

# **Status Update - J2334 Corrosion Test**

**John Repp  
Corrpro Companies, Inc.**

**US Army Corrosion Summit  
March 5-7, 2002**



## **Presentation Outline**

- **Background on J2334 test**
- **Recent work by ASP**
- **Status and availability of J2334**
- **Future work**

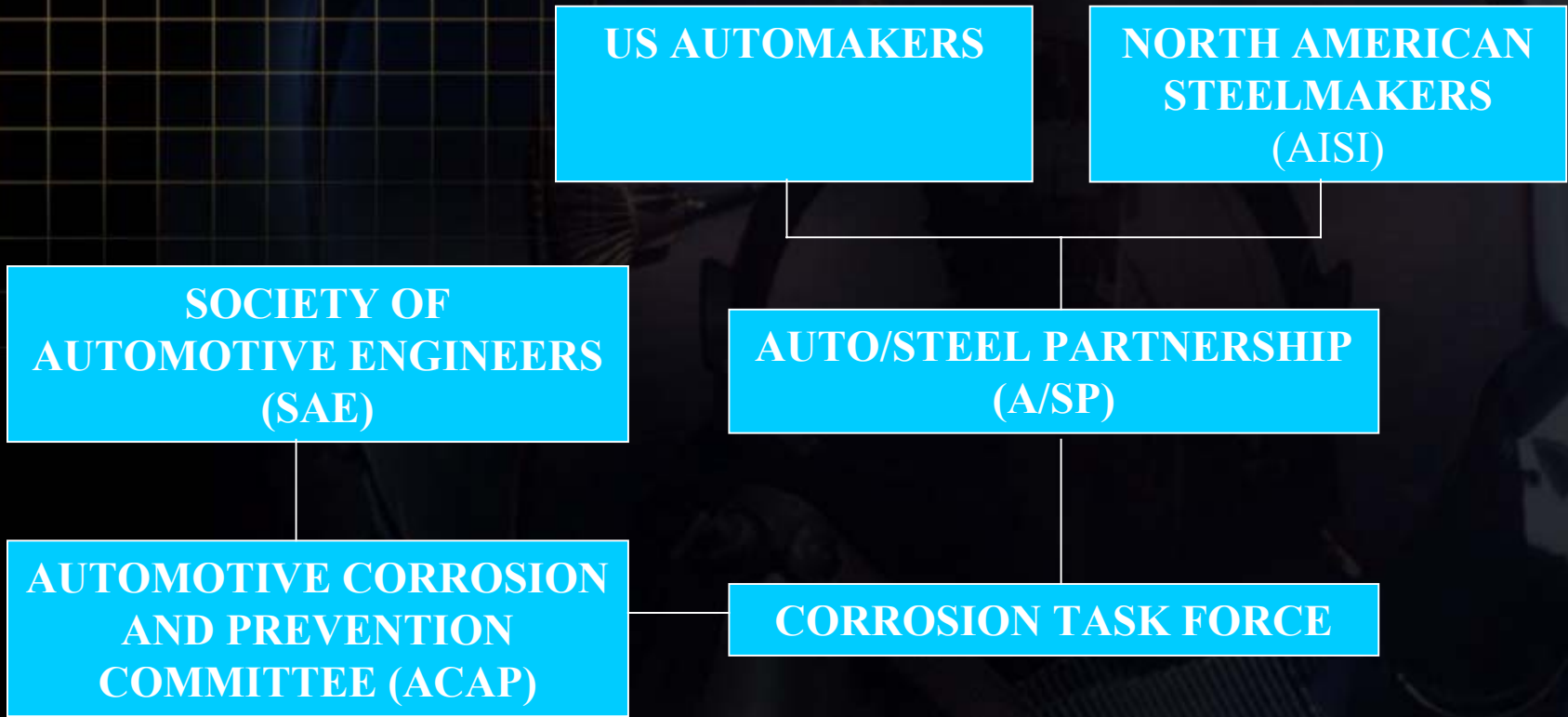


## Background - J2334

- **SAE J2334 “Corrosion Lab Test”**
  - *Developed as an industry standardized corrosion test*
  - *Issuing committee - Automotive Corrosion and Prevention Committee (ACAP)*
  - *Developed with cooperation of Auto/Steel Partnership (A/SP)*
  - *Cyclic test to evaluate corrosion performance*
  - *SAE J2334 published November 1998*



# Background - J2334

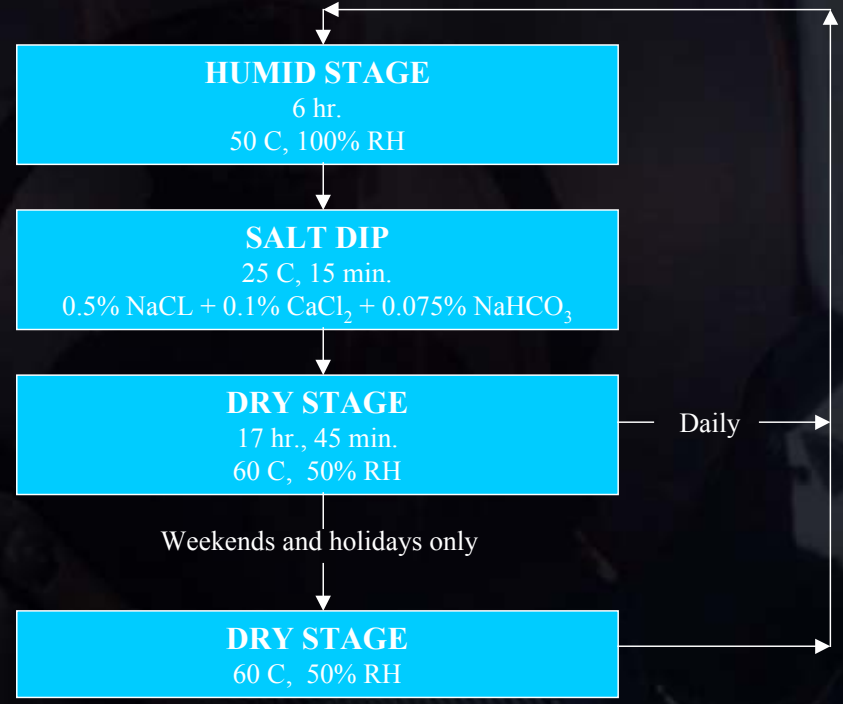




# Background - J2334

## ■ Test Method

- *24-hour operating cycle*
- *Workday events performed manually or by automated cabinet*
- *Additional dry stage used during non-operational events*





## **Recent Work by A/SP**

- **Round-robin test to confirm precision of J2334**
- **Update SAE J2334 document**
- **Crevice corrosion test development**



## **Round-Robin Test**

- **Used to correlate test results and precision**
- **Looked at test repeatability (within a lab) and reproducibility (between labs)**
- **Comparison between 13 labs, 11 materials with 3 replicates**
- **Test sample performance correlated to field performance**



# Round-Robin Test

## ■ Test Laboratories

- *Automakers*
- *Testers*
- *Suppliers*
- *US Army*



# Round-Robin Test



## Canadian Tests

- Horizontal & vertical orientation
- 5-year exposure
- Montreal, Quebec and St. John's  
  Fewfoundland



## US Tests

- License plate bracket
- 5-year exposure
- Detroit, MI, Chardon, OH and  
  Bethlehem, PA



## Round-Robin Test

- **Test results evaluated**
  - *Scribe creep used for comparison*
  - *All results compared to 5-year data*
  - *Determined correlation coefficient (C) and r-square ( $R^2$ ) for each test*
  - *Tests compared based on their  $C+R^2$  values (perfect value = 2)*



# Round-Robin Test

Test	Duration	C	R <sup>2</sup>	C+R <sup>2</sup>
SAE J2334	80 cycles	0.97	0.96	1.93
Acid Rain CCT	45 cycles	0.97	0.78	1.75
CCT-IV	35 cycles	0.86	0.74	1.6
GM9540P(B) (GM)	50 cycles	0.59	0.84	1.43
JASO M610	45 cycles	0.98	0.44	1.42
AISI-A	50 cycles	0.75	0.46	1.21
AISI-C	50 cycles	0.41	0.74	1.15
Michigan Suburban	24 months	0.51	0.61	1.12
GM9540P(B) (ACT)	50 cycles	0.67	0.44	1.11
Chrysler Chipping	25 cycles	0.56	0.54	1.1
AISI-B	70 cycles	0.29	0.74	1.03
Proving Ground 2	5-yr equivalent	0.39	0.64	1.03
AISI-E	50 cycles	0.38	0.62	1
Proving Ground 3	8-yr equivalent	0.59	0.37	0.96
Hoogovens Method 1	20 weeks	0.91	0.01	0.92



# Round-Robin Test

Test	Duration	C	R <sup>2</sup>	C+R <sup>2</sup>
Montreal	24 months	0.28	0.62	0.9
Michigan Rural	24 months	0.19	0.68	0.87
AISI-D	70 cycles	0.41	0.45	0.86
West Virginia	24 months	0.25	0.58	0.83
QUV-Prohesion	12 weeks	0.2	0.62	0.82
Proving Ground 1	10-yr equivalent	0.72	0.1	0.82
CCT-I	60 cycles	0.21	0.56	0.77
Michigan Urban	24 months	0.15	0.61	0.76
South Florida	24 months	0.4	0.34	0.74
Navistar CCT	100 cycles	0.24	0.49	0.73
Philadelphia	24 months	0.23	0.49	0.72
GM9511P	20 cycles	0.18	0.35	0.53
Hoogovens Method 2	20 weeks	0.37	0.02	0.39
B117 Salt Spray	4 weeks	0.05	0.19	0.24
CCT-III	960 cycles	0	0	0

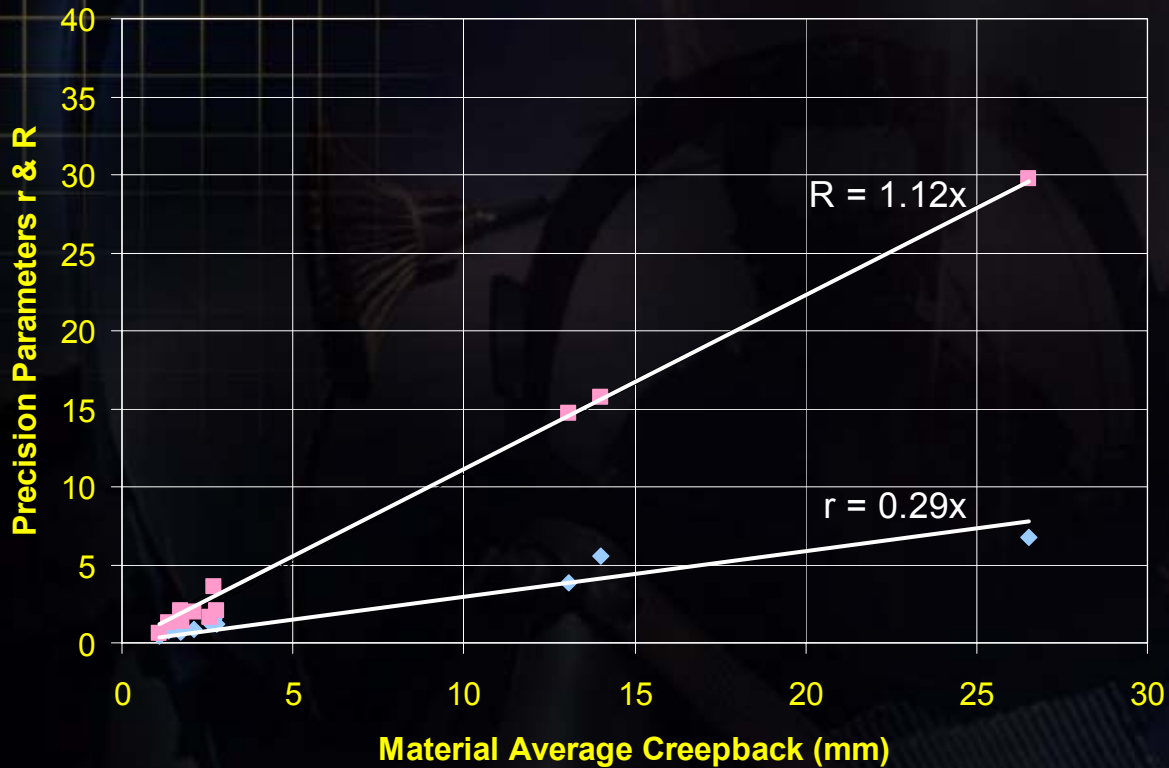


# Round-Robin Test

- **Evaluation of techniques**
  - ***J2334 best correlation to 5-year data at 80-cycles***
  - ***ASTM B117 little or no correlation***
  - ***ASTM E691 performed***
    - **Measure of intra- and inter-laboratory reproducibility and repeatability**
    - **Scribe creep used for determination**



# Round-Robin Test





# Round-Robin Test

- **Test repeatability - 95% confidence level**
  - 1997 - 25%
  - 2001 - 29%
  - *Repeatability similar*
- **Test reproducibility - 95% confidence level**
  - 1997 - 144%
  - 2001 - 112%
  - *Increase in reproducibility*
- **All labs agreed on general rank order of materials!**



## Round-Robin Test

- **Other variables/issues investigated**
  - *Solution application - dip, fog, spray*
  - *Solution concentration - %NaCl, %CaCl*
  - *Solution measurement - conductivity, specific gravity*



## Round-Robin Test

- **Variable investigation results**
  - ***Solution application - dip preferred method, fog at twice rate of ASTM B117 ok***
  - ***Solution concentration - did not change (0.5% NaCl, 0.1% CaCl, 0.075% NaHCO<sub>3</sub>)***
  - ***Solution measurement - conductivity preferred (quick and precise)***



## Status

- **Revisions to specification**
  - *Revisions made based on the last 3 years of continued testing*
    - Solution application - all methods still listed
    - Solution concentration - best results with original
    - Solution measurement - conductivity
  - *Revisions have just passed balloting*

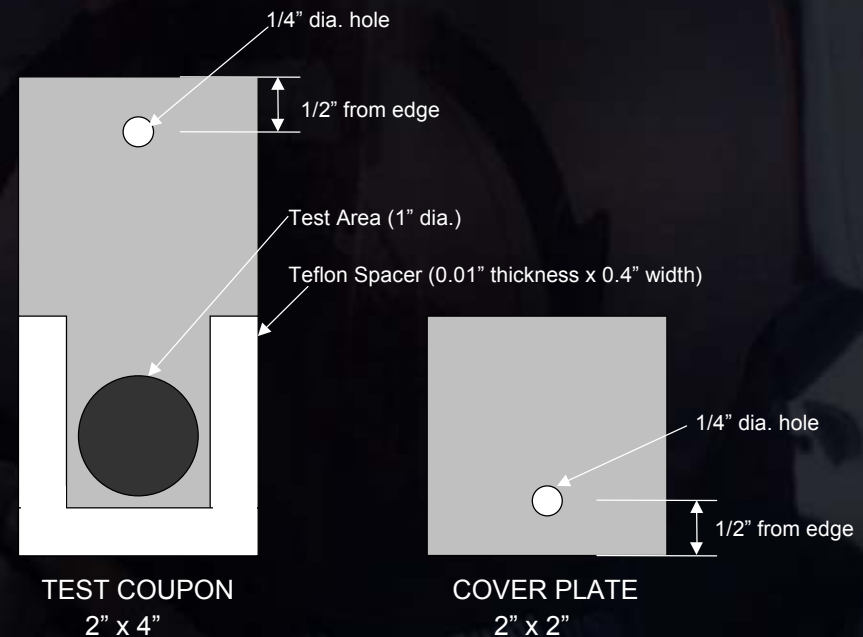


# Implementation

- **Current users of J2334**
  - *Daimler Chrysler specified for functional testing*
  - *AISI use for study of panel building materials*
  - *A/SP to report on summary of users*

## ■ Perforation (crevice) corrosion test

- *Development of crevice coupon*
- *Analysis technique/procedure established*
- *Matrix of materials finalized*
- *Initiated field investigations*
- *Identified and initiated current industry tests*





## **Future Work**

- **Investigation of solution application parameters**
- **Suitability of J2334 to evaluate functional performance**
- **Light truck frame corrosion evaluation**
- **Maintain AISI design manual for corrosion**
- **Continued development/refinement of cosmetic and perforation test activities**
- **Investigate application to other corrosion mechanisms**



## Army Focus

- **Working group the Army can/does participate in**
  - *Access to industry corrosion test experts*
  - *Information on materials the Army uses*
- **Alternative to other corrosion test methods**
  - *ASTM B117 - Salt Fog*
  - *ASTM G85/Prohesion*
  - *GM9540P*
- **Not the end-all, be-all of DoD corrosion test**



## **A/SP Meetings**

- **Auto/Steel Partnership meetings are open to the public**
- **Participation by Army is encouraged**
- **Regular meetings held in Detroit, MI area**
- **Next meeting April 2, 2002 in the A/SP Offices Southfield, MI at 9:30am**