

NANSULATE®

AWARD-WINNING ENERGY SAVING & ASSET PROTECTION COATINGS

Welcome

Nansulate® Application Training Overview

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AWARD-WINNING ENERGY SAVING & ASSET PROTECTION COATINGS

About Nansulate® Coatings

Nansulate® coatings are a patented thermal barrier technology by Industrial Nanotech, Inc. that provide a unique combination of characteristics: Thermal insulation, mold resistance, corrosion prevention, moisture resistance, UV resistance, chemical resistance, and flame resistance.

What is most exciting about these nanotechnology-based coatings is that they take a complex thermal barrier technology and deploy it **in a simple, paintable coating**. Though the application may be simple, the performance is powerful. This technology is able to achieve significant energy savings (typically between 10%-30%) for our customers with an exceptionally short payback period (typically less than 1 year).



insulate equipment



insulate buildings

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Insulation Simplified



Insulation & Corrosion Control
Guadalajara, Mexico



Energy Sustainability for Airport
Bangkok, Thailand



Reduced Energy Cost for Boiler
Istanbul, Turkey



Insulation for High Humidity
Middle East



Insulation & Energy Savings
Sofia, Bulgaria



Condensation & Rust Prevention
Seattle, Washington



Insulation & Energy Efficiency
Middle East



Insulation & Energy Efficiency
Istanbul, Turkey


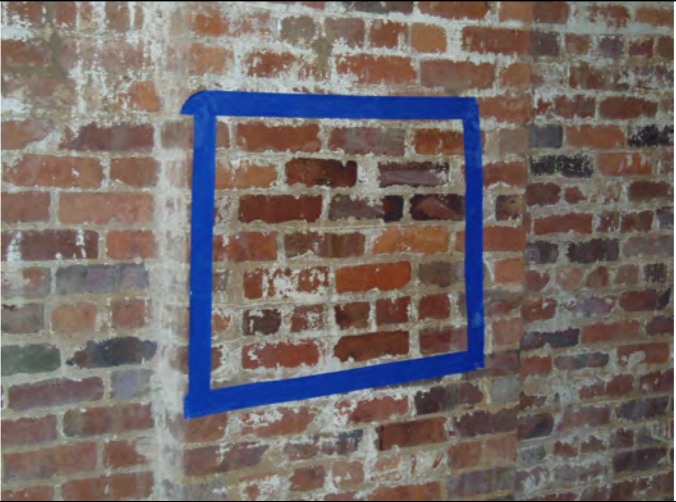


Corrosion Prevention & Insulation
U.A.E.



Pipe Insulation & Energy Savings
Middle East



Building Envelope Solutions

	Insulation and Energy Savings: Walls, Ceilings - Nansulate® Energy Protect Sloped Roofs - Nansulate® Crystal	Lead Encapsulation: Nansulate® LDX
Application	Application of 150 microns (6 mils) dry film thickness (3 coats) (Applied at wet film thickness of 100 microns (4 mils) per coat)	Application of 100 microns (4 mils) dry film thickness (2 coats) Nansulate® LDX (Applied at wet film thickness of 100 microns (4 mils) per coat)
Typical Energy Savings*	Between 20%-40%	N/A - For lead abatement
Finish	Translucent, Smooth	Translucent, Smooth
		
Use	Indoor or Outdoor	Indoor use only
Final Dry Film Thickness (DFT) Estimate	Nansulate® Energy Protect: 150 microns (6 mils) DFT (3 coats) Nansulate® Crystal: 150 microns (6 mils) DFT (3 coats)	100 microns (4 mils) DFT (2 coats)

*Based upon laboratory testing and field studies. Actual results are dependent upon environmental temperatures and elements.

Equipment Insulation Solutions

NOTE: These are example specifications based upon actual applications and reported energy savings. Each application is specified according to customer needs through our Gold Standard Application Program, and actual thickness may differ from those shown below.

	Clear Insulation Solution (CIS): Nansulate® High Heat Typically used for equipment that is not stationary, or has moving parts that need the thinnest application choice.	Ultimate Insulation Solution (UIS): Nansulate® High Heat & Nansulate® EPX Typically used for equipment that is stationary. Provides higher thermal performance in fewer passes, and chemical and flame
Step 1	Application of 500-750 microns (19.7-29.5 mils) dry film thickness (10-15 coats) Nansulate® Translucent High Heat (Applied at wet film thickness of 100 microns (4 mils) per coat)	Application of 200 microns (8 mils) dry film thickness (4 coats) Nansulate® Translucent High Heat (Applied at wet film thickness of 100 microns (4 mils) per coat)
Step 2	none	Application of 1.2 mm (48.2 mils) dry film thickness (2 coats) Nansulate® EPX (Applied at wet film thickness of 1 millimeter (39 mils) per coat)
Step 3	none	Application of 50 microns (2 mils) dry film thickness (1 coat) Nansulate® Translucent High Heat as finish coat.
Typical Energy Savings*	Between 10%-20%	Between 15%-30%
Finish	Translucent, Smooth	Blue or Grey, Textured
		
Chemical resistance	No	Yes, splash resistant to acids, bases and fuels
Final Dry Film Thickness (DFT) Estimate	500 microns (19.7 mils) DFT (10 coats) 650 microns (25.6 mils) DFT (13 coats) 750 microns (29.5 mils) DFT (15 coats)	1450 microns (58 mils) DFT

*Based upon laboratory testing and field studies. Actual results are dependent upon environmental temperatures and elements.

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Industrial Application Overview

1 Step 1 - Nansulate® HH or PT:

- ✓ Use airless sprayer to apply Nansulate® High Heat Coating to dye machines in approximately 16 passes total.



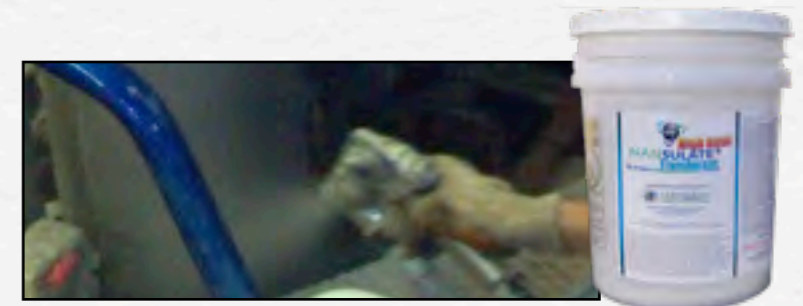
2 Step 2 - Nansulate® EPX:

- ✓ Use texture sprayer to apply Nansulate® EPX 2-part Epoxy System to dye machines in approximately 2-3 passes total. (Total wet film thickness of 2000 microns (78.7 mils))



3 Step 3 - Nansulate® HH or PT as finish coat:

- ✓ Use airless sprayer to apply finish coat of Nansulate® High Heat Coating (at 100 microns wet) to dye machines in 1 pass. (Provides UV protection for the EPX)



Tips for Success

Tip 1:

✓ It is better to apply a pass/coat too thin than too thick (thick risks peeling).
Apply more, thinner passes, rather than applying too thick.

Tip 2:

✓ Practice a pass with each type of sprayer, then measure thickness with a Wet or Dry Film Thickness Gauge. This will give you a feel for how you spray each coat and the resulting thickness.

Tip 3:

✓ Follow temperature guidelines, and keep equipment at proper temperature throughout application.

Tip 4:

✓ Make repairs to coating film as needed. Repair of the coating is easily done with both High Heat and EPX by going back over the damaged area.

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Application - Surface Preparation

Proper surface preparation is important for any coating application to ensure good adhesion.

BEFORE applying the coating, equipment surfaces should be:

CLEAN

- ✓ No Dirt
- ✓ No Caked on Dye Chemicals
- ✓ No Grease or Oil
- ✓ No Rust
- ✓ No Flaking Paint
- ✓ No Dry Cleaner Residue

DRY

- ✓ No Moisture
- ✓ No Dripping Water
- ✓ No Wet Dye Chemicals
- ✓ No Condensation
- ✓ No Wet Cleaner Residue



Methods for Cleaning:

Rotary grinders fitted with steel brushes.

Steel wool and wire brushes.

If you are worried about damage to surface with wire brush, detergent and water can be used with scrub brushes.

Wipe clean with wet towels using sufficient amounts of clean water.

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Application - Preparation

BEFORE applying the coating:

PREPARE EQUIPMENT

- ✓ Tape off valves, gauges, etc...
- ✓ Cover any critical parts not meant to be coated

PREPARE ENVIRONMENT

- ✓ Cover any areas that may be subject to overspray, which you don't want coated
- ✓ Gather and place items such as drop cloths, extension cords, buckets and water for cleaning, safety items (glasses, gloves). Use the Equipment Check List
- ✓ Place industrial fans in appropriate areas
- ✓ Ensure personnel are clear on the machine temperature needs during and after application
- ✓ Use Environment Checklist



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Application - Types

HOT Equipment Application

(Surface Temperature 100°C-175°C)

Preferred Method

Pros

- ✓ Shortest dry/cure times
- ✓ Zero or short amount of downtime*
- ✓ Least amount of plant disruption

Cons

- ✓ More passes to complete final DFT
- ✓ Smell due to coating drying on hot surface
- ✓ Machines should be kept above 100°C during application**

NOTES:

* More easily completed with no damage to coating when machines are in "machine strip" mode. Not in operation, but heated to operating temperatures. If applying while machines are operational, care must be taken when loading and unloading, not to damage the 'in-progress' coating application.

** Machines may be shut off overnight if the appropriate amount of time has passed after the last coat application for that day at operating temp.

WARM or COLD Equipment Application

(COLD: Surface Temperature 4°C-39°C)

(WARM: Surface Temperature 40°C-99°C)

Pros

- ✓ Less smell due to equipment being cooler
- ✓ Less passes required obtain final film thickness

Cons

- ✓ Equipment must be kept out of operation for at least 45-60 days after application*
- ✓ Longer dry times/cure times**
- ✓ Long down time for equipment

NOTES:

* Loss of adhesion of the coating to the surface due to blistering will occur if equipment is coated below 100°C and then brought above 100°C before the application has completely finished curing (Note: Cure time and dry time are NOT the same thing).

** The main difference between the COLD and WARM application, is that dry times between coats will be slightly less for the WARM application as compared to the COLD application.

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Application - Step 1

I Step 1 - Nansulate® HH:

MISSION OBJECTIVE:

Use airless sprayer to apply Nansulate® High Heat Coating to dye machines in approximately 8 passes total.
Final dry film thickness for Step 1 should be 200 microns (8 mils)

APPLICATION METHOD:

Airless sprayer - Coats are 'Misted' on very lightly (approximately 30 microns) in order to avoid blistering of the water-based coating on the hot metal. Allow to thoroughly dry before applying next coat.

SUGGESTED TIP:

Begin with a 2-4 fan size and orifice between .011-.013. Adjust as needed for dye equipment size. Control thickness of the application by doing shorter passes over the area for thinner coverage.

SUGGESTED FILM THICKNESS GAUGE: DRY

Measure dry film thickness after each pass with Dry Film Thickness Gauge after the coat has completely dried and note on the Project Application Log. A Wet Film Thickness Gauge may be used, but will be more difficult on a hot surface, due to fast drying of the coat.

ESTIMATED PASSES NEEDED: 8

ESTIMATED TIME TAKEN TO COMPLETE: 1 day



Mixing:

Nansulate® High Heat is a 1-part system.

Open can and mix at low speed with hurricane/rotary mixer.

Hand mixing is allowed, but must be thorough.



Application Tool:
Airless paint sprayer



Hurricane/rotary mixer attached
to drill

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Application - Step 2

2 Step 2 - Nansulate® EPX:

MISSION OBJECTIVE:

Use texture sprayer to apply Nansulate® EPX 2-part Epoxy System to dye machines in approximately 2-3 passes total (Wet Film thickness build to 2000 microns (78.7 mils) in 2-3 passes). Final dry film thickness for Step 2 (added to Step 1 thickness) should be 1400 microns (56 mils).

APPLICATION METHOD:

Texture sprayer - Coats are sprayed on at approximately 666 to 1000 microns wet film thickness each. Allow to thoroughly dry before applying next coat.

SUGGESTED TIP:

Begin with the 'small' tip that comes with the sprayer. Adjust as needed for dye equipment size. Control thickness of the application by doing shorter passes over the area for thinner coverage.

SUGGESTED FILM THICKNESS GAUGE: WET & DRY

Measure wet film thickness after each pass and note on the Project Application Log. After entire application has dried, use Dry Film Thickness Gauge to measure overall thickness.

ESTIMATED PASSES NEEDED: 2-3

ESTIMATED TIME TAKEN TO COMPLETE: 1-2 days



Part A - Grey and Part B - Yellow
As opened



Application Tool:
Texture sprayer

Mixing:

Nansulate® EPX is a 2-part system.

Open cans and mix each at low speed with hurricane/rotary mixer. Then pour Part B (smaller) into Part A, and mix thoroughly. **It is important that the system is mixed well, no ribbons of colors.**

Hand mixing is NOT recommended.

Allow EPX to set for 10 Minutes after mixing.



Part A and Part B
Mixed together

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Application - Step 3

3 Step 3 - Nansulate® HH as Finish Coat:

MISSION OBJECTIVE:

Use airless sprayer to apply finish coat of Nansulate® High Heat to dye machines in 1 pass. Final dry film thickness for Step 3 (added to Step 1 & 2 thickness) should be 1450 microns (58 mils)

APPLICATION METHOD:

Airless sprayer - Coat is applied at approximately 100 microns wet film thickness and will dry to approximately 50 microns dry film thickness.

IMPORTANT: Be sure the EPX surface is completely dry prior to application, otherwise "alligatoring" - Patterned cracking in the surface of the paint - can occur.

SUGGESTED TIP:

Begin with a 2-4 fan size and orifice between .011-.013. Adjust as needed for dye equipment size.

SUGGESTED FILM THICKNESS GAUGE: DRY

Measure dry film thickness with Dry Film Thickness Gauge after the coat has completely dried and note on the Project Application Log. A Wet Film Thickness Gauge may be used, but will be difficult due to translucence of the coating.

ESTIMATED PASSES NEEDED: 1

ESTIMATED TIME TAKEN TO COMPLETE: 1 day



Mixing:

Nansulate® High Heat is a 1-part system.

Open can and mix at low speed with hurricane/rotary mixer.

Hand mixing is allowed, but must be thorough.



Application Tool:
Airless paint sprayer



Hurricane/rotary mixer attached
to drill

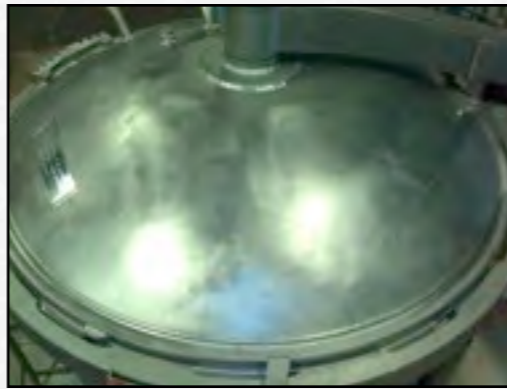
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Application - Visual Overview

1 Step 1 - Nansulate® HH

Nansulate® High Heat will appear translucent over the surface.



2 Step 2 - Nansulate® EPX

Nansulate® EPX will appear grey over the surface. Note: It is normal for the grey to darken as it dries.



3 Step 3 - Nansulate® HH as Finish Coat

Nansulate® High Heat will give the EPX a slightly 'finished' look.



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Application - Tools



Airless Sprayer

Use with High Heat

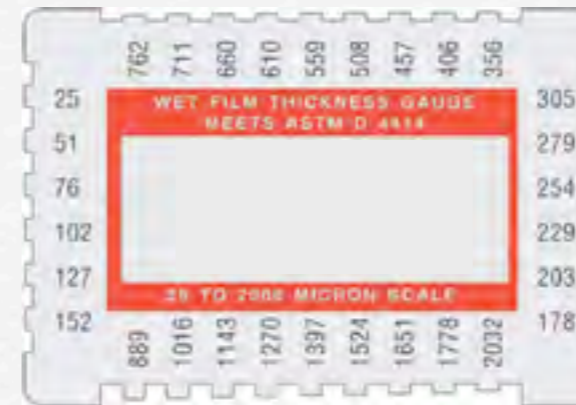
- ✓ Extremely versatile for spraying
- ✓ Makes spraying fast and easy
- ✓ Consistent spray fan at all pressures



Texture Sprayer

Use with EPX

- ✓ No-tools pump removal
- ✓ Makes texture spraying fast and easy
- ✓ Delivers smooth material flow for uniform coverage



Wet Film Gauge

Use with EPX

Used by placing the edge in the wet coating film and seeing where the coating leaves a mark. The teeth measure one side in microns, and the other side in mils.

Used when coating is wet.



Dry Film Gauge

Use with High Heat & EPX

Used by placing the sensor on the dry coating surface. The thickness will register on the screen. Measures both microns and mils.

Used when coating is dry.

What to Watch For

We will show you what to watch out for so your application goes smoothly.

Application - Temperatures

When working with water-based coatings, temperatures during application are CRITICAL. For the preferred HOT application method, the surface needs to stay HOT (over 100°C) both during and at least 3-5 hours after the last coat is applied to ensure the moisture in the coating has sufficiently dissipated.

WHAT HAPPENS WHEN YOU COOL OFF A MACHINE TOO SOON AFTER APPLICATION, THEN HEAT IT BACK UP OVER 100°C ?

The water-based coating will blister and loss of adhesion will occur.

REMEMBER:

- ✓ Keep temperatures above 100°C during entire application, and for at least 3-5 hours after the last coat has been applied.
- ✓ It is better to keep equipment heated above 100°C during entire application (even though this may be inconvenient for those few days) than to risk a mistake that will result in the need to remove and reapply coating.
- ✓ If you adhere to the temperature guidelines, your application has the best chance of success.



Correct

Panel was coated **HOT** (above 100°C) and the surface temperature was kept **HOT** throughout entire application and for at least 3-5 hours after the last coat was applied. Adhesion is excellent.



Incorrect

Panel was coated **COLD** (below 100°C). Then two days later the panel was taken over 100°C. This caused the moisture still in the material to boil and blister, and loss of adhesion occurred. Loss of adhesion.

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Application - Pot Life

Nansulate® EPX-4 is a 2-part water-based epoxy system. It has a pot life of 2 hours after the two components have been mixed together. Pot life is the period of time during which a material maintains its workable properties after it has been mixed.

You will notice pot life thickening the material during the first hour after mixing. The mixed material will begin to thicken within 10-15 minutes after mixing. It remains a sprayable consistency throughout the 2 hour pot life.

WHAT HAPPENS WHEN YOU USE THE MATERIAL PAST ITS POT LIFE?

The film will dry light instead of dark and there will be several hairline cracks throughout the film.

REMEMBER:

- ✓ Keep record on Project Application Log of the timing when components have been mixed, so you will know when pot life has expired.
- ✓ Just because the material still has a workable viscosity DOES NOT mean it can be used.
- ✓ Do not use EPX after pot life has expired - 2 hours after Part A and Part B have been mixed.



Correct

EPX was used within the 2 hour time frame before pot life expired. The film surface will dry to dark grey. Used within 2 hour pot life.

Incorrect

EPX was used after the pot life had expired. It dried to a light grey with several hairline cracks throughout the surface. Used after pot life had expired.

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Application - Dry Times

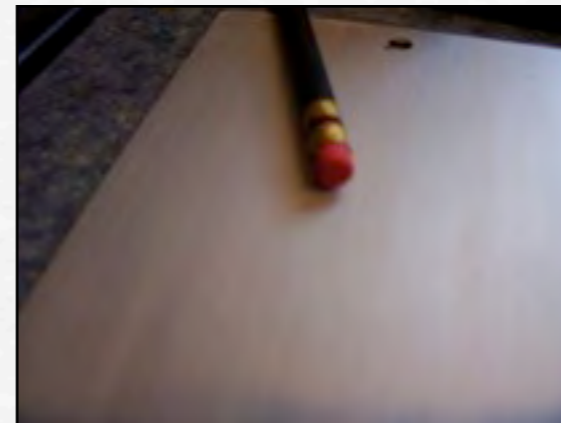
Application dry times will vary according to humidity, whether you have fans running, and whether you are doing a HOT, WARM or COLD application. The dry times between coats are given in the application instructions as a guideline, but **you should always check your last coat to ensure it is completely dry prior to adding the next coat.**

WHAT HAPPENS WHEN YOU APPLY THE NEXT COAT BEFORE THE LAST COAT HAS DRIED TO TOUCH (NON-TACKY)?

The application may crack and peel due to excess moisture in the film coverage.

REMEMBER:

- ✓ Surfaces will dry faster in low humidity, and slower in high humidity
- ✓ Surfaces will dry faster in a HOT application than in a WARM or COLD application
- ✓ Industrial fans (giving air movement) will help surfaces dry faster
- ✓ Always ensure the surface is dry (non-tacky) prior to applying your next coat



CORRECT

Coating film surface is dry and does not leave a mark when touched with object.



INCORRECT

Coating film surface is still tacky to touch, and leaves a mark when touched, and residue on object.

Application - Moisture Damage

If you are coating machines that are in operation over the application period then you will need to use care when loading and unloading, not to damage the coating film or drip water or dye onto the not yet dry coating.

WHAT HAPPENS WHEN WATER OR DYE DRIP ONTO AN "IN PROGRESS" APPLICATION?

The application may crack and peel due to excess moisture in the film coverage. Loss of adhesion will occur and repair will be necessary.

REMEMBER:

✓ The surface should not be subject to drips or contact with water, dye or other liquids during the first 72 hours after the application is completed.

HOW TO REPAIR:

✓ Repair by sanding or wire brushing away the damaged area. Smooth area, clean thoroughly, and dry completely. Reapply over damaged area.



ISSUE

Water or dye dripped into the application that was still in progress.



Loss of adhesion due to moisture dripping on the surface of the application before it has thoroughly dried.

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Application - Overspray

There is less overspray with the clear Nansulate® acrylic latex coatings than there is with the Nansulate® EPX 2-part epoxy.

Recommendations for protection of equipment from overspray during application of Nansulate® EPX and details on surface taping.

Splatter Shields:

Nansulate® EPX will have a heavier overspray during application with a texture sprayer than Nansulate® High Heat.

To facilitate protection of any instrument panels, product skids, etc.. Splatter Shields can be very useful. These are simply portable shields created with plastic tubing and plastic sheets, which can be moved behind and around equipment being coated to protect from overspray.



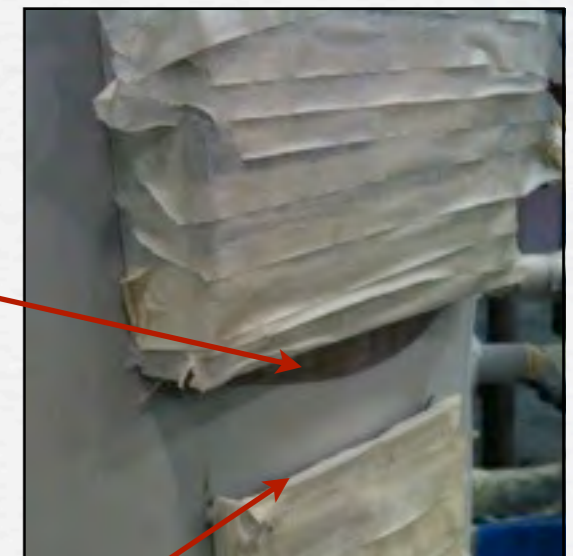
Have splatter shields, tarps, etc.. in place on all equipment being coated to facilitate faster application, and movement between pieces of equipment.



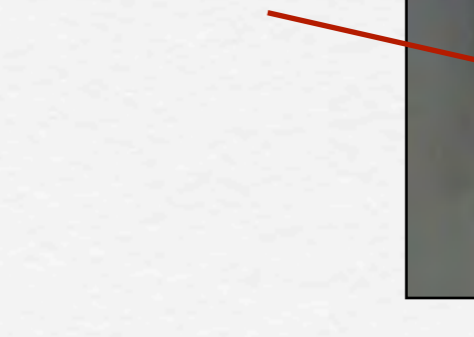
Proper Taping of Equipment Parts:

Make sure when taping over plate or other equipment parts that you don't tape onto the surface of the machine. Otherwise, when you remove the tape, you may have a bare area that you will need to coat.

Tape was incorrectly placed on machine surface, causing a bare spot when it was removed



Tape was correctly cut not to lay onto machine surface.



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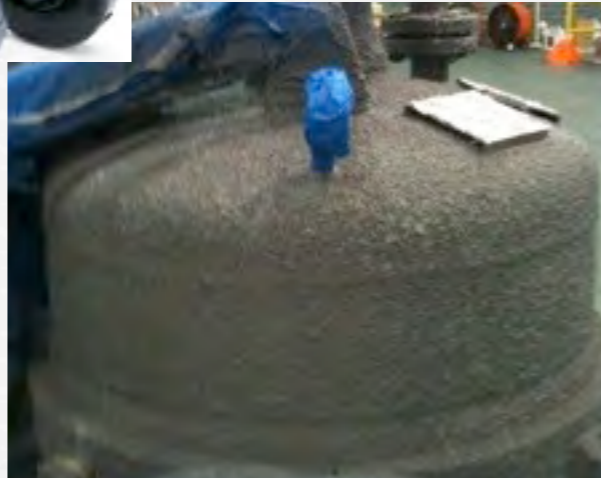
Application - EPX Spray Application

There are ways that the final look of the EPX surface can be smoothed. Also, it is important to use a smaller spray nozzle for a finer finish

Use a Small Nozzle on the Texture Spayer for a Better finish:



TOO LARGE -
Too large of a nozzle will
give a rough finish



SMALLER IS BETTER -
A smaller nozzle will give a
nice, even finish



Additional smoothing of the surface can be done with a stiff paint brush or a trowel. NOTE: If you are doing a HOT application, you will need to smooth immediately after the spray pass before the material hardens (it dries quite rapidly).

COLOR: If you desire a particular color other than grey on the exterior of your dye machines, Nansulate® can be painted over with a colored water-based paint. Allow the coating to completely dry and cure for 14 days (hot application) or 60 days (cold application) before painting over with a colored paint.



*Example of a smoothed and
painted EPX surface.*

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Spray Application Best Practices

Use the Hopper Gun Attachment to Spray Nansulate® EPX

Use a Hopper Gun or the Hopper Gun attachment to your texture sprayer when spraying EPX. DO NOT put EPX through a hose.



Use the Hopper Gun attachment on larger sprayers rather than putting the EPX through the hose. When you try to put it through the long hose, it can get easily clogged, and will make the application take more time due to need to clear out the hose constantly.

The Hopper Gun delivers the product directly from the hopper to the spray tip, reducing any clogs

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Application Best Practices

Keep the Skin off the Top of Nansulate® Translucent Coatings

After having your bucket open for a period of time, a thin skin may form on the top of the coating in the can. You can easily strain that off with a 5-gallon bucket paint strainer, found at any paint or hardware store.

Start with a clean can, and put the net strainer over the top. Then pour your Nansulate® High Heat from the open can through the strainer and any formed skin will be left in the net, rather than to clog your spray equipment.



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Application Best Practices

Use Practice Surface Before Spraying Equipment

Before you have your crew spray your dye machines, it is a good idea to have them practice spray on boards, trash cans, or other 'practice' surfaces. This will allow them to get familiar with the spray equipment, both for the High Heat coating and the EPX coating, and how to get an even spray pass across the surface BEFORE they begin spraying your equipment.

Practice with Airless Paint Sprayer for Nansulate® Translucent



Practice with Texture Sprayer for Nansulate® EPX



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Application Best Practices

Industrial fans significantly decrease dry time between coats.

Turn fans OFF when you are applying the coatings to the equipment, so that the fan doesn't interfere with the spraying process.

Turn fans ON when you are finished with a coat to help decrease dry time with air circulation.



Measure thickness in several areas.

When measuring your dry film or wet film thickness, be sure to measure it on several areas of the dye machine, in order to keep an even coverage throughout the application.



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Application Temperature Notes:

Translucent Coatings

Application to surface at approximately 199F and below: Application dries clear.



Application to surface at approximately 200F and higher: Application dries white/opaque.



Damage Repair

Repair of a damaged application area is done easily.

REPAIR STEPS:

- ✓ Remove Damaged Coating By Sanding or Wire Brushing**
- ✓ Clean and Dry Area**
- ✓ Reapply Coating Over Area**

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Project Application Log

We have created a Project Application Log to make it easy for your team to track application information for each dye machine.

Fill in the project and machine information.

Chart the time that each spray pass was made.

Note the actual dry time when coat was dry to touch (non-tacky) and ready for the next coat to be applied.

Keep a running total of your DRY film thickness so that you will know when the TARGET thickness is reached and that Step is complete.

PROJECT APPLICATION LOG
Coats Global Energy Saving Project
(HOT APPLICATION - Surface Temperature 100C-175C)

Date: _____ Part Location: _____
 Project Leader Name: _____
 Applicator Name(s): _____
 Machine Identification: _____ Machine Square Meter Surface Area: _____
 Surface Temperature: _____ Machine in Operation? (circle) YES NO

Step 1 Nansulate® High Heat - Target DRY film thickness 500 microns
Estimated number of passes 14

Passes with Surveys	Apply Pass at What Thickness (Wet Film Accumulation)	Notes Time Spray Pass Completed	When Length of Dry Time - When surface is DRY to touch (non-tacky)	When Consistently Dry Measure Accumulated DRY Film Thickness
1	30/15			
2	30/30			
3	30/50			
4	30/60			
5	30/80			
6	40/100			
7	50/120			
8	50/150			
9	50/175			
10	50/200			
11	100/250			
12	100/300			
13	100/350			
14	100/400			
15	100/450			
16	100/500			
TOTAL:				GOAL: 500 Microns DRY Film Thickness

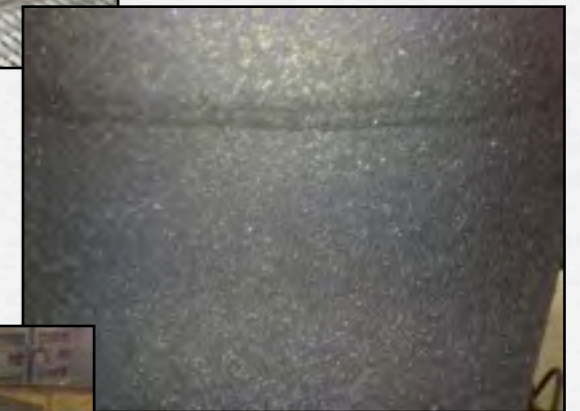
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Tips for a Successful Application

The coatings are very easy to apply, if you follow a few simple tips.

- ✓ **Do Proper Surface Preparation**
- ✓ **Mix Coatings Thoroughly, but do not damage the nanocomposite. Mix at low to medium speed, do not drag the mixer onto the sides of the bucket.**
- ✓ **Chart pot life for EPX**
- ✓ **Adhere To Application Temperature Guidelines**
- ✓ **Measure Film Thickness Throughout Application**
- ✓ **Protect Application From Water/Dye Spillage**



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Application Photos - Equipment



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Application Photos - Buildings

