

# **GREAT DESIGNS IN STEEL**

**Presentations will be available for  
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Wednesday, May 22**

# **GREAT DESIGNS IN STEEL**

## **CORROSION PROTECTION OF AHSS IN CHASSIS APPLICATIONS**

### **AUTO/STEEL PARTNERSHIP**

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# PROJECT GOALS

- Develop a test to simulate 15-year corrosion environment for chassis components
  - Evaluate Crevice corrosion, GMAW effects & Gravel Chipping Effects
- Test different steels with different coatings and surface treatments:
  - Uncoated, Galvanized, Aluminized & Zinc Vapor Deposition
  - Standard Paint Systems & several Zinc-Rich Coatings

# PAINT SYSTEMS

- **Baseline:** Degreased, Zinc Phosphate, **E-Coat Only**
- Degreased, Shot peened, **Zinc-Rich Coating #1**, E-Coat
- Clean & Acid Pickle, Chemical Phosphate, **Zinc-Rich Coating #2**, E-Coat
- Media Blast & Ultrasound Cleaning, **Zinc Vapor Diffusion Coating**, E-Coat

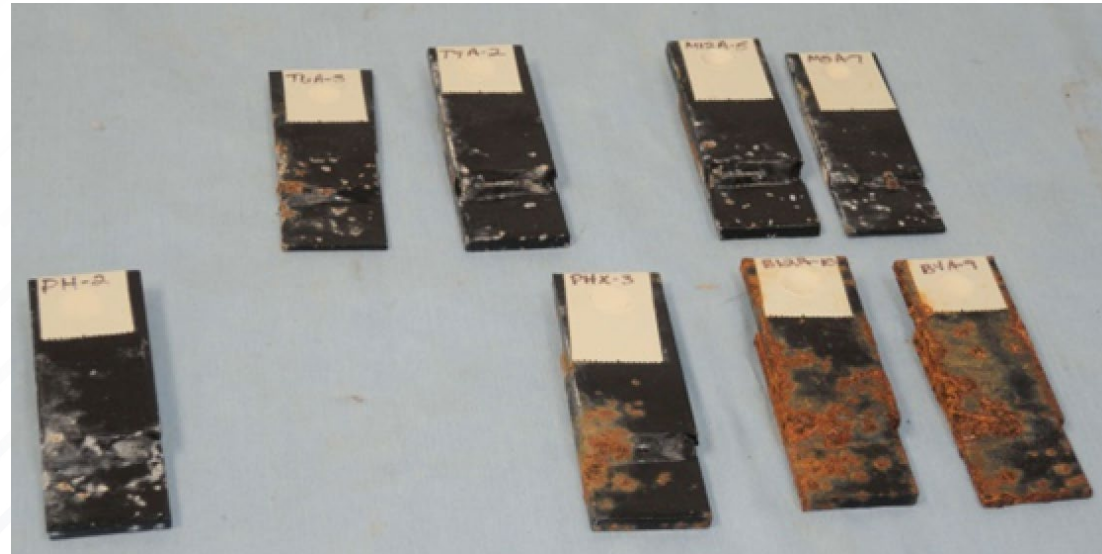
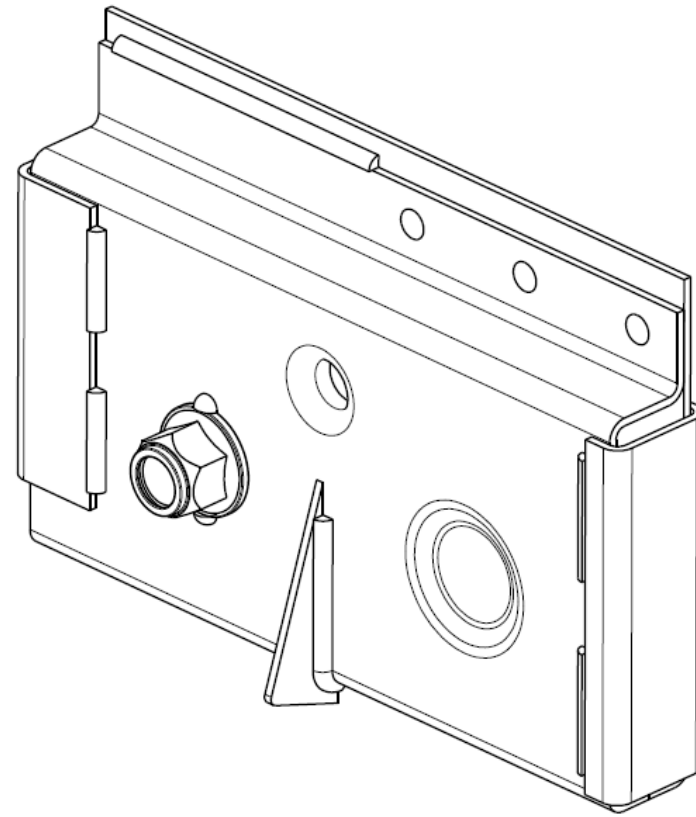


# STEEL GRADES EVALUATED

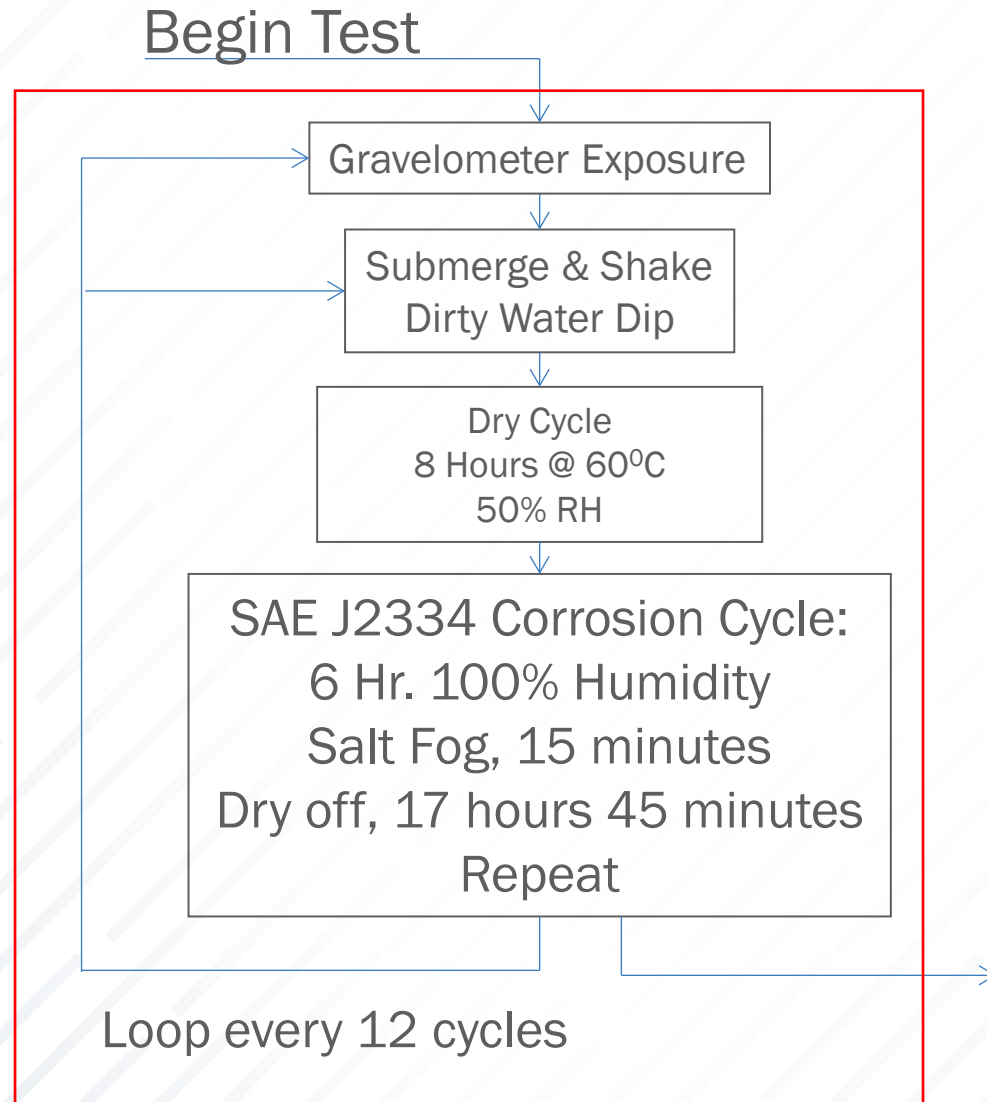
- HSLA 550X, GI
- 590SF, GI
- TRIP 780, GI
- CP780, GI
- DP780, GI
- DP980, GI
- 780SF, Bare
- A606 Weathering Steel, Bare
- A690 Marine Grade, Bare
- 22MnB5, AlSi coated

# TEST COUPONS

- “Biscuit Tin”
  - GMAW Fillet Welds
  - Spot welds
  - Welded nut
  - Perch flange
  - Crevices
  - Dimple
  - Scribe (back)
- Lap Welded Coupons



# TEST PROCEDURE



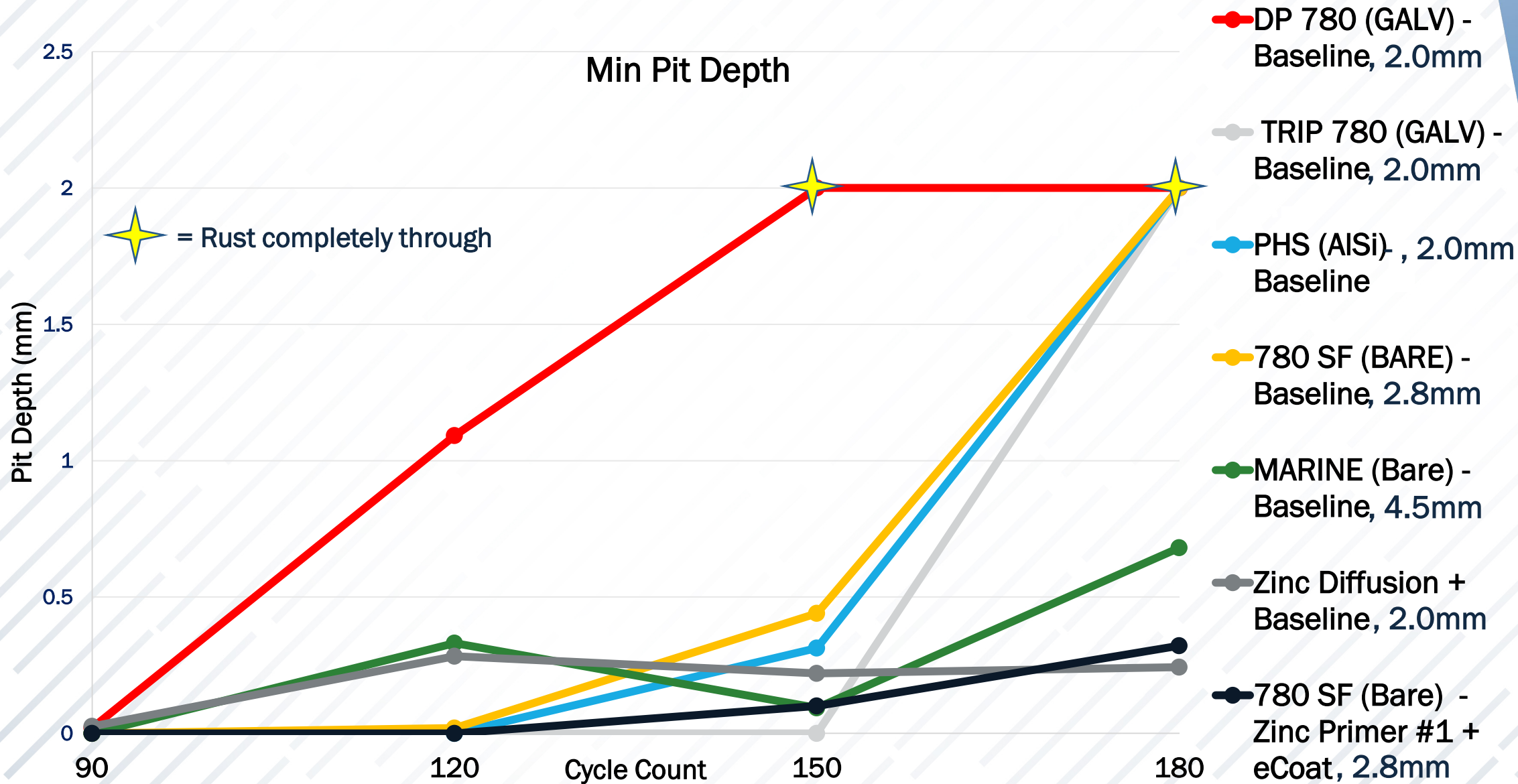
Gravelometer at 3<sup>rd</sup>  
Year Points, i.e., 1, 3,  
6, 9 & 12 only

At 90, 120 & 150 Cycles  
Extract a set of Lap Weld Coupons

Test Ends @ 180 Cycles  
Extract & Prepare Samples

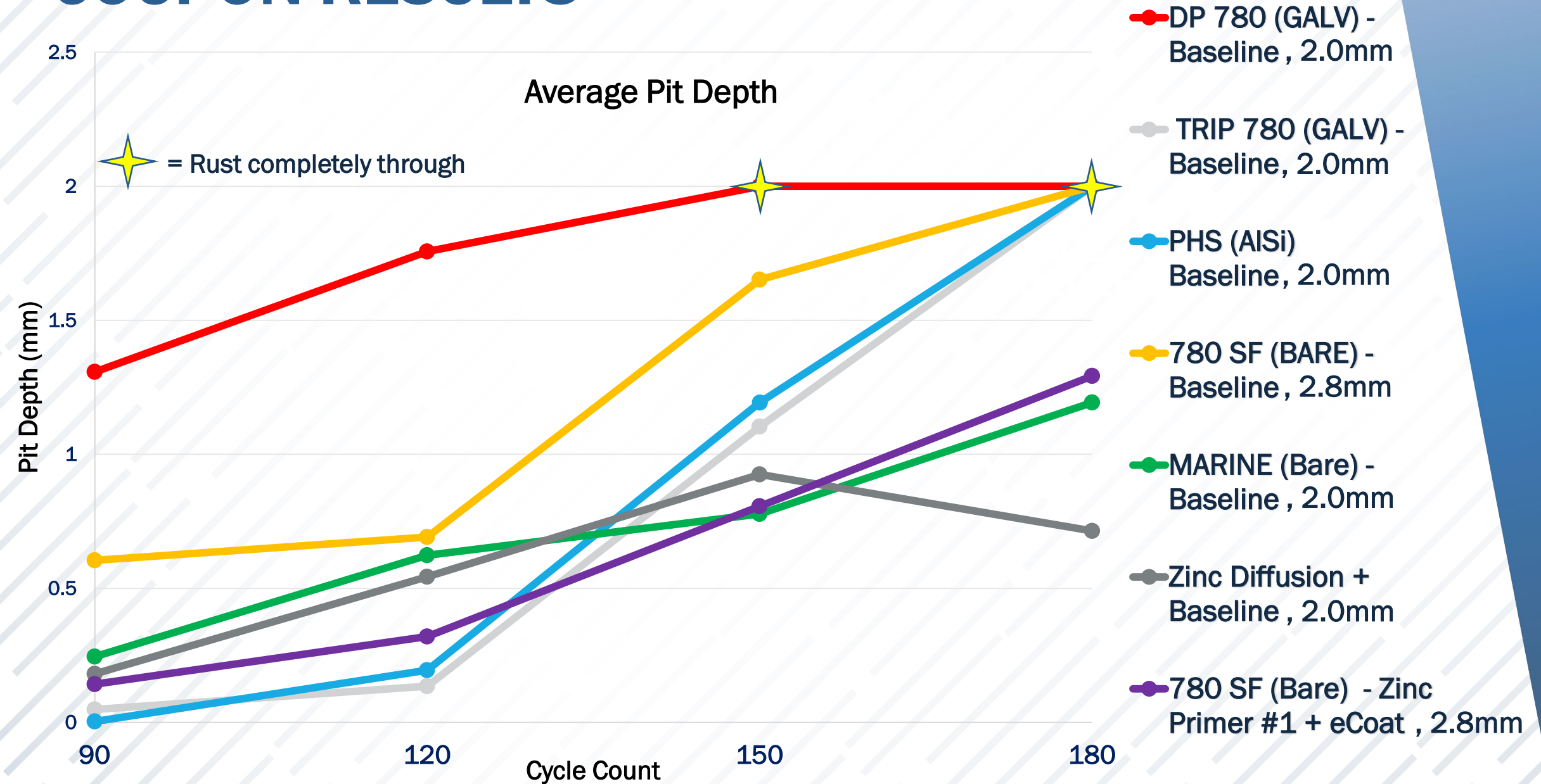


# COUPON RESULTS

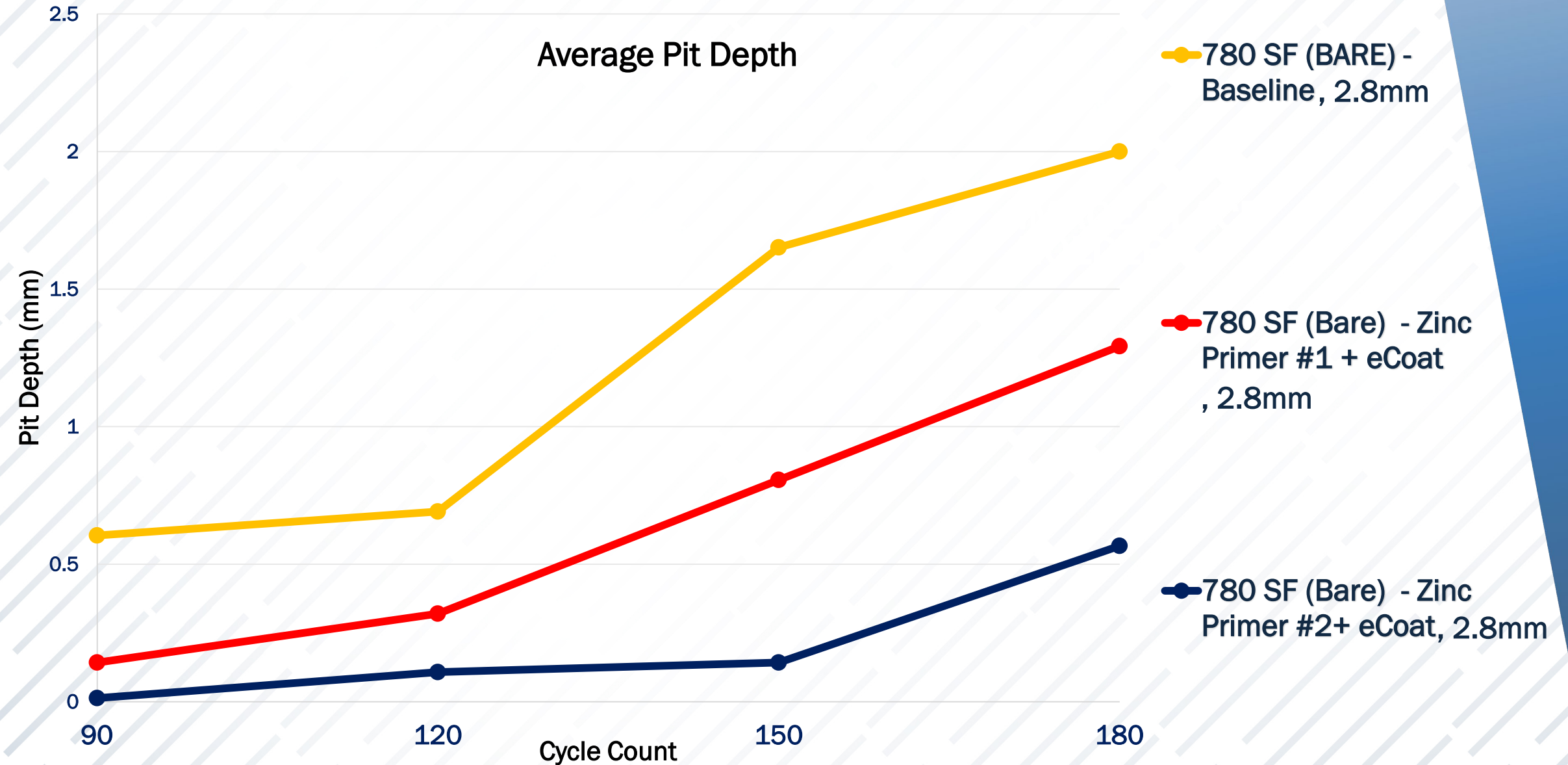




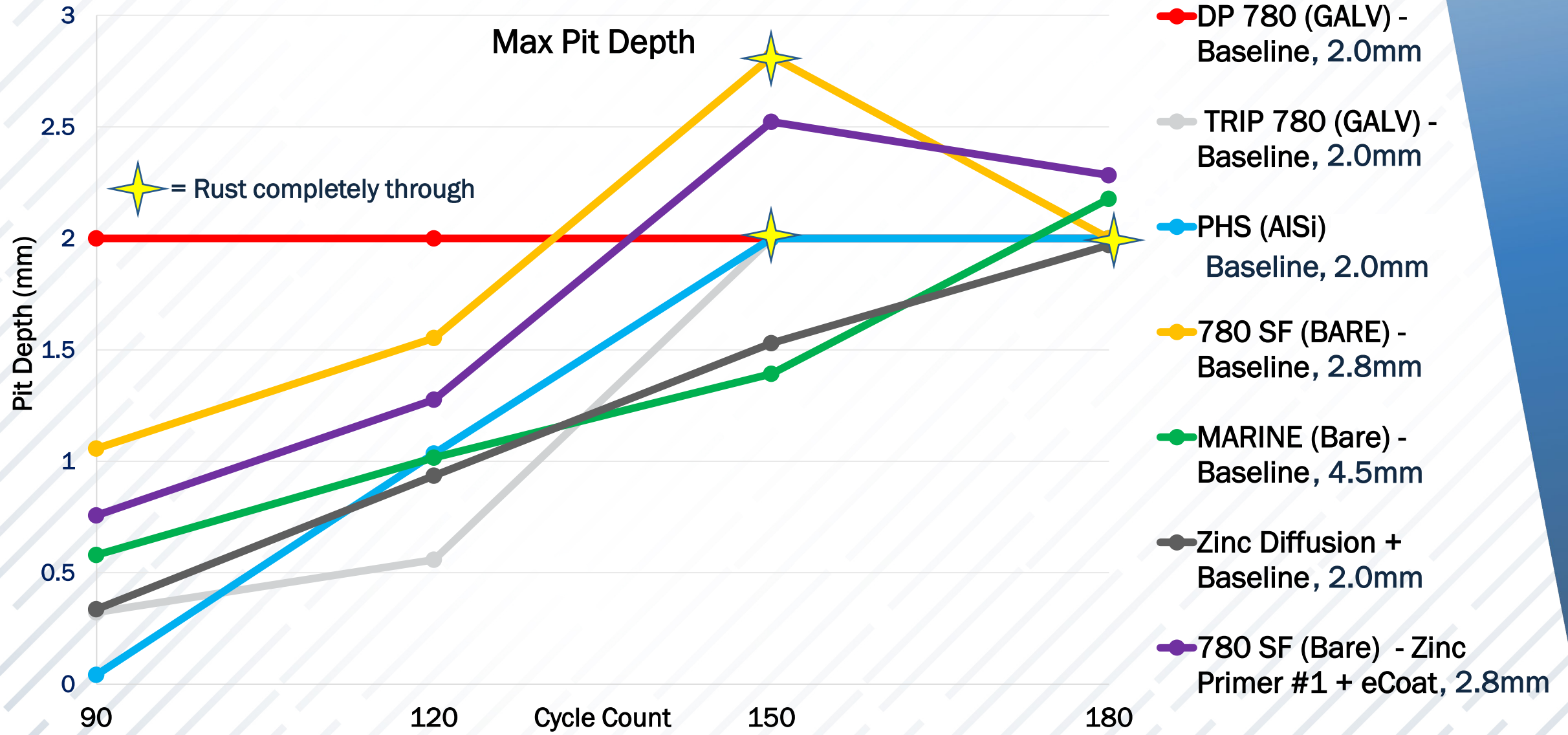
# COUPON RESULTS



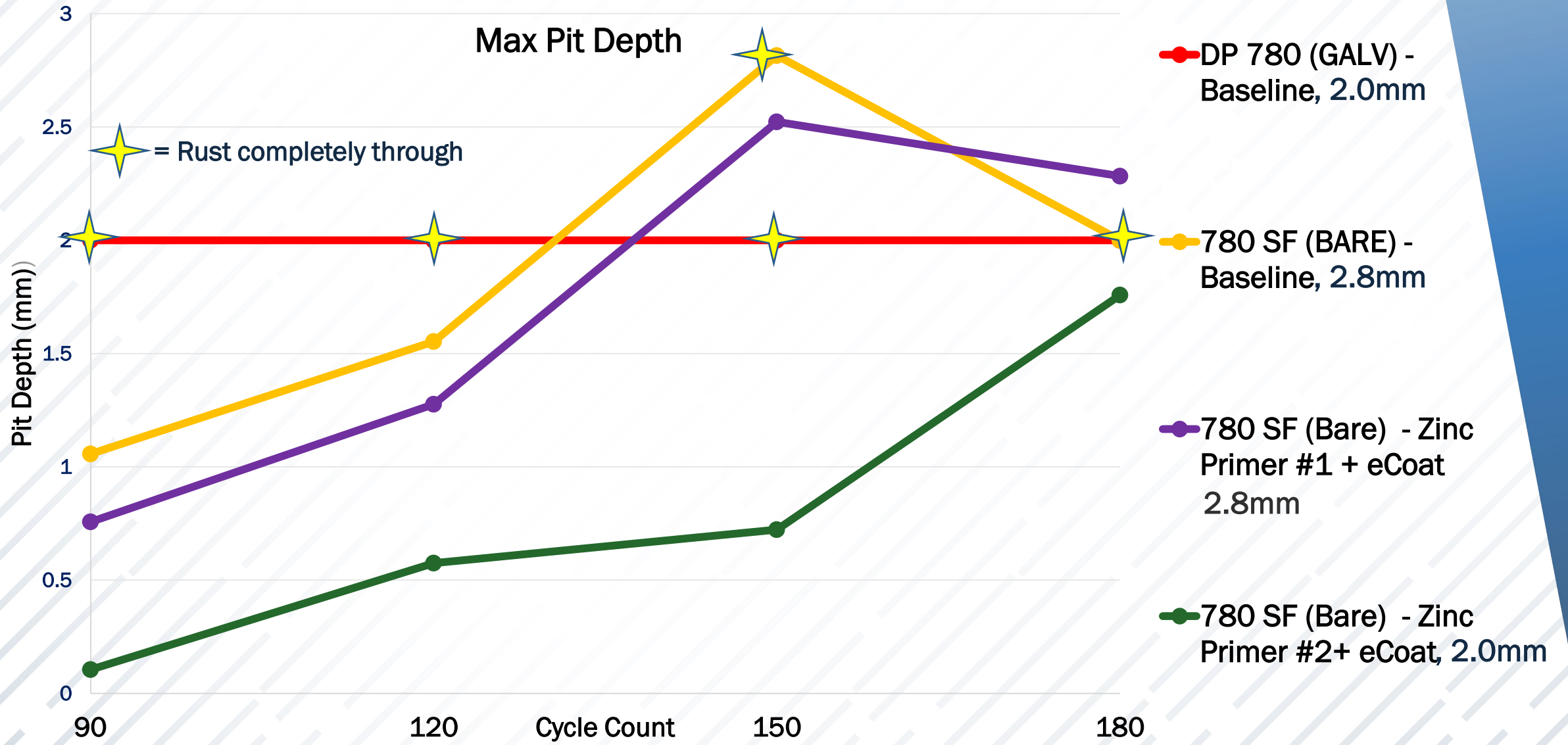
# COUPON RESULTS



# COUPON RESULTS



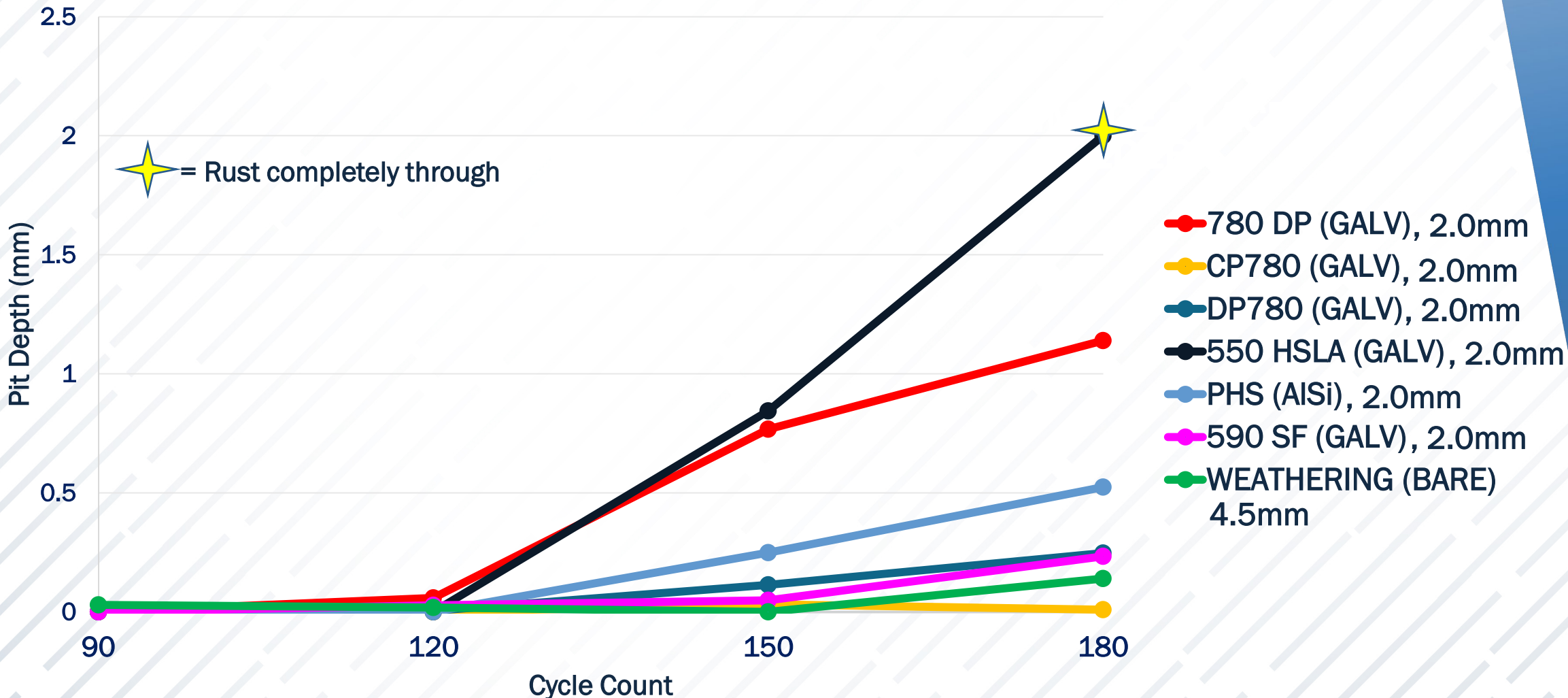
# COUPON RESULTS



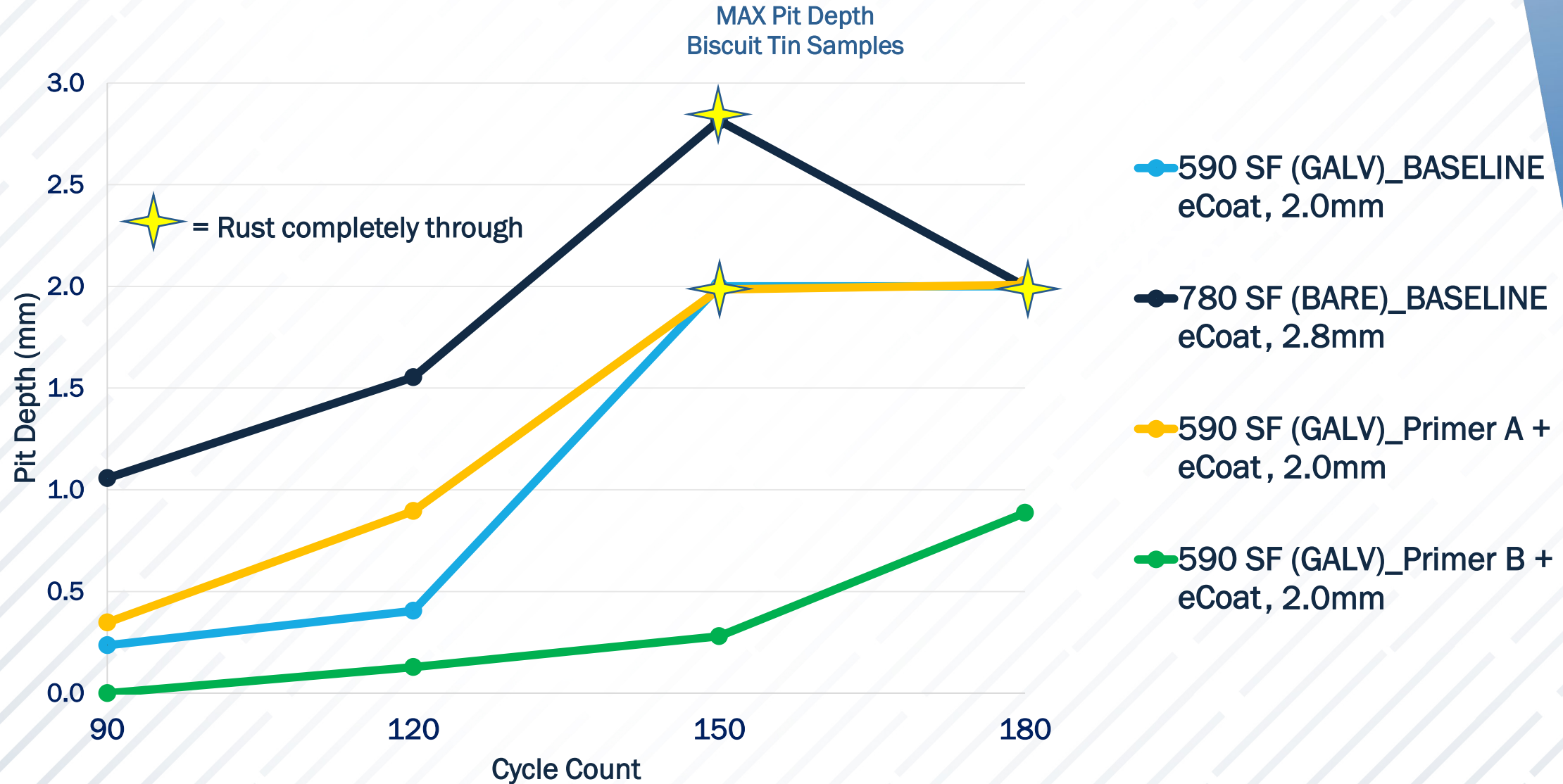


# BISCUIT TIN RESULTS

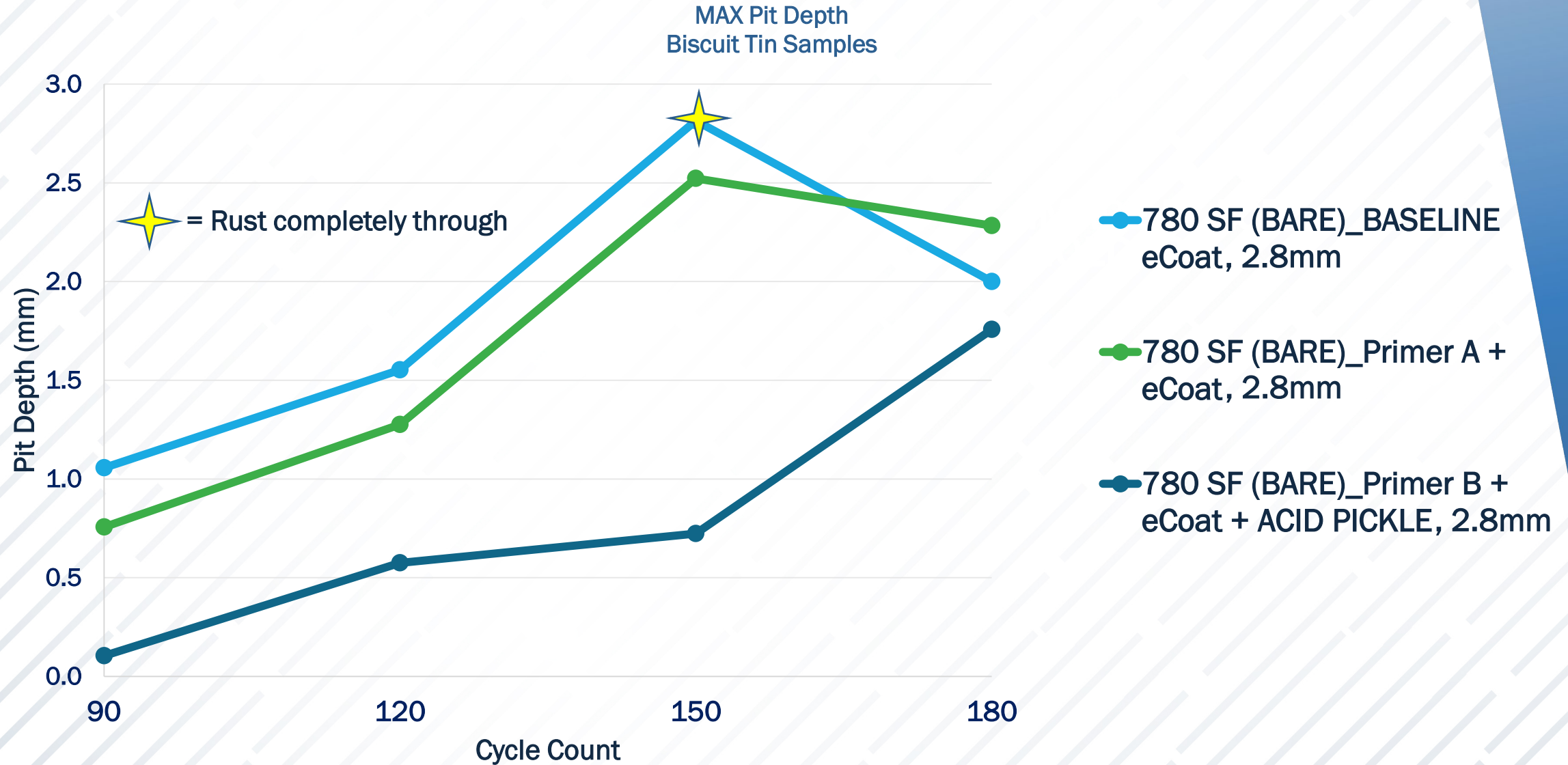
Average Pit Depth  
GALV + Acid Pickle + Primer B + eCOAT



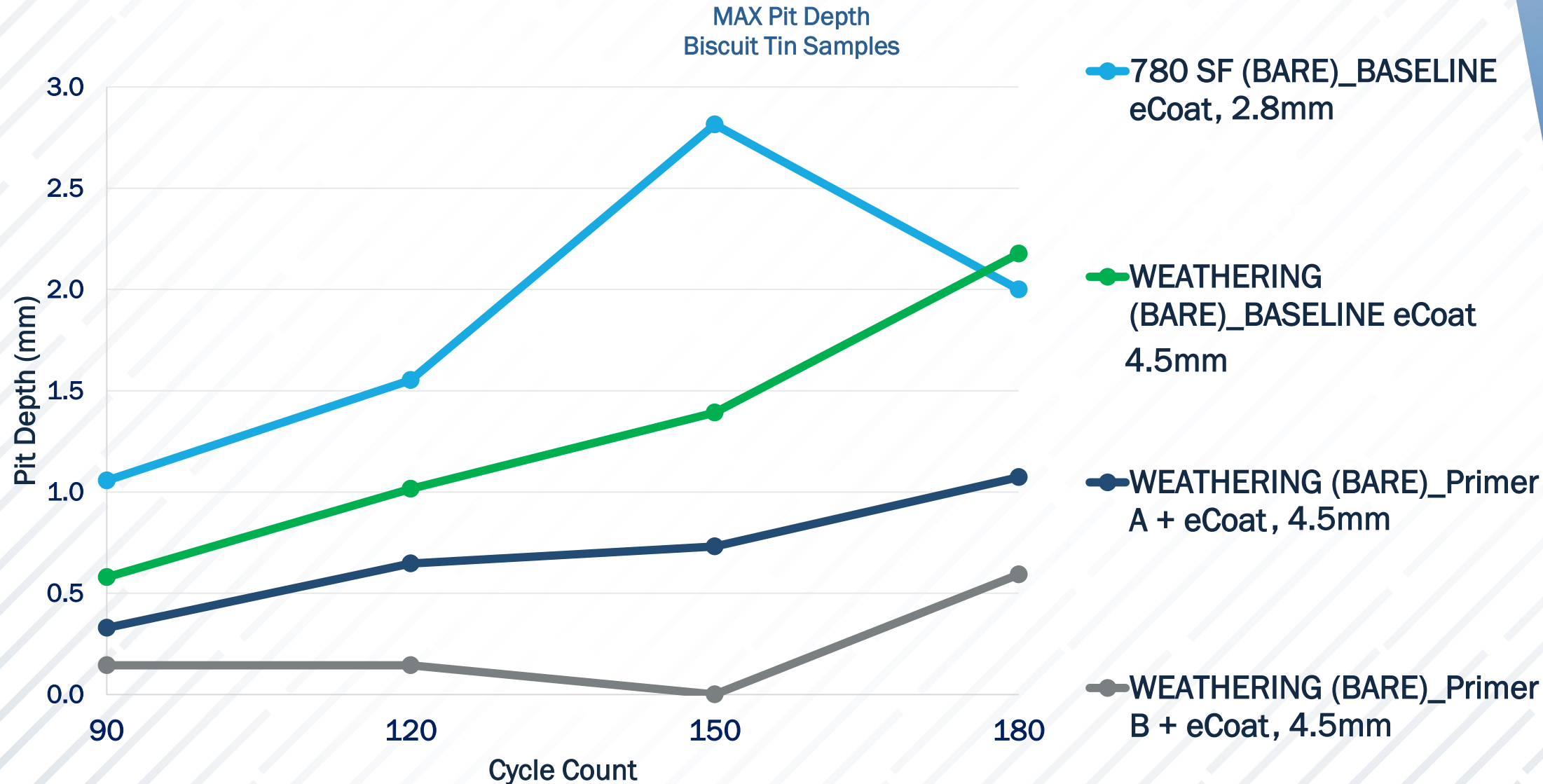
# BISCUIT TIN RESULTS



# BISCUIT TIN RESULTS



# BISCUIT TIN RESULTS



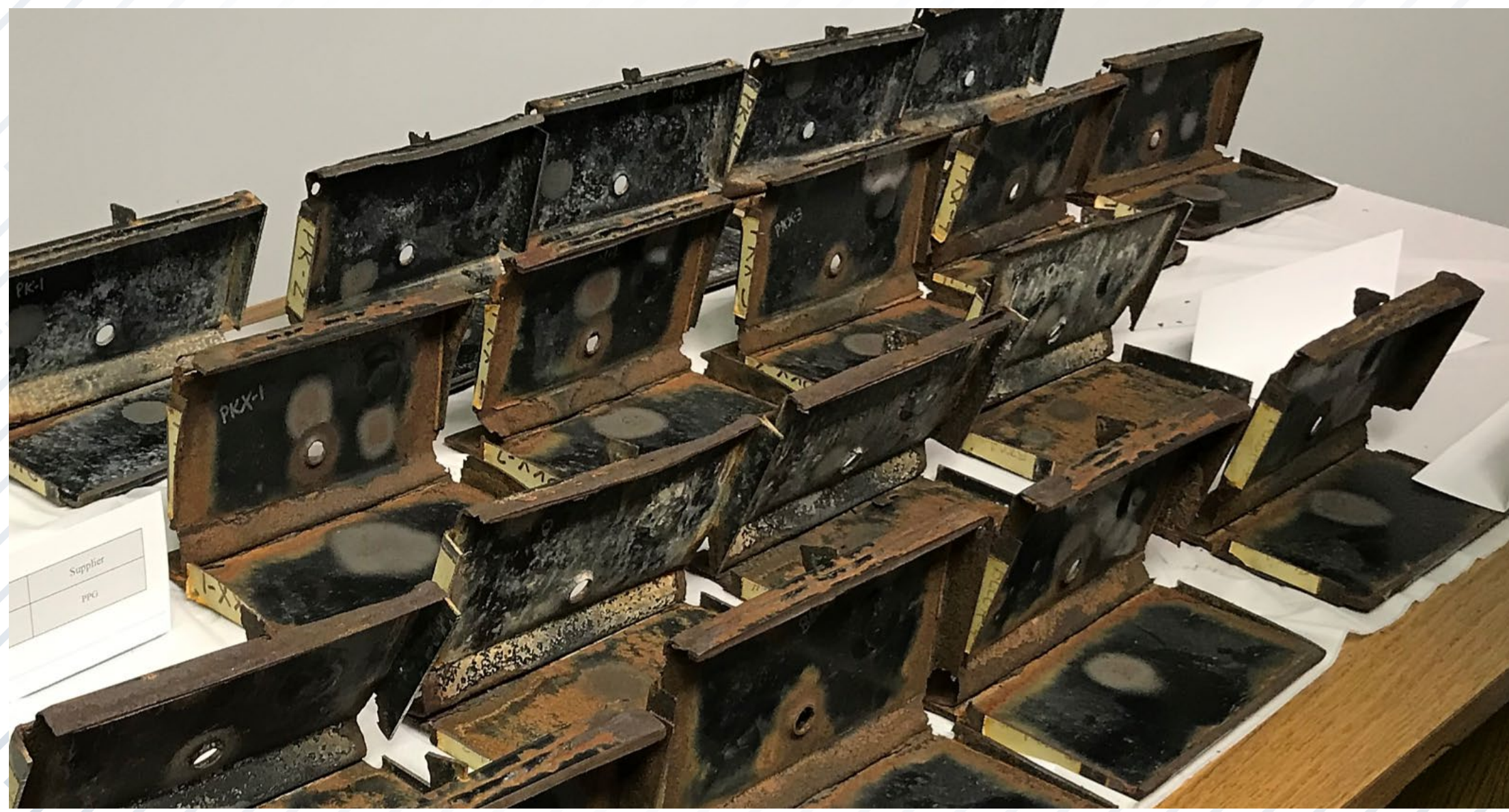


# WELD COUPONS AFTER TESTING





# BISCUIT TINS AFTER 15-YR SIMULATION



# CONCLUSIONS

- Baseline E-Coat only & DP780 GI + E-coat Only performed poorly
- Zinc rich Coating #1 showed noticeable improvement over Baseline
- Zinc rich Coating #2 with acid pickle showed noticeable improvement over Coating #1, which is likely due to acid pickle
- Zinc Vapor Deposition performed better than GI + E-coat but not as well as acid pickled GI coatings
- Bare weathering steel performed well
- Corrosion results were not linear over time, suggesting location in test chamber affected results



# OTHER OBSERVATIONS

- Biscuit Tin performed well for evaluating corrosion, however too many data points to easily compare results
- Welded Coupons results were similar to Biscuit Tin results
- Acid Pickle of welds is believed to result in significant corrosion improvement, along with zinc-rich coating



*Thank You!*

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