The Nuts and Bolts of Zinc-Nickel

OEM Zinc Nickel Implementation on Fasteners – Getting It Into Production

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The Nuts and Bolts of Zinc-Nickel: OEM Zinc Nickel Implementation on Fasteners - Getting It Into Production
1. Cadmium Plated Fasteners currently in production
2. Problem at Hand – Hexavalent Chromates
3. Transition to Zinc-Nickel
4. Preliminary Testing
5. Plan moving forward for Qualifications and Implementation
Cadmium Plated Fasteners

- **Bolts**

- **Screws**
Cadmium Plated Fasteners

- Nuts/Nut Plates

- Inserts
Cadmium Plated Fasteners

- Hi-Loks

- Blind Fasteners
Problem At Hand

REACH Initiative: Eliminate Hexavalent chromates

Cadmium Plating: September 21, 2017
Solution for Fasteners

Zinc-Nickel Plating
Where is Zinc-Nickel used today?

• Low Strength Steel – just about everywhere
  • Rod
  • Brackets
  • Baskets of Nut plates

• High Strength Steel
  • Landing gear
  • Flap tracks on wings
So why not fasteners?

Threads
What has Boeing done in preparation?

Goal: Zinc-Nickel Plated Fasteners to be a drop-in replacement for CAD Plated Fasteners

Boeing Research and Technology conducted 6 phases of testing before moving into qualification and implementation phase of Zinc-Nickel plating of threaded fasteners.
6 Phases of Testing

- **Phase I** – Failed, Acid based Zinc-Nickel, Fasteners were not representative of fasteners used in production

- **Phase II** – Failed, Acid based Zinc-Nickel, Results were not acceptable. Switch to Alkaline based Zinc-Nickel

- **Phase III** – Failed, Alkaline based Zinc-Nickel, Results Unacceptable

- **Phase IV** – Failed, Alkaline based Zinc-Nickel, Coating too thick

- **Phase V** – Failed, Alkaline based Zinc-Nickel, parts were stripped and re-plated (altered data)
1. Metallurgical Testing - thickness check  Comparable
2. Torque Tension – NASM1312-15  Comparable, need more data
   • 3 sizes, 6 tests configurations
3. High RPM Installation – galling check  Comparable
4. Torque Effectively and Reusability – BPS-N-70  Crimp Optimization needed
5. Salt Spray – NASM1312-1  Comparable
6. Installation Force – BMS10-85  Further investigation needed with interference fit fasteners
What is the plan?

Qualification is not equal to Implementation

1. Structures and design community risk adverse
2. Immature supply chain
Where are we?

Qualifications in-process

1) Bolts
   - Thickness
   - Appearance
   - Dimensions
   - Corrosion

2) Nuts
   - Thickness
   - Appearance
   - Dimensions
   - Torque Effectivity and Resuability – Adjust crimp factors
   - Additional Torque Tension to complete data set
Next Steps

• Continue qualifying fasteners (hi-loks, collars, blinds, nut plates, inserts)

• Complete specification changes

• Complete torque tension data package during the qualifications

• Slowly get parts into production (Start with low risk parts and increase confidence) and build the supply chain