	7.49	
48 hr	18.68	+22.9	4.18	13.33	5

Metal Specimen Data		
Weight change, mg/cm²:	Al	0.00
	Ti	0.00
	Ag	–0.06
	Steel	0.00
	Cu	–0.28
	Mg	–0.12
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	L yellow
	Steel	Blue
	Cu	L etching
	Mg	No change

Test Cell Data		
Sludge in oil:	200-mesh filter	Trace
	Centrifuge, vol %	Trace
Tube deposits:	Total demerits	24

Breakpoint Data	
Neut. no., hr to 1 mg KOH/g/8 hr	31
100°F vis, hr to 1 cs/8 hr	36

Test Conditions	
Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

(a) Blend (1:1) of O-67-7 and O-67-20.

TEST NO. 351-2. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON ATL-868 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	12.93	–	3.46	0.26	
16 hr	13.00	0.5	3.43	1.32	
24 hr	13.03	0.8	3.44	1.75	
40 hr	13.10	1.3	3.43	2.34	
48 hr	13.16	1.8	3.42	2.92	3

Metal Specimen Data		
Weight change, mg/cm²:	Al	0.00
	Ti	–0.02
	Ag	–0.06
	Steel	–0.04
	Cu	–0.04
	Mg	+0.16
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	Gray
	Steel	L purple
	Cu	Black
	Mg	L blue

Test Cell Data		
Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	2

Breakpoint Data	
Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions	
Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 351-3. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON M-1103[a] AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	14.09	–	3.48	0.20	
16 hr	14.62	3.8	3.54	0.52	
24 hr	14.73	4.5	3.54	0.71	
40 hr	14.85	5.4	3.55	1.03	
48 hr	14.93	6.0	3.57	1.25	2

Metal Specimen Data		
Weight change, mg/cm²:	Al	0.00
	Ti	–0.02
	Ag	–0.06
	Steel	0.00
	Cu	–0.10
	Mg	0.00
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	L yellow
	Steel	Blue
	Cu	L green
	Mg	No change

Test Cell Data		
Sludge in oil:	200-mesh filter	Trace
	Centrifuge, vol %	None
Tube deposits:	Total demerits	34

Breakpoint Data	
Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions	
Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

(a) Blend (4:1) of O-67-20 and O-67-7.

TEST NO. 352-1. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-60-18 AT 374°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	12.12	–	3.19	0.20	
16 hr	12.81	5.7	3.30	0.82	
24 hr	12.96	6.9	3.36	0.99	
40 hr	12.94	6.8	3.33	1.31	
48 hr	12.66	4.5	3.26	1.44	3

Metal Specimen Data		
Weight change, mg/cm²:	Al	0.00
	Ti	+0.04
	Ag	+0.16
	Steel	–0.02
	Cu	0.00
	Mg	+0.08
Metal discoloration, deposits, pitting, or etching:	Al	L brown
	Ti	L yellow
	Ag	L yellow
	Steel	Purple
	Cu	Brown
	Mg	Brown

Test Cell Data		
Sludge in oil:	200-mesh filter	Trace
	Centrifuge, vol %	Trace
Tube deposits:	Total demerits	260

Breakpoint Data	
Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions	
Sample temperature, °F	374
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 352-2. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-67-3 AT 374°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	12.77	–	3.13	0.24	
16 hr	13.28	4.0	3.21	0.48	
24 hr	13.52	5.9	3.23	0.56	
40 hr	13.67	7.0	3.27	0.75	
48 hr	13.72	7.4	3.28	0.92	3

Metal Specimen Data

Weight change, mg/cm²:	Al	−0.02
	Ti	0.00
	Ag	+0.04
	Steel	+0.04
	Cu	+0.14
	Mg	+0.74
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	L yellow
	Steel	Green
	Cu	Gold
	Mg	Brown deposit

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	2

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions

Sample temperature, °F	374
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 352-3. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-67-7 AT 374°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	17.[illegible]	–	4.58	0.26	
16 hr	17.[illegible]	−1.2	4.51	0.65	
24 hr	17.[illegible]	−1.4	4.49	0.83	
40 hr	[illegible]	−2.2	4.45	0.96	
48 hr	[illegible]	−2.9	4.41	1.22	3

Metal Specimen Data

Weight change, mg/cm²:	Al	−0.04
	Ti	+0.06
	Ag	+0.02
	Steel	+0.04
	Cu	+0.02
	Mg	+0.24
Metal discoloration, deposits, pitting, or etching:	Al	L brown
	Ti	L yellow
	Ag	L yellow
	Steel	Blue
	Cu	Yellow
	Mg	Brown deposit

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	49

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions

Sample temperature, °F	374
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 352-4. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-67-9 AT 374°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	14.87	–	3.69	0.04	
16 hr	15.04	1.1	3.73	0.54	
24 hr	15.09	1.5	3.74	0.66	
40 hr	15.03	1.1	3.71	0.88	
48 hr	15.02	1.0	3.71	0.99	3

Metal Specimen Data			Test Cell Data		
Weight change, mg/cm²:	Al	+0.02	Sludge in oil:	200-mesh filter	None
	Ti	+0.10		Centrifuge, vol %	None
	Ag	+0.06			
	Steel	0.00	Tube deposits:	Total demerits	13
	Cu	–0.10			
	Mg	+0.20	**Breakpoint Data**		
Metal discoloration, deposits, pitting, or etching:			Neut. no., hr to 1 mg KOH/g/8 hr		48+
			100°F vis, hr to 1 cs/8 hr		48+
	Al	L brown	**Test Conditions**		
	Ti	Brown			
	Ag	L yellow	Sample temperature, °F		374
	Steel	Blue	Sample volume, ml		200
	Cu	Brown	Air rate, liters/hr		10
	Mg	Black deposit	Condensate return		Yes

TEST NO. 352-5. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-67-11 AT 374°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.26	–	3.21	0.05	
16 hr	13.77	3.8	3.30	0.25	
24 hr	13.89	4.8	3.33	0.20	
40 hr	14.09	6.3	3.36	0.64	
48 hr	14.23	7.3	3.38	0.75	3

Metal Specimen Data			Test Cell Data		
Weight change, mg/cm²:	Al	–0.04	Sludge in oil:	200-mesh filter	None
	Ti	0.00		Centrifuge, vol %	None
	Ag	0.00			
	Steel	–0.04	Tube deposits:	Total demerits	0
	Cu	–0.02			
	Mg	+0.04	**Breakpoint Data**		
Metal discoloration, deposits, pitting, or etching:			Neut. no., hr to 1 mg KOH/g/8 hr		48+
			100°F vis, hr to 1 cs/8 hr		48+
	Al	No change	**Test Conditions**		
	Ti	No change			
	Ag	L yellow	Sample temperature, °F		374
	Steel	Blue	Sample volume, ml		200
	Cu	Yellow	Air rate, liters/hr		10
	Mg	No change	Condensate return		Yes

TEST NO. 352-6. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-67-20 AT 374°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.48	–	3.25	0.21	
16 hr	14.09	4.5	3.36	0.31	
24 hr	14.25	5.7	3.38	0.39	
40 hr	14.45	7.2	3.42	0.53	
48 hr	14.54	7.9	3.43	0.64	4

Metal Specimen Data

Weight change, mg/cm²:	Al	–0.04
	Ti	+0.04
	Ag	+0.04
	Steel	–0.08
	Cu	+0.06
	Mg	+0.10
Metal discoloration, deposits, pitting, or etching:	Al	L yellow
	Ti	Brown
	Ag	Brown
	Steel	Green
	Cu	Brown
	Mg	L yellow

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	1

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions

Sample temperature, °F	374
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 352-7. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-67-24 AT 374°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.04	–	3.47	0.24	
16 hr	13.14	0.8	3.49	0.92	
24 hr	13.10	0.5	3.47	1.05	
40 hr	13.17	1.0	3.43	1.41	
48 hr	13.19	1.2	3.46	1.63	3

Metal Specimen Data

Weight change, mg/cm²:	Al	–0.04
	Ti	–0.02
	Ag	+0.04
	Steel	–0.04
	Cu	+0.02
	Mg	+0.08
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	Yellow
	Steel	No change
	Cu	No change
	Mg	No change

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	1

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions

Sample temperature, °F	374
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 352-8. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-68-1 AT 374°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.29	–	3.21	0.00	
16 hr	13.80	3.8	3.30	0.11	
24 hr	13.86	4.3	3.31	0.21	
40 hr	14.15	6.5	3.34	0.42	
48 hr	14.26	7.3	3.37	0.48	2

Metal Specimen Data

Weight change, mg/cm²:	Al	−0.10
	Ti	0.00
	Ag	−0.12
	Steel	−0.04
	Cu	0.00
	Mg	+0.10
Metal discoloration, deposits, pitting, or etching:	Al	L yellow
	Ti	Brown
	Ag	L yellow
	Steel	L purple
	Cu	Gold
	Mg	No change

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	0

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions

Sample temperature, °F	374
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 353-1. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON L-1136A[a] AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	16.08	–	4.13	0.15	
16 hr	15.74	−2.1	4.02	0.94	
24 hr	15.60	−3.0	3.97	1.19	
40 hr	15.38	−4.4	3.74	7.91	
48 hr	17.44	+8.5	4.06	14.95	4

Metal Specimen Data

Weight change, mg/cm²:	Al	−0.04
	Ti	−0.02
	Ag	−0.10
	Steel	+0.02
	Cu	−0.28
	Mg	−0.82
Metal discoloration, deposits, pitting, or etching:	Al	L brown
	Ti	Brown
	Ag	Brown
	Steel	Green
	Cu	L pitting
	Mg	M etching

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	48

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	29
100°F vis, hr to 1 cs/8 hr	42

Test Conditions

Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

(a) Blend (1:1) of O-67-7 and O-67-9.

TEST NO. 353-2. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON M-1106[a] AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	15.22	–	3.85	0.17	
16 hr	15.28	0.4	3.82	0.60	
24 hr	15.26	0.3	3.81	0.79	
40 hr	15.24	0.1	3.70	3.70	
48 hr	17.49	14.9	3.98	10.51	3

Metal Specimen Data		
Weight change, mg/cm²:	Al	0.00
	Ti	–0.04
	Ag	–0.10
	Steel	–0.04
	Cu	–0.14
	Mg	–0.56
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	L yellow
	Steel	Blue-green
	Cu	Gold
	Mg	L etching

Test Cell Data		
Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	2

Breakpoint Data	
Neut. no., hr to 1 mg KOH/g/8 hr	30
100°F vis, hr to 1 cs/8 hr	42

Test Conditions	
Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

(a) Blend (1:1) of O-67-7 and O-67-11.

TEST NO. 353-3. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON M-1107[a] AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	15.11	–	4.00	0.25	
16 hr	15.05	–0.4	3.93	1.13	
24 hr	14.91	–1.3	3.89	1.39	
40 hr	15.02	–0.6	3.72	10.16	
48 hr	16.72	+10.7	3.98	17.85	4

Metal Specimen Data		
Weight change, mg/cm²:	Al	0.00
	Ti	–0.04
	Ag	–0.12
	Steel	–0.02
	Cu	–0.34
	Mg	–0.54
Metal discoloration, deposits, pitting, or etching:	Al	L brown
	Ti	No change
	Ag	Tan
	Steel	L purple
	Cu	L pitting
	Mg	L etching

Test Cell Data		
Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	26

Breakpoint Data	
Neut. no., hr to 1 mg KOH/g/8 hr	28
100°F vis, hr to 1 cs/8 hr	45

Test Conditions	
Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	100
Condensate return	Yes

(a) Blend (1:1) of O-67-7 and O-67-24.

TEST NO. 353-4. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON M-1108[a] AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	14.16	–	3.49	0.06	
16 hr	14.46	2.1	3.52	0.47	
24 hr	14.53	2.6	3.52	0.59	
40 hr	14.58	3.0	3.52	0.79	
48 hr	14.63	3.3	3.53	0.93	2

Metal Specimen Data			Test Cell Data		
Weight change, mg/cm²:	Al	0.00	Sludge in oil:	200-mesh filter	None
	Ti	−0.04		Centrifuge, vol %	None
	Ag	−0.02			
	Steel	0.00	Tube deposits:	Total demerits	0
	Cu	−0.02			
	Mg	−0.06	**Breakpoint Data**		
Metal discoloration, deposits, pitting, or etching:			Neut. no., hr to 1 mg KOH/g/8 hr		48+
			100°F vis, hr to 1 cs/8 hr		48+
	Al	No change	**Test Conditions**		
	Ti	No change			
	Ag	No change			
	Steel	Blue-green	Sample temperature, °F		392
	Cu	Gold	Sample volume, ml		200
	Mg	No change	Air rate, liters/hr		10
			Condensate return		Yes

(a) Blend (1:1) of O-67-9 and O-67-11.

TEST NO. 353-5. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON M-1109[a] AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	14.21	–	3.49	0.12	
16 hr	14.60	2.7	3.52	0.47	
24 hr	14.67	3.2	3.52	0.60	
40 hr	14.76	3.9	3.54	0.84	
48 hr	14.81	4.2	3.53	1.08	2

Metal Specimen Data			Test Cell Data		
Weight change, mg/cm²:	Al	−0.04	Sludge in oil:	200-mesh filter	Trace
	Ti	0.00		Centrifuge, vol %	Trace
	Ag	−0.06			
	Steel	0.00	Tube deposits:	Total demerits	73
	Cu	−0.18			
	Mg	−0.12	**Breakpoint Data**		
Metal discoloration, deposits, pitting, or etching:			Neut. no., hr to 1 mg KOH/g/8 hr		48+
			100°F vis, hr to 1 cs/8 hr		48+
	Al	No change	**Test Conditions**		
	Ti	No change			
	Ag	Tan			
	Steel	Blue	Sample temperature, °F		392
	Cu	Orange	Sample volume, ml		200
	Mg	No change	Air rate, liters/hr		10
			Condensate return		Yes

(a) Blend (1:1) of O-67-9 and O-67-20.

TEST NO. 353-6. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON M-1110[a] AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.96	–	3.60	0.16	
16 hr	14.08	-0.9	3.59	0.94	
24 hr	14.08	+0.9	3.58	1.19	
40 hr	13.94	–0.1	3.54	2.04	
48 hr	14.75	+5.7	3.59	8.35	2

Metal Specimen Data			Test Cell Data		
Weight change, mg/cm²:	Al	0.00	Sludge in oil:	200-mesh filter	None
	Ti	+0.06		Centrifuge, vol %	None
	Ag	–0.04			
	Steel	+0.04	Tube deposits:	Total demerits	13
	Cu	–0.32			
	Mg	+0.06			
			Breakpoint Data		
Metal discoloration, deposits, pitting, or etching:			Neut. no., hr to 1 mg KOH/g		39
			100°F vis, hr to 1 cs/8 hr		46
	Al	No change			
	Ti	No change	**Test Conditions**		
	Ag	Tan			
	Steel	L purple	Sample temperature, °F		392
	Cu	L etching	Sample volume, ml		200
	Mg	Blue-green	Air rate, liters/hr		10
			Condensate return		Yes

(a) Blend (1:1) of O-67-9 and O-67-24.

TEST NO. 353-7. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON M-1111[a] AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.36	–	3.24	0.12	
16 hr	14.11	5.6	3.36	0.49	
24 hr	14.30	7.0	3.39	0.68	
40 hr	14.52	8.7	3.41	0.89	
48 hr	[illegible]	9.1	3.44	1.13	2

Metal Specimen Data			Test Cell Data		
Weight change, mg/cm²:	Al	–0.04	Sludge in oil:	200-mesh filter	None
	Ti	+0.04		Centrifuge, vol %	None
	Ag	–0.06			
	Steel	+0.04	Tube deposits:	Total demerits	1
	Cu	–0.02			
	Mg	+0.06			
			Breakpoint Data		
Metal discoloration, deposits, pitting, or etching:			Neut. no., hr to 1 mg KOH/g/8 hr		48+
			100°F vis, hr to 1 cs/8 hr		48+
	Al	No change			
	Ti	No change	**Test Conditions**		
	Ag	Tan			
	Steel	Green	Sample temperature, °F		392
	Cu	Orange	Sample volume, ml		200
	Mg	Gray	Air rate, liters/hr		10
			Condensate return		Yes

(a) Blend (1:1) of O-67-11 and O-67-20.

TEST NO. 354-1. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON M-1112[a] AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.03	–	3.33	0.16	
16 hr	13.49	3.5	3.40	1.18	
24 hr	13.66	4.8	3.41	1.99	
40 hr	16.76	28.6	3.82	11.47	
48 hr	19.30	48.1	4.20	16.21	6

Metal Specimen Data			Test Cell Data		
Weight change, mg/cm²:	Al	–0.02	Sludge in oil:	200-mesh filter	None
	Ti	+0.04		Centrifuge, vol %	None
	Ag	0.00			
	Steel	+0.04	Tube deposits:	Total demerits	2
	Cu	–0.30			
	Mg	–1.06	**Breakpoint Data**		
Metal discoloration, deposits, pitting, or etching:			Neut. no., hr to 1 mg KOH/g/8 hr		22
			100°F vis, hr to 1 cs/8 hr		29
	Al	L blue	**Test Conditions**		
	Ti	No change			
	Ag	Tan	Sample temperature, °F		392
	Steel	Purple	Sample volume, ml		200
	Cu	L etching	Air rate, liters/hr		10
	Mg	L pitting	Condensate return		Yes

(a) Blend (1:1) of O-67-11 and O-67-24.

TEST NO. 354-2. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON M-1113[a] AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.13	–	3.34	0.22	
16 hr	13.65	4.0	3.42	0.84	
24 hr	13.77	4.9	3.42	1.45	
40 hr	14.54	10.7	3.52	4.87	
48 hr	16.66	26.9	3.82	11.81	3

Metal Specimen Data			Test Cell Data		
Weight change, mg/cm²:	Al	0.00	Sludge in oil:	200-mesh filter	None
	Ti	+0.04		Centrifuge, vol %	Trace
	Ag	–0.06			
	Steel	+0.06	Tube deposits:	Total demerits	4
	Cu	–0.26			
	Mg	–0.72	**Breakpoint Data**		
Metal discoloration, deposits, pitting, or etching:			Neut. no., hr to 1 mg KOH/g/8 hr		29
			100°F vis, hr to 1 cs/8 hr		39
	Al	No change	**Test Conditions**		
	Ti	No change			
	Ag	Gray	Sample temperature, °F		392
	Steel	Purple	Sample volume, ml		200
	Cu	L etching	Air rate, liters/hr		10
	Mg	M pitting	Condensate return		Yes

(a) Blend (1:1) of O-67-20 and O-67-24.

TEST NO. 355-1. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON M-1082A[a] AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	15.21	–	3.87	0.20	
16 hr	15.12	–0.6	3.78	0.66	
24 hr	15.11	–0.7	3.72	0.90	
40 hr	17.30	+13.7	3.94	9.37	
48 hr	19.60	+28.9	4.25	14.94	5

Metal Specimen Data

Weight change, mg/cm²:	Al	–0.08
	Ti	–0.08
	Ag	0.00
	Steel	–0.04
	Cu	–0.22
	Mg	–0.28
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	L brown
	Steel	Blue
	Cu	L etching
	Mg	L pitting

Test Cell Data

Sludge in oil:	200-mesh filter	Trace
	Centrifuge, vol %	0.2
Tube deposits:	Total demerits	68

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	29
100°F vis, hr to 1 cs/8 hr	32

Test Conditions

Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

(a) Blend (1:1) of O-67-7 and O-67-20.

TEST NO. 355-2. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON M-1114[a] AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	15.13	–	3.82	0.18	
16 hr	15.14	+0.1	3.76	0.64	
24 hr	15.10	–0.2	3.74	0.84	
40 hr	15.37	+1.6	3.71	3.37	
48 hr	17.02	+12.5	3.91	9.14	3

Metal Specimen Data

Weight change, mg/cm²:	Al	0.00
	Ti	–0.02
	Ag	0.00
	Steel	+0.04
	Cu	–0.02
	Mg	0.00
Metal discoloration, deposits, pitting, or etching:	Al	L yellow
	Ti	L brown
	Ag	L brown
	Steel	Blue-green
	Cu	Orange
	Mg	L yellow

Test Cell Data

Sludge in oil:	200-mesh filter	Trace
	Centrifuge, vol %	0.4
Tube deposits:	Total demerits	88

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	32
100°F vis, hr to 1 cs/8 hr	43

Test Conditions

Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

(a) Blend (1:1:1) of O-67-7, O-67-9, and O-67-20.

TEST NO. 355-3. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON M-1116[a] AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	14.33	–	3.55	0.19	
15 hr	14.76	3.0	3.58	0.53	
24 hr	14.79	3.2	3.57	0.75	
40 hr	14.91	4.0	3.55	1.17	
48 hr	14.98	4.5	3.59	1.67	2

Metal Specimen Data		
Weight change, mg/cm²:	Al	0.00
	Ti	0.00
	Ag	–0.02
	Steel	0.00
	Cu	–0.10
	Mg	–0.06
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	L yellow
	Steel	Blue
	Cu	Brown
	Mg	No change

Test Cell Data		
Sludge in oil:	200-mesh filter	Trace
	Centrifuge, vol %	None
Tube deposits:	Total demerits	–

Breakpoint Data	
Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions	
Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

(a) Blend (1:3) of O-67-7 and O-67-20.

TEST NO. 355-4. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON M-1117[a] AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	16.23	–	4.20	0.24	
16 hr	15.74	–3.0	4.03	0.79	
24 hr	15.51	–4.4	3.96	1.11	
40 hr	17.15	+5.7	4.04	11.80	
48 hr	19.06	+17.4	4.33	17.56	6

Metal Specimen Data		
Weight change, mg/cm²:	Al	+0.02
	Ti	+0.04
	Ag	–0.02
	Steel	+0.04
	Cu	–0.72
	Mg	–0.26
Metal discoloration, deposits, pitting, or etching:	Al	L yellow
	Ti	L brown
	Ag	L yellow
	Steel	Green
	Cu	L etching
	Mg	L pitting

Test Cell Data		
Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	Trace
Tube deposits:	Total demerits	66

Breakpoint Data	
Neut. no., hr to 1 mg KOH/g/8 hr	28
100°F vis, hr to 1 cs/8 hr	35

Test Conditions	
Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

(a) Blend (3:1) of O-67-7 and O-67-20.

TEST NO. 356-1. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-60-18 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	12.12	–	3.19	0.20	
16 hr	13.02	7.4	3.34	1.40	
24 hr	12.78	5.4	3.30	1.75	
40 hr	12.82	5.8	3.30	2.40	
48 hr	12.85	6.0	3.30	2.90	5

Metal Specimen Data

Weight change, mg/cm²:	Al	+0.26
	Ti	+0.28
	Ag	+0.24
	Steel	+0.26
	Cu	–0.20
	Mg	+0.30
Metal discoloration, deposits, pitting, or etching:	Al	Brown deposit
	Ti	Brown deposit
	Ag	Brown deposit
	Steel	Black deposit
	Cu	L etching
	Mg	Black deposit

Test Cell Data

Sludge in oil:	200-mesh filter	Trace
	Centrifuge, vol %	0.2
Tube deposits:	Total demerits	283

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions

Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	20
Condensate return	Yes

TEST NO. 356-2. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-67-3 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	12.77	–	3.13	0.24	
16 hr	13.61	6.6	3.26	0.75	
24 hr	13.77	7.8	3.29	0.95	
40 hr	14.01	9.7	3.34	1.13	
48 hr	14.11	10.5	3.33	1.27	2

Metal Specimen Data

Weight change, mg/cm²:	Al	0.00
	Ti	+0.02
	Ag	+0.06
	Steel	0.00
	Cu	+0.06
	Mg	+0.26
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	L yellow
	Steel	L green
	Cu	Orange
	Mg	Gray deposit

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	3

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions

Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	20
Condensate return	Yes

TEST NO. 356-3. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-67-7 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	17.34	–	4.58	0.26	
16 hr	16.94	–2.3	4.43	1.02	
24 hr	16.66	–3.9	4.36	1.36	
40 hr	17.69	+2.0	4.15	1.66	
48 hr	21.50	+24.0	4.78	23.9	8

Metal Specimen Data

Weight change, mg/cm²:	Al	+0.04
	Ti	+0.02
	Ag	+0.06
	Steel	–0.04
	Cu	–0.88
	Mg	–18.0
Metal discoloration, deposits, pitting, or etching:	Al	L brown
	Ti	L purple
	Ag	L brown
	Steel	Gold
	Cu	M etching
	Mg	H etching & M pitting

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	64

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	44
100°F vis, hr to 1 cs/8 hr	38

Test Conditions

Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	20
Condensate return	Yes

TEST NO. 356-4. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-67-9 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	14.87	–	3.69	0.04	
16 hr	15.04	+1.1	3.70	0.93	
24 hr	14.98	+0.7	3.70	1.14	
40 hr	14.86	–0.1	3.64	1.74	
48 hr	15.71	+5.6	3.69	6.93	4

Metal Specimen Data

Weight change, mg/cm²:	Al	+0.02
	Ti	0.00
	Ag	+0.04
	Steel	–0.04
	Cu	–0.02
	Mg	+0.02
Metal discoloration, deposits, pitting, or etching:	Al	L brown
	Ti	L purple
	Ag	L brown
	Steel	Blue-green
	Cu	Purple-gold
	Mg	L yellow

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	24

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	41
100°F vis, hr to 1 cs/8 hr	46

Test Conditions

Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	20
Condensate return	Yes

TEST NO. 356-5. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-67-11 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.26	–	3.21	0.05	
16 hr	14.65	10.5	3.36	0.56	
24 hr	14.31	7.9	3.38	0.84	
40 hr	14.64	10.4	3.43	1.01	
48 hr	14.76	11.3	3.46	1.16	3

Metal Specimen Data

Weight change, mg/cm²:	Al	−0.04
	Ti	−0.02
	Ag	0.00
	Steel	−0.02
	Cu	+0.06
	Mg	+0.06
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	No change
	Steel	Blue-green
	Cu	Gold
	Mg	No change

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	2

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions

Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	20
Condensate return	Yes

TEST NO. 356-6. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-67-20 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.48	–	3.25	0.21	
16 hr	14.43	7.0	3.40	0.55	
24 hr	14.62	8.5	3.43	0.68	
40 hr	14.93	10.8	3.48	0.72	
48 hr	15.08	11.9	3.52	0.85	4

Metal Specimen Data

Weight change, mg/cm²:	Al	+0.04
	Ti	−0.04
	Ag	+0.02
	Steel	0.00
	Cu	0.00
	Mg	+0.04
Metal discoloration, deposits, pitting, or etching:	Al	L brown
	Ti	L brown
	Ag	Tan
	Steel	Blue-green
	Cu	Brown
	Mg	No change

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	14

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions

Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	20
Condensate return	Yes

TEST NO. 356-7. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-67-24 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.04	–	3.47	0.24	
16 hr	13.19	1.2	3.46	1.56	
24 hr	13.22	1.4	3.45	1.77	
40 hr	13.22	1.4	3.44	2.56	
48 hr	13.14	0.8	3.44	4.68	4

Metal Specimen Data

Weight change, mg/cm²:	Al	+0.04
	Ti	–0.04
	Ag	–0.04
	Steel	0.00
	Cu	0.04
	Mg	+0.10
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	Gray
	Steel	L purple
	Cu	No change
	Mg	L blue

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	1

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	40
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions

Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	20
Condensate return	Yes

TEST NO. 356-8. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-68-1 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.29		3.21	0.00	
16 hr	14.16	6.5	3.34	0.39	
24 hr	14.35	8.0	3.35	0.56	
40 hr	14.49	9.0	3.40	0.66	
48 hr	14.73	10.8	3.44	0.82	3

Metal Specimen Data

Weight change, mg/cm²:	Al	+0.02
	Ti	0.02
	Ag	0.00
	Steel	0.00
	Cu	0.00
	Mg	0.00
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	L brown
	Ag	L yellow
	Steel	Purple-gold
	Cu	Orange
	Mg	No change

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	0

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions

Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	20
Condensate return	Yes

TEST NO. 357-1. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON ATL-877 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	14.01	–	3.37	0.15	
16 hr	14.71	5.0	3.49	0.35	
24 hr	14.96	6.8	3.52	0.50	
40 hr	15.08	7.6	3.54	0.76	
48 hr	15.24	8.8	3.56	0.91	4

Metal Specimen Data		
Weight change, mg/cm²:	Al	0.00
	Ti	−0.02
	Ag	0.00
	Steel	0.00
	Cu	−0.04
	Mg	−0.02
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	No change
	Steel	Blue
	Cu	Pink
	Mg	L brown

Test Cell Data		
Sludge in oil:	200-mesh filter	Trace
	Centrifuge, vol %	0.4
Tube deposits:	Total demerits	41

Breakpoint Data	
Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions	
Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 357-2. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON ATL-883 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.41	–	3.31	0.25	
16 hr	14.26	6.3	3.44	0.59	
24 hr	14.44	7.7	3.47	0.73	
40 hr	14.57	8.7	3.50	1.12	
48 hr	14.77	10.1	3.53	1.42	3

Metal Specimen Data		
Weight change, mg/cm²:	Al	0.00
	Ti	−0.02
	Ag	0.00
	Steel	0.04
	Cu	0.06
	Mg	+0.06
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	No change
	Steel	Blue
	Cu	Pink
	Mg	L yellow

Test Cell Data		
Sludge in oil:	200-mesh filter	Trace
	Centrifuge, vol %	0.4
Tube deposits:	Total demerits	46

Breakpoint Data	
Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions	
Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 357-3. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON ATL-885 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.87	–	3.39	0.12	
16 hr	14.68	5.8	3.49	0.48	
24 hr	14.87	7.2	3.52	0.61	
40 hr	14.97	7.9	3.53	0.81	
48 hr	15.09	8.8	3.55	0.95	2

Metal Specimen Data		
Weight change, mg/cm^2:	Al	0.00
	Ti	0.00
	Ag	−0.02
	Steel	+0.02
	Cu	−0.06
	Mg	0.00
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	No change
	Steel	Blue
	Cu	Brown-pink
	Mg	L yellow

Test Cell Data		
Sludge in oil:	200-mesh filter	Trace
	Centrifuge, vol %	0.2
Tube deposits:	Total demerits	80

Breakpoint Data	
Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions	
Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 357-4. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON ATL-884 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.80	–	3.32	0.18	
16 hr	14.57	5.6	3.45	0.46	
24 hr	14.74	6.8	3.47	0.58	
40 hr	14.83	7.5	3.48	0.79	
48 hr	14.99	8.6	3.50	0.89	2

Metal Specimen Data		
Weight change, mg/cm^2:	Al	0.00
	Ti	−0.02
	Ag	−0.02
	Steel	0.00
	Cu	0.04
	Mg	0.00
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	No change
	Steel	Blue
	Cu	Brown-pink
	Mg	L yellow

Test Cell Data		
Sludge in oil:	200-mesh filter	Trace
	Centrifuge, vol %	0.2
Tube deposits:	Total demerits	60

Breakpoint Data	
Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions	
Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 357-5. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON ATL-869 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.80	–	3.36	0.15	
16 hr	14.35	4.0	3.44	0.38	
24 hr	14.51	5.1	3.49	0.44	
40 hr	14.63	6.0	3.48	0.65	
48 hr	14.70	6.5	3.50	0.84	3

Metal Specimen Data		
Weight change, mg/cm²:	Al	0.00
	Ti	0.00
	Ag	+0.04
	Steel	0.00
	Cu	–0.04
	Mg	0.00
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	L yellow
	Steel	Blue-green
	Cu	Orange
	Mg	No change

Test Cell Data		
Sludge in oil:	200-mesh filter	Trace
	Centrifuge, vol %	None
Tube deposits:	Total demerits	58

Breakpoint Data	
Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions	
Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 357-6. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON ATL-870 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.85	–	3.34	0.17	
16 hr	14.48	4.5	3.44	0.38	
24 hr	14.61	5.5	3.48	0.49	
40 hr	14.71	6.2	3.49	0.70	
48 hr	14.83	7.1	3.50	0.73	2

Metal Specimen Data		
Weight change, mg/cm²:	Al	0.00
	Ti	-0.06
	Ag	+0.02
	Steel	0.00
	Cu	0.02
	Mg	0.00
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	L yellow
	Steel	Blue-green
	Cu	Orange
	Mg	No change

Test Cell Data		
Sludge in oil:	200-mesh filter	Trace
	Centrifuge, vol %	Trace
Tube deposits:	Total demerits	43

Breakpoint Data	
Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions	
Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 358-1. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-67-7 AT 347°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	17.34	–	4.58	0.26	
7 days	16.89	–2.6	4.45	1.23	3

Metal Specimen Data			Test Cell Data		
Weight change, mg/cm²:	Al	+0.08	Sludge in oil:	200-mesh filter	None
	Ti	+0.04		Centrifuge, vol %	None
	Ag	+0.08			
	Steel	+0.04	Tube deposits:	Total demerits	14
	Cu	–0.04			
	Mg	–0.08	**Breakpoint Data**		
Metal discoloration, deposits, pitting, or etching:			Neut. no., days to 1 mg KOH/g/4 days		7+
			100°F vis, days to 1 cs/4 days		7+
	Al	L brown	**Test Conditions**		
	Ti	L brown			
	Ag	L yellow			
	Steel	Blue	Sample temperature, °F		347
	Cu	Gold–L green	Sample volume, ml		200
	Mg	Brown	Air rate, liters/hr		10
			Condensate return		Yes

TEST NO. 358-2. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-67-7 AT 347°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	17.34	–	4.58	0.26	
7 days	16.85	–2.8	4.43	1.27	
14 days	15.95	–8.0	4.16	2.97	3

Metal Specimen Data			Test Cell Data		
Weight change, mg/cm²:	Al	+0.02	Sludge in oil:	200-mesh filter	None
	Ti	+0.06		Centrifuge, vol %	None
	Ag	0.00			
	Steel	+0.02	Tube deposits:	Total demerits	26
	Cu	+0.02			
	Mg	+0.04	**Breakpoint Data**		
Metal discoloration, deposits, pitting, or etching			Neut. no., days to 1 mg KOH/g/4 days		12
			100°F vis, days to 1 cs/4 days		14+
	Al	L brown	**Test Conditions**		
	Ti	L brown			
	Ag	Yellow			
	Steel	L yellow & blue	Sample temperature, °F		347
	Cu	Gold	Sample volume, ml		200
	Mg	Brown	Air rate, liters/hr		10
			Condensate return		Yes

TEST NO. 358-3. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-67-7 AT 347°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	17.34	–	4.58	0.26	
7 days	16.90	-2.5	4.44	1.21	
14 days	16.05	-7.4	4.19	2.47	
21 days	31.69	+82.8	6.62	39.7	10

Metal Specimen Data

Weight change, mg/cm²:	Al	+0.02
	Ti	+0.02
	Ag	0.00
	Steel	+0.02
	Cu	-1.53
	Mg	-0.10
Metal discoloration, deposits, pitting, or etching:	Al	Yellow
	Ti	Yellow
	Ag	Yellow
	Steel	Orange
	Cu	M pitting
	Mg	Tan

Test Cell Data

Sludge in oil:	200-mesh filter	Trace
	Centrifuge, vol %	0.4
Tube deposits:	Total demerits	75

Breakpoint Data

Neut. no., days to 1 mg KOH/g/4 days	14
100°F vis, days to 1 cs/4 days	17

Test Conditions

Sample temperature, °F	347
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 358-4. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-67-24 AT 347°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.04	–	3.47	0.24	
7 days	13.27	1.8	3.46	1.88	2

Metal Specimen Data

Weight change, mg/cm²:	Al	+0.04
	Ti	+0.12
	Ag	+0.02
	Steel	+0.12
	Cu	0.34
	Mg	+0.10
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	L yellow
	Ag	L yellow
	Steel	Yellow
	Cu	L etching
	Mg	L brown

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	4

Breakpoint Data

Neut. no., days to 1 mg KOH/g/4 days	7+
100°F vis, days to 1 cs/4 days	7+

Test Conditions

Sample temperature, °F	347
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 358-5. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-67-24 AT 347°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt. %
Initial	13.04		3.47	0.24	
7 days	13.30	2.0	3.47	1.83	
14 days	13.32	2.1	3.44	3.38	4

Metal Specimen Data

Weight change, mg/cm²:	Al	+0.02
	Ti	+0.02
	Ag	0.02
	Steel	-0.02
	Cu	-0.50
	Mg	+0.08
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	L yellow
	Steel	L yellow
	Cu	L etching
	Mg	L yellow

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	4

Breakpoint Data

Neut. no., days to 1 mg KOH/g/4 days	12
100°F vis, days to 1 cs/4 days	14+

Test Conditions

Sample temperature, °F	347
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 358-6. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-67-24 AT 347°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt. %
Initial	13.04	-	3.47	0.24	
7 days	13.29	1.9	3.45	1.90	
14 days	13.51	3.6	3.44	5.74	
21 days	39.65	204	6.93	60.7	17

Metal Specimen Data

Weight change, mg/cm²:	Al	+0.02
	Ti	0.00
	Ag	0.12
	Steel	0.00
	Cu	0.64
	Mg	4.10
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	Gray
	Steel	L brown & blue
	Cu	L etching & pitting
	Mg	H etching

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	72

Breakpoint Data

Neut. no., days to 1 mg KOH/g/4 days	8
100°F vis, days to 1 cs/4 days	20

Test Conditions

Sample temperature, °F	347
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 358-7. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-67-24 AT 347°

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.04	–	3.47	0.24	
7 days	13.31	2.1	3.48	1.77	
14 days	13.34	2.3	3.47	2.35	
21 days	13.38	2.6	3.46	3.02	
26 days	13.40	2.8	3.46	2.99	5

Metal Specimen Data

Weight change, mg/cm²:	Al	-0.02
	Ti	+0.02
	Ag	-0.10
	Steel	+0.02
	CA674	+0.14
	Mg	+0.08
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	Yellow
	Steel	L purple
	CA674	Purple & green
	Mg	No change

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	1

Breakpoint Data

Neut. no., days to 1 mg KOH/g/4 days	26+
100°F vis, days to 1 cs/4 days	26+

Test Conditions

Sample temperature, °F	347
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 358-8. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-67-24 AT 347°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.04	–	3.47	0.24	
7 days	13.31	2.1	3.48	1.72	
14 days	13.34	2.3	3.37	2.41	
21 days	13.34	2.3	3.46	2.71	
26 days	13.38	2.6	3.46	2.95	4

Metal Specimen Data

Weight change, mg/cm²:	Al	+0.08
	Ti	+0.02
	Ag	-0.02
	Steel	+0.06
	CA674	+0.06
	Mg	+0.06
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	Yellow
	Steel	L purple
	CA674	Purple & L green
	Mg	No change

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	2

Breakpoint Data

Neut. no., days to 1 mg KOH/g/4 days	26+
100°F vis, days to 1 cs/4 days	26+

Test Conditions

Sample temperature, °F	347
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 359-1. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-67-8 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.24	–	3.26	0.23	
16 hr	14.40	8.8	3.46	1.22	
24 hr	14.57	10.0	3.47	1.42	
40 hr	14.85	12.2	3.54	1.78	
48 hr	14.99	13.2	3.56	2.11	4

Metal Specimen Data

Weight change, mg/cm²	Al	0.00
	Ti	+0.02
	Ag	0.00
	Steel	0.00
	Cu	−0.26
	Mg	−0.02
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	L brown
	Steel	Blue
	Cu	L etching
	Mg	L yellow

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	14

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions

Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 359-2. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-67-21 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	12.92	–	3.15	0.14	
16 hr	13.77	6.6	3.26	0.57	
24 hr	13.94	7.9	3.31	0.84	
40 hr	14.12	9.3	3.33	1.08	
48 hr	14.21	10.0	3.36	1.30	2

Metal Specimen Data

Weight change, mg/cm²:	Al	0.02
	Ti	0.00
	Ag	0.00
	Steel	0.02
	Cu	0.06
	Mg	0.02
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	L yellow
	Steel	Blue-green
	Cu	Gold
	Mg	Gray

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	19

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions

Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 359-3. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-68-6 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.10		3.19	0.29	
16 hr	14.16	8.1	3.35	1.41	
24 hr	14.43	10.2	3.39	1.95	
40 hr	17.01	29.8	3.77	8.46	
48 hr	18.59	41.9	3.99	12.08	5

Metal Specimen Data		
Weight change, mg/cm²:	Al	−0.04
	Ti	+0.02
	Ag	−0.02
	Steel	0.00
	Cu	−0.90
	Mg	−1.00
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	L yellow
	Steel	Blue-green-brown
	Cu	L etching
	Mg	L pitting & L etching

Test Cell Data		
Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	6

Breakpoint Data	
Neut. no., hr to 1 mg KOH/g/8 hr	25
100°F vis, hr to 1 cs/8 hr	27

Test Conditions	
Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 360-1. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON L-1136A[a] AT 347°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	16.08		4.13	0.15	
7 days	15.84	1.5	4.04	1.26	
14 days	16.06	0.1	4.05	1.73	
21 days	15.68	2.5	3.95	2.51	
26 days	15.81	1.7	3.98	2.33	17

Metal Specimen Data		
Weight change, mg/cm²:	Al	+0.02
	Ti	0.00
	Ag	0.02
	Steel	0.00
	Cu	0.56
	Mg	0.00
Metal discoloration, deposits, pitting, or etching	Al	Yellow
	Ti	Blue
	Ag	L yellow
	Steel	Green
	Cu	L pitting
	Mg	Yellow

Test Cell Data		
Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	20

Breakpoint Data	
Neut. no., days to 1 mg KOH/g/4 days	26+
100°F vis, days to 1 cs/4 days	26+

Test Conditions	
Sample temperature, °F	347
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

(a) Blend (1:1) of O-67-7 and O-67-9.

TEST NO. 360-2. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-68-1 AT 347°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt. %
Initial	13.29	–	3.21	0.00	
7 days	14.43	8.6	3.40	0.47	
14 days	14.71	10.7	3.43	0.67	
21 days	14.97	12.6	3.47	0.63	
26 days	15.07	13.4	3.54	0.73	5

Metal Specimen Data

Weight change, mg/cm²:	Al	0.00
	Ti	0.00
	Ag	+0.02
	Steel	+0.02
	Cu	-0.08
	Mg	–0.04
Metal discoloration, deposits, pitting, or etching:	Al	L yellow
	Ti	[illegible]le-gold
	Ag	Tan
	Steel	Blue-green
	Cu	Gold
	Mg	No change

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	6

Breakpoint Data

Neut. no., days to 1 mg KOH/g/4 days	26+
100°F vis, days to 1 cs/4 days	26+

Test Conditions

Sample temperature, °F	347
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 361-1. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-68-6 AT 385°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt. %
Initial	13.10		3.19	0.29	
16 hr	14.11	7.7	3.33	1.25	
24 hr	14.28	9.0	3.35	1.65	
40 hr	15.81	20.7	3.56	5.40	
48 hr	17.59	34.3	3.83	9.37	5

Metal Specimen Data

Weight change, mg/cm²:	Al	+0.02
	Ti	+0.02
	Ag	0.00
	Steel	0.00
	Cu	0.44
	Mg	0.20
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	L yellow
	Steel	Blue & gold
	Cu	[illegible]
	Mg	L pitting & etching

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	4

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	[illegible]
100°F vis, hr to 1 cs/8 hr	[illegible]

Test Conditions

Sample temperature, °F	385
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 362-1. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-67-8 AT 401°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.24	–	3.25	0.23	
16 hr	14.50	9.5	3.47	1.51	
24 hr	14.72	11.2	3.50	1.77	
40 hr	15.00	13.3	3.55	2.24	
48 hr	15.16	14.5	3.59	2.49	3

Metal Specimen Data

Weight change, mg/cm²:	Al	–0.02
	Ti	+0.02
	Ag	–0.04
	Steel	+0.02
	Cu	–0.24
	Mg	–0.02
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	L yellow
	Steel	Blue-green
	Cu	L etching
	Mg	Yellow

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	2

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions

Sample temperature, °F	401
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 362-2. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-67-21 AT 401°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	12.92		3.15	0.14	
16 hr	13.89	7.5	3.31	0.83	
24 hr	13.98	8.2	3.34	0.99	
40 hr	14.31	10.8	3.36	1.47	
48 hr	14.42	11.6	3.39	1.67	2

Metal Specimen Data

Weight change, mg/cm²:	Al	0.00
	Ti	+0.04
	Ag	[illegible]
	Steel	+0.02
	Cu	0.02
	Mg	0.00
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	L yellow
	Ag	No change
	Steel	Green
	Cu	Gold
	Mg	No change

Test Cell Data

Sludge in oil:	[illegible]	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	12

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions

Sample temperature, °F	401
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 362-3. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-68-7 AT 401°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.69		3.38	0.08	
16 hr	14.56	6.4	3.52	1.23	
24 hr	14.78	8.0	3.55	1.91	
40 hr	15.21	11.1	3.61	3.19	
48 hr	16.45	20.2	3.79	8.07	3

Metal Specimen Data

Weight change, mg/cm²:	Al	0.00
	Ti	0.00
	Ag	-0.02
	Steel	+0.04
	Cu	-0.02
	Mg	+0.02
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	L yellow
	Steel	Green
	Cu	Gold
	Mg	No change

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits.	Total demerits	29

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	36
100°F vis, hr to 1 cs/8 hr	45

Test Conditions

Sample temperature, °F	401
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 363-1. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-68-10 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	15.24		3.98	0.28	
16 hr	15.25	+0.1	3.91	1.17	
24 hr	15.29	+0.3	3.93	1.49	
40 hr	15.28	+0.3	3.91	2.09	
48 hr	15.22	0.1	3.89	2.50	3

Metal Specimen Data

Weight change, mg/cm²:	Al	+0.02
	Ti	0.14
	Ag	+0.02
	Steel	+0.06
	Cu	0.00
	Mg	+0.10
Metal discoloration, deposits, pitting, or etching	Al	L blue
	Ti	L yellow
	Ag	Gray
	Steel	Brown & blue
	Cu	Orange
	Mg	Gray

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits	Total demerits	2

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions

Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 363-2. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON ATL-891 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.95	–	3.34	0.16	
16 hr	14.55	4.3	3.43	0.48	
24 hr	14.73	5.6	3.47	0.66	
40 hr	14.98	7.4	3.51	0.88	
48 hr	15.07	8.0	3.52	1.08	3

Metal Specimen Data			Test Cell Data		
Weight change, mg/cm²	Al	−0.02	Sludge in oil:	200-mesh filter	Trace
	Ti	−0.02		Centrifuge, vol %	Trace
	Ag	−0.04			
	Steel	−0.02	Tube deposits:	Total demerits	
	Cu	+0.06			
	Mg	−0.04	**Breakpoint Data**		
Metal discoloration, deposits, pitting, or etching:			Neut. no., hr to 1 mg KOH/g/8 hr		48+
			100°F vis, hr to 1 cs/8 hr		48+
	Al	No change	**Test Conditions**		
	Ti	No change			
	Ag	No change	Sample temperature, °F		392
	Steel	Blue	Sample volume, ml		200
	Cu	Pink	Air rate, liters/hr		10
	Mg	No change	Condensate return		Yes

TEST NO. 363-3. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON M-1052[a] AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.58	–	3.41	0.16	
16 hr	14.05	3.5	3.47	0.52	
24 hr	14.15	4.2	3.46	0.80	
40 hr	14.30	5.3	3.47	1.57	
48 hr	15.54	14.4	3.62	6.34	4

Metal Specimen Data			Test Cell Data		
Weight change, mg/cm²	Al	+0.04	Sludge in oil:	200-mesh filter	None
	Ti	−0.12		Centrifuge, vol %	None
	Ag	−0.02			
	Steel	0.00	Tube deposits:	Total demerits	3
	Cu	−0.24			
	Mg	−0.04	**Breakpoint Data**		
Metal discoloration, deposits, pitting, or etching			Neut. no., hr to 1 mg KOH/g/8 hr		59
			100°F vis, hr to 1 cs/8 hr		44
	Al	L brown	**Test Conditions**		
	Ti	No change			
	Ag	Gray	Sample temperature, °F		392
	Steel	Blue	Sample volume, ml		200
	Cu	L etching	Air rate, liters/hr		10
	Mg	L blue	Condensate return		Yes

(a) Blend (1:1:1:1) of O-67-9, O-67-11, O-67-20, and O-67-24.

TEST NO. 363-4. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON N-1000[a] AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.56	–	3.37	0.15	
16 hr	13.95	2.9	3.40	0.61	
24 hr	14.14	4.3	3.44	1.01	
40 hr	14.35	5.8	3.43	1.67	
48 hr	15.40	13.6	3.60	5.81	5

Metal Specimen Data		
Weight change, mg/cm²:	Al	0.00
	Ti	–0.14
	Ag	–0.02
	Steel	–0.10
	Cu	–0.20
	Mg	–0.04
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	Gray
	Steel	Purple
	Cu	L etching
	Mg	L green

Test Cell Data		
Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	16

Breakpoint Data	
Neut. no., hr to 1 mg KOH/g/8 hr	40
100°F vis, hr to 1 cs/8 hr	46

Test Conditions	
Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

(a) Blend (1:1:1:1:1) of O-67-9, O-67-11, O-67-20, O-67-24, and O-68-6.

TEST NO. 363-5. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON N-1001[a] AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.65	–	3.41	0.11	
16 hr	14.14	3.6	3.45	0.56	
24 hr	14.18	3.9	3.48	0.81	
40 hr	14.44	5.8	3.48	1.45	
48 hr	14.56	6.7	3.52	1.85	4

Metal Specimen Data		
Weight change, mg/cm²	Al	+0.02
	Ti	0.12
	Ag	0.02
	Steel	0.12
	Cu	–0.16
	Mg	0.02
Metal discoloration, deposits, pitting, or etching	Al	No change
	Ti	No change
	Ag	Gray
	Steel	Purple
	Cu	Brown
	Mg	L blue

Test Cell Data		
Sludge in oil	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits	Total demerits	2

Breakpoint Data	
Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions	
Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

(a) Blend (1:1:1:1:1) of O-67-9, O-67-11, O-67-20, O-67-24, and O-68-7.

TEST NO. 364-1. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-67-8 AT 410°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.24	–	3.26	0.23	
16 hr	14.66	10.7	3.49	2.02	
24 hr	14.96	13.0	3.55	2.03	
40 hr	15.51	17.1	3.61	3.05	
48 hr	16.18	22.2	3.74	5.17	5

Metal Specimen Data			Test Cell Data		
Weight change, mg/cm²:	Al	–0.06	Sludge in oil:	200-mesh filter	Trace
	Ti	–0.08		Centrifuge, vol %	None
	Ag	–0.10			
	Steel	+0.06	Tube deposits:	Total demerits	–
	Cu	–0.36			
	Mg	–0.06	**Breakpoint Data**		
Metal discoloration, deposits, pitting, or etching:			Neut. no., hr to 1 mg KOH/g/8 hr		38
			100°F vis, hr to 1 cs/8 hr		48+
	Al	No change	**Test Conditions**		
	Ti	No change			
	Ag	L yellow	Sample temperature, °F		410
	Steel	Blue-green	Sample volume, ml		200
	Cu	L etching	Air rate, liters/hr		10
	Mg	Gray	Condensate return		Yes

TEST NO. 364-2. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-67-21 AT 410°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	12.92	–	3.15	0.14	
16 hr	14.03	8.6	3.22	1.05	
24 hr	14.26	10.4	3.36	1.08	
40 hr	14.57	12.8	3.40	1.71	
48 hr	14.77	14.3	3.44	2.47	3

Metal Specimen Data			Test Cell Data		
Weight change, mg/cm²:	Al	–0.10	Sludge in oil:	200-mesh filter	None
	Ti	–0.06		Centrifuge, vol %	None
	Ag	–0.14			
	Steel	+0.06	Tube deposits:	Total demerits	8
	Cu	–0.08			
	Mg	–0.04	**Breakpoint Data**		
Metal discoloration, deposits, pitting, or etching:			Neut. no., hr to 1 mg KOH/g/8 hr		46
			100°F vis, hr to 1 cs/8 hr		48+
	Al	No change	**Test Conditions**		
	Ti	No change			
	Ag	L yellow	Sample temperature, °F		410
	Steel	Blue-yellow	Sample volume, ml		200
	Cu	Gold	Air rate, liters/hr		10
	Mg	No change	Condensate return		Yes

TEST NO. 363-4. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON N-1000[a] AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.56	–	3.37	0.15	
16 hr	13.95	2.9	3.40	0.61	
24 hr	14.14	4.3	3.44	1.01	
40 hr	14.35	5.8	3.43	1.67	
48 hr	15.40	13.6	3.60	5.81	5

Metal Specimen Data		
Weight change, mg/cm²:	Al	0.00
	Ti	–0.14
	Ag	–0.02
	Steel	–0.10
	Cu	–0.20
	Mg	–0.04
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	Gray
	Steel	Purple
	Cu	L etching
	Mg	L green

Test Cell Data		
Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	16

Breakpoint Data	
Neut. no., hr to 1 mg KOH/g/8 hr	40
100°F vis, hr to 1 cs/8 hr	46

Test Conditions	
Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

(a) Blend (1:1:1:1:1) of O-67-9, O-67-11, O-67-20, O-67-24, and O-68-6.

TEST NO. 363-5. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON N-1001[a] AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.65	–	3.41	0.11	
16 hr	14.14	3.6	3.45	0.56	
24 hr	14.18	3.9	3.48	0.81	
40 hr	14.44	5.8	3.48	1.45	
48 hr	14.56	6.7	3.52	1.85	4

Metal Specimen Data		
Weight change, mg/cm²:	Al	+0.02
	Ti	–0.12
	Ag	–0.02
	Steel	–0.12
	Cu	–0.16
	Mg	–0.02
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	Gray
	Steel	Purple
	Cu	Brown
	Mg	L blue

Test Cell Data		
Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	2

Breakpoint Data	
Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions	
Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

(a) Blend (1:1:1:1:1) of O-67-9, O-67-11, O-67-20, O-67-24, and O-68-7.

TEST NO. 364-3. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-68-1 AT 410°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.29	–	3.21	0.00	
16 hr	14.37	8.1	3.35	0.76	
24 hr	14.58	9.7	3.41	1.00	
40 hr	14.94	12.4	3.45	1.49	
48 hr	15.25	14.7	3.51	2.20	3

Metal Specimen Data

Weight change, mg/cm²:	Al	–0.06
	Ti	–0.12
	Ag	+0.04
	Steel	+0.08
	Cu	–0.10
	Mg	–0.02
Metal discoloration, deposits, pitting, or etching:	Al	L brown
	Ti	Yellow
	Ag	L brown
	Steel	Blue & yellow
	Cu	Green & orange
	Mg	No change

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	17

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	47
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions

Sample temperature, °F	410
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 365-1. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-68-6 AT 347°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.10		3.19	0.29	
7 days	15.45	17.9	3.55	3.37	
14 days	70.31	437	9.72	25.3	
21 days	90.36	590	11.92	21.6	
26 days	79.37	506	11.16	17.04	27

Metal Specimen Data

Weight change, mg/cm²:	Al	–0.04
	Ti	0.00
	Ag	–0.02
	Steel	–0.06
	Cu	–4.20
	Mg	–16.5
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	L yellow
	Steel	Blue-green
	Cu	L & M pitting
	Mg	H etching

Test Cell Data

Sludge in oil:	200-mesh filter	Trace
	Centrifuge, vol %	None
Tube deposits:	Total demerits	15

Breakpoint Data

Neut. no., days to 1 mg KOH/g/4 days	2
100°F vis, days to 1 cs/4 days	3

Test Conditions

Sample temperature, °F	347
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 365-2. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-68-7 AT 347°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.69	–	3.38	0.08	
7 days	14.72	7.5	3.56	0.94	
14 days	15.03	9.8	3.61	1.38	
21 days	15.17	10.8	3.64	1.46	
26 days	15.24	11.3	3.65	1.54	8

Metal Specimen Data

Weight change, mg/cm²:	Al	−0.04
	Ti	0.00
	Ag	−0.10
	Steel	−0.06
	Cu	−0.12
	Mg	+0.02
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	L brown
	Steel	Blue-green
	Cu	Gold
	Mg	No change

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	49

Breakpoint Data

Neut. no., days to 1 mg KOH/g/4 days	26+
100°F vis, days to 1 cs/4 days	26+

Test Conditions

Sample temperature, °F	347
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 365-3. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON M-1052[a] AT 347°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.58	–	3.41	0.16	
7 days	14.29	5.2	3.50	0.71	
14 days	14.57	7.3	3.53	1.11	
21 days	14.81	9.1	3.56	1.11	
26 days	14.86	9.4	3.60	1.18	8

Metal Specimen Data

Weight change, mg/cm²:	Al	0.00
	Ti	0.00
	Ag	0.06
	Steel	0.08
	Cu	0.42
	Mg	+0.08
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	Tan
	Steel	Blue-green
	Cu	L etching & pitting
	Mg	Peacock

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	58

Breakpoint Data

Neut. no., days to 1 mg KOH/g/4 days	26+
100°F vis, days to 1 cs/4 days	26+

Test Conditions

Sample temperature, °F	347
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

(a) Blend (1:1:1:1) of O-67-9, O-67-11, O-67-20, and O-67-24

TEST NO. 366-1. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-68-10 AT 401°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	15.24	–	3.98	0.28	
16 hr	15.20	–0.3	3.91	1.55	
24 hr	15.24	0.0	3.91	2.05	
40 hr	15.13	–0.7	3.82	3.97	
48 hr	16.83	+10.4	3.99	14.56	4

Metal Specimen Data		
Weight change, mg/cm²:	Al	–0.06
	Ti	–0.04
	Ag	–0.04
	Steel	+0.06
	Cu	–0.18
	Mg	–1.60
Metal discoloration, deposits, pitting, or etching:	Al	L blue
	Ti	L yellow
	Ag	Tan
	Steel	Peacock
	Cu	Brown
	Mg	M pitting

Test Cell Data		
Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	L trace
Tube deposits:	Total demerits	2

Breakpoint Data	
Neut. no., hr to 1 mg KOH/g/8 hr	35
100°F vis, hr to 1 cs/8 hr	45

Test Conditions	
Sample temperature, °F	401
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 368-1. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-68-10 AT 347°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	15.24	–	3.98	0.28	
7 days	15.52	1.8	3.97	1.55	
14 days	15.30	0.4	3.88	2.89	
21 days	20.87	36.9	4.59	26.7	
26 days	34.64	127	6.49	50.5	19

Metal Specimen Data		
Weight change, mg/cm²:	Al	0.02
	Ti	0.00
	Ag	0.08
	Steel	+0.02
	Cu	0.94
	Mg	0.18
Metal discoloration, deposits, pitting, or etching	Al	L yellow
	Ti	No change
	Ag	Tan
	Steel	Peacock
	Cu	M pitting
	Mg	Brown

Test Cell Data		
Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	76

Breakpoint Data	
Neut. no., days to 1 mg KOH/g/4 days	12
100°F vis, days to 1 cs/4 days	18

Test Conditions	
Sample temperature, °F	347
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 368-2. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-68-15 AT 347°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	12.90	–	3.11	0.13	
7 days	13.65	5.8	3.23	0.59	
14 days	13.97	8.3	3.28	0.68	
21 days	14.28	10.7	3.34	0.91	
26 days	14.56	12.9	3.38	1.32	4

Metal Specimen Data

Weight change, mg/cm²:	Al	0.00
	Ti	+0.08
	Ag	–0.08
	Steel	–0.04
	Cu	–0.14
	Mg	0.00
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	L yellow
	Steel	Blue-green
	Cu	Orange-gold
	Mg	No change

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	40

Breakpoint Data

Neut. no., days to 1 mg KOH/g/4 days	26+
100°F vis, days to 1 cs/4 days	26+

Test Conditions

Sample temperature, °F	347
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 368-3. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON N-1000[a] AT 347°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.56	–	3.37	0.15	
7 days	14.38	6.0	3.48	0.86	
14 days	14.68	8.3	3.53	1.08	
21 days	14.91	10.0	3.56	1.20	
26 days	15.01	10.7	3.58	1.23	9

Metal Specimen Data

Weight change, mg/cm²:	Al	–0.06
	Ti	+0.06
	Ag	–0.08
	Steel	0.00
	Cu	–0.34
	Mg	+0.02
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	Tan
	Steel	Blue
	Cu	L etching
	Mg	L green

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	Trace
Tube deposits:	Total demerits	36

Breakpoint Data

Neut. no., days to 1 mg KOH/g/4 days	26+
100°F vis, days to 1 cs/4 days	26+

Test Conditions

Sample temperature, °F	347
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

(a) Blend (1:1:1:1:1) of O-67-9, O-67-11, O-67-20, O-67-24, and O-68-6.

TEST NO. 368-4. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON N-1001[a] AT 347°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.65	–	3.41	0.11	
7 days	[illegible]	5.9	3.52	0.61	
14 days	[illegible]	7.8	3.56	1.02	
21 days	14.90	9.2	3.59	1.20	
26 days	14.95	9.5	3.60	1.35	10

Metal Specimen Data

Weight change, mg/cm²:	Al	+0.04
	Ti	0.00
	Ag	-0.08
	Steel	-0.06
	Cu	-0.42
	Mg	+0.04
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	Tan
	Steel	Blue
	Cu	L etching & pitting
	Mg	L green

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	49

Breakpoint Data

Neut. no., days to 1 mg KOH/g/4 days	26+
100°F vis, days to 1 cs/4 days	26+

Test Conditions

Sample temperature, °F	347
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

(a) Blend (1:1:1:1:1) of O-67-9, O-67-11, O-67-20, O-67-24, and O-68-7.

TEST NO. 369-1. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-67-8 AT 419°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.34		3.26	0.23	
16 hr	14.71	10.3	3.52	1.92	
24 hr	15.12	13.3	3.58	2.42	
40 hr	16.80	25.9	3.83	6.39	
48 hr	18.40	37.9	4.09	10.11	4

Metal Specimen Data

Weight change, mg/cm²:	Al	0.04
	Ti	0.00
	Ag	0.00
	Steel	+0.02
	Cu	0.82
	Mg	0.06
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	No change
	Steel	Blue-green
	Cu	L etching
	Mg	Brown

Test Cell Data

Sludge in oil:	200-mesh filter	Trace
	Centrifuge, vol %	None
Tube deposits:	Total demerits	81

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	30
100°F vis, hr to 1 cs/8 hr	34

Test Conditions

Sample temperature, °F	419
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 369-2. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-67-21 AT 419°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	12.92	–	3.15	0.14	
16 hr	14.08	9.0	3.34	1.35	
24 hr	14.37	11.2	3.38	1.74	
40 hr	15.29	18.3	3.52	3.47	
48 hr	16.75	29.6	3.73	6.43	2

Metal Specimen Data

Weight change, mg/cm²:	Al	−0.04
	Ti	0.00
	Ag	0.00
	Steel	0.00
	Cu	0.00
	Mg	−0.28
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	No change
	Steel	Brown-green
	Cu	Gold
	Mg	L pitting

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	9

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	34
100°F vis, hr to 1 cs/8 hr	44

Test Conditions

Sample temperature, °F	419
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 370-1. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-68-12 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.47	–	3.25	0.17	
16 hr	14.36	6.6	3.40	0.66	
24 hr	14.53	7.9	3.42	0.80	
40 hr	14.73	9.4	3.46	0.95	
48 hr	14.72	9.3	3.47	1.13	1

Metal Specimen Data

Weight change, mg/cm²:	Al	+0.02
	Ti	-0.02
	Ag	0.00
	Steel	0.00
	Cu	0.12
	Mg	0.02
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	Gray
	Steel	Blue-brown
	Cu	Brown
	Mg	No change

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	2

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions

Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 370-2. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-68-14 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.35	–	3.32	0.14	
16 hr	14.16	6.1	3.44	1.01	
24 hr	14.38	7.7	3.46	1.57	
40 hr	14.63	9.6	3.51	2.28	
48 hr	14.68	10.0	3.53	2.63	2

Metal Specimen Data		
Weight change, mg/cm².	Al	0.00
	Ti	0.00
	Ag	+0.02
	Steel	0.00
	Cu	0.00
	Mg	+0.02
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	L yellow
	Steel	Peacock
	Cu	Orange
	Mg	No change

Test Cell Data		
Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	15

Breakpoint Data	
Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions	
Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 370-3. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-68-15 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	12.90		3.11	0.13	
16 hr	13.31	3.2	3.17	0.35	
24 hr	13.51	4.7	3.21	0.59	
40 hr	13.78	6.8	3.23	1.01	
48 hr	13.91	7.8	3.27	1.40	2

Metal Specimen Data		
Weight change, mg/cm²:	Al	0.00
	Ti	0.00
	Ag	+0.02
	Steel	0.00
	Cu	+0.04
	Mg	+0.04
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	No change
	Steel	Blue-brown
	Cu	Gold
	Mg	No change

Test Cell Data		
Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	9

Breakpoint Data	
Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions	
Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 370-4. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON ATL-888 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.85	–	3.32	0.13	
16 hr	14.52	4.8	3.44	0.40	
24 hr	14.61	5.5	3.46	0.70	
40 hr	14.85	7.2	3.48	0.92	
48 hr	14.94	7.9	3.50	0.90	2

Metal Specimen Data

Weight change, mg/cm²:	Al	0.00
	Ti	0.00
	Ag	+0.02
	Steel	0.00
	Cu	0.00
	Mg	+0.50
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	L brown
	Steel	Blue
	Cu	Brown-green
	Mg	Gray deposit

Test Cell Data

Sludge in oil:	200-mesh filter	Trace
	Centrifuge, vol %	Trace
Tube deposits:	Total demerits	115

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions

Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 370-5. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON ATL-889 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.90	–	3.33	0.12	
16 hr	14.57	4.8	3.43	0.49	
24 hr	14.81	6.5	3.48	0.64	
40 hr	14.97	7.7	3.48	0.79	
48 hr	15.08	8.5	3.52	0.92	3

Metal Specimen Data

Weight change, mg/cm²:	Al	0.00
	Ti	0.00
	Ag	+0.02
	Steel	0.00
	Cu	-0.02
	Mg	+0.10
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	L brown
	Steel	Blue
	Cu	Violet
	Mg	Brown

Test Cell Data

Sludge in oil:	200-mesh filter	Trace
	Centrifuge, vol %	0.2
Tube deposits:	Total demerits	144

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions

Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 370-6. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON ATL-890 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt. %
Initial	14.38		3.42	0.17	
16 hr	14.93	3.8	3.50	0.44	
24 hr	15.18	5.6	3.55	0.60	
40 hr	15.39	7.0	3.59	0.76	
48 hr	15.51	7.9	3.60	0.77	2

Metal Specimen Data

Weight change, mg/cm²:	Al	0.02
	Ti	0.00
	Ag	0.00
	Steel	0.00
	Cu	+0.02
	Mg	+0.06
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	No change
	Steel	Blue-green
	Cu	Pink
	Mg	No change

Test Cell Data

Sludge in oil:	200-mesh filter	Trace
	Centrifuge, vol %	0.4
Tube deposits:	Total demerits	75

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions

Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 370-7. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON ATL-892 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt. %
Initial	13.89		3.51	0.17	
16 hr	14.51	4.5	3.58	1.44	
24 hr	14.80	6.6	3.62	1.84	
40 hr	15.11	8.8	3.70	2.61	
48 hr	15.55	12.0	3.74	5.19	3

Metal Specimen Data

Weight change, mg/cm²:	Al	0.00
	Ti	0.00
	Ag	+0.02
	Steel	0.00
	Cu	0.16
	Mg	+0.04
Metal discoloration, deposits, pitting, or etching	Al	No change
	Ti	No change
	Ag	Tan
	Steel	Purple
	Cu	Brown
	Mg	No change

Test Cell Data

Sludge in oil	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits	Total demerits	2

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	40
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions

Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters	10
Condensate return	Yes

TEST NO. 371-1. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON N-1000[a] AT 385°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt %
Initial	13.56	-	3.37	0.15	
16 hr	13.90	2.5	3.42	0.50	
24 hr	13.99	3.2	3.43	0.75	
40 hr	14.30	5.5	3.46	1.19	
48 hr	14.35	5.8	3.47	1.46	3

Metal Specimen Data		
Weight change, mg/cm²	Al	−0.06
	Ti	+0.02
	Ag	+0.08
	Steel	+0.08
	Cu	−0.16
	Mg	+0.06
Metal discoloration, deposits, pitting, or etching	Al	No change
	Ti	No change
	Ag	Tan
	Steel	Violet
	Cu	Brown
	Mg	L blue

Test Cell Data		
Sludge in oil	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits	Total demerits	4

Breakpoint Data	
Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions	
Sample temperature, °F	385
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

(a) Blend (1:1:1:1:1) of O-67-9, O-67-11, O-67-20, O-67-24, and O-68-6.

TEST NO. 372-1. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON ATL-892 AT 401°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.89		3.51	0.17	
16 hr	14.61	5.2	3.62	1.99	
24 hr	14.91	7.3	3.65	2.67	
40 hr	16.63	19.7	3.89	10.22	
48 hr	18.39	32.4	4.16	16.50	6

Metal Specimen Data		
Weight change, mg/cm²	Al	0.06
	Ti	0.08
	Ag	0.00
	Steel	+0.04
	Cu	1.40
	Mg	2.14
Metal discoloration, deposits, pitting, or etching	Al	No change
	Ti	No change
	Ag	L brown
	Steel	Purple
	Cu	L pitting & etching
	Mg	M pitting

Test Cell Data		
Sludge in oil	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits	Total demerits	4

Breakpoint Data	
Neut. no., hr to 1 mg KOH/g/8 hr	23
100°F vis, hr to 1 cs/8 hr	34

Test Conditions	
Sample temperature, °F	401
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 372-2. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON N-1001[a] AT 401°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt. %
Initial	13.65	–	3.41	0.11	
16 hr	14.18	3.9	3.46	0.99	
24 hr	14.32	4.9	3.48	1.50	
40 hr	16.36	19.9	3.74	8.46	
48 hr	18.72	37.1	4.10	12.97	5

Metal Specimen Data		
Weight change, mg/cm²	Al	–0.08
	Ti	–0.06
	Ag	–0.02
	Steel	0.00
	Cu	–0.24
	Mg	–0.12
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	L yellow
	Steel	Blue
	Cu	L etching
	Mg	Brown

Test Cell Data		
Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	48

Breakpoint Data	
Neut. no., hr to 1 mg KOH/g/8 hr	26
100°F vis, hr to 1 cs/8 hr	33

Test Conditions	
Sample temperature, °F	401
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

(a) Blend (1:1:1:1:1) of O-67-9, O-67-11, O-67-20, O-67-24, and O-68-7.

TEST NO. 373-1. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-62-4 AT 385°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt. %
Initial	15.01	–	3.93	0.11	
16 hr	15.27	1.7	3.95	1.31	
24 hr	15.22	1.4	3.94	1.39	
40 hr	15.08	0.5	3.90	1.74	
48 hr	15.06	0.3	3.89	1.90	3

Metal Specimen Data		
Weight change, mg/cm²:	Al	+0.02
	Ti	+0.06
	Ag	0.00
	Steel	–0.02
	Cu	–0.10
	Mg	–0.90
Metal discoloration, deposits, pitting, or etching:	Al	L brown
	Ti	Pink
	Ag	L yellow
	Steel	Violet & green
	Cu	Brown
	Mg	L pitting

Test Cell Data		
Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	Trace
Tube deposits:	Total demerits	92

Breakpoint Data	
Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions	
Sample temperature, °F	385
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 373-2. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-64-12 AT 385°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.79	–	3.52	0.52	
16 hr	15.14	9.8	3.70	1.41	
24 hr	14.54	5.4	3.68	1.85	
40 hr	15.01	8.8	3.72	2.12	
48 hr	14.72	6.7	3.68	2.55	3

Metal Specimen Data

Weight change, mg/cm²:	Al	+0.04
	Ti	+0.06
	Ag	+0.16
	Steel	+0.06
	Cu	-0.14
	Mg	-0.02
Metal discoloration, deposits, pitting, or etching:	Al	Brown
	Ti	Brown
	Ag	Brown
	Steel	Brown
	Cu	Black
	Mg	Brown

Test Cell Data

Sludge in oil:	200-mesh filter	Trace
	Centrifuge, vol %	0.2
Tube deposits:	Total demerits	384

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions

Sample temperature, °F	385
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 373-3. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-64-18 AT 385°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	16.84	–	4.29	0.11	
16 hr	17.11	+1.6	4.30	1.36	
24 hr	17.04	+1.2	4.30	1.49	
40 hr	16.75	-0.5	4.18	2.58	
48 hr	16.50	-2.0	4.04	6.93	3

Metal Specimen Data

Weight change, mg/cm²:	Al	-0.06
	Ti	0.00
	Ag	-0.02
	Steel	-0.06
	Cu	-0.16
	Mg	-0.12
Metal discoloration, deposits, pitting, or etching:	Al	L green
	Ti	Green
	Ag	L yellow
	Steel	Yellow-green
	Cu	Peacock
	Mg	Gray

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	Trace
Tube deposits:	Total demerits	36

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	38
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions

Sample temperature, °F	385
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 373-4. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-67-7 AT 385°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	17.34	–	4.58	0.26	
16 hr	17.04	–1.7	4.47	0.94	
24 hr	16.87	–2.7	4.44	1.12	
40 hr	16.44	–5.5	4.23	1.53	
48 hr	15.59	–10.1	4.05	3.29	5

Metal Specimen Data		
Weight change, mg/cm² :	Al	–0.04
	Ti	–0.02
	Ag	0.00
	Steel	0.00
	Cu	–0.10
	Mg	–0.16
Metal discoloration, deposits, pitting, or etching:	Al	L brown
	Ti	Brown
	Ag	L brown
	Steel	Blue-green
	Cu	Orange
	Mg	L brown

Test Cell Data		
Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	82

Breakpoint Data	
Neut. no., hr to 1 mg KOH/g/8 hr	41
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions	
Sample temperature, °F	385
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 373-5. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-67-9 AT 385°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	14.87	–	3.69	0.04	
16 hr	15.04	1.1	3.72	0.67	
24 hr	14.99	0.8	3.72	0.84	
40 hr	14.94	0.5	3.69	1.09	
48 hr	14.87	0.0	3.66	1.28	3

Metal Specimen Data		
Weight change, mg/cm² :	Al	+0.06
	Ti	–0.06
	Ag	–0.02
	Steel	–0.04
	Cu	–0.30
	Mg	0.00
Metal discoloration, deposits, pitting, or etching:	Al	L yellow
	Ti	Yellow
	Ag	L brown
	Steel	Blue
	Cu	L etching
	Mg	L brown

Test Cell Data		
Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	45

Breakpoint Data	
Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions	
Sample temperature, °F	385
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 373-6. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-67-24 AT 385°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.04	–	3.47	0.24	
16 hr	13.15	0.8	3.45	1.23	
24 hr	13.20	1.2	3.46	1.48	
40 hr	13.24	1.5	3.44	2.00	
48 hr	13.26	1.7	3.45	2.30	4

Metal Specimen Data

Weight change, mg/cm²:	Al	+0.10
	Ti	0.00
	Ag	–0.02
	Steel	+0.04
	Cu	–0.12
	Mg	+0.06
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	Tan
	Steel	L brown
	Cu	Brown
	Mg	L blue

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	4

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions

Sample temperature, °F	385
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 374-1. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-62-4 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	15.01	–	3.93	0.11	
16 hr	15.12	0.7	3.94	1.44	
24 hr	15.21	1.3	3.91	1.62	
40 hr	15.02	0.1	3.88	1.96	
48 hr	15.19	1.2	3.79	6.89	3

Metal Specimen Data

Weight change, mg/cm²:	Al	+0.04
	Ti	+0.02
	Ag	–0.02
	Steel	+0.06
	Cu	–0.28
	Mg	–1.88
Metal discoloration, deposits, pitting, or etching:	Al	L brown
	Ti	Pink
	Ag	Yellow
	Steel	Green
	Cu	L etching
	Mg	L pitting

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	Trace
Tube deposits:	Total demerits	106

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	40
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions

Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 374-2. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-64-12 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.79	–	3.52	0.52	
16 hr	15.00	8.8	3.73	1.71	
24 hr	15.01	8.8	3.70	2.23	
40 hr	15.01	8.8	3.71	2.75	
48 hr	14.82	7.5	3.69	3.24	3

Metal Specimen Data

Weight change, mg/cm²:	Al	+0.26
	Ti	+0.24
	Ag	+0.10
	Steel	+0.18
	Cu	+0.04
	Mg	+0.10
Metal discoloration, deposits, pitting, or etching:	Al	Brown deposit
	Ti	Brown deposit
	Ag	Brown
	Steel	Black
	Cu	Black
	Mg	L brown

Test Cell Data

Sludge in oil:	200-mesh filter	Trace
	Centrifuge, vol %	0.2
Tube deposits:	Total demerits	406

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions

Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 374-3. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-64-18 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	16.84	–	4.29	0.11	
16 hr	17.03	+1.1	4.28	1.53	
24 hr	16.91	+0.4	4.23	2.99	
40 hr	16.75	–0.5	4.06	7.71	
48 hr	18.31	+8.7	4.27	13.06	4

Metal Specimen Data

Weight change, mg/cm²:	Al	+0.02
	Ti	+0.04
	Ag	+0.04
	Steel	0.00
	Cu	–0.32
	Mg	–0.06
Metal discoloration, deposits, pitting, or etching:	Al	L green
	Ti	L green
	Ag	Green-yellow
	Steel	Yellow
	Cu	L etching
	Mg	Gray

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	Trace
Tube deposits:	Total demerits	96

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	25
100°F vis, hr to 1 cs/8 hr	46

Test Conditions

Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 375-1. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-68-6 AT 374°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.10	–	3.19	0.29	
16 hr	13.87	5.9	3.31	0.84	
24 hr	14.04	7.2	3.34	1.12	
40 hr	14.35	9.5	3.38	1.63	
48 hr	14.61	11.5	3.43	2.13	3

Metal Specimen Data

Weight change, mg/cm²:	Al	−0.08
	Ti	+0.02
	Ag	−0.02
	Steel	0.00
	Cu	−0.24
	Mg	+0.06
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	L yellow
	Ag	L brown
	Steel	Brown & purple
	Cu	L etching
	Mg	L green

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	13

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions

Sample temperature, °F	374
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 376-1. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-62-4 AT 401°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	15.01	–	3.93	0.11	
16 hr	15.18	1.1	3.91	1.65	
24 hr	15.10	0.6	3.89	1.93	
40 hr	17.21	14.7	4.09	12.18	
48 hr	30.74	104	6.91	15.70	5

Metal Specimen Data

Weight change, mg/cm²:	Al	−0.04
	Ti	+0.10
	Ag	+0.04
	Steel	−0.04
	Cu	−0.56
	Mg	−19.0
Metal discoloration, deposits, pitting, or etching:	Al	Brown
	Ti	Pink
	Ag	Pink
	Steel	Green
	Cu	L etching
	Mg	H pitting & etching

Test Cell Data

Sludge in oil:	200-mesh filter	Trace
	Centrifuge, vol %	0.2
Tube deposits:	Total demerits	210

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	29
100°F vis, hr to 1 cs/8 hr	34

Test Conditions

Sample temperature, °F	401
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 376-2. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-64-12 AT 401°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.79	–	3.52	0.52	
16 hr	15.31	11.0	3.70	2.13	
24 hr	14.92	8.2	3.69	2.52	
40 hr	14.97	8.6	3.72	3.55	
48 hr	15.14	9.8	3.73	5.24	3

Metal Specimen Data

Weight change, mg/cm²:	Al	+0.38
	Ti	+0.34
	Ag	+0.28
	Steel	+0.28
	Cu	–0.04
	Mg	+0.44
Metal discoloration, deposits, pitting, or etching:	Al	Brown deposit
	Ti	Black deposit
	Ag	Black deposit
	Steel	Black deposit
	Cu	Brown
	Mg	Brown deposit

Test Cell Data

Sludge in oil:	200-mesh filter	1.7
	Centrifuge, vol %	0.2
Tube deposits:	Total demerits	457

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	39
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions

Sample temperature, °F	401
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 376-3. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-64-18 AT 401°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	16.84	–	4.29	0.11	
16 hr	16.90	+0.4	4.23	1.93	
24 hr	16.48	–2.1	4.08	3.47	
40 hr	18.91	+12.3	4.34	8.88	
48 hr	21.17	+25.7	4.74	18.37	5

Metal Specimen Data

Weight change, mg/cm²:	Al	+0.06
	Ti	+0.06
	Ag	+0.06
	Steel	+0.02
	Cu	–0.74
	Mg	+0.02
Metal discoloration, deposits, pitting, or etching:	Al	L green
	Ti	Green-yellow
	Ag	Green-yellow
	Steel	Gold
	Cu	L etching
	Mg	Brown

Test Cell Data

Sludge in oil:	200-mesh filter	Trace
	Centrifuge, vol %	Trace
Tube deposits:	Total demerits	68

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	10
100°F vis, hr to 1 cs/8 hr	31

Test Conditions

Sample temperature, °F	401
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 377-1. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-64-12 AT 410°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.79	–	3.52	0.52	
16 hr	15.09	9.4	3.74	2.52	
24 hr	15.09	9.4	3.73	3.33	
40 hr	16.89	22.5	3.99	11.15	
48 hr	19.03	38.0	4.39	15.14	6

Metal Specimen Data

Weight change, mg/cm²:	Al	+0.54
	Ti	+0.44
	Ag	+0.22
	Steel	+0.34
	Cu	-0.80
	Mg	+0.40
Metal discoloration, deposits, pitting, or etching:	Al	Black deposit
	Ti	Black deposit
	Ag	Black deposit
	Steel	Black deposit
	Cu	L etching
	Mg	Black deposit

Test Cell Data

Sludge in oil:	200-mesh filter	Trace
	Centrifuge, vol %	Trace
Tube deposits:	Total demerits	470

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	22
100°F vis, hr to 1 cs/8 hr	34

Test Conditions

Sample temperature, °F	410
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 377-2. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-67-20 AT 410°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.48	–	3.25	0.21	
16 hr	14.62	8.5	3.43	0.88	
24 hr	14.82	9.9	3.45	1.25	
40 hr	15.52	15.1	3.57	2.06	
48 hr	17.03	26.3	3.78	5.38	5

Metal Specimen Data

Weight change, mg/cm²:	Al	0.00
	Ti	+0.02
	Ag	0.00
	Steel	+0.10
	Cu	+0.66
	Mg	0.00
Metal discoloration, deposits, pitting, or etching:	Al	L yellow
	Ti	L yellow
	Ag	Tan
	Steel	Blue-green
	Cu	Brown deposit
	Mg	No change

Test Cell Data

Sludge in oil:	200-mesh filter	Trace
	Centrifuge, vol %	None
Tube deposits:	Total demerits	–

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	39
100°F vis, hr to 1 cs/8 hr	45

Test Conditions

Sample temperature, °F	410
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 378-1. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-68-12 AT 401°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.47	–	3.25	0.17	
16 hr	14.45	7.3	3.41	0.81	
24 hr	14.61	8.5	3.43	0.96	
40 hr	14.92	10.8	3.48	1.23	
48 hr	15.11	12.2	3.52	1.99	3

Metal Specimen Data

Weight change, mg/cm²:	Al	−0.02
	Ti	+0.08
	Ag	+0.06
	Steel	−0.06
	Cu	−0.20
	Mg	+0.04
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	No change
	Steel	Blue-green
	Cu	L etching
	Mg	Gray

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	4

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	46
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions

Sample temperature, °F	401
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 378-2. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-68-14 AT 401°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.35	–	3.32	0.14	
16 hr	14.31	7.2	3.46	0.71	
24 hr	14.47	8.4	3.48	2.01	
40 hr	14.83	11.1	3.54	2.84	
48 hr	14.95	12.0	3.57	3.51	3

Metal Specimen Data

Weight change, mg/cm²:	Al	+0.02
	Ti	0.00
	Ag	0.00
	Steel	0.00
	Cu	0.00
	Mg	+0.06
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	Tan
	Steel	Peacock
	Cu	Gold
	Mg	No change

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	15

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions

Sample temperature, °F	401
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 378-3. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-68-15 AT 401°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	12.90	–	3.11	0.13	
16 hr	13.50	4.7	3.20	0.76	
24 hr	13.69	6.1	3.23	1.04	
40 hr	15.27	18.4	3.47	3.89	
48 hr	16.79	30.2	3.71	5.42	5

Metal Specimen Data		
Weight change, mg/cm²:	Al	0.00
	Ti	0.00
	Ag	+0.02
	Steel	–0.04
	Cu	–2.78
	Mg	–0.02
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	No change
	Steel	Blue-green
	Cu	M etching
	Mg	Gray

Test Cell Data		
Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	15

Breakpoint Data	
Neut. no., hr to 1 mg KOH/g/8 hr	27
100°F vis, hr to 1 cs/8 hr	36

Test Conditions	
Sample temperature, °F	401
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 378-4. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-68-17 AT 401°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	12.96	–	3.45	0.25	
16 hr	12.99	0.2	3.41	2.32	
24 hr	13.14	1.4	3.42	4.94	
40 hr	16.32	25.9	3.85	19.49	
48 hr	18.49	42.7	4.22	26.0	8

Metal Specimen Data		
Weight change, mg/cm²:	Al	0.00
	Ti	+0.06
	Ag	–0.02
	Steel	–0.08
	Cu	–0.70
	Mg	–7.54
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	Tan
	Steel	Brown
	Cu	L etching
	Mg	M etching & H pitting

Test Cell Data		
Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	11

Breakpoint Data	
Neut. no., hr to 1 mg KOH/g/8 hr	9
100°F vis, hr to 1 cs/8 hr	29

Test Conditions	
Sample temperature, °F	401
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 379-1. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON ATL-896 AT 385°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.93	–	3.59	0.32	
16 hr	14.13	1.4	3.64	0.91	
24 hr	14.19	1.9	3.65	1.18	
40 hr	15.72	12.8	3.86	8.85	
48 hr	18.13	30.2	4.24	16.73	6

Metal Specimen Data

Weight change, mg/cm²:	Al	+0.02
	Ti	–0.06
	Ag	–0.04
	Steel	+0.02
	Cu	–0.40
	Mg	–0.12
Metal discoloration, deposits, pitting, or etching:	Al	L brown
	Ti	Purple
	Ag	L yellow
	Steel	Blue-green
	Cu	L etching
	Mg	L brown

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	Trace
Tube deposits:	Total demerits	18

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	28
100°F vis, hr to 1 cs/8 hr	36

Test Conditions

Sample temperature, °F	385
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 379-2. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON ATL-898 AT 385°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.82	–	3.59	0.32	
16 hr	13.93	0.8	3.61	0.86	
24 hr	13.96	1.0	3.62	1.11	
40 hr	15.74	13.9	3.79	10.64	
48 hr	17.49	26.6	4.14	17.35	6

Metal Specimen Data

Weight change, mg/cm²:	Al	–0.02
	Ti	+0.02
	Ag	0.00
	Steel	+0.04
	Cu	–0.60
	Mg	–0.36
Metal discoloration, deposits, pitting, or etching:	Al	L brown
	Ti	Pink
	Ag	L yellow
	Steel	Blue-green
	Cu	L etching
	Mg	L etching

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	Trace
Tube deposits:	Total demerits	30

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	29
100°F vis, hr to 1 cs/8 hr	34

Test Conditions

Sample temperature, °F	385
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 379-3. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON ATL-899 AT 385°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	14.08	–	3.67	0.34	
16 hr	14.19	0.8	3.68	0.91	
24 hr	14.22	1.0	3.69	1.28	
40 hr	16.15	14.7	4.02	12.26	
48 hr	17.73	25.9	4.19	18.04	5

Metal Specimen Data

Weight change, mg/cm²:	Al	−0.04
	Ti	0.00
	Ag	0.00
	Steel	+0.06
	Cu	−1.06
	Mg	−0.58
Metal discoloration, deposits, pitting, or etching:	Al	L brown
	Ti	Pink
	Ag	L yellow
	Steel	Blue-green
	Cu	L etching
	Mg	L etching

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	Trace
Tube deposits:	Total demerits	32

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	27
100°F vis, hr to 1 cs/8 hr	33

Test Conditions

Sample temperature, °F	385
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 380-1. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-68-13 AT 385°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	14.63	–	3.58	0.18	
16 hr	14.91	1.9	3.61	0.42	
24 hr	14.96	2.3	3.61	0.76	
40 hr	15.06	2.9	3.64	1.13	
48 hr	15.11	3.3	3.64	1.18	3

Metal Specimen Data

Weight change, mg/cm²:	Al	−0.12
	Ti	0.08
	Ag	+0.04
	Steel	0.02
	Cu	0.08
	Mg	0.00
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	Tan
	Steel	Pink
	Cu	Gold
	Mg	No change

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	31

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions

Sample temperature, °F	385
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 380-2. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON 65-L-114 AT 385°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt. %
Initial	13.53	–	3.54	0.10	
16 hr	14.12	4.4	3.64	1.16	
24 hr	14.07	4.0	3.62	1.29	
40 hr	14.03	3.7	3.62	1.79	
48 hr	14.01	3.5	3.61	1.74	4

Metal Specimen Data		
Weight change, mg/cm²:	Al	−0.10
	Ti	0.00
	Ag	+0.12
	Steel	−0.04
	Cu	−0.08
	Mg	−0.52
Metal discoloration, deposits, pitting, or etching:	Al	L green & pink
	Ti	Peacock
	Ag	Pink
	Steel	Blue, green, & pink
	Cu	Orange
	Mg	L pitting & etching

Test Cell Data		
Sludge in oil:	200-mesh filter	Trace
	Centrifuge, vol %	0.4
Tube deposits:	Total demerits	94

Breakpoint Data	
Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions	
Sample temperature, °F	385
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 380-3. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON ATL-897 AT 385°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt. %
Initial	13.70	–	3.57	0.32	
16 hr	13.80	0.7	3.59	0.83	
24 hr	13.86	1.2	3.59	1.10	
40 hr	15.41	12.5	3.81	9.41	
48 hr	16.91	23.4	4.06	16.55	4

Metal Specimen Data		
Weight change, mg/cm²:	Al	−0.08
	Ti	+0.02
	Ag	+0.06
	Steel	−0.06
	Cu	−1.36
	Mg	−0.22
Metal discoloration, deposits, pitting, or etching:	Al	L brown
	Ti	L purple
	Ag	L yellow
	Steel	Blue-green
	Cu	L etching
	Mg	L etching

Test Cell Data		
Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	Trace
Tube deposits:	Total demerits	40

Breakpoint Data	
Neut. no., hr to 1 mg KOH/g/8 hr	29
100°F vis, hr to 1 cs/8 hr	36

Test Conditions	
Sample temperature, °F	385
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 381-1. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-68-12 AT 410°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt. %
Initial	13.47	–	3.25	0.17	
16 hr	14.60	8.4	3.47	0.98	
24 hr	14.83	10.1	3.48	1.16	
40 hr	15.61	15.9	3.59	2.75	
48 hr	16.80	24.7	3.77	5.46	3

Metal Specimen Data

Weight change, mg/cm²:	Al	+0.02
	Ti	+0.02
	Ag	+0.02
	Steel	0.00
	Cu	–0.22
	Mg	0.00
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	Gray
	Steel	Blue
	Cu	L etching
	Mg	Gray

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	10

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	36
100°F vis, hr to 1 cs/8 hr	45

Test Conditions

Sample temperature, °F	410
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 381-2. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-68-14 AT 410°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt. %
Initial	13.35	–	3.32	0.14	
16 hr	14.44	8.2	3.49	1.83	
24 hr	14.68	10.0	3.51	2.47	
40 hr	15.19	13.8	3.61	3.67	
48 hr	15.52	16.3	3.65	4.97	3

Metal Specimen Data

Weight change, mg/cm²:	Al	–0.04
	Ti	–0.04
	Ag	+0.02
	Steel	–0.06
	Cu	+0.18
	Mg	–0.06
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	Yellow
	Steel	Peacock
	Cu	Gold
	Mg	Gray

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	12

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	43
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions

Sample temperature, °F	410
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 382-1. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-69-1 AT 428°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	28.62	–	5.34	0.45	
16 hr	32.91	15.0	5.87	1.03	
24 hr	33.82	18.2	5.99	0.99	
40 hr	36.97	29.2	6.29	2.24	
48 hr	40.21	40.5	6.72	4.25	4

Metal Specimen Data

Weight change, mg/cm²:	Al	–0.08
	Ti	+0.04
	Ag	–0.02
	Steel	–0.06
	Cu	–0.22
	Mg	–
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	L yellow
	Steel	Blue
	Cu	L etching & pitting
	Mg	–

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	71

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	38
100°F vis, hr to 1 cs/8 hr	30

Test Conditions

Sample temperature, °F	428
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 382-2. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-69-1 AT 428°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	28.62	–	5.34	0.45	
16 hr	32.90	15.0	5.87	0.98	
24 hr	33.78	18.0	5.98	1.18	
40 hr	36.11	26.2	6.16	1.96	
48 hr	38.26	33.7	6.54	4.16	4

Metal Specimen Data

Weight change, mg/cm²:	Al	–0.06
	Ti	+0.04
	Ag	+0.02
	Steel	–0.06
	Cu	–0.28
	Mg	–
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	L yellow
	Steel	Blue
	Cu	L etching & pitting
	Mg	–

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	66

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	39
100°F vis, hr to 1 cs/8 hr	31

Test Conditions

Sample temperature, °F	428
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 383-1. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-68-13 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	14.63	–	3.58	0.18	
16 hr	14.95	2.2	3.60	0.59	
24 hr	14.99	2.5	3.61	0.86	
40 hr	15.21	4.0	3.63	1.10	
48 hr	15.19	3.8	3.62	1.30	5

Metal Specimen Data

Weight change, mg/cm²:	Al	–0.06
	Ti	+0.12
	Ag	+0.04
	Steel	+0.08
	Cu	–0.14
	Mg	+0.20
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	Gray
	Steel	Violet
	Cu	Gold
	Mg	No change

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	36

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions

Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 383-2. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-68-17 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	12.96	–	3.45	0.25	
16 hr	12.97	0.1	3.42	1.64	
24 hr	13.02	0.5	3.45	2.09	
40 hr	14.87	14.7	3.63	13.35	
48 hr	16.91	30.5	3.94	21.4	7

Metal Specimen Data

Weight change, mg/cm²:	Al	+0.10
	Ti	+0.12
	Ag	+0.12
	Steel	+0.16
	Cu	–0.36
	Mg	–3.14
Metal discoloration, deposits, pitting, or etching:	Al	L blue
	Ti	No change
	Ag	Tan
	Steel	Brown
	Cu	L etching
	Mg	L pitting & M etching

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	6

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	26
100°F vis, hr to 1 cs/8 hr	33

Test Conditions

Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 383-3. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON ATL-891 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.95	–	3.34	0.16	
16 hr	14.65	5.0	3.46	0.40	
24 hr	14.79	6.0	3.47	0.59	
40 hr	15.04	7.8	3.52	0.78	
48 hr	15.12	8.4	3.54	0.94	2

Metal Specimen Data

Weight change, mg/cm²:	Al	+0.22
	Ti	+0.10
	Ag	+0.14
	Steel	+0.06
	Cu	0.00
	Mg	+0.10
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	L yellow
	Steel	Blue
	Cu	Pink
	Mg	L brown

Test Cell Data

Sludge in oil:	200-mesh filter	Trace
	Centrifuge, vol %	None
Tube deposits:	Total demerits	13

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions

Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 384-1. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-67-8 AT 410°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.34	–	3.26	0.23	
16 hr	14.54	9.0	3.51	1.67	
24 hr	14.87	11.5	3.53	2.03	
40 hr	15.41	15.5	3.63	3.16	
48 hr	15.97	19.7	3.71	5.45	5

Metal Specimen Data

Weight change, mg/cm²:	Al	+0.14
	Ti	+0.08
	Ag	0.00
	Steel	+0.16
	Cu	–0.18
	Mg	+0.02
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	L yellow
	Steel	Blue
	Cu	Brown
	Mg	Brown

Test Cell Data

Sludge in oil:	200-mesh filter	Trace
	Centrifuge, vol %	Trace
Tube deposits:	Total demerits	51

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	38
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions

Sample temperature, °F	410
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 385-1. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-69-1 AT 464°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	28.62	–	5.34	0.45	
16 hr	35.02	22.4	6.14	2.81	
24 hr	37.71	31.8	6.45	4.04	
40 hr	48.36	69.0	7.71	7.59	
48 hr	56.47	97.3	8.63	9.57	7

Metal Specimen Data

Weight change, mg/cm²:	Al	+0.02
	Ti	+0.12
	Ag	+0.10
	Steel	+0.10
	Cu	–0.50
	Mg	–
Metal discoloration, deposits, pitting, or etching:	Al	L brown
	Ti	L brown
	Ag	L brown
	Steel	Green
	Cu	L etching
	Mg	–

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	69

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	<8
100°F vis, hr to 1 cs/8 hr	<8

Test Conditions

Sample temperature, °F	464
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 385-2. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-69-1 AT 464°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	28.62	–	5.34	0.45	
16 hr	35.30	23.3	6.17	2.56	
24 hr	38.73	35.3	6.56	4.43	
40 hr	52.79	84.5	8.17	7.73	
48 hr	63.71	123	9.40	15.79	7

Metal Specimen Data

Weight change, mg/cm²:	Al	+0.08
	Ti	+0.02
	Ag	+0.02
	Steel	+0.20
	Cu	–0.66
	Mg	–
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	L brown
	Ag	L yellow
	Steel	Green
	Cu	L etching
	Mg	

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	80

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	8
100°F vis, hr to 1 cs/8 hr	<8

Test Conditions

Sample temperature, °F	464
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 386-1. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-68-17 AT 385°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	12.96	–	3.45	0.25	
16 hr	14.08	8.6	3.43	0.82	
24 hr	14.27	10.1	3.46	0.72	
40 hr	14.58	12.5	3.50	1.93	
48 hr	14.70	13.4	3.53	2.15	0

Metal Specimen Data			Test Cell Data		
Weight change, mg/cm²:	Al	+0.04	Sludge in oil:	200-mesh filter	None
	Ti	+0.02		Centrifuge, vol %	None
	Ag	−0.10			
	Steel	0.00	Tube deposits:	Total demerits	5
	Cu	+0.04			
	Mg	−0.04	**Breakpoint Data**		
Metal discoloration, deposits, pitting, or etching:			Neut. no., hr to 1 mg KOH/g/8 hr		48+
			100°F vis, hr to 1 cs/8 hr		48+
	Al	No change	**Test Conditions**		
	Ti	No change			
	Ag	Tan	Sample temperature, °F		385
	Steel	Peacock	Sample volume, ml		200
	Cu	Gold	Air rate, liters/hr		10
	Mg	No change	Condensate return		Yes

TEST NO. 387-1. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-68-1 AT 401°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.29	–	3.21	0.00	
16 hr	14.19	6.8	3.35	0.62	
24 hr	14.35	8.0	3.38	0.68	
40 hr	14.58	9.7	3.42	1.05	
48 hr	14.77	11.1	3.44	1.28	1

Metal Specimen Data			Test Cell Data		
Weight change, mg/cm²:	Al	+0.06	Sludge in oil:	200-mesh filter	None
	Ti	−0.02		Centrifuge, vol %	None
	Ag	−0.02			
	Steel	+0.10	Tube deposits:	Total demerits	15
	Cu	−0.12			
	Mg	+0.04	**Breakpoint Data**		
Metal discoloration, deposits, pitting, or etching:			Neut. no., hr to 1 mg KOH/g/8 hr		48+
			100°F vis, hr to 1 cs/8 hr		48+
	Al	No change	**Test Conditions**		
	Ti	L yellow			
	Ag	L yellow	Sample temperature, °F		401
	Steel	Peacock	Sample volume, ml		200
	Cu	Brown & L green	Air rate, liters/hr		10
	Mg	No change	Condensate return		Yes

TEST NO. 387-2. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-68-1[a] AT 401°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.29	–	3.21	0.00	
16 hr	14.20	6.8	3.34	0.52	
24 hr	14.37	8.1	3.38	0.75	
40 hr	14.64	10.2	3.42	1.00	
48 hr	14.76	11.1	3.44	1.29	2

Metal Specimen Data

Weight change, mg/cm²:	Al	+0.10
	Ti	+0.04
	Ag	–0.06
	Steel	+0.10
	Cu	–0.06
	Mg	–0.02
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	L yellow
	Ag	L yellow
	Steel	Blue & L green
	Cu	Brown & L green
	Mg	No change

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	12

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions

Sample temperature, °F	401
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

(a) 10 ppm powdered iron added to initial 200-ml sample.

TEST NO. 387-3. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-68-1[a] AT 401°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.29	–	3.21	0.00	
16 hr	14.20	6.8	3.34	0.50	
24 hr	14.35	8.0	3.37	0.68	
40 hr	14.62	10.0	3.42	0.92	
48 hr	14.73	10.8	3.44	1.35	2

Metal Specimen Data

Weight change, mg/cm²:	Al	+0.04
	Ti	0.00
	Ag	+0.02
	Steel	–0.02
	Cu	–0.04
	Mg	+0.02
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	L yellow
	Steel	Peacock
	Cu	Brown & L green
	Mg	No change

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	18

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions

Sample temperature, °F	401
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

(a) 40 ppm powdered iron added to initial 200-ml sample.

TEST NO. 387-4. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-68-1[a] AT 401°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.29	–	3.21	0.00	
16 hr	14.18	6.7	3.35	0.45	
24 hr	14.34	7.9	3.38	0.66	
40 hr	14.63	10.1	3.43	0.93	
48 hr	14.77	11.1	3.44	1.25	3

Metal Specimen Data		
Weight change, mg/cm²:	Al	+0.06
	Ti	–0.02
	Ag	+0.04
	Steel	+0.06
	Cu	–0.06
	Mg	–0.02
Metal discoloration, deposits, pitting, or etching:	Al	L brown
	Ti	L brown
	Ag	L brown
	Steel	Blue & L green
	Cu	Brown & L green
	Mg	No change

Test Cell Data		
Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	15

Breakpoint Data	
Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions	
Sample temperature, °F	401
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

(a) 80 ppm powdered iron added to initial 200-ml sample.

TEST NO. 387-5. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-68-13 AT 401°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	14.63	–	3.58	0.18	
16 hr	14.94	2.1	3.60	1.30	
24 hr	15.04	2.8	3.61	1.46	
40 hr	15.53	6.2	3.65	3.84	
48 hr	16.25	11.1	3.75	7.67	4

Metal Specimen Data		
Weight change, mg/cm²:	Al	+0.04
	Ti	+0.04
	Ag	–0.08
	Steel	0.00
	Cu	–2.96
	Mg	0.00
Metal discoloration, deposits, pitting, or etching:	Al	L yellow
	Ti	No change
	Ag	Gray
	Steel	Purple
	Cu	M pitting & L etching
	Mg	L yellow

Test Cell Data		
Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	98

Breakpoint Data	
Neut. no., hr to 1 mg KOH/g/8 hr	32
100°F vis, hr to 1 cs/8 hr	47

Test Conditions	
Sample temperature, °F	401
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 388-1. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-68-14 AT 419°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.35	–	3.32	0.14	
16 hr	13.31	–0.03	3.40	5.67	
24 hr	15.45	+15.7	3.70	6.10	
40 hr	26.64	+99.6	5.87	26.0	
48 hr	162.8	+1119	28.25	32.9	13

Metal Specimen Data

Weight change, mg/cm²:	Al	+0.04
	Ti	+0.02
	Ag	–0.08
	Steel	+0.06
	Cu	–1.04
	Mg	–35.0
Metal discoloration, deposits, pitting, or etching:	Al	L brown
	Ti	L yellow
	Ag	Tan
	Steel	Brown
	Cu	L pitting & etching
	Mg	67% destroyed

Test Cell Data

Sludge in oil:	200-mesh filter	Trace
	Centrifuge, vol %	0.2
Tube deposits:	Total demerits	144

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	27
100°F vis, hr to 1 cs/8 hr	16

Test Conditions

Sample temperature, °F	419
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 389-1. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON ATL-814 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.45	–	3.37	0.23	
16 hr	14.32	6.5	3.51	0.68	
24 hr	14.56	8.3	3.55	1.14	
40 hr	17.79	32.3	4.01	9.67	
48 hr	19.47	44.8	4.28	14.20	5

Metal Specimen Data

Weight change, mg/cm²:	Al	0.00
	Ti	–0.02
	Ag	+0.06
	Steel	0.00
	Cu	–0.98
	Mg	–0.50
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	L yellow
	Ag	Tan
	Steel	Blue & pink
	Cu	M etching
	Mg	L pitting

Test Cell Data

Sludge in oil:	200-mesh filter	Trace
	Centrifuge, vol %	0.6
Tube deposits:	Total demerits	26

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	27
100°F vis, hr to 1 cs/8 hr	27

Test Conditions

Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 389-2. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON ATL-896 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.93	–	3.59	0.32	
16 hr	14.18	1.8	3.62	1.17	
24 hr	14.30	2.7	3.64	[illegible].99	
40 hr	16.90	21.3	4.04	13.49	
48 hr	18.90	35.7	4.36	17.38	4

Metal Specimen Data		
Weight change, mg/cm^2:	Al	+0.10
	Ti	+0.02
	Ag	0.00
	Steel	–0.12
	Cu	–0.80
	Mg	–0.62
Metal discoloration, deposits, pitting, or etching:	Al	L brown
	Ti	Yellow & purple
	Ag	L brown
	Steel	Blue & green
	Cu	L etching
	Mg	L pitting

Test Cell Data		
Sludge in oil:	200-mesh filter	L trace
	Centrifuge, vol %	Trace
Tube deposits:	Total demerits	24

Breakpoint Data	
Neut. no., hr to 1 mg KOH/g/8 hr	23
100°F vis, hr to 1 cs/8 hr	30

Test Conditions	
Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 389-3. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON ATL-897 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.70	–	3.57	0.32	
16 hr	13.90	1.5	3.62	1.23	
24 hr	13.98	2.0	3.62	1.65	
40 hr	16.57	20.9	4.00	14.41	
48 hr	18.28	33.4	4.29	18.55	5

Metal Specimen Data		
Weight change, mg/cm^2:	Al	–0.18
	Ti	–0.04
	Ag	–0.06
	Steel	0.00
	Cu	–2.08
	Mg	–0.82
Metal discoloration, deposits, pitting, or etching:	Al	L brown
	Ti	Yellow & purple
	Ag	L brown
	Steel	Blue & green
	Cu	L etching
	Mg	L etching

Test Cell Data		
Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	Trace
Tube deposits:	Total demerits	24

Breakpoint Data	
Neut. no., hr to 1 mg KOH/g/8 hr	26
100°F vis, hr to 1 cs/8 hr	29

Test Conditions	
Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 389-4. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON ATL-898 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.82		3.59	0.32	
16 hr	13.96	1.0	3.62	1.09	
24 hr	14.16	2.5	3.64	2.48	
40 hr	16.80	21.6	4.03	13.87	
48 hr	17.65	27.7	4.32	20.2	5

Metal Specimen Data		
Weight change, mg/cm²:	Al	+0.18
	Ti	+0.06
	Ag	+0.04
	Steel	+0.10
	Cu	−0.44
	Mg	−1.28
Metal discoloration, deposits, pitting, or etching:	Al	L brown
	Ti	Pink
	Ag	L brown
	Steel	Blue & green
	Cu	L etching
	Mg	L etching & pitting

Test Cell Data		
Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	Trace
Tube deposits:	Total demerits	21

Breakpoint Data	
Neut. no., hr to 1 mg KOH/g/8 hr	18
100°F vis, hr to 1 cs/8 hr	24

Test Conditions	
Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 389-5. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON ATL-899 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	14.08	–	3.67	0.34	
16 hr	14.26	1.3	3.69	1.22	
24 hr	14.45	2.6	3.72	3.09	
40 hr	17.09	21.4	4.08	15.16	
48 hr	18.75	33.2	4.38	20.4	5

Metal Specimen Data		
Weight change, mg/cm²:	Al	0.00
	Ti	−0.02
	Ag	+0.02
	Steel	+0.02
	Cu	−1.22
	Mg	−0.90
Metal discoloration, deposits, pitting, or etching:	Al	L brown
	Ti	Pink
	Ag	L brown
	Steel	Blue & green
	Cu	L etching
	Mg	L etching & pitting

Test Cell Data		
Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	Trace
Tube deposits:	Total demerits	29

Breakpoint Data	
[illegible] no., hr to 1 mg KOH/g/8 hr	15
[illegible] vis, hr to 1 cs/8 hr	29

Test Conditions	
Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 389-6. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON ATL-900 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	30.93	–	5.54	0.65	
16 hr	32.60	5.4	5.75	1.04	
24 hr	33.08	7.0	5.82	1.12	
40 hr	34.02	10.0	5.92	0.92	
48 hr	34.64	12.0	6.00	1.12	4

Metal Specimen Data			Test Cell Data		
Weight change, mg/cm²:	Al	–0.02	Sludge in oil:	200-mesh filter	None
	Ti	+0.14		Centrifuge, vol %	None
	Ag	–0.02			
	Steel	0.00	Tube deposits:	Total demerits	2
	Cu	–1.06			
	Mg	+0.04			
			Breakpoint Data		
Metal discoloration, deposits, pitting, or etching:			Neut. no., hr to 1 mg KOH/g/8 hr		48+
			100°F vis, hr to 1 cs/8 hr		48+
	Al	No change			
	Ti	No change	**Test Conditions**		
	Ag	No change			
	Steel	Blue	Sample temperature, °F		392
	Cu	L etching	Sample volume, ml		200
	Mg	L blue	Air rate, liters/hr		10
			Condensate return		Yes

TEST NO. 390-1. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON ATL-886 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.51	–	3.30	0.22	
16 hr	14.28	5.7	3.45	0.47	
24 hr	14.47	7.1	3.47	0.64	
40 hr	14.65	8.4	3.49	0.90	
48 hr	14.74	9.1	3.52	1.04	3

Metal Specimen Data			Test Cell Data		
Weight change, mg/cm²:	Al	–0.04	Sludge in oil:	200-mesh filter	Trace
	Ti	+0.04		Centrifuge, vol %	0.2
	Ag	–0.14			
	Steel	+0.04	Tube deposits:	Total demerits	32
	Cu	–0.10			
	Mg	0.00			
			Breakpoint Data		
Metal discoloration, deposits, pitting, or etching:			Neut. no., hr to 1 mg KOH/g/8 hr		48+
			100°F vis, hr to 1 cs/8 hr		48+
	Al	No change			
	Ti	No change	**Test Conditions**		
	Ag	No change			
	Steel	Blue	Sample temperature, °F		392
	Cu	Violet	Sample volume, ml		200
	Mg	Brown	Air rate, liters/hr		10
			Condensate return		Yes

TEST NO. 390-2. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON ATL-901 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt. %
Initial	13.67	–	3.29	0.30	
16 hr	14.34	4.9	3.40	0.45	
24 hr	14.48	5.9	3.42	0.63	
40 hr	14.66	7.2	3.45	0.86	
48 hr	14.77	8.0	3.46	0.92	2

Metal Specimen Data

Weight change, mg/cm²:	Al	–0.12
	Ti	–0.04
	Ag	+0.06
	Steel	+0.04
	Cu	–0.02
	Mg	0.00
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	No change
	Steel	Blue
	Cu	Pink
	Mg	L blue

Test Cell Data

Sludge in oil:	200-mesh filter	Trace
	Centrifuge, vol %	Trace
Tube deposits:	Total demerits	43

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions

Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 390-3. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON ATL-902 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt. %
Initial	13.55	–	3.27	0.18	
16 hr	14.42	6.4	3.41	0.37	
24 hr	14.55	7.4	3.43	0.54	
40 hr	14.75	8.9	3.46	0.79	
48 hr	14.82	9.4	3.48	0.81	3

Metal Specimen Data

Weight change, mg/cm²:	Al	–0.08
	Ti	–0.04
	Ag	+0.04
	Steel	0.00
	Cu	–0.06
	Mg	–0.10
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	L yellow
	Steel	Blue
	Cu	Green
	Mg	Brown

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	Trace
Tube deposits:	Total demerits	10

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions

Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 391-1. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON RAO-21-68 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	27.60	–	5.06	0.15	
16 hr	30.25	9.5	5.38	0.29	
24 hr	30.85	11.8	5.45	0.35	
40 hr	31.70	14.9	5.56	0.40	
48 hr	31.99	15.9	5.60	0.44	4

Metal Specimen Data		
Weight change, mg/cm²:	Al	+0.04
	Ti	–0.06
	Ag	–0.06
	Steel	+0.12
	Cu	–0.06
	Mg	–0.02
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	Yellow
	Steel	Blue
	Cu	Pink
	Mg	No change

Test Cell Data		
Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	1

Breakpoint Data	
Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions	
Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 391-2. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON RAO-22-68 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	16.91	–	4.29	0.12	
16 hr	17.05	+0.8	4.28	1.56	
24 hr	16.90	–0.1	4.21	1.93	
40 hr	16.76	–0.9	4.06	8.11	
48 hr	18.55	+9.7	4.31	14.45	4

Metal Specimen Data		
Weight change, mg/cm²:	Al	+0.10
	Ti	–0.02
	Ag	–0.08
	Steel	+0.02
	Cu	–0.26
	Mg	+0.02
Metal discoloration, deposits, pitting, or etching:	Al	L green
	Ti	L green
	Ag	L green
	Steel	Yellow
	Cu	L etching
	Mg	Tan

Test Cell Data		
Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	Trace
Tube deposits:	Total demerits	58

Breakpoint Data	
Neut. no., hr to 1 mg KOH/g/8 hr	28
100°F vis, hr to 1 cs/8 hr	41

Test Conditions	
Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 391-3. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON RAO-23-68 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.55	–	3.26	0.16	
16 hr	14.32	5.7	3.39	0.48	
24 hr	14.51	7.1	3.41	0.70	
40 hr	14.77	9.0	3.46	0.82	
48 hr	14.83	9.4	3.48	1.02	2

Metal Specimen Data

Weight change, mg/cm²:	Al	+0.06
	Ti	–0.04
	Ag	–0.10
	Steel	+0.02
	Cu	–0.02
	Mg	+0.04
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	L brown
	Steel	Blue
	Cu	Brown
	Mg	No change

Test Cell Data

Sludge in oil:	200-mesh filter	Trace
	Centrifuge, vol %	None
Tube deposits:	Total demerits	4

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions

Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 391-4. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON RAO-24-68 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	27.27	–	5.45	0.18	
16 hr	29.14	6.9	5.53	1.32	
24 hr	30.09	10.3	5.60	1.71	
40 hr	33.64	23.4	5.99	1.08	
48 hr	36.16	32.6	6.30	0.88	7

Metal Specimen Data

Weight change, mg/cm²:	Al	+0.02
	Ti	–0.04
	Ag	–0.02
	Steel	+0.10
	Cu	–6.86
	Mg	–0.08
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	No change
	Steel	Blue
	Cu	H etching
	Mg	L brown

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	12

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	23

Test Conditions

Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 391-5. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON RAO-25-68 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	25.99	–	5.04	0.19	
16 hr	28.07	8.0	5.29	0.45	
24 hr	28.56	9.9	5.36	0.54	
40 hr	29.27	12.6	5.45	0.80	
48 hr	29.48	13.4	5.50	0.82	4

Metal Specimen Data

Weight change, mg/cm²:	Al	+0.04
	Ti	–0.02
	Ag	–0.06
	Steel	+0.02
	Cu	+0.06
	Mg	–0.02
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	Tan
	Steel	L green
	Cu	Gold
	Mg	No change

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	6

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions

Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 391-6. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON RAO-26-68 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	12.39	–	3.19	2.54	
16 hr	12.81	3.4	3.25	3.77	
24 hr	12.91	4.2	3.29	3.55	
40 hr	13.06	5.4	3.30	4.83	
48 hr	13.07	5.5	3.32	6.59	4

Metal Specimen Data

Weight change, mg/cm²:	Al	+0.18
	Ti	+0.14
	Ag	+0.18
	Steel	+0.22
	Cu	–0.12
	Mg	+0.08
Metal discoloration, deposits, pitting, or etching:	Al	Brown
	Ti	Brown
	Ag	Brown
	Steel	Brown deposit
	Cu	Brown
	Mg	Brown

Test Cell Data

Sludge in oil:	200-mesh filter	Trace
	Centrifuge, vol %	1.0
Tube deposits:	Total demerits	247

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	38
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions

Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 392-1. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-64-25 AT 419°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	28.58	–	5.45	0.00	
16 hr	30.76	7.6	5.59	0.42	
24 hr	31.30	9.5	5.66	0.53	
40 hr	32.50	13.7	5.82	0.85	
48 hr	34.90	22.1	6.06	2.56	4

Metal Specimen Data

Weight change, mg/cm²:	Al	–0.04
	Ti	+0.02
	Ag	+0.04
	Steel	+0.06
	Cu	–0.30
	Mg	+0.06
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	L yellow
	Steel	Peacock
	Cu	L etching
	Mg	L brown

Test Cell Data

Sludge in oil:	200-mesh filter	Trace
	Centrifuge, vol %	None
Tube deposits:	Total demerits	39

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	41
100°F vis, hr to 1 cs/8 hr	37

Test Conditions

Sample temperature, °F	419
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 392-2. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-65-15 AT 419°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	27.20	–	5.04	0.02	
16 hr	30.94	13.7	5.50	0.86	
24 hr	31.82	17.0	5.60	1.18	
40 hr	33.79	24.2	5.83	1.97	
48 hr	35.20	29.4	6.00	2.14	4

Metal Specimen Data

Weight change, mg/cm²:	Al	+0.02
	Ti	0.00
	Ag	0.00
	Steel	+0.06
	Cu	–0.32
	Mg	+0.10
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	L Yellow
	Steel	Yellow
	Cu	L etching
	Mg	L brown

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	8

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	32

Test Conditions

Sample temperature, °F	419
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 392-3. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-65-16 AT 419°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	26.69	–	5.13	0.20	
16 hr	30.37	13.8	5.56	1.30	
24 hr	31.15	16.7	5.66	1.40	
40 hr	33.19	24.4	5.91	2.41	
48 hr	35.40	32.6	6.15	4.19	4

Metal Specimen Data

Weight change, mg/cm²:	Al	–0.02
	Ti	0.00
	Ag	–0.16
	Steel	+0.08
	Cu	+0.02
	Mg	+0.08
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	Tan
	Steel	L yellow
	Cu	Gold
	Mg	L brown

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	19

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	39
100°F vis, hr to 1 cs/8 hr	33

Test Conditions

Sample temperature, °F	419
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 392-4. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-67-20 AT 419°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.48	–	3.25	0.21	
16 hr	14.81	9.9	3.46	1.21	
24 hr	15.23	13.0	3.53	2.24	
40 hr	17.55	30.2	3.85	7.35	
48 hr	19.87	47.4	4.19	9.44	5

Metal Specimen Data

Weight change, mg/cm²:	Al	–0.04
	Ti	–0.06
	Ag	+0.06
	Steel	–0.06
	Cu	–0.34
	Mg	0.68
Metal discoloration, deposits, pitting, or etching:	Al	L brown
	Ti	Brown
	Ag	Tan
	Steel	L blue
	Cu	L etching
	Mg	L etching & pitting

Test Cell Data

Sludge in oil:	200-mesh filter	Trace
	Centrifuge, vol %	None
Tube deposits:	Total demerits	26

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	20
100°F vis, hr to 1 cs/8 hr	31

Test Conditions

Sample temperature, °F	419
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 392-5. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-68-9 AT 419°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	28.16	–	5.31	0.16	
16 hr	31.49	11.8	5.72	0.65	
24 hr	31.97	13.5	5.78	0.78	
40 hr	33.03	17.3	5.94	0.95	
48 hr	33.62	19.4	6.00	0.97	4

Metal Specimen Data

Weight change, mg/cm²:	Al	–0.06
	Ti	0.00
	Ag	–0.04
	Steel	+0.02
	Cu	–0.12
	Mg	+0.08
Metal discoloration, deposits, pitting, or etching:	Al	L brown
	Ti	Brown
	Ag	L yellow
	Steel	L green
	Cu	Gold
	Mg	Gray

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	16

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions

Sample temperature, °F	419
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 393-1. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-64-25 AT 347°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	28.58	–	5.45	0.00	
7 days	30.77	7.7	5.61	0.19	
14 days	31.37	9.8	5.69	0.27	
21 days	31.86	11.5	5.75	0.26	
26 days	31.78	11.2	5.75	0.21	11

Metal Specimen Data

Weight change, mg/cm²:	Al	+0.04
	Ti	+0.06
	Ag	–0.02
	Steel	+0.10
	Cu	+0.12
	Mg	+0.02
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	L yellow
	Steel	Peacock
	Cu	Brown
	Mg	No change

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	1

Breakpoint Data

Neut. no., days to 1 mg KOH/g/4 days	26+
100°F vis, days to 1 cs/4 days	26+

Test Conditions

Sample temperature, °F	347
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 393-2. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-65-15 AT 347°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	27.20	–	5.04	0.02	
7 days	30.83	13.3	5.51	0.30	
14 days	31.78	16.8	5.64	0.42	
21 days	32.69	20.2	5.75	0.62	
26 days	32.96	21.2	5.79	0 78	10

Metal Specimen Data			Test Cell Data		
Weight change, mg/cm²:	Al	0.00	Sludge in oil:	200-mesh filter	None
	Ti	+0.10		Centrifuge, vol %	None
	Ag	−0.04			
	Steel	0.00	Tube deposits:	Total demerits	5
	Cu	−0.22			
	Mg	−0.10	**Breakpoint Data**		
Metal discoloration, deposits, pitting, or etching:			Neut. no., days to 1 mg KOH/g/4 days		26+
			100°F vis, days to 1 cs/4 days		26+
	Al	No change	**Test Conditions**		
	Ti	No change			
	Ag	Brown	Sample temperature, °F		347
	Steel	Peacock	Sample volume, ml		200
	Cu	L etching	Air rate, liters/hr		10
	Mg	Gray	Condensate return		Yes

TEST NO. 393-3. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-65-16 AT 347°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	26.69	–	5.13	0.20	
7 days	30.07	12.7	5.56	0.45	
14 days	30.89	15.7	5.67	0.58	
21 days	31.63	18.5	5.77	0.64	
26 days	31.75	19.0	5.79	0.56	10

Metal Specimen Data			Test Cell Data		
Weight change, mg/cm²:	Al	0.00	Sludge in oil:	200-mesh filter	None
	Ti	+0.06		Centrifuge, vol %	None
	Ag	0.00			
	Steel	+0.02	Tube deposits:	Total demerits	4
	Cu	+0.10			
	Mg	+0.02	**Breakpoint Data**		
Metal discoloration, deposits, pitting, or etching:			Neut. no., days to 1 mg KOH/g/4 days		26+
			100°F vis, days to 1 cs/4 days		26+
	Al	No change	**Test Conditions**		
	Ti	L yellow			
	Ag	L yellow	Sample temperature, °F		347
	Steel	Blue-green	Sample volume, ml		200
	Cu	Gold	Air rate, liters/hr		10
	Mg	No change	Condensate return		Yes

TEST NO. 393-4. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-67-20 AT 347°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.48	–	3.25	0.21	
7 days	14.75	9.4	3.47	0.47	
14 days	15.10	12.0	3.53	0.47	
21 days	15.51	15.1	3.59	0.67	
26 days	15.53	15.2	3.59	0.85	9

Metal Specimen Data			Test Cell Data		
Weight change, mg/cm²:	Al	0.00	Sludge in oil:	200-mesh filter	Trace
	Ti	0.00		Centrifuge, vol %	None
	Ag	−0.10			
	Steel	−0.06	Tube deposits:	Total demerits	17
	Cu	−0.18			
	Mg	+0.18	**Breakpoint Data**		
Metal discoloration, deposits, pitting, or etching:			Neut. no., days to 1 mg KOH/g/4 days		26+
			100°F vis, days to 1 cs/4 days		26+
	Al	L yellow	**Test Conditions**		
	Ti	Brown			
	Ag	Tan	Sample temperature, °F		347
	Steel	Peacock	Sample volume, ml		200
	Cu	Brown	Air rate, liters/hr		10
	Mg	Gray	Condensate return		Yes

TEST NO. 393-5. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-68-9 AT 347°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	28.16	–	5.31	0.16	
7 days	31.55	12.0	5.76	0.39	
14 days	32.17	14.2	5.84	0.39	
21 days	32.81	16.5	5.92	0.42	
26 days	32.87	16.7	5.93	0.33	11

Metal Specimen Data			Test Cell Data		
Weight change, mg/cm²:	Al	0.00	Sludge in oil:	200-mesh filter	None
	Ti	+0.04		Centrifuge, vol %	None
	Ag	−0.12			
	Steel	−0.10	Tube deposits:	Total demerits	$< 10^{(a)}$
	Cu	+0.06			
	Mg	+0.08	**Breakpoint Data**		
Metal discoloration, deposits, pitting, or etching:			Neut. no., days to 1 mg KOH/g/4 days		26+
			100°F vis, days to 1 cs/4 days		26+
	Al	No change	**Test Conditions**		
	Ti	L yellow			
	Ag	Tan	Sample temperature, °F		347
	Steel	Blue & gold	Sample volume, ml		200
	Cu	Gold	Air rate, liters/hr		10
	Mg	No change	Condensate return		Yes

(a) Demerit rating not obtained–cell lost in handling.

TEST NO. 393-6. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON L-1136A[a] AT 347°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	16.11	–	4.14	0.15	
7 days	15.85	–1.6	4.02	1.06	
14 days	15.52	–3.7	3.88	2.15	
21 days	15.59	–3.2	3.84	4.96	
26 days	16.05	–0.4	3.92	5.35	10

Metal Specimen Data

Weight change, mg/cm²:	Al	0.00
	Ti	+0.06
	Ag	–0.02
	Steel	+0.02
	Cu	–0.08
	Mg	+0.20
Metal discoloration, deposits, pitting, or etching:	Al	L green
	Ti	Green
	Ag	Tan
	Steel	Green-yellow
	Cu	Peacock
	Mg	L brown deposit

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	Trace
Tube deposits:	Total demerits	46

Breakpoint Data

Neut. no., days to 1 mg KOH/g/4 days	14
100°F vis, days to 1 cs/4 days	26+

Test Conditions

Sample temperature, °F	347
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

(a) Blend (1:1) of O-67-7 and O-67-9.

TEST NO. 394-1. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON RAO-22-68 AT 385°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	16.91	–	4.29	0.12	
16 hr	17.08	+1.0	4.30	1.41	
24 hr	16.94	+0.2	4.25	1.63	
40 hr	16.69	–1.3	4.19	2.46	
48 hr	16.44	–2.8	4.01	5.86	2

Metal Specimen Data

Weight change, mg/cm²:	Al	–0.02
	Ti	+0.18
	Ag	+0.18
	Steel	+0.12
	Cu	–0.24
	Mg	+0.04
Metal discoloration, deposits, pitting, or etching:	Al	L brown
	Ti	L green
	Ag	L yellow
	Steel	Green
	Cu	L etching
	Mg	Gray

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	Trace
Tube deposits:	Total demerits	45

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	39
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions

Sample temperature, °F	385
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 395-1. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON ALO-839-F617948 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	14.02	–	3.51	0.19	
16 hr	14.38	2.6	3.56	1.03	
24 hr	14.38	2.6	3.56	1.18	
40 hr	14.50	3.4	3.56	1.72	
48 hr	14.53	3.6	3.59	2.95	2

Metal Specimen Data

Weight change, mg/cm²:	Al	–0.02
	Ti	0.00
	Ag	+0.08
	Steel	+0.12
	Cu	–0.24
	Mg	+0.04
Metal discoloration, deposits, pitting, or etching:	Al	L yellow
	Ti	Brown
	Ag	Yellow
	Steel	Blue
	Cu	L etching
	Mg	L brown

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	Trace
Tube deposits:	Total demerits	9

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	45
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions

Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 396-1. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON RAO-21-68 AT 401°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	27.60	–	5.06	0.15	
16 hr	30.73	11.3	5.44	0.62	
24 hr	31.23	13.2	5.50	0.40	
40 hr	32.17	16.6	5.60	0.52	
48 hr	32.62	18.2	5.68	0.53	4

Metal Specimen Data

Weight change, mg/cm²:	Al	+0.04
	Ti	+0.08
	Ag	+0.10
	Steel	+0.06
	Cu	–0.12
	Mg	+0.06
Metal discoloration, deposits, pitting, : etching:	Al	No change
	Ti	No change
	Ag	Yellow
	Steel	Blue
	Cu	Gold
	Mg	No change

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	0

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions

Sample temperature, °F	401
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 396-2. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON RAO-23-68 AT 401°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.55	–	3.26	0.16	
16 hr	14.43	6.5	3.41	0.66	
24 hr	14.58	7.6	3.43	0.32	
40 hr	14.95	10.3	3.50	1.19	
48 hr	15.03	10.9	3.53	1.55	2

Metal Specimen Data

Weight change, mg/cm²:	Al	+0.08
	Ti	−0.02
	Ag	−0.02
	Steel	0.00
	Cu	−0.14
	Mg	+0.16
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	L yellow
	Steel	Blue
	Cu	Brown
	Mg	L brown

Test Cell Data

Sludge in oil:	200-mesh filter	Trace
	Centrifuge, vol %	None
Tube deposits:	Total demerits	9

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions

Sample temperature, °F	401
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 396-3. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON RAO-24-68 AT 401°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	7.27	–	5.45	0.18	
16 hr	[illegible].47	8.1	5.55	1.62	
24 hr	31.10	14.0	5.70	1.78	
40 hr	35.54	30.3	6.21	1.49	
48 hr	38.35	40.6	6.53	2.30	6

Metal Specimen Data

Weight change, mg/cm²:	Al	+0.06
	Ti	+0.08
	Ag	+0.04
	Steel	+0.08
	Cu	−7.16
	Mg	−0.52
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	No change
	Steel	Blue
	Cu	H etching
	Mg	L etching & pitting

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	10

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	46
100°F vis, hr to 1 cs/8 hr	<16

Test Conditions

Sample temperature, °F	401
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 396-4. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON RAO-25-68 AT 401°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	25.99	–	5.04	0.19	
16 hr	28.45	9.5	5.35	0.65	
24 hr	28.98	11.5	5.41	0.67	
40 hr	29.85	14.9	5.53	0.88	
48 hr	30.35	16.8	5.60	0.90	4

Metal Specimen Data

Weight change, mg/cm²:	Al	+0.10
	Ti	+0.04
	Ag	+0.08
	Steel	+0.10
	Cu	+0.02
	Mg	+0.06
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	Yellow
	Steel	Brown
	Cu	Gold
	Mg	No change

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	2

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions

Sample temperature, °F	401
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 396-5. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON RAO-26-68 AT 401°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	12.39	–	3.19	2.54	
16 hr	12.96	4.6	3.29	3.93	
24 hr	13.08	5.6	3.30	4.69	
40 hr	14.40	16.2	3.52	12.83	
48 hr	16.67	34.5	3.83	18.92	4

Metal Specimen Data

Weight change, mg/cm²:	Al	+0.44
	Ti	+0.42
	Ag	+0.30
	Steel	+0.26
	Cu	–0.20
	Mg	+0.34
Metal discoloration, deposits, pitting, or etching:	Al	Brown deposit
	Ti	Brown deposit
	Ag	Brown deposit
	Steel	Brown deposit
	Cu	L pitting
	Mg	Brown deposit

Test Cell Data

Sludge in oil:	200-mesh filter	Trace
	Centrifuge, vol %	Trace
Tube deposits:	Total demerits	299

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	23
100°F vis, hr to 1 cs/8 hr	37

Test Conditions

Sample temperature, °F	401
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 397-1. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON RAO-22-68 AT 374°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	16.91	–	4.29	0.12	
16 hr	17.15	1.4	4.31	1.11	
24 hr	17.17	1.5	4.31	1.31	
40 hr	17.09	1.1	4.29	1.65	
48 hr	17.00	0.5	4.27	1.90	4

Metal Specimen Data		
Weight change, mg/cm²:	Al	+0.06
	Ti	–0.10
	Ag	–0.02
	Steel	–0.02
	Cu	–0.28
	Mg	–0.04
Metal discoloration, deposits, pitting, or etching:	Al	Gray
	Ti	L blue
	Ag	L yellow
	Steel	Purple
	Cu	L etching
	Mg	Gray

Test Cell Data		
Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	35

Breakpoint Data	
Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions	
Sample temperature, °F	374
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 398-1. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-67-20 AT 410°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.48	–	3.25	0.21	
16 hr	14.59	8.2	3.40	0.89	
24 hr	14.84	10.1	3.47	1.14	
40 hr	15.42	14.4	3.57	2.08	
48 hr	16.20	20.2	3.68	3.66	3

Metal Specimen Data		
Weight change, mg/cm²:	Al	–0.02
	Ti	+0.02
	Ag	–0.04
	Steel	+0.04
	Cu	–0.34
	Mg	0.00
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	Tan
	Steel	Blue
	Cu	L etching
	Mg	No change

Test Cell Data		
Sludge in oil:	200-mesh filter	Trace
	Centrifuge, vol %	None
Tube deposits:	Total demerits	19

Breakpoint Data	
Neut. no., hr to 1 mg KOH/g/8 hr	44
100°F vis, hr to 1 cs/8 hr	46

Test Conditions	
Sample temperature, °F	410
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 398-2. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON RAO-21-68 AT 410°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	27.60	–	5.06	0.15	
16 hr	31.05	12.5	5.47	0.47	
24 hr	31.63	14.6	5.53	0.57	
40 hr	32.62	18.2	5.66	0.73	
48 hr	33.11	20.0	5.74	0.77	4

Metal Specimen Data		
Weight change, mg/cm²:	Al	−0.10
	Ti	−0.04
	Ag	+0.06
	Steel	+0.04
	Cu	−0.14
	Mg	−0.06
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	Yellow
	Steel	Blue
	Cu	Gold
	Mg	No change

Test Cell Data		
Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	8

Breakpoint Data	
Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions	
Sample temperature, °F	410
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 398-3. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON RAO-23-68 AT 410°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.55	–	3.26	0.16	
16 hr	14.60	7.7	3.42	0.86	
24 hr	14.82	9.4	3.46	1.22	
40 hr	15.42	13.8	3.56	2.00	
48 hr	16.30	20.3	3.68	4.21	4

Metal Specimen Data		
Weight change, mg/cm²:	Al	0.00
	Ti	−0.04
	Ag	+0.10
	Steel	+0.04
	Cu	−0.24
	Mg	−0.06
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	Tan
	Steel	Blue
	Cu	L etching
	Mg	No change

Test Cell Data		
Sludge in oil:	200-mesh filter	Trace
	Centrifuge, vol %	None
Tube deposits:	Total demerits	12

Breakpoint Data	
Neut. no., hr to 1 mg KOH/g/8 hr	39
100°F vis, hr to 1 cs/8 hr	46

Test Conditions	
Sample temperature, °F	410
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 398-4. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON RAO-25-68 AT 410°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	25.99	–	5.04	0.19	
16 hr	28.78	10.7	5.39	0.65	
24 hr	29.50	13.5	5.49	0.79	
40 hr	30.48	17.3	5.61	1.03	
48 hr	31.11	20.0	5.69	1.05	5

Metal Specimen Data

Weight change, mg/cm²:	Al	–0.10
	Ti	–0.04
	Ag	0.00
	Steel	0.00
	Cu	+0.06
	Mg	–0.08
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	Brown
	Ag	L brown
	Steel	Feacock
	Cu	Gold
	Mg	No change

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	6

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions

Sample temperature, °F	410
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 399-1. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON RAO-21-68 AT 419°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	27.60	–	5.06	0.15	
16 hr	31.30	13.4	5.51	0.60	
24 hr	32.13	16.4	5.60	0.77	
40 hr	33.67	22.0	5.76	1.12	
48 hr	34.61	25.4	5.88	1.62	4

Metal Specimen Data

Weight change, mg/cm²:	Al	–0.02
	Ti	+0.06
	Ag	+0.06
	Steel	–0.02
	Cu	–0.16
	Mg	–0.02
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	L yellow
	Steel	Blue-green
	Cu	Gold
	Mg	No change

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	10

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions

Sample temperature, °F	419
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 399-2. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON RAO-25-68 AT 419°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	25.99	–	5.04	0.19	
16 hr	29.11	12.0	5.43	0.99	
24 hr	29.81	14.7	5.51	1.23	
40 hr	31.60	21.6	5.72	2.06	
48 hr	33.60	29.3	5.93	3.38	4

Metal Specimen Data

Weight change, mg/cm²:	Al	0.00
	Ti	+0.06
	Ag	–0.04
	Steel	0.00
	Cu	–0.02
	Mg	+0.04
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	Brown
	Ag	Yellow
	Steel	Blue & brown
	Cu	Gold
	Mg	No change

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	21

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	45
100°F vis, hr to 1 cs/8 hr	37

Test Conditions

Sample temperature, °F	419
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 400-1. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON RAO-21-68 AT 428°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	27.60	–	5.06	0.15	
16 hr	31.85	15.4	5.57	0.79	
24 hr	32.81	18.9	5.68	1.08	
40 hr	35.31	27.9	5.96	2.05	
48 hr	37.53	36.0	6.20	3.46	5

Metal Specimen Data

Weight change, mg/cm²:	Al	–0.14
	Ti	–0.02
	Ag	–0.10
	Steel	0.00
	Cu	–0.22
	Mg	–0.02
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	L brown
	Ag	L yellow
	Steel	Blue-green
	Cu	L etching
	Mg	Gray spots

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	15

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	41
100°F vis, hr to 1 cs/8 hr	29

Test Conditions

Sample temperature, °F	428
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 400-2. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON RAO-25-68 AT 428°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	25.99	–	5.04	0.19	
16 hr	29.63	14.0	5.49	1.33	
24 hr	30.70	18.1	5.62	1.81	
40 hr	34.72	33.6	6.08	5.05	
48 hr	38.27	47.2	6.48	6.26	5

Metal Specimen Data

Weight change, mg/cm²:	Al	–0.04
	Ti	–0.06
	Ag	+0.14
	Steel	0.00
	Cu	–0.14
	Mg	–0.08
Metal discoloration, deposits, pitting, or etching:	Al	L brown
	Ti	Brown
	Ag	Yellow
	Steel	Peacock
	Cu	Gold
	Mg	Gray spots

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	23

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	24
100°F vis, hr to 1 cs/8 hr	29

Test Conditions

Sample temperature, °F	428
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 400-3. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON RAO-21-68[a] AT 428°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	27.60	–	5.06	0.15	
16 hr	31.86	15.4	5.56	0.81	
24 hr	32.88	19.1	5.69	1.10	
40 hr	35.33	28.0	5.96	2.00	
48 hr	37.12	34.5	6.15	3.48	5

Metal Specimen Data

Weight change, mg/cm²:	Al	–0.10
	Ti	+0.08
	Ag	–0.04
	Steel	+0.02
	Cu	–0.20
	Mg	–0.14
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	L yellow
	Steel	Blue-green
	Cu	L etching
	Mg	Gray spots

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	16

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	44
100°F vis, hr to 1 cs/8 hr	29

Test Conditions

Sample temperature, °F	428
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

(a) Evaluated in aluminum block.

TEST NO. 400-4. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON RAO-25-68[a] AT 428°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	25.99	–	5.04	0.19	
16 hr	29.58	13.8	5.49	1.41	
24 hr	30.63	17.9	5.62	1.95	
40 hr	33.91	30.5	5.98	4.33	
48 hr	36.60	40.8	6.30	5.99	5

Metal Specimen Data

Weight change, mg/cm²:	Al	–0.04
	Ti	+0.04
	Ag	–0.04
	Steel	–0.04
	Cu	–0.12
	Mg	–0.34
Metal discoloration, deposits, pitting, or etching:	Al	L yellow
	Ti	Brown
	Ag	Yellow
	Steel	Peacock
	Cu	Gold
	Mg	L pitting

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	Trace
Tube deposits:	Total demerits	23

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	30
100°F vis, hr to 1 cs/8 hr	29

Test Conditions

Sample temperature, °F	428
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

(a) Evaluated in aluminum block.

TEST NO. 401-1. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-68-1 AT 401°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.29	–	3.21	0.00	
16 hr	14.17	6.6	3.35	0.48	
24 hr	14.36	8.1	3.37	0.59	
40 hr	14.59	9.8	3.40	0.82	
48 hr	14.73	10.8	3.44	0.99	3

Metal Specimen Data

Weight change, mg/cm²:	Al	+0.02
	Ti	+0.04
	Ag	0.00
	Steel	+0.04
	Cu	0.00
	Mg	+0.02
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	L yellow
	Steel	Blue & brown
	Cu	Gold & green
	Mg	Gray

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	8

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions

Sample temperature, °F	401
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 401-2. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-68-1[a] AT 401°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.29	–	3.21	0.00	
16 hr	14.20	6.8	3.35	0.56	
24 hr	14.38	8.2	3.37	0.49	
40 hr	14.66	10.3	3.42	0.72	
48 hr	14.78	11.2	3.44	0.90	2

Metal Specimen Data

Weight change, mg/cm²:	Al	+0.04
	Ti	+0.10
	Ag	0.00
	Steel	+0.10
	Cu	+0.02
	Mg	0.00
Metal discoloration, deposits, pitting, or etching:	Al	L brown
	Ti	Brown
	Ag	L yellow
	Steel	Peacock
	Cu	Gold & green
	Mg	Gray

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	10

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions

Sample temperature, °F	401
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

(a) 10 ppm iron added to sample as red iron oxide.

TEST NO. 401-3. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-68-1[a] AT 401°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.29	–	3.21	0.00	
16 hr	14.20	6.8	3.35	0.20	
24 hr	14.37	8.1	3.38	0.49	
40 hr	14.64	10.2	3.42	0.74	
48 hr	14.78	11.2	3.44	0.90	2

Metal Specimen Data

Weight change, mg/cm²:	Al	0.00
	Ti	+0.06
	Ag	+0.04
	Steel	–
	Cu	+0.02
	Mg	0.00
Metal discoloration, deposits, pitting, or etching:	Al	L brown
	Ti	Brown
	Ag	L yellow
	Steel	Peacock
	Cu	Gold & green
	Mg	No change

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	10

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions

Sample temperature, °F	401
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

(a) 50 ppm iron added to sample as red iron oxide.

TEST NO. 401-4. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-68-1[a] AT 401°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.29	–	3.21	0.00	
16 hr	14.16	6.5	3.35	0.54	
24 hr	14.34	7.9	3.37	0.56	
40 hr	14.61	9.9	3.42	0.76	
48 hr	14.75	11.0	3.45	0.92	2

Metal Specimen Data		
Weight change, mg/cm²:	Al	+0.04
	Ti	+0.04
	Ag	+0.02
	Steel	+0.14
	Cu	+0.06
	Mg	+0.04
Metal discoloration, deposits, pitting, or etching:	Al	L brown
	Ti	Brown
	Ag	L Yellow
	Steel	Peacock
	Cu	Gold & green
	Mg	No change

Test Cell Data		
Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	13

Breakpoint Data	
Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions	
Sample temperature, °F	401
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

(a) 100 ppm iron added to sample as red iron oxide.

TEST NO. 402-1. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON ATL-920 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	14.01	–	3.42	0.15	
16 hr	14.62	4.4	3.52	0.40	
24 hr	14.88	6.2	3.55	0.48	
40 hr	15.10	7.8	3.57	0.72	
48 hr	15.33	9.4	3.62	1.31	3

Metal Specimen Data		
Weight change, mg/cm²:	Al	-0.06
	Ti	-0.04
	Ag	-0.08
	Steel	+0.12
	Cu	0.00
	Mg	+0.08
Metal discoloration, deposits, pitting, or etching	Al	No change
	Ti	No change
	Ag	L yellow
	Steel	Blue
	Cu	Orange
	Mg	Brown

Test Cell Data		
Sludge in oil:	200-mesh filter	Trace
	Centrifuge, vol %	None
Tube deposits:	Total demerits	49

Breakpoint Data	
Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions	
Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 403-1. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON RAO 24-68 AT 374°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	27.27	–	5.45	0.18	
16 hr	28.57	4.8	5.53	0.54	
24 hr	29.21	7.1	5.57	1.01	
40 hr	31.29	14.7	5.74	1.07	
48 hr	32.87	20.5	5.91	0.20	7

Metal Specimen Data

Weight change, mg/cm²:	Al	0.00
	Ti	+0.02
	Ag	–0.04
	Steel	0.00
	Cu	–4.88
	Mg	+0.02
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	No change
	Steel	Violet
	Cu	H etching
	Mg	Brown

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	3

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	31

Test Conditions

Sample temperature, °F	374
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 404-1. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON RAO-24-68 AT 385°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	27.27	–	5.45	0.18	
16 hr	28.78	5.5	5.53	0.87	
24 hr	29.30	7.4	5.58	1.53	
40 hr	31.80	16.6	5.77	1.59	
48 hr	33.46	22.7	5.98	0.7[illegible]	5

Metal Specimen Data

Weight change, mg/cm²:	Al	-0.06
	Ti	-0.04
	Ag	0.02
	Steel	+0.04
	Cu	-5.64
	Mg	+0.06
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	L yellow
	Steel	Blue & Violet
	Cu	H etching
	Mg	Gray

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	5

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	29

Test Conditions

Sample temperature, °F	385
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 404-2. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON RAO-26-68 AT 335°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	12.39	–	3.19	2.54	
16 hr	12.78	3.1	3.26	2.84	
24 hr	12.81	3.4	3.27	3.24	
40 hr	12.95	4.5	3.30	3.91	
48 hr	12.95	4.5	3.29	3.75	4

Metal Specimen Data

Weight change, mg/cm²:	Al	+0.02
	Ti	+0.02
	Ag	+0.02
	Steel	+0.12
	Cu	−0.38
	Mg	+0.14
Metal discoloration, deposits, pitting, or etching:	Al	Brown
	Ti	Brown
	Ag	Brown
	Steel	Brown & purple
	Cu	L etching
	Mg	Brown

Test Cell Data

Sludge in oil:	200-mesh filter	Trace
	Centrifuge, vol %	0.1
Tube deposits:	Total demerits	298

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions

Sample temperature, °F	385
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 405-1. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-69-2 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.53		3.25	0.04	
16 hr	14.43	6.7	3.37	0.68	
24 hr	14.63	8.1	3.43	0.79	
40 hr	14.98	10.7	3.47	0.83	
48 hr	15.08	11.5	3.50	1.42	3

Metal Specimen Data

Weight change, mg/cm²:	Al	0.00
	Ti	+0.08
	Ag	+0.02
	Steel	0.00
	Cu	+0.10
	Mg	+0.04
Metal discoloration, deposits, pitting, or etching	Al	No change
	Ti	No change
	Ag	L yellow
	Steel	L blue
	Cu	Orange
	Mg	No change

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	0

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	47
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions

Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 405-2. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON ATL-791 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt. %
Initial	16.06	–	3.63	2.26	
16 hr	17.05	6.2	3.78	2.40	
24 hr	17.39	8.3	3.85	1.80	
40 hr	18.16	13.1	3.96	2.13	
48 hr	19.31	20.2	4.12	4.71	3

Metal Specimen Data		
Weight change, mg/cm²:	Al	−0.06
	Ti	+0.02
	Ag	+0.08
	Steel	+0.04
	Cu	−0.82
	Mg	−0.14
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	No change
	Steel	Purple
	Cu	L etching
	Mg	Gray spots

Test Cell Data		
Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	4

Breakpoint Data	
Neut. no., hr to 1 mg KOH/g/8 hr	41
100°F vis, hr to 1 cs/8 hr	41

Test Conditions	
Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 405-3. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON ATL-820 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt. %
Initial	16.22	–	3.67	0.88	
16 hr	16.70	3.0	3.74	1.27	
24 hr	16.87	4.0	3.76	1.17	
40 hr	17.11	5.5	3.81	1.12	
48 hr	17.25	6.4	3.83	1.66	3

Metal Specimen Data		
Weight change, mg/cm²:	Al	0.00
	Ti	+0.10
	Ag	+0.02
	Steel	−0.02
	Cu	+0.02
	Mg	−0.06
Metal discoloration, deposits, pitting, or etching:	Al	L brown
	Ti	Yellow
	Ag	Tan
	Steel	L green
	Cu	Gold
	Mg	No change

Test Cell Data		
Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	Trace
Tube deposits:	Total demerits	19

Breakpoint Data	
Neut. no., hr to 1 mg KOH/g/8 hr	47
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions	
Sample temperature, °F	392
Sample volume, ml	200
Air rate liters/hr	10
Condensate return	Yes

TEST NO. 405-4. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON ATL-882 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	15.93	–	3.63	0.84	
16 hr	16.41	3.0	3.71	1.23	
24 hr	16.58	4.1	3.74	1.17	
40 hr	16.84	5.7	3.78	1.05	
48 hr	17.02	6.8	3.81	1.57	3

Metal Specimen Data		
Weight change, mg/cm²:	Al	−0.10
	Ti	+0.16
	Ag	0.00
	Steel	−0.02
	Cu	−0.02
	Mg	−0.04
Metal discoloration, deposits, pitting, or etching:	Al	L yellow
	Ti	Yellow
	Ag	Tan
	Steel	Blue
	Cu	Gold
	Mg	No change

Test Cell Data		
Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	Trace
Tube deposits:	Total demerits	16

Breakpoint Data	
Neut. no., hr to 1 mg KOH/g/8 hr	47
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions	
Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 405-5. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON ATL-910 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.59	–	3.42	0.17	
16 hr	14.09	3.7	3.49	0.63	
24 hr	14.52	6.8	3.57	0.61	
40 hr	17.12	26.0	3.93	11.70	
48 hr	20.08	47.8	4.38	9.88	5

Metal Specimen Data		
Weight change, mg/cm²:	Al	0.04
	Ti	+0.02
	Ag	+0.04
	Steel	0.00
	Cu	−0.50
	Mg	−0.08
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	L yellow
	Ag	L yellow
	Steel	Blue
	Cu	L etching
	Mg	Gray

Test Cell Data		
Sludge in oil:	200-mesh filter	Trace
	Centrifuge, vol %	0.8
Tube deposits:	Total demerits	58

Breakpoint Data	
Neut. no., hr to 1 mg KOH/g/8 hr	32
100°F vis, hr to 1 cs/8 hr	31

Test Conditions	
Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 405-6. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON ATL-911 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.61	–	3.35	0.15	
16 hr	14.34	5.4	3.47	0.52	
24 hr	14.38	5.7	3.47	0.44	
40 hr	14.66	7.7	3.52	0.73	
48 hr	16.51	21.3	3.75	5.92	4

Metal Specimen Data

Weight change, mg/cm²:	Al	+0.06
	Ti	+0.02
	Ag	−0.10
	Steel	+0.12
	Cu	−0.20
	Mg	−0.04
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	No change
	Steel	Blue
	Cu	L etching
	Mg	Brown

Test Cell Data

Sludge in oil:	200-mesh filter	Trace
	Centrifuge, vol %	0.8
Tube deposits:	Total demerits	30

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	40
100°F vis, hr to 1 cs/8 hr	43

Test Conditions

Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 405-7. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON ATL-912 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.89	–	3.36	0.09	
16 hr	14.86	7.0	3.52	0.57	
24 hr	15.09	8.6	3.56	0.48	
40 hr	15.29	10.1	3.58	0.66	
48 hr	15.45	11.2	3.62	1.16	3

Metal Specimen Data

Weight change, mg/cm²:	Al	−0.04
	Ti	+0.04
	Ag	0.02
	Steel	0.02
	Cu	−0.28
	Mg	−0.06
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	No change
	Steel	Blue
	Cu	L etching
	Mg	Brown

Test Cell Data

Sludge in oil:	200-mesh filter	Trace
	Centrifuge, vol %	1.0
Tube deposits:	Total demerits	36

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	48
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions

Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 405-8. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON ATL-917 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	16.14	–	3.76	1.63	
16 hr	16.62	3.0	3.84	2.33	
24 hr	16.85	4.4	3.87	1.66	
40 hr	17.30	7.2	3.97	1.97	
48 hr	17.49	8.4	4.00	3.50	3

Metal Specimen Data		
Weight change, mg/cm²:	Al	−0.04
	Ti	+0.08
	Ag	−0.06
	Steel	+0.08
	Cu	−0.96
	Mg	−0.02
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	No change
	Steel	Purple
	Cu	L etching
	Mg	Gray

Test Cell Data		
Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	Trace
Tube deposits:	Total demerits	13

Breakpoint Data	
Neut. no., hr to 1 mg KOH/g/8 hr	41
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions	
Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 406-1. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-69-2 AT 410°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.53	–	3.25	0.04	
16 hr	14.78	9.2	3.44	1.11	
24 hr	14.98	10.7	3.48	1.62	
40 hr	17.48	29.2	3.81	5.59	
48 hr	19.91	47.2	4.14	7.19	4

Metal Specimen Data		
Weight change, mg/cm²:	Al	0.00
	Ti	+0.02
	Ag	0.00
	Steel	0.00
	Cu	−0.06
	Mg	−0.06
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	No change
	Ag	L yellow
	Steel	Blue & yellow
	Cu	Orange
	Mg	No change

Test Cell Data		
Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	0

Breakpoint Data	
Neut. no., hr to 1 mg KOH/g/8 hr	25
100°F vis, hr to 1 cs/8 hr	31

Test Conditions	
Sample temperature, °F	410
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 407-1. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-67-10 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis. cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	17.32	–	4.61	0.26	
16 hr	16.59	–4.2	4.36	1.00	
24 hr	16.25	–5.2	4.28	1.35	
40 hr	17.75	+2.5	4.17	14.86	
48 hr	20.84	+20.3	4.74	18.65	8

Metal Specimen Data		
Weight change, mg/cm²:	Al	–0.02
	Ti	–0.02
	Ag	+0.04
	Steel	+0.04
	Cu	–0.96
	Mg	–23.2
Metal discoloration, deposits, pitting, or etching:	Al	L brown
	Ti	Brown
	Ag	L brown
	Steel	Blue
	Cu	M etching
	Mg	H pitting

Test Cell Data		
Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	Trace
Tube deposits:	Total demerits	48

Breakpoint Data	
Neut. no., hr to 1 mg KOH/g/8 hr	28
100°F vis, hr to 1 cs/8 hr	36

Test Conditions	
Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 409-1. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-64-12 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis. cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.80	–	3.52	0.53	
16 hr	15.11	9.5	3.75	1.66	
24 hr	14.90	8.0	3.65	1.91	
40 hr	14.84	7.5	3.65	2.47	
48 hr	14.75	6.9	3.68	2.74	3

Metal Specimen Data		
Weight change, mg/cm²:	Al	+0.36
	Ti	+0.34
	Ag	+0.16
	Steel	+0.16
	Cu	–0.08
	Mg	+0.18
Metal discoloration, deposits, pitting, or etching	Al	Black deposit
	Ti	Black deposit
	Ag	Brown
	Steel	Brown-black
	Cu	Brown-black
	Mg	Brown-black

Test Cell Data		
Sludge in oil:	200-mesh filter	Trace
	Centrifuge, vol %	0.2
Tube deposits:	Total demerits	381

Breakpoint Data	
Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions	
Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 409-2. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-64-18 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	16.80	–	4.30	0.12	
16 hr	17.05	+1.5	4.28	1.46	
24 hr	16.93	+0.8	4.24	1.86	
40 hr	16.75	–0.3	4.06	7.91	
48 hr	18.55	+10.4	4.30	13.29	5

Metal Specimen Data		
Weight change, mg/cm²:	Al	+0.04
	Ti	+0.02
	Ag	–0.02
	Steel	+0.02
	Cu	–0.22
	Mg	+0.02
Metal discoloration, deposits, pitting, or etching:	Al	L green
	Ti	Green
	Ag	L green
	Steel	Yellow
	Cu	L etching
	Mg	L yellow

Test Cell Data		
Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	Trace
Tube deposits:	Total demerits	76

Breakpoint Data	
Neut. no., hr to 1 mg KOH/g/8 hr	27
100°F vis, hr to 1 cs/8 hr	41

Test Conditions	
Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 417-1. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-69-5 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.57	–	3.25	0.01	
16 hr	14.45	6.5	3.40	0.52	
24 hr	14.65	8.0	3.45	0.56	
40 hr	14.96	10.2	3.48	0.82	
48 hr	15.11	11.3	3.50	1.49	3

Metal Specimen Data		
Weight change, mg/cm²:	Al	-0.04
	Ti	-0.14
	Ag	-0.04
	Steel	0.00
	Cu	-0.14
	Mg	+0.06
Metal discoloration, deposits, pitting, or etching	Al	No change
	Ti	L yellow
	Ag	No change
	Steel	L green
	Cu	Gold
	Mg	No change

Test Cell Data		
Sludge in oil	200-mesh filter	None
	Centrifuge, vol	None
Tube deposits	Total demerits	1

Breakpoint Data	
Neut. no., hr to 1 mg KOH/g/8 hr	47
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions	
Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 417-2. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-69-10 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.47	–	3.24	0.03	
16 hr	14.37	6.7	3.37	0.61	
24 hr	14.57	8.2	3.43	0.91	
40 hr	14.89	10.5	3.45	1.17	
48 hr	15.02	11.5	3.48	1.37	3

Metal Specimen Data		
Weight change, mg/cm²:	Al	–0.08
	Ti	+0.06
	Ag	–0.02
	Steel	–0.04
	Cu	–0.08
	Mg	0.00
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	L yellow
	Ag	No change
	Steel	L green
	Cu	Gold
	Mg	No change

Test Cell Data		
Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	0

Breakpoint Data	
Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions	
Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 417-3. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON ATL-919 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	23.52	–	5.16	0.12	
16 hr	24.02	2.1	5.22	0.61	
24 hr	24.93	6.0	5.23	2.32	
40 hr	30.79	30.9	5.92	7.29	
48 hr	34.70	47.5	6.42	13.06	6

Metal Specimen Data		
Weight change, mg/cm²:	Al	–0.04
	Ti	+0.08
	Ag	–0.04
	Steel	–0.08
	Cu	–0.94
	Mg	–0.10
Metal discoloration, deposits, pitting, or etching	Al	No change
	Ti	L yellow
	Ag	No change
	Steel	Blue
	Cu	L etching
	Mg	No change

Test Cell Data		
Sludge in oil	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits	Total demerits	7

Breakpoint Data	
Neut. no., hr to 1 mg KOH/g/8 hr	17
100°F vis, hr to 1 cs/8 hr	22

Test Conditions	
Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 417-4. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON ATL-922 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	14.27	–	3.39	0.06	
16 hr	15.16	6.2	3.52	0.75	
24 hr	15.38	7.8	3.56	1.00	
40 hr	15.69	10.0	3.61	1.28	
48 hr	15.84	11.0	3.64	1.41	3

Metal Specimen Data

Weight change, mg/cm²:	Al	0.00
	Ti	–0.06
	Ag	0.00
	Steel	+0.02
	Cu	–0.12
	Mg	+0.08
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	L yellow
	Ag	No change
	Steel	L green
	Cu	Tan
	Mg	L brown

Test Cell Data

Sludge in oil:	200-mesh filter	Trace
	Centrifuge, vol %	0.2
Tube deposits:	Total demerits	62

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions

Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 417-5. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON ATL-923 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.76	–	3.36	0.29	
16 hr	14.22	3.3	3.44	0.46	
24 hr	14.36	4.4	3.46	0.47	
40 hr	14.61	6.2	3.50	0.70	
48 hr	14.88	8.1	3.54	2.13	3

Metal Specimen Data

Weight change, mg/cm²	Al	–0.10
	Ti	–0.08
	Ag	–0.12
	Steel	–0.02
	Cu	–0.22
	Mg	–0.02
Metal discoloration, deposits, pitting, or etching	Al	No change
	Ti	L yellow
	Ag	No change
	Steel	Blue
	Cu	L etching
	Mg	Gray

Test Cell Data

Sludge in oil	200-mesh filter	1.4
	Centrifuge, vol %	Trace
Tube deposits	Total demerits	102

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	45
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions

Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 417-6. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON ATL-939 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.59	–	3.27	0.19	
16 hr	14.32	5.4	3.39	0.39	
24 hr	14.52	6.8	3.40	0.53	
40 hr	14.66	7.9	3.44	0.70	
48 hr	14.79	8.8	3.46	0.94	4

Metal Specimen Data		
Weight change, mg/cm²:	Al	–0.06
	Ti	–0.08
	Ag	–0.02
	Steel	–0.02
	Cu	0.00
	Mg	+0.02
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	L yellow
	Ag	L yellow
	Steel	Blue
	Cu	Pink
	Mg	Gray

Test Cell Data		
Sludge in oil:	200-mesh filter	Trace
	Centrifuge, vol %	Trace
Tube deposits:	Total demerits	105

Breakpoint Data	
Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions	
Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 417-7. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON ATL-940 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.45	–	3.28	0.08	
16 hr	14.24	5.9	3.38	0.21	
24 hr	14.35	6.7	3.41	0.21	
40 hr	14.47	7.6	3.39	0.34	
48 hr	14.56	8.3	3.44	0.81	3

Metal Specimen Data		
Weight change, mg/cm²:	Al	+0.04
	Ti	–0.04
	Ag	–0.04
	Steel	–0.06
	Cu	0.00
	Mg	–0.02
Metal discoloration, deposits, pitting, or etching	Al	No change
	Ti	L yellow
	Ag	L yellow
	Steel	Blue
	Cu	Pink & L green
	Mg	Yellow

Test Cell Data		
Sludge in oil:	200-mesh filter	Trace
	Centrifuge, vol %	None
Tube deposits:	Total demerits	52

Breakpoint Data	
Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions	
Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 418-1. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-69-5 AT 410°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt. %
Initial	13.57	–	3.25	0.01	
16 hr	14.74	8.6	3.43	1.19	
24 hr	15.04	10.8	3.46	1.64	
40 hr	18.45	36.0	3.91	6.66	
48 hr	21.99	62.0	4.39	10.35	4

Metal Specimen Data

Weight change, mg/cm²:	Al	−0.06
	Ti	−0.02
	Ag	−0.06
	Steel	+0.04
	Cu	−0.04
	Mg	−0.08
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	L yellow
	Ag	L yellow
	Steel	L green
	Cu	Gold
	Mg	Gray

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	2

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	24
100°F vis, hr to 1 cs/8 hr	30

Test Conditions

Sample temperature, °F	410
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 418-2. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-69-10 AT 410°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt. %
Initial	13.47	–	3.24	0.03	
16 hr	14.67	8.9	3.43	1.12	
24 hr	14.96	11.1	3.44	1.53	
40 hr	17.39	29.1	3.79	5.68	
48 hr	20.23	50.2	4.18	9.48	4

Metal Specimen Data

Weight change, mg/cm²	Al	0.02
	Ti	−0.06
	Ag	+0.04
	Steel	+0.08
	Cu	0.14
	Mg	0.00
Metal discoloration, deposits, pitting, or etching	Al	No change
	Ti	L yellow
	Ag	L yellow
	Steel	Brown
	Cu	Gold
	Mg	No change

Test Cell Data

Sludge in oil	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits	Total demerits	2

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	25
100°F vis, hr to 1 cs/8 hr	32

Test Conditions

Sample temperature, °F	410
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 419-1. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON ATL-942 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	14.07	–	3.63	0.17	
16 hr	14.22	1.1	3.63	1.08	
24 hr	14.18	0.8	3.61	1.26	
40 hr	14.88	5.8	3.60	8.27	
48 hr	16.90	20.1	3.86	15.63	5

Metal Specimen Data

Weight change, mg/cm²:	Al	0.00
	Ti	0.00
	Ag	–0.14
	Steel	–0.10
	Cu	–0.52
	Mg	–0.92
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	L yellow
	Ag	Tan
	Steel	Purple
	Cu	L etching
	Mg	L etching & pitting

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	24

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	31
100°F vis, hr to 1 cs/8 hr	40

Test Conditions

Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 419-2. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON ATL-943 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.22	–	3.39	(a)	
16 hr	13.66	3.3	3.46	1.14	
24 hr	13.78	4.2	3.47	3.60	
40 hr	15.37	16.3	3.69	9.20	
48 hr	17.20	30.1	3.99	16.00	4

Metal Specimen Data

Weight change, mg/cm²:	Al	–0.04
	Ti	0.00
	Ag	–0.18
	Steel	–0.12
	Cu	–0.70
	Mg	–0.82
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	L yellow
	Ag	Tan
	Steel	Purple
	Cu	L etching
	Mg	L pitting

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	12

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	15
100°F vis, hr to 1 cs/8 hr	35

Test Conditions

Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

(a) Insufficient sample to determine initial neutralization number.

TEST NO. 419-3. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON ATL-963 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.31	–	3.37	0.41	
16 hr	13.71	3.0	3.46	1.62	
24 hr	13.88	4.3	3.49	2.09	
40 hr	15.86	19.2	3.78	11.67	
48 hr	17.38	30.6	4.02	17.88	5

Metal Specimen Data

Weight change, mg/cm²:	Al	0.00
	Ti	0.00
	Ag	–0.22
	Steel	–0.08
	Cu	–5.20
	Mg	–0.12
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	L yellow
	Ag	L etching
	Steel	Purple
	Cu	M etching
	Mg	Gray

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	4

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	25
100°F vis, hr to 1 cs/8 hr	34

Test Conditions

Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 432-1. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON ATL-972 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	18.09	–	4.13	3.61	
16 hr	19.19	6.1	4.27	3.61	
24 hr	19.65	8.6	4.33	3.88	
40 hr	20.56	13.7	4.34	4.12	
48 hr	21.09	16.6	4.53	5.17	3

Metal Specimen Data

Weight change, mg/cm²:	Al	–0.02
	Ti	+0.02
	Ag	+0.08
	Steel	+0.10
	Cu	–0.40
	Mg	–0.06
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	Tan
	Ag	L yellow
	Steel	Purple
	Cu	L etching
	Mg	No change

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	5

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	45
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions

Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 432-2. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON ATL-944 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.24	–	3.25	0.43	
16 hr	13.66	3.2	3.32	0.61	
24 hr	13.95	5.4	3.38	0.61	
40 hr	14.24	7.6	3.39	1.03	
48 hr	14.27	7.8	3.43	1.32	1

Metal Specimen Data

Weight change, mg/cm²:	Al	+0.04
	Ti	+0.08
	Ag	+0.14
	Steel	0.00
	Cu	–0.02
	Mg	+0.14
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	Tan
	Ag	N. C.
	Steel	Brown-purple
	Cu	Gold
	Mg	Gray

Test Cell Data

Sludge in oil:	200-mesh filter	Trace
	Centrifuge, vol %	0.8
Tube deposits:	Total demerits	24

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions

Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 432-3. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON ATL-945 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.35	–	3.32	0.10	
16 hr	14.05	5.2	3.44	0.53	
24 hr	14.16	6.1	3.46	0.70	
40 hr	14.43	8.1	3.52	1.09	
48 hr	15.96	19.6	3.72	5.34	2

Metal Specimen Data

Weight change, mg/cm²:	Al	+0.04
	Ti	–0.10
	Ag	0.00
	Steel	+0.12
	Cu	–0.16
	Mg	+0.08
Metal discoloration, deposits, pitting, or etching:	Al	Yellow
	Ti	Brown-purple
	Ag	Tan
	Steel	Blue-green
	Cu	Brown-gold
	Mg	Yellow

Test Cell Data

Sludge in oil:	200-mesh filter	Trace
	Centrifuge, vol %	0.3
Tube deposits:	Total demerits	36

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	42
100°F vis, hr to 1 cs/8 hr	45

Test Conditions

Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 432-4. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON ATL-946 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.94	–	3.59	0.25	
16 hr	14.05	0.8	3.60	1.12	
24 hr	14.46	3.7	3.61	2.96	
40 hr	16.95	21.6	4.09	13.41	
48 hr	18.50	32.7	4.32	16.68	5

Metal Specimen Data

Weight change, mg/cm²:	Al	+0.06
	Ti	+0.04
	Ag	+0.04
	Steel	+0.08
	Cu	–8.70
	Mg	–0.22
Metal discoloration, deposits, pitting, or etching:	Al	Yellow
	Ti	Brown-purple
	Ag	L tan
	Steel	Blue-green
	Cu	H etching
	Mg	L etching & pitting

Test Cell Data

Sludge in oil:	200-mesh filter	Trace
	Centrifuge, vol %	Trace
Tube deposits:	Total demerits	47

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	17
100°F vis, hr to 1 cs/8 hr	31

Test Conditions

Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 432-5. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON ATL-964 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.81	–	3.45	0.20	
16 hr	14.01	1.4	3.46	0.46	
24 hr	14.52	5.1	3.57	1.44	
40 hr	16.59	20.1	3.90	5.21	
48 hr	19.46	40.9	4.30	11.12	3

Metal Specimen Data

Weight change, mg/cm²:	Al	–0.06
	Ti	–0.04
	Ag	+0.10
	Steel	–0.04
	Cu	–0.48
	Mg	–0.06
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	Tan
	Ag	No change
	Steel	Blue
	Cu	L etching
	Mg	L yellow

Test Cell Data

Sludge in oil:	200-mesh filter	Trace
	Centrifuge, vol %	0.6
Tube deposits:	Total demerits	20

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	21
100°F vis, hr to 1 cs/8 hr	31

Test Conditions

Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 432-6. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON ATL-965 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.91	–	3.42	0.15	
16 hr	14.28	2.7	3.45	0.45	
24 hr	14.77	6.2	3.47	0.63	
40 hr	15.09	8.5	3.61	0.86	
48 hr	15.15	8.9	3.63	1.03	1

Metal Specimen Data

Weight change, mg/cm²:	Al	–0.04
	Ti	–0.02
	Ag	–0.14
	Steel	+0.08
	Cu	–0.06
	Mg	+0.10
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	Tan
	Ag	No change
	Steel	Blue
	Cu	Gold
	Mg	L yellow

Test Cell Data

Sludge in oil:	200-mesh filter	Trace
	Centrifuge, vol %	0.3
Tube deposits:	Total demerits	34

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions

Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 432-7. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON ATL-966 AT 392°F

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	13.60	–	3.33	0.08	
16 hr	14.46	6.3	3.42	0.34	
24 hr	14.50	6.6	3.42	0.53	
40 hr	14.83	9.0	3.51	0.72	
48 hr	14.90	9.6	3.53	0.74	3

Metal Specimen Data

Weight change, mg/cm²:	Al	+0.08
	Ti	+0.08
	Ag	–0.04
	Steel	+0.02
	Cu	+0.06
	Mg	0.00
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	Tan
	Ag	L yellow
	Steel	Blue
	Cu	Gold-pink
	Mg	L yellow

Test Cell Data

Sludge in oil:	200-mesh filter	Trace
	Centrifuge, vol %	0.2
Tube deposits:	Total demerits	38

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions

Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 535-1, RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-64-25

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	28.76	–	5.36	0.00	
16 hr	29.45	2.4	5.50	0.17	
24 hr	29.77	3.4	5.53	0.22	
40 hr	30.79	7.1	5.62	0.29	
48 hr	31.15	8.3	5.62	0.34	2

Metal Specimen Data

Weight change, mg/cm²:	Al	0.00
	Ti	+0.02
	Ag	+0.04
	Steel	0.00
	Cu	–0.04
	Mg	–0.06
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	Tan
	Ag	Yellow
	Steel	Peacock
	Cu	Brown
	Mg	Slight etching

Test Cell Data

Sludge in oil:	200-mesh filter	Trace
	Centrifuge, vol %	Trace
Tube deposits:	Total demerits	21

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions

Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 535-2, RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-64-25

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	28.76	–	5.36	0.00	
16 hr	29.72	3.3	5.50	0.17	
24 hr	30.31	5.4	5.56	0.22	
40 hr	30.80	7.1	5.62	0.28	
48 hr	31.11	8.2	5.65	0.33	4

Metal Specimen Data

Weight change, mg/cm²:	Al	0.00
	Ti	0.00
	Ag	+0.06
	Steel	0.00
	Cu	–0.01
	Mg	0.00
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	Tan
	Ag	Yellow
	Steel	Peacock
	Cu	Brown
	Mg	Slight etching

Test Cell Data

Sludge in oil:	200-mesh filter	Trace
	Centrifuge, vol %	Trace
Tube deposits:	Total demerits	22

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions

Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 535-3. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-65-15

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt. %
Initial	27.20	–	5.04	0.02	
16 hr	29.55	8.6	5.35	0.33	
24 hr	30.30	11.4	5.41	0.47	
40 hr	31.01	14.0	5.52	0.62	
48 hr	31.40	15.4	5.56	0.67	3

Metal Specimen Data

Weight change, mg/cm²:	Al	0.00
	Ti	+0.02
	Ag	0.00
	Steel	0.00
	Cu	−0.16
	Mg	0.00
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	Tan
	Ag	No change
	Steel	Brown-blue
	Cu	Yellow-orange
	Mg	No change

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	2

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions

Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 535-4. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-65-15

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt. %
Initial	27.20	–	5.04	0.02	
16 hr	29.58	8.7	5.34	0.31	
24 hr	30.29	11.4	5.44	0.45	
40 hr	30.96	13.8	5.53	0.60	
48 hr	31.38	15.4	5.56	0.66	4

Metal Specimen Data

Weight change, mg/cm²:	Al	0.00
	Ti	0.00
	Ag	+0.08
	Steel	0.00
	Cu	−0.14
	Mg	−0.08
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	Tan
	Ag	No change
	Steel	Brown-blue
	Cu	Yellow-orange
	Mg	Slight etching

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	3

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions

Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 535-5. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-65-16

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	26.69	–	5.13	0.20	
16 hr	29.05	8.8	5.45	0.50	
24 hr	29.60	10.9	5.47	0.65	
40 hr	30.15	13.0	5.57	0.81	
48 hr	30.65	14.8	5.61	0.91	4

Metal Specimen Data

Weight change, mg/cm²:	Al	0.00
	Ti	0.00
	Ag	0.00
	Steel	0.00
	Cu	0.00
	Mg	–0.02
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	Tan
	Ag	L yellow
	Steel	Green-blue
	Cu	Orange
	Mg	No change

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	12

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions

Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 535-6. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-65-16

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	26.69	–	5.13	0.20	
16 hr	28.85	8.1	5.40	0.50	
24 hr	29.61	10.9	5.49	0.63	
40 hr	30.31	13.6	5.57	0.83	
48 hr	30.58	14.6	5.61	0.93	4

Metal Specimen Data

Weight change, mg/cm²:	Al	0.00
	Ti	0.00
	Ag	+0.02
	Steel	0.00
	Cu	+0.06
	Mg	+0.02
Metal discoloration, deposits, pitting, or etching:	Al	No change
	Ti	Tan
	Ag	L yellow
	Steel	Green-blue
	Cu	Orange
	Mg	No change

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	13

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions

Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 535-7. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-68-9

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	28.16	--	5.31	0.16	
16 hr	30.29	7.6	5.63	0.42	
24 hr	31.06	10.3	5.68	0.46	
40 hr	31.34	11.3	5.77	0.52	
48 hr	31.81	13.0	5.80	0.54	4

Metal Specimen Data

Weight change, mg/cm²:	Al	0.00
	Ti	0.00
	Ag	+0.02
	Steel	0.00
	Cu	- 0.08
	Mg	0.00
Metal discoloration deposits, pitting, or etching:	Al	No change
	Ti	L brown
	Ag	L yellow
	Steel	Green-blue
	Cu	Orange
	Mg	No change

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	15

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions

Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 535-8. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-68-9

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	28.16	-	5.31	0.16	
16 hr	30.39	7.9	5.61	0.40	
24 hr	31.06	10.3	5.66	0.45	
40 hr	31.43	11.6	5.77	0.50	
48 hr	31.69	12.5	5.79	0.53	3

Metal Specimen Data

Weight change, mg/cm²	Al	0.00
	Ti	0.00
	Ag	0.00
	Steel	0.00
	Cu	0.00
	Mg	0.06
Metal discoloration, deposits, pitting, or etching	Al	No change
	Ti	L brown
	Ag	L yellow
	Steel	Green-blue
	Cu	Orange
	Mg	No change

Test Cell Data

Sludge in oil:	200-mesh filter	None
	Centrifuge, vol %	None
Tube deposits:	Total demerits	15

Breakpoint Data

Neut. no., hr to 1 mg KOH/g/8 hr	48+
100°F vis, hr to 1 cs/8 hr	48+

Test Conditions

Sample temperature, °F	392
Sample volume, ml	200
Air rate, liters/hr	10
Condensate return	Yes

TEST NO. 540 1. RESULTS OF REFLUX OXIDATION-CORROSION TEST ON O-67-10

	Vis, cs/100°F	100°F Vis Increase, %	Vis, cs/210°F	Neut. No., mg KOH/g	Oil Loss, wt, %
Initial	17.32	–	4.61	0.26	
16 hr	16.63	–4.0	4.36	0.99	
24 hr	15.96	–7.9	4.16	1.84	
40 hr	17.91	+3.4	4.16	14.68	
48 hr	21.07	+21.7	4.78	18.80	5

Metal Specimen Data			Test Cell Data		
Weight change, mg/cm²:	Al	+0.02	Sludge in oil:	200-mesh filter	Trace
	Ti	0.00		Centrifuge, vol %	Trace
	Ag	–0.04			
	Steel	+0.02	Tube deposits:	Total demerits	55
	Cu	–0.88			
	Mg	–35.76	**Breakpoint Data**		
Metal discoloration, deposits, pitting, or etching:			Neut. no., hr to 1 mg KOH/g/8 hr		22
	Al	Yellow	100°F vis, hr to 1 cs/8 hr		33
	Ti	Brown	**Test Conditions**		
	Ag	Yellow-brown			
	Steel	L green-blue	Sample temperature, °F		392
	Cu	Slight etching	Sample volume, ml		200
	Mg	Severe etching	Air rate, liters/hr		10
			Condensate return		Yes

UNCLASSIFIED

Security Classification

DOCUMENT CONTROL DATA - R & D

(Security classification of title, body of abstract and indexing annotation must be entered when the overall report is classified)

1. ORIGINATING ACTIVITY *(Corporate author)* Southwest Research Institute 8500 Culebra Road San Antonio, Texas 78228	2a. REPORT SECURITY CLASSIFICATION UNCLASSIFIED 2b. GROUP

3. REPORT TITLE

EVALUATION STUDY OF THE OXIDATION-CORROSION-DEPOSITION CHARACTERISTICS OF AIRCRAFT TURBINE ENGINE LUBRICANTS–Volume II

4. DESCRIPTIVE NOTES *(Type of report and inclusive dates)*

Phase Report, February 1, 1969 through April 15, 1970

5. AUTHOR(S) *(First name, middle initial, last name)*

J. P. Cuellar
B. B. Baber

6. REPORT DATE October 1970	7a. TOTAL NO. OF PAGES 145	7b. NO. OF REFS None
8a. CONTRACT OR GRANT NO. F33615-69-C-1295 b. PROJECT NO. 3048 c. d.	9a. ORIGINATOR'S REPORT NUMBER(S) RS-547 9b. OTHER REPORT NO(S) *(Any other numbers that may be assigned this report)* AFAPL-TR-70-59, Volume II	

10. DISTRIBUTION STATEMENT

This document is subject to special export controls and each transmittal to foreign governments or foreign nationals may be made only with prior approval of the Fuel, Lubrication, and Hazards Division (APF), Air Force Aero Propulsion Laboratory, Wright-Patterson Air Force Base, Ohio 45433.

11. SUPPLEMENTARY NOTES	12. SPONSORING MILITARY ACTIVITY Air Force Aero Propulsion Laboratory Air Force Systems Command Wright-Patterson Air Force Base, Ohio

13. ABSTRACT

Volume II of this report contains a compilation of the individual test data sheets for all tests included in Volume I. The data sheets are presented in order of test number.

DD FORM 1 NOV 65 1473

UNCLASSIFIED

Security Classification

UNCLASSIFIED
Security Classification

14. KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT
Lubricants						
Oxidation-Corrosion						
Deposition						
Aircraft Turbine Engines						
Test Methods						

UNCLASSIFIED
Security Classification