Trivalent Yellow Chromate

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Yellow gets no respect

- Trivalent Clear/Blue achieves 120-150 hours of salt spray. If you are only looking for corrosion you do not need yellow. Hexavalent achieves 72-144 hours.
- Why has yellow not faded into the sunset? CHANGE IS HARD! COLOR!

Hexavalent Yellow Facts

- What is it? Chromic acid, acids and catalysts.
- Corrosion protection 72-144 hours
- Thick chromate film that is gelatinous that when scratched still provides protection.

Hexavalent Challenges

- Temperatures above 150 F the corrosion protection is lost because the gelatinous film loses its water of hydration and it cracks.
- Baking for hydrogen embrittlement involves plating/ baking/ and then chromating. A NEW PARADIGM!

Process “A”

- Color slightly green hue
- Make up of Solution ONE TANK!
  Process A Component A 3% by volume
  Process A Component B 2% by volume
  Tap water 95% by volume

Process “A” parameters

- pH 1.6 -2.0 optimum 1.8 use ammonium hydroxide to raise pH
- Temperature 80-140F
- Immersion time 30- 120 seconds optimum 60 seconds

Process A Plating process

- Zinc plating acid chloride, alkaline non cyanide, and cyanide zinc to minimum zinc plating thickness of 0.0003 “ or 0.3mls or 300 micro inches
- Rinse
- Bright dip in sulfuric acid 0.5-1.0% by volume. DO NOT USE NITRIC ACID!
- Rinse

Process A Plating Process

- Apply process A per parameters
- Rinse Process A
- Spin dry or dry off oven for parts
- New Paradigm you can now bake for hydrogen embrittlement right after chromating without putting the parts back on the line.

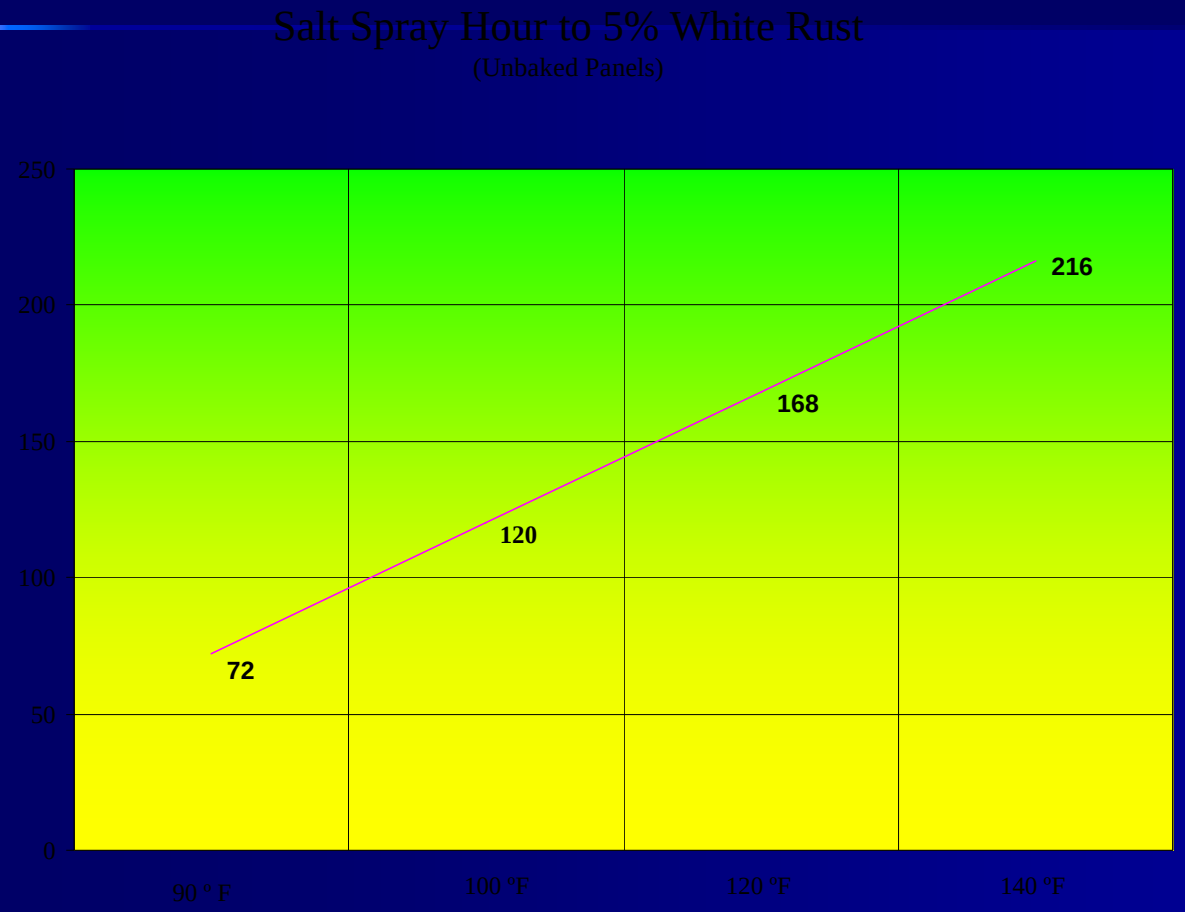
Process A Baking Parts

- After baking the parts at 325-400F for 2-4 hours corrosion protection increases to 300 hours!
- Color does not change after baking
- If you bake for hydrogen embrittlement with rack parts you can save your customer money!

Process A Red Rust

- Red rust results are a function of plating thickness.
- At 0.0003 “ red rust is 250 – 300 hours.

Salt Spray Hours to 5% White Rust Process “A”



Process “A” Corrosion Results Variabilities

- pH must be in range. Purchase a five point pH meter so that you can calibrate to pH of 1.60
- Temperature has the largest range of effect on salt spray results

Process “A” UV stability

- Some dyes processes fade in the sun in a matter of days because the dyes are not light stable
- What tests can be done to evaluate various trivalent yellow chromates?

  QUV and Q- Sun

Process “A” UV testing

- QUV test is a long established test for Q-Panels for paints and coatings.
- QUV test in done @ 300-400nm wavelength
- Test was performed for 500 hours and a hexavalent yellow panel was used as a control.....

Process “A” UV stability

- Results showed Process “A” faded the same as the hexavalent yellow chromate after 500 hours.
- Next was to test the Process “A” and “B” to in the Q-Sun test which does different wavelengths

Process “A” UV Stability

- Process “A” and “B” were placed together with a hexavalent yellow chromate.
- After 100 hours Process “A” and “B” faded to a clear/blue color, while the hexavalent yellow faded some with some yellow still left.

Process “A” UV Stability

- QUV and Q-Sun measure two different types of fading with the Q-Sun being most severe. Work to be done.
- Q-Lab states that it is very difficult to find yellow colors that are stable in the Q-Sun

Process “A” UV Stability

- What causes colors to fade?

- Light
- High temperature
- Moisture

Process “A” Advantages

- Salt Spray resistance 150-300 hours
- Passes the thumb test
- QUV test does not fade
- Baking for hydrogen embrittlement
- All happens in one tank fits into existing lines easily
- Works in barrel and rack

Process “B”

- Why do you need a “B” product with a such a great “A”?
- COLOR
- COST 30% LESS THAN “A”
- Lower temperature 80-100F
- “B” offers some scratch resistance and longer salt spray hours 200-250
- No rinsing needed after applying

Process “B”

- Process “B” Component - A 3% by vol
- Process “B” Component - B 2% by vol
- Tap Water 95% by vol

Process “B” Parameters

- Do not have to adjust the pH up
- 80-140 F
- Immersion Time 30 seconds to 5 minutes Optimum 60 seconds
- Optional rinsing after applying the Process “B”

Process “ B” Procedure

1.Zinc Plate in acid chloride, alkaline non cyanide zinc and cyanide zinc processes minimum thicknesses 0.0003”

2. Rinse zinc plated part

3. Bright dip using sulfuric acid 0.5-1.0% by volume, nitric acid can cause poor color.

4. Rinse sulfuric acid bright dip.

5. Apply Process “B” chromate

Process “B” Procedure

6. Optional rinse Process “B” as it is not required like Process “A”
7. Dry part in oven, note that the part can be baked over 150 F
8. Bake part for optional hydrogen embrittlement, but corrosion does not improve like Process “A”

Process “B” Results

- Salt Spray Hours 180-200 hours 5% white corrosion with rinsing
- Salt Spray Hours 240-260 hours no rinsing after Process “B”
- Baking part will not lose color, but the corrosion resistance does not double like process “A”

Process “A” and “B”

- Cyanide zinc process has about 48-72 hours less than acid chloride or alkaline non cyanide zinc.
- SAE Paper 2006-01-1671

  Variation in Corrosion Resistance of Trivalent Chromate Coating Depending on type of Zinc Plating Bath

Process “A” and “B”

- Watanabe, Oshio and Kunieda from Toyota Motor Corporation
- This paper discusses that the type of zinc plating results in differing corrosion protection.
- Alkaline non cyanide, acid chloride and then cyanide zinc.

Trivalent Chromate Facts

Minimum plating thickness 0.0003”

Cyanide zinc offers less corrosion resistance than the other zinc processes.

Use Q-PANELS to qualify processes not parts. Read ASTM B-117

ASTM B 633-07 revised for RoHs and trivalent chromates

Trivalent Yellow Chromate

- THANK YOU FOR YOU TIME!

- More questions www.epi.com or visit us at booth 425