

I Like it Hot:

A Novel Technique to Assess Application of Thick-Film Thermoset Plural Component Coatings

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2019 PDA Conference
October 17 – 18, 2019
Hilton Orange County/Costa Mesa



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

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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???

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What's the Difference?



Night Vision of Barn
Typical “green glow”

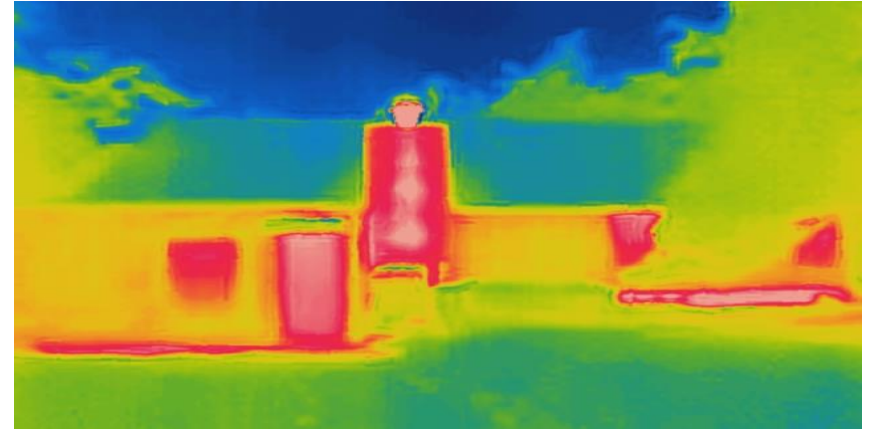
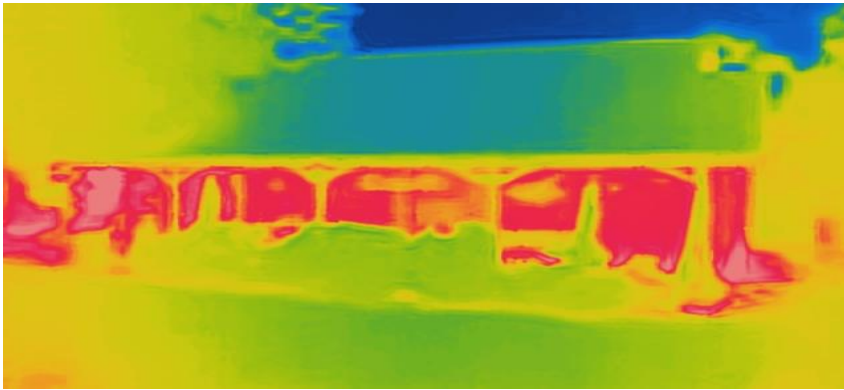
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IR Thermal Image of Same Barn
WhiteHeat Palette



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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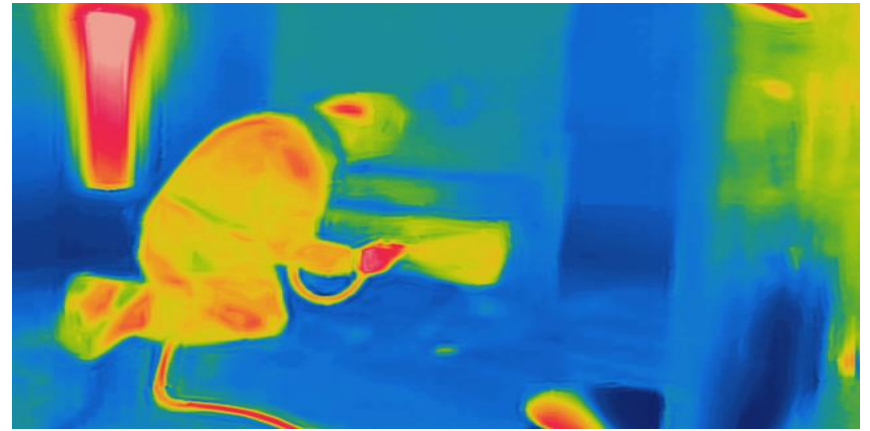
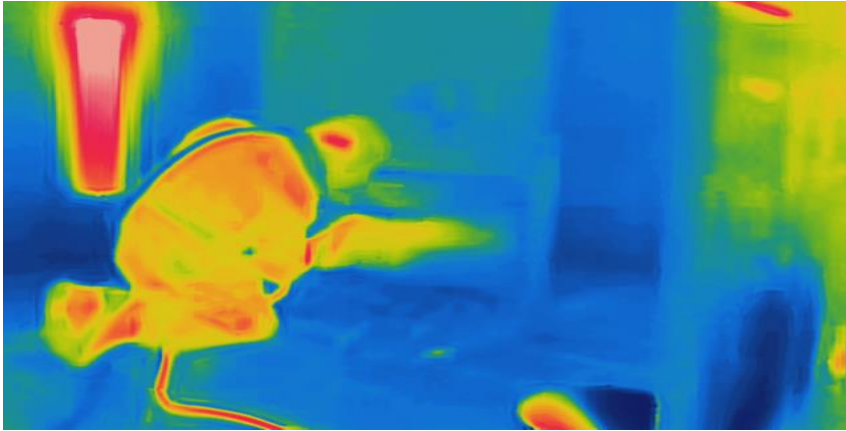
Coating Application Use

- 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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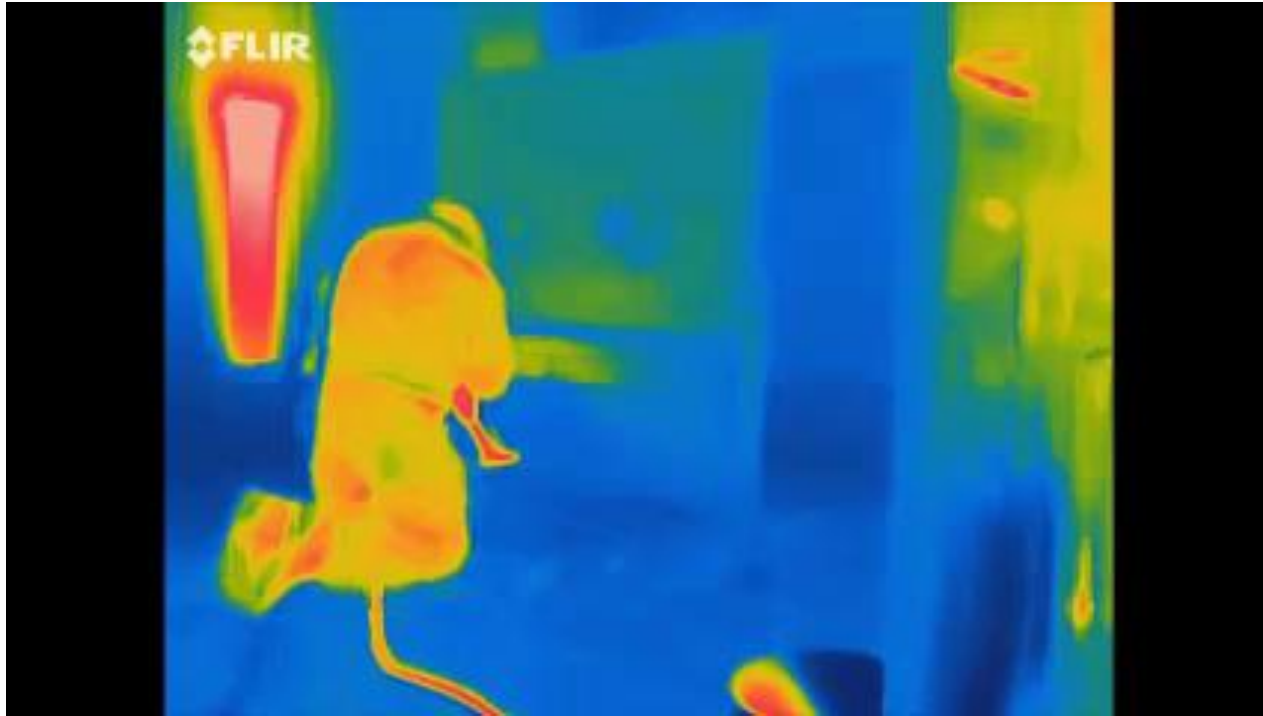
2-K Plural Epoxy System



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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

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Characteristics of Polyurea Technology

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

Melted expanded polystyrene



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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)

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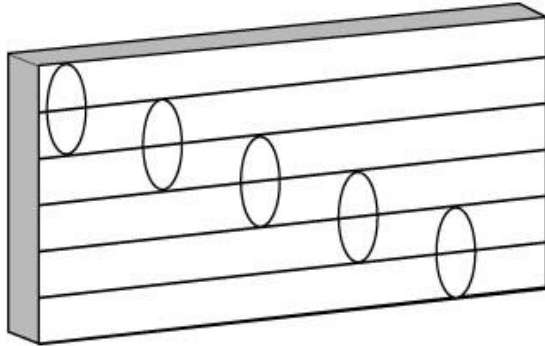


Fast Set Polyurea Spray Coatings

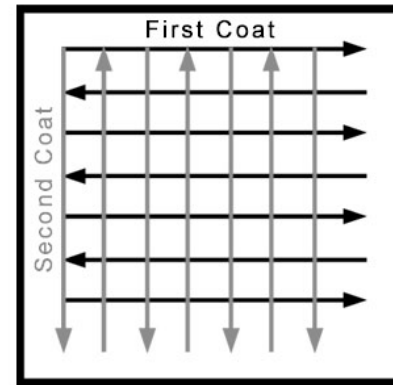
Standard Application Technique

- Over Lap Pattern & Cross-Hatch

> 50% Overlap on Passes



Coating Cross-Hatching

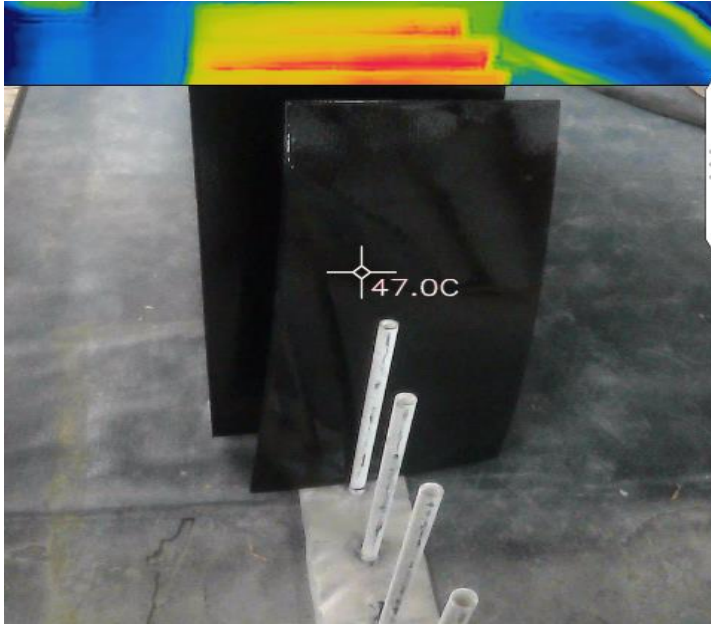


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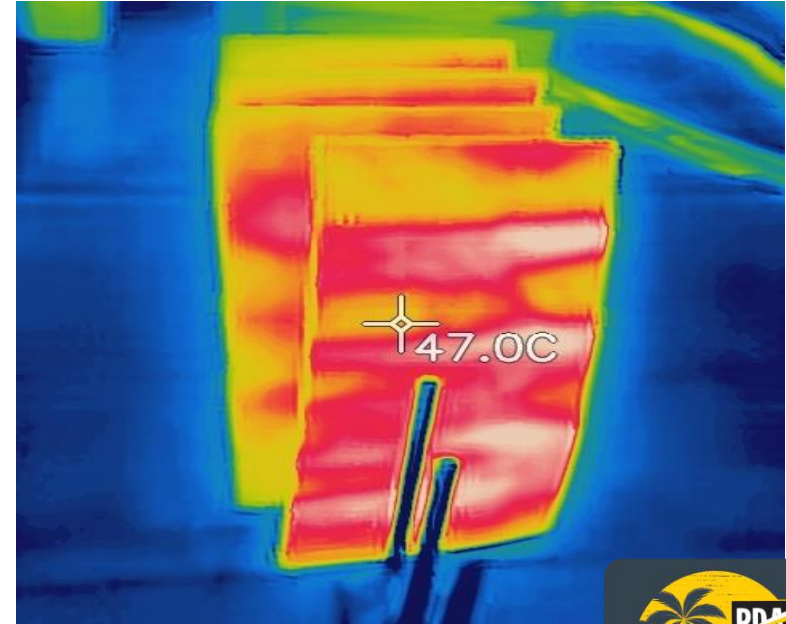


Fast Set Polyurea Spray Coatings

Visual, Coated Panel



IR-Thermal Image, Coated Panel

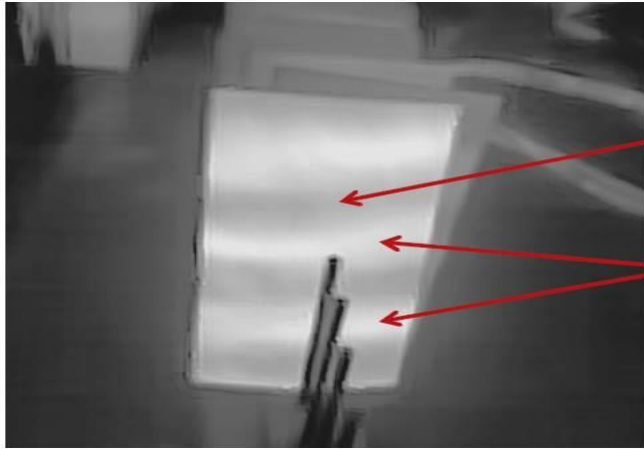


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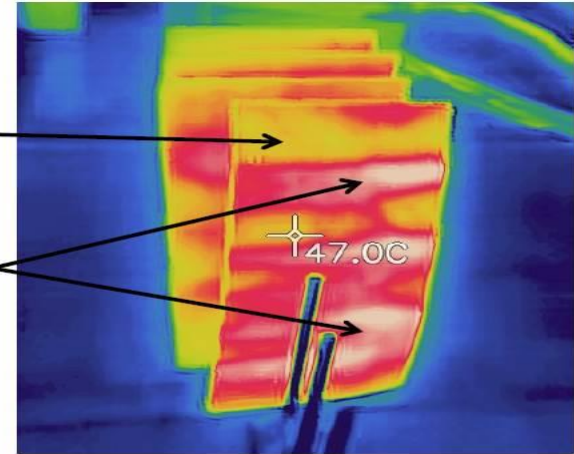
Fast Set Polyurea Spray Coatings

DFT Evaluation of Coated Panels



15 – 20 mils /
380 – 500 μm

25 – 35 mils /
635 – 890 μm



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

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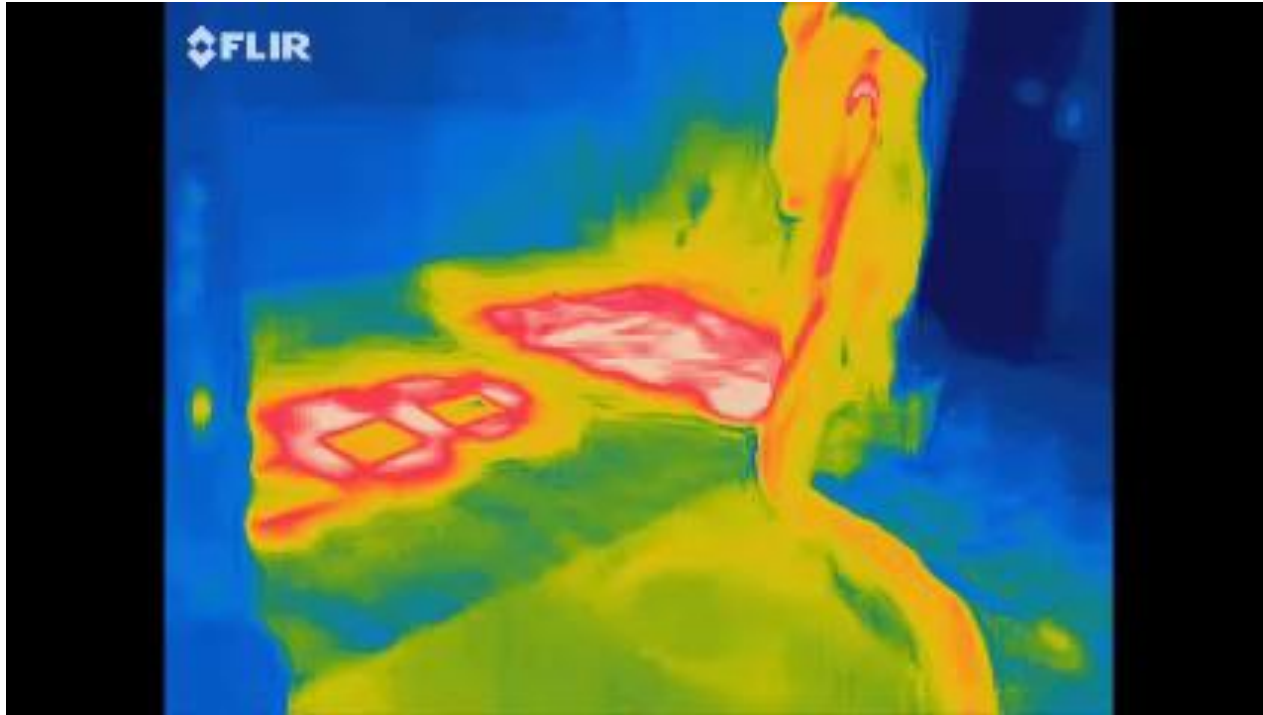
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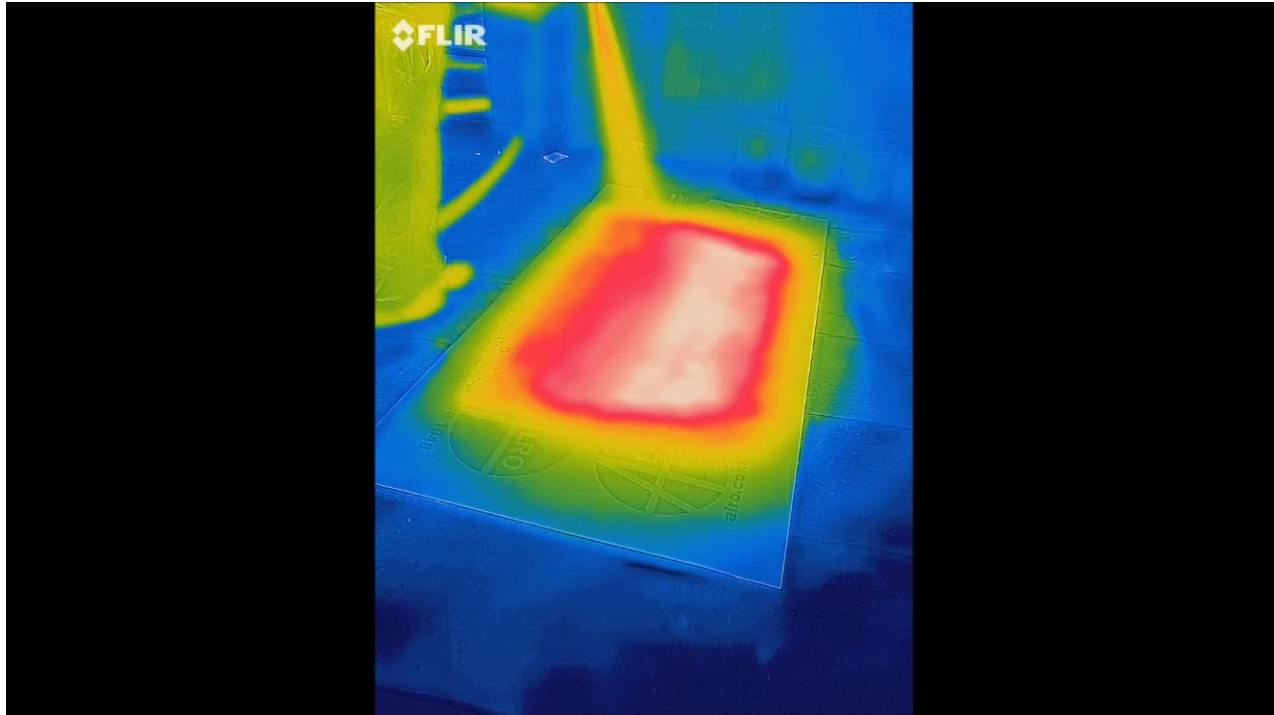
IR-TI of Polyurea Spray Process

Improper Spray Technique

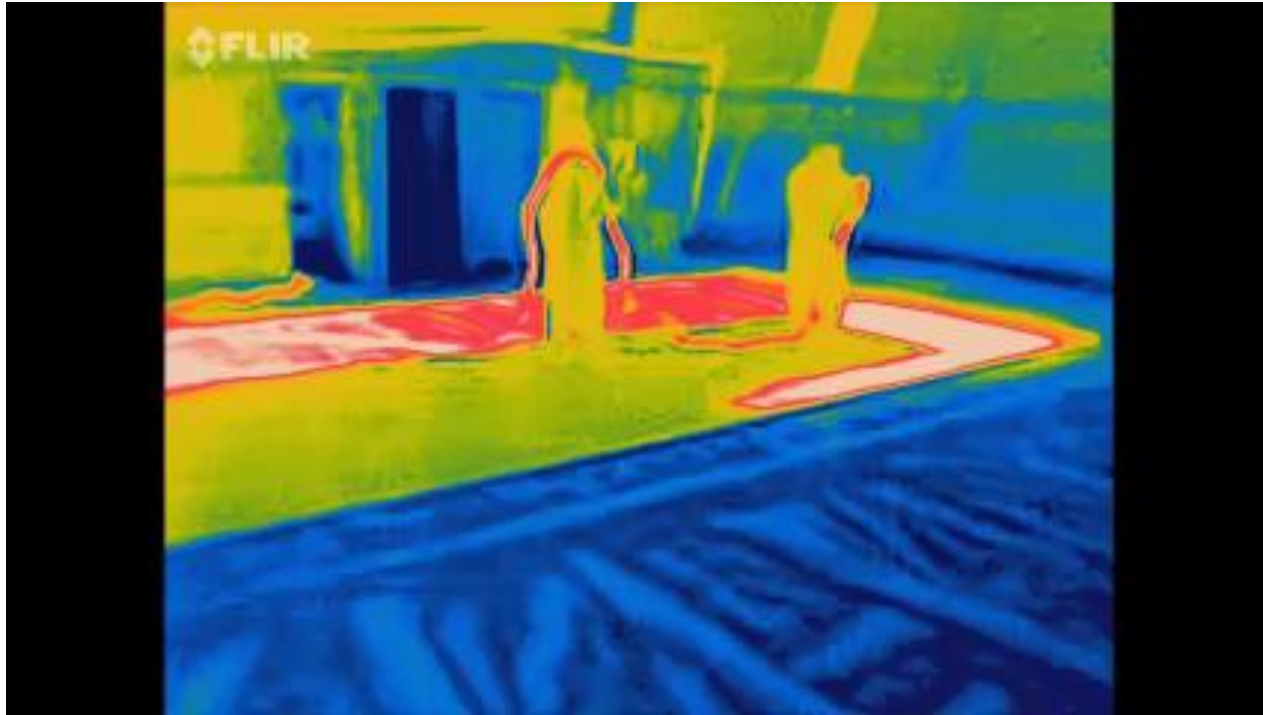


IR-TI of Polyurea Spray Process

Proper Spray Technique

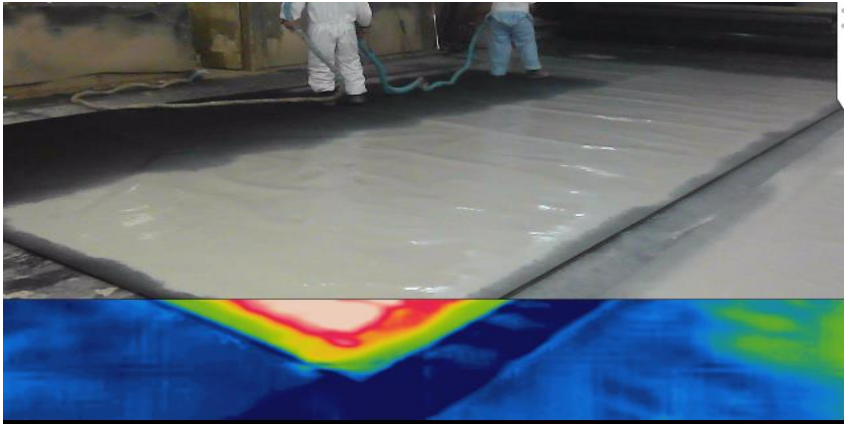


IR-TI of Polyurea Spray Process

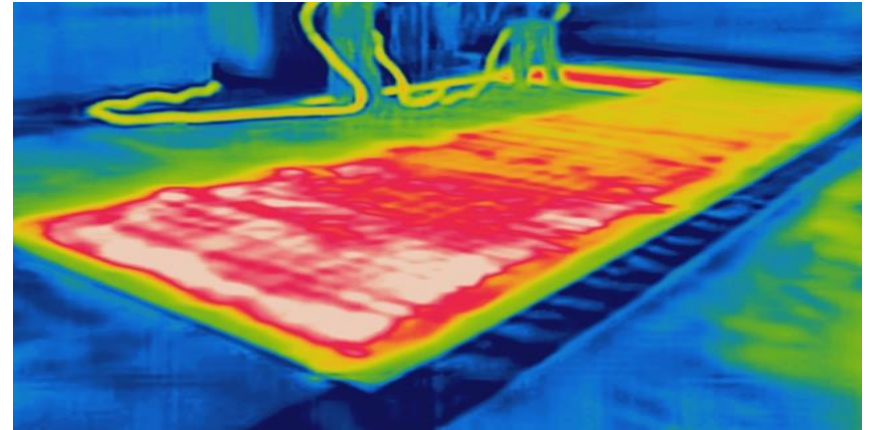


IR-TI of Polyurea Spray Process

Visual



IR-TI



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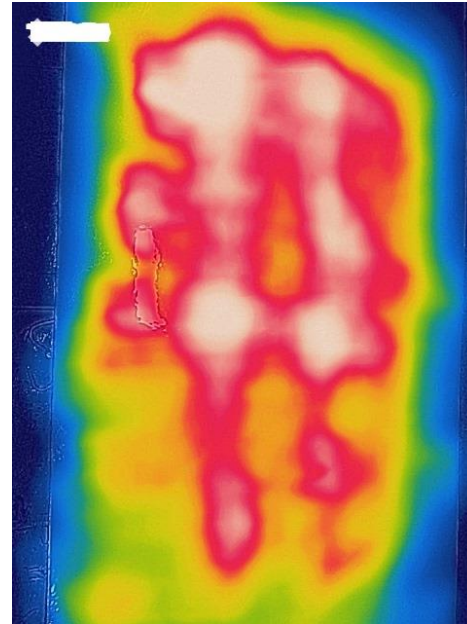


IR-TI of Polyurea Spray Process

Visual



IR-TI



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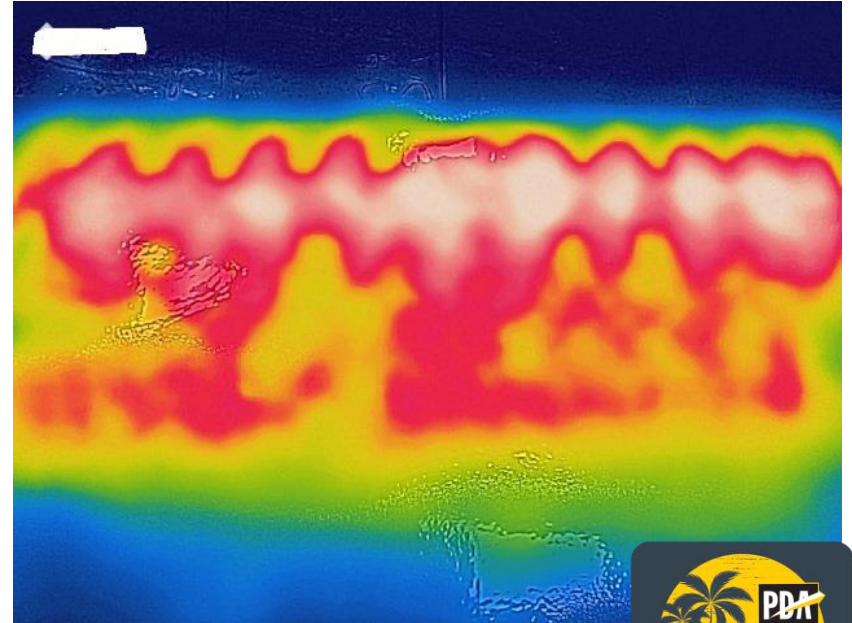


IR-TI of Polyurea Spray Process

Visual



IR-TI



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IR-TI 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
 - Otherwsie, still have thin areas / non-uniformity
- Not a suggested application technique

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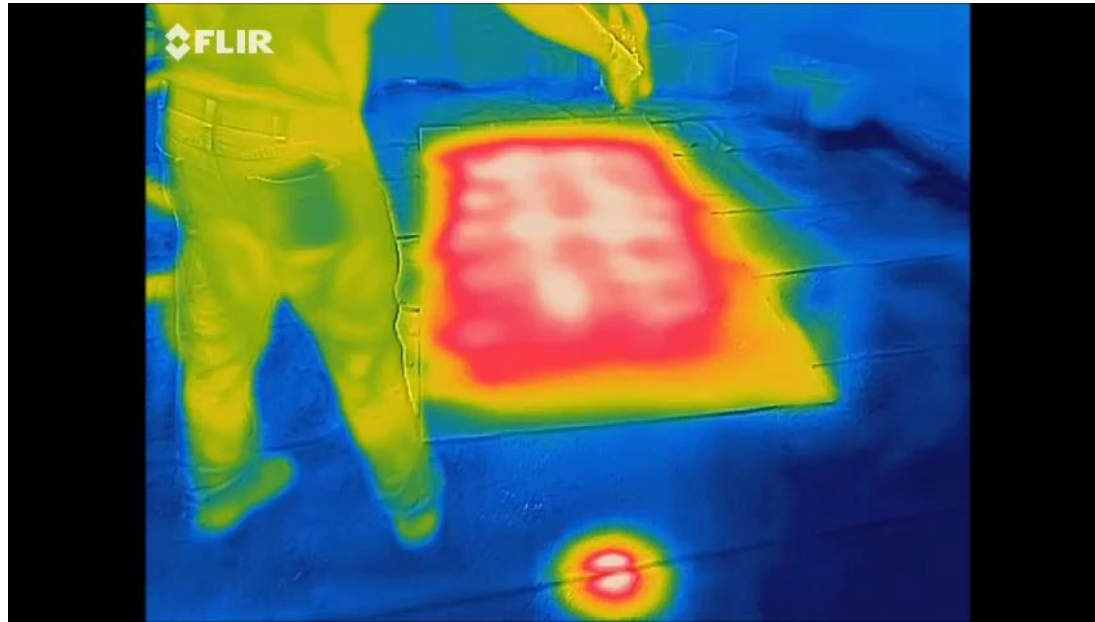
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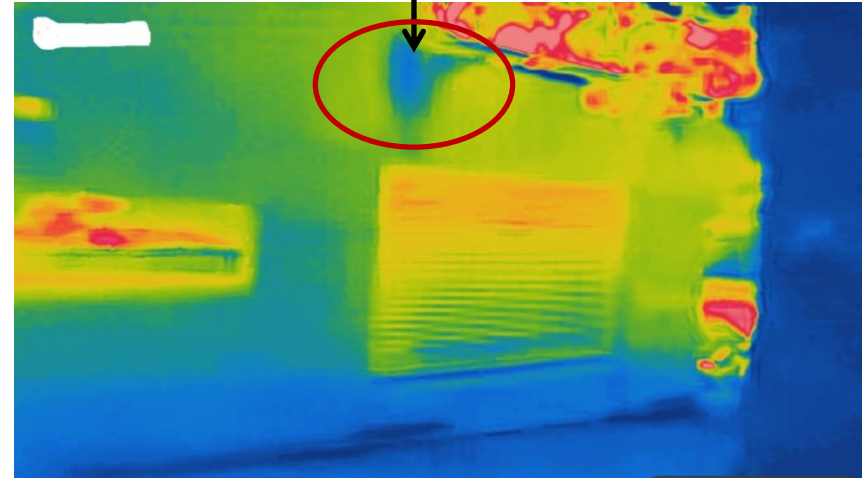
IR-TI of Polyurea Spray Process

The “Swirl” Process



IR-TI 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



IR-TI Camera

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Conclusions

- And for fun...



What's This????



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Thank You!

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