I Like it Hot:
A Novel Technique to Assess Application of Thick-Film Thermoset Plural Component Coatings

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Learning Objectives

• Employ a unique technique to monitor coating application
  – Infrared Thermal Imaging / IR-TI (FLIR)
• Use a characteristic of Fast Set Plural Polyurea Technology
  – High Exotherm during application
• Monitor Uniform Application Technique
• Monitor Uniform Application Thickness
• Detect defects in coating
Background Information

• IR-TI, or FLIR, has been used commercially since 1965
  – FLIR – Forward Looking Infrared
  – Power Line Inspection work
• Use in fire-fighting applications
  – Find hot-spots, fire growth, egress routes, etc.
• Use in Law Enforcement / Military
• Use in Construction Industry
  – Recent work for concrete support pillar strength
• The Coatings Industry???
What’s the Difference?

Night Vision of Barn
Typical “green glow”

IR Thermal Image of Same Barn
WhiteHeat Palette

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Construction Industry Use

IR Thermal Image of Home to Show Heat Loss
IronBow Palette
Red to White is Hot / Green to Blue is Cool

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Coating Application Use

• Monitor application & technique
• Coating system would be exothermic
• Confined to reactive coating systems
  – Fast setting
  – Thermoset
  – High solids content
  – Epoxy, polyurethane, polyurea

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2-K Plural Epoxy System
2-K Plural Epoxy System
Characteristics of Polyurea Technology

• Fast-set, plural component systems
• Thick-film coating, > 20 mil (> 1 mm) DFT
• Processed at high temperature
  – 150° – 170° F / ~ 65° – 75° C
• Capable of high exotherm values
  – > 200° F (~95° C) in thick DFT’s
• Wet Film Thickness (WFT) not practical
Characteristics of Polyurea Technology

• Exotherm affects on substrate
  – Condensation upon cooling
    • Recoat delamination
  – Distortion of substrate
  – Adverse affect on primers

Melted expanded polystyrene
Fast Set Polyurea Spray Coatings

Standard Application Technique

• Proper gun angle & distance
  – Perpendicular and parallel to surface
  – Distance from substrate (output dependant)
    • Low output = 12 inches (30.5 cm)
    • Medium output = 18-20 inches (45 – 50 cm)
    • High output = 20-30 inches (50 – 76 cm)
Fast Set Polyurea Spray Coatings

Standard Application Technique

• Over Lap Pattern & Cross-Hatch

> 50% Overlap on Passes

Coating Cross-Hatching

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Visual, Coated Panel

IR-Thermal Image, Coated Panel

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DFT Evaluation of Coated Panels

Evaluation using Type 2 DFT Gauge, ASTM D 7091
Visually, looked uniform; applied in one direction
SSPC-PA 2 may not have caught this DFT variability, size of substrate
IR-Tl of Polyurea Spray Process

Improper Spray Technique
IR-TI of Polyurea Spray Process

Proper Spray Technique
IR-TI of Polyurea Spray Process
IR-TI of Polyurea Spray Process

Visual

IR-TI

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IR-Tl of Polyurea Spray Process

Visual

IR-Tl

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IR-Tl of Polyurea Spray Process

Visual

IR-Tl

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IR-Tl of Polyurea Spray Process

The “Swirl” Process

• Used by some to “simulate” the cross-hatch
• For round spray pattern only
• Swirling the wrist as moving the spray gun
  – Can become tiresome
• Follow “rules” of >50% pattern overlap
  – Otherwise, still have thin areas / non-uniformity
• Not a suggested application technique
IR-Tl of Polyurea Spray Process

The “Swirl” Process
IR-Tl of Polyurea Spray Coating

Post application, detection of non-visible coating blistering / disbondment

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Conclusions

- On-line / Real-time evaluation of application
  - Specific to high exothermic systems / Polyurea
- Training tool to evaluate new applicators
- Potential to correlate exotherm to applied DFT
- Evaluate in hard access applications
  - Robotic pipelining work
- Evaluate post application for problems
- Allow to “see” what we can not see

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Conclusions

• Simple, yet effective tool
  – Attachment to your Smart Phone
Conclusions

• And for fun...

What’s This????
Thank You!

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