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Proceedings of the REAPS Technical Symposium

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An Overview of the Manual and the Computerized "MOST" Work Measurement Systems

U.S. DEPARTMENT OF THE NAVY CARDEROCK DIVISION, NAVAL SURFACE WARFARE CENTER

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October 14-16, 1980
Philadelphia, Pennsylvania
AN OVERVIEW OF THE MANUAL AND THE COMPUTER "MOST" WORK MEASUREMENT SYSTEMS

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Mr. Yates has the responsibility for the administration of all company sales information and reports. He aids the sales staff with computer systems configuration and proposal preparation. He also provides presentations and demonstrations of H. B. Maynard and Company services to potential clients as well as interested professional organizations.

Mr. Yates holds a degree in administration from the University of Pittsburgh, and is a graduate of Carnegie-Mellon University.
MOST
COMPUTER
SYSTEMS

A NEW AUTOMATED
SYSTEM FOR THE ESTABLISHMENT AND
MAINTENANCE OF ENGINEERED LABOR TIME STANDARDS

H. B. MAYNARD and COMPANY, INC.
INTERNATIONAL MANAGEMENT CONSULTANTS
WHY DO WE NEED LABOR TIME STANDARDS?

- Satisfy a basic human characteristic (the need to know what is expected from a person)
- Plan and schedule labor regarding time and manpower
- Control output and productivity
- Calculate product and labor costs
- Pay by results
WHAT IS REQUIRED TO CALCULATE AN ENGINEERED TIME STANDARD?

1. DOCUMENTATION OF WORK CONDITIONS
2. WORK MEASUREMENT TECHNIQUE (MOST)
3. SUB-OPERATION DATA DEVELOPMENT PRINCIPLES AND RULES
4. FILING SYSTEM FOR SUB-OPERATION DATA
5. CALCULATION FORMATS FOR FINAL TIME STANDARDS
'MOST' SYSTEMS

- Time Standards
- Work Management
- Production Controls
- Productivity Improvements
- Investment Payoff < One Year
MOST® COMPUTER SYSTEMS

- COST ESTIMATING
  - PRODUCT COSTING
  - STANDARDIZATION
  - COMPONENT DESIGN
  - COMPARISON OF ALTERNATE PRODUCTION METHODS

MOST® COMPUTER SYSTEMS

- ENGINEERED LABOR TIME STANDARDS THAT:
  - REFLECT CURRENT METHODS
  - MAINTAINABLE
  - ACCURATE
  - CONSISTENT
  - EASILY COMMUNICATED
  - REFLECT QUALITY REQUIREMENTS

- MANAGEMENT INFORMATION SYSTEMS
  - LABOR PERFORMANCE REPORTING
  - WORK IN PROCESS
  - UTILIZATION REPORTS
  - VARIANCE ANALYSIS
  - INCENTIVE WAGE PAYMENTS

- MATERIAL PLANNING
  - ROUTING
  - BILLS OF MATERIAL
  - MATERIAL REQUIREMENTS PLANNING
  - INVENTORY CONTROL

- SHOP LOADING
- SCHEDULING
- BUDGETING
- MANPOWER PLANNING

CAPACITY PLANNING

572
'MOST’ FEATURES

- Universal Approach
- Fast to Apply
- Adequate Accuracy
- Easy to Understand and Learn
- Minimum of Paperwork
- Multilevel System
- Consistent Results
- Encourage Methods Development
- Open to Supplements
- Economic Installation
MOST® COMPUTER SYSTEMS

WILL -

• SIMPLIFY AND ACCELERATE THE DEVELOPMENT AND MAINTENANCE
  OF TIME STANDARDS

• IMPROVE THE PRODUCTIVITY OF THE INDUSTRIAL ENGINEER

• MAKE THE INDUSTRIAL ENGINEER’S JOB MORE CHALLENGING AND
  STIMULATING

• GENERATE UNIFORM INFORMATION AND DATA FOR FASTER AND MORE
  CONSISTENT PRODUCTION PLANNING AND CONTROL

• INCREASE THE SAVINGS/COST RATIO FOR THE INDUSTRIAL ENGINEERING
  FUNCTION AND THE PROFITABILITY FOR THE COMPANY
REDUCED MANPOWER REQUIREMENTS FOR:

DEVELOPMENT

20%

INCREASE IN OUTPUT

> 5 TIMES

APPLICATION

25%

> 4 TIMES

MAINTENANCE

10%

> 10 TIMES
PROGRAM MODULES

BASIC PROGRAM

MOST WORK MEASUREMENT
- WORK AREA GENERATOR
- MOST ANALYSIS
- EDITOR

TIME STD. CALCULATIONS
- TITLE SHEET ORGANIZATION
- RATE SHEET CALCULATIONS
- METHOD SHEET
- ROUTE SHEET
- EDITOR

SUB-OPER. DATABASE

TIME STD. DATABASE

SUPPLEMENTARY MODULES

MACHINING DATA
- FEEDS AND SPEEDS
- MACHINING TIMES

WELDING DATA
- ARC TIMES

LINE BALANCING
- MINIMUM BALANCE DELAYS

MULTI-MAN MACHINE ANALYSIS
- INTERFERENCE DELAYS
- WAITING TIMES

LABOR REPORTING
- PERFORMANCE
- UTILIZATION
- COVERAGE
- PRODUCTIVITY
- ETC.

WORD PROCESSING
- DOCUMENTATION
- EDITOR

MACHINE LOADING

MASS UPDATING
- REVISION
- SIMULATION
BASIC DATA ENTRY

OPERATOR

WORK PLACE

METHOD

TAPE RECORDING

CRT TERMINAL

MINI COMPUTER

PRINTED

WORK PLACE
DATA + LAYOUT

MOST CALCULATION

TIME

578
## Analysis Example

**Workplace:** Rivet Machine

![Diagram of Rivet Machine, Left Support, Right Support, Pallet, Fin Bin, Leg Bin, Operator]

### Work Stations:

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Action Distances:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rivet Machine</td>
<td>3 steps</td>
</tr>
<tr>
<td>Left Support</td>
<td></td>
</tr>
<tr>
<td>Right Support</td>
<td></td>
</tr>
<tr>
<td>Pallet/Bend</td>
<td></td>
</tr>
<tr>
<td>Leg Bin</td>
<td></td>
</tr>
<tr>
<td>Fin Bin</td>
<td></td>
</tr>
</tbody>
</table>

### Equipment:

- Rivet Machine - PT = 0.5 sec.

### Tools:

- None

### Parts/Objects:

- Pallet - Angles
- Rivet Machine - Rivet Pins
- Leg Bin - Legs

---

579
FASTEN WITH RIVETER
RIVET 2 LEGS TO CENTER SUPPORT

1. PLACE 1ST LEG TO RIVETPINS AND LEFT SUPPORT
   A3 B0 G1 A1 B0 P3 A0
2. PLACE ANGLE FROM PALLET TO RIVETPINS F 2
   A3 B6 G1 A3 B0 P3 A0
3. PUSH FOOTPEDAL FOR RIVETING LEG
   A1 B0 G1 M1 X1 I0 A0
4. HOLDMOVE ANGLE FROM RIVET MACHINE TO RIGHT SUPPORT
   A0 B0 G0 A1 B0 P1 A0
5. PLACE 2ND LEG AND ANGLE TO RIVETPINS
   A1 B0 G1 A1 B0 P3 A0
6. PUSH FOOTPEDAL FOR RIVETING LEG
   A1 B0 G1 M1 X1 I0 A0
7. HOLDMOVE LEG ASSEMBLY TO FINISH
   A0 B0 G0 A3 B0 P1 A0

TOTAL THU

107/1005/2

600
# Manual Handling

<table>
<thead>
<tr>
<th>Activity</th>
<th>Sequence Model</th>
<th>Sub-Activities</th>
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<tbody>
<tr>
<td>General Move</td>
<td>ABGABPA</td>
<td>A - Action Distance</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B - Body Motion</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Q - Gain Control</td>
</tr>
<tr>
<td></td>
<td></td>
<td>P - Place</td>
</tr>
<tr>
<td>Controlled Move</td>
<td>ABGMXIA</td>
<td>M - Move Controlled</td>
</tr>
<tr>
<td></td>
<td></td>
<td>X - Process Time</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I - Align</td>
</tr>
<tr>
<td>Tool Use</td>
<td>ABGABP ABPA</td>
<td>F - Fasten</td>
</tr>
<tr>
<td></td>
<td></td>
<td>L - Loosen</td>
</tr>
<tr>
<td></td>
<td></td>
<td>M - Measure</td>
</tr>
<tr>
<td></td>
<td></td>
<td>R - Record</td>
</tr>
<tr>
<td></td>
<td></td>
<td>S - Surface Treat</td>
</tr>
<tr>
<td></td>
<td></td>
<td>T - Think</td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>MAJOR CATEGORIES</th>
<th>EXAMPLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACTIVITY(IES)</td>
<td>EXCHANGE</td>
</tr>
<tr>
<td>OBJECT(S)/COMPONENT(S)</td>
<td>WORKPIECE in</td>
</tr>
<tr>
<td>EQUIPMENT/PRODUCT</td>
<td>3-JAW CHUCK with</td>
</tr>
<tr>
<td>TOOL(S)</td>
<td>T-WRENCH at</td>
</tr>
<tr>
<td>LOCATION</td>
<td>ENGINE LATHE #341</td>
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</table>

<table>
<thead>
<tr>
<th>SUPPLEMENTARY DATA</th>
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<tbody>
<tr>
<td>PER</td>
<td>PER</td>
</tr>
<tr>
<td>unit</td>
<td>part</td>
</tr>
<tr>
<td>OCCURRENCE FREQUENCY GROUP</td>
<td>OFG2</td>
</tr>
<tr>
<td>DATE</td>
<td>11/7/77</td>
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<tr>
<td>SPECIAL USER CATEGORY(IES)</td>
<td>(APPLICATOR, PLANT, ETC.)</td>
</tr>
<tr>
<td>CONDITIONS</td>
<td>(RESTRICTIONS, SPECIAL APPLICATIONS, ETC.)</td>
</tr>
</tbody>
</table>
MOST" COMPUTER SYSTEMS
FILING CATEGORIES FOR TIME STANDARDS

- PRODUCT/SUBASSEMBLY/PART NUMBER
- PRODUCT/SUBASSEMBLY/PART NAME
- COMPONENT CLASSIFICATION NUMBER
- PLANT NUMBER
- DEPARTMENT NUMBER
- COST CENTER NUMBER
- WORK CENTER NUMBER
- BILL OF MATERIAL NUMBER
- ROUTE SHEET NUMBER
- OPERATION NUMBER
- OPERATION NAME

583
PROCEDURE FOR DEVELOPMENT & APPLICATION OF STANDARDS

**DEVELOPMENT**

- Work Shop Conditions
- Data Bank
- Work Order
- Process Planning
  - Operation Method Standard
  - Operation Method Standard
  - Operation Method Standard
  - Operation Method Standard

**APPLICATION**

- Work Sheet
- Time Standard

Most Calculation
Sub-operation
Time

585
A - INDIVIDUAL STANDARDS COMBINED FOR WORK PACKAGE APPLICATION - APPEAR ON THE STANDARDS CALCULATION SHEET

B - FINAL COMBINED MOST ANALYSES

C - INDIVIDUAL OR COMBINED MOST ANALYSES
<table>
<thead>
<tr>
<th>MAJOR CATEGORY</th>
<th>NO.</th>
<th>DESCRIPTION</th>
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<td>Install reinforcement ring</td>
<td>Ring</td>
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<tr>
<td></td>
<td>2</td>
<td>Make-up reinforcement ring</td>
<td>Ring</td>
<td>7777</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Plates</td>
<td>4</td>
<td>Make-up face plate to web or section part</td>
<td>Foot</td>
<td>9999</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td></td>
<td></td>
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<td></td>
<td>8</td>
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<td></td>
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</tr>
<tr>
<td>Level</td>
<td>LN</td>
<td>Operation</td>
<td>FR</td>
<td></td>
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<tr>
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<td>----</td>
<td>----------------------</td>
<td>----</td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>6666</td>
<td>COMB SUB-OPERATION</td>
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<tr>
<td></td>
<td>555</td>
<td>MAKE-UP RING</td>
<td>1</td>
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<tr>
<td></td>
<td>444</td>
<td>GRIND</td>
<td>1</td>
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<tr>
<td>B</td>
<td>333</td>
<td>INSTALL RING</td>
<td>1</td>
<td></td>
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<tr>
<td></td>
<td>222</td>
<td>GRIND</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>555</td>
<td>MAKE-UP RING</td>
<td>FR</td>
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<tr>
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<td>123</td>
<td>MOVE</td>
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<td>TACK</td>
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<td>243</td>
<td>INSPECT</td>
<td>2</td>
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</tr>
<tr>
<td></td>
<td>234</td>
<td>ASIDE</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>
WHY SHOULD YOU USE MOST® COMPUTER SYSTEMS?

(1) BECAUSE MOST® COMPUTER SYSTEMS CAN:

- PROVIDE YOU WITH ACCURATE AND CONSISTENT WELL-DOCUMENTED TIME STANDARDS AND METHODS DESCRIPTIONS

- PROVIDE YOU WITH REALISTIC TIME STANDARDS FOR COSTING, SCHEDULING, MANPOWER PLANNING, PERFORMANCE CONTROL, WAGE INCENTIVES, ETC., E.G., THE BASIS FOR YOUR "MANUFACTURING INFORMATION SYSTEM"

- PROVIDE YOU WITH EASY-TO-READ METHOD INSTRUCTIONS FOR YOUR OPERATORS, ROUTE OR PROCESS SHEETS AS WELL AS WORKPLACE LAYOUTS AND DATA

- PROVIDE YOU WITH AN EXTREMELY COST EFFECTIVE SET OF LABOR TIME STANDARDS WITH SAVINGS OF:
  - 25% - DEVELOPMENT
  - 75% - APPLICATION
  - 90% - MAINTENANCE
  COMPARED TO A MANUAL APPLICATION

- PROVIDE THE BASIS FOR A COMPREHENSIVE INCENTIVE CORRECTION PROGRAM WITHIN REASONABLE TIME AND COST

- PROVIDE YOUR UNION AND/OR WORKER REPRESENTATIVES WITH FULL KNOWLEDGE AND PROPER APPLICATION EXPERIENCE TO ENHANCE THEIR UNDERSTANDING AND INVOLVEMENT IN THE IMPLEMENTATION

- PROVIDE THE OPPORTUNITY FOR EITHER A COMPUTERIZED OR A MANUAL APPLICATION ALIKE

- PROVIDE A UNIFORM APPLICATION IN MULTI-PLANT ORGANIZATIONS AS A RESULT OF YOUR 'CENTRAL COORDINATION AND INSTANT INTERCHANGEABILITY OF COMPUTER STORED DATA
WHY SHOULD YOU USE MOST® COMPUTER SYSTEMS?

(2) BECAUSE YOU CAN:

● PRE-SET COMPLETE ENGINEERED TIME STANDARDS INCLUDING MANUAL, PROCESS AND ALLOWANCE TIMES AND KEEP THESE STANDARDS UP-TO-DATE WITH A MINIMUM OF EFFORT

● DOCUMENT ALL YOUR WORKSHOP CONDITIONS AND DATA FOR RAPID AND NEAT PRINTING AND UPDATING TO BE USED FOR INSTRUCTIONS AND REFERENCING AS WELL AS THE BASIS FOR FURTHER COMPANY-WIDE DEVELOPMENTS

● ADAPT PROGRAM OUTPUT FORMATS TO YOUR PRESENT ESTABLISHED PROCEDURES AND ROUTINES

● SIMULATE POSSIBLE PRODUCTIVITY IMPROVEMENT OPPORTUNITIES IN YOUR MANUFACTURING AREAS, A KEY TASK FOR YOUR INDUSTRIAL ENGINEERS

● INCREASE YOUR INDUSTRIAL ENGINEERS' OUTPUT AND PRODUCTIVITY AS WELL AS IMPROVE THE QUALITY OF THEIR WORK

● ATTRACT NEW AND QUALIFIED INDUSTRIAL ENGINEERING CAPACITY AS WELL AS KEEP YOUR COMPETENT INDUSTRIAL ENGINEERING PERSONNEL

● INCORPORATE MODERN COMPUTER TECHNOLOGY IN YOUR INDUSTRIAL ENGINEERING DEPARTMENT WITHOUT REQUIRING SOPHISTICATED COMPUTER SKILLS FROM THE USERS

● INSTALL A DEDICATED MINI-COMPUTER IN YOUR INDUSTRIAL ENGINEERING DEPARTMENT FOR DIRECT ON-LINE ACCESS AND INTERFACE THE OUTPUT OF COMPLETE TIME STANDARDS WITH EXISTING SOFTWARE PROGR AND YOUR MAIN FRAME COMPUTER

● UTILIZE A VARIETY OF ADDITIONAL PROGRAM FEATURES THAT WILL ADVANCE YOUR INDUSTRIAL ENGINEERING AND IMPROVE YOUR OVERALL PRODUCT PLANNING AND CONTROL
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