

Technology Advances in Coating

Ohio Gas Association 2012 Technical Seminar

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Your Authorized Distributor of
3M Scotchkote™, Denso®, AMCORR™ & Indumar
Corrosion Protection Products

Pipeline Spills and Explosions Make Headlines...

Don't let
this be *your*
15 minutes
of fame



Enbridge oil spill in the Kalamazoo River near Marshall, Michigan



Headlines continued

Corrosion has been reported as a primary cause of major pipeline incidents over the last ten years. (1)

January 2012, Nearly 117,000 gallons of gasoline was released from a burst 8-inch pipeline, owned by Sunoco Logistics, in Wellington, Ohio. Seventy residents were evacuated from the area due to high levels of toxic chemicals. (2)

January 2012, A Columbia Gas pipeline exploded & burned in Estill County, KY. Flames were reported reaching over 1,000 feet high. Residents up to a mile away from the failure were evacuated. (3)

Headlines continued

November 2011, A 36-inch Tennessee Gas transmission pipeline near Glouster, OH failed at a girth weld, exploded and burned, destroying three homes and two barns and damaging four others. (4)



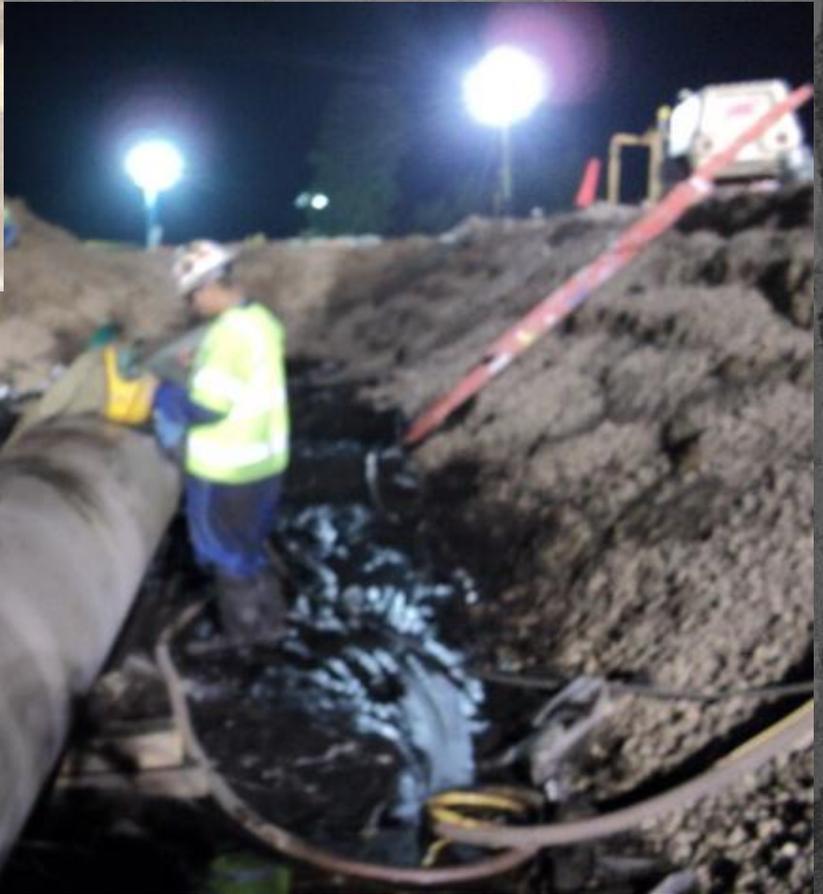
Gas explosion in Glouster, OH
<http://changesontheearth.com>

July 2011, A 12-inch ExxonMobil pipeline spilled an estimated 63,300 gallons of crude oil into the Yellowstone River in Montana, costing the company \$1,060,390 in cleanup and penalties. An additional penalty of \$1.3 million worth of DEQ-approved supplemental environmental projects to be completed by ExxonMobil.(5)

2010 Oil Pipeline Failure near Marshall, MI



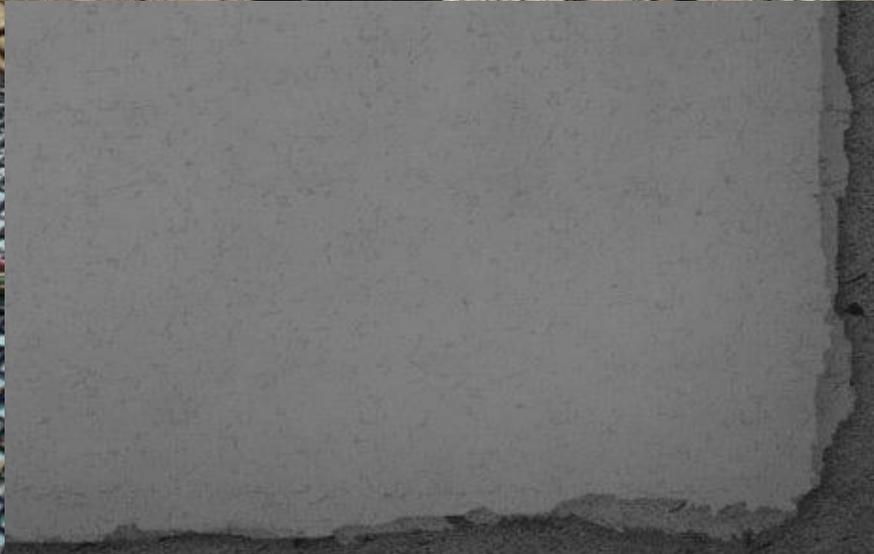
















New Legislation to Enhance Pipeline Safety



www.oil-world-2011.com



Crews work to clear oil from the Yellowstone River in Laurel, Montana. (Jim Urquhart, AP/ July 5, 2011)

On January 4, 2012 President Obama signed the Pipeline Safety, Regulatory Certainty, and Job Creation Act which adds more regulation for pipelines.

The bill doubles the fine for safety violations to \$2 million, requires automatic shut-off valves on new or replaced pipelines and more pipeline inspectors. (6)

How effective is your corrosion mitigation program?

What causes coating failure?

A “Paint/Coatings Failure Analysis” by Matco Services Inc. cites six primary causes (7):

- Improper substrate preparation
- Improper coating selection (environment, substrate compatibility)
- Improper application

What causes coating failure?

- Improper drying, curing, and over coating times
- Lack of protection against water and aqueous systems
- Mechanical damage due to improper handling of the coated substrate

Substrate Preparation

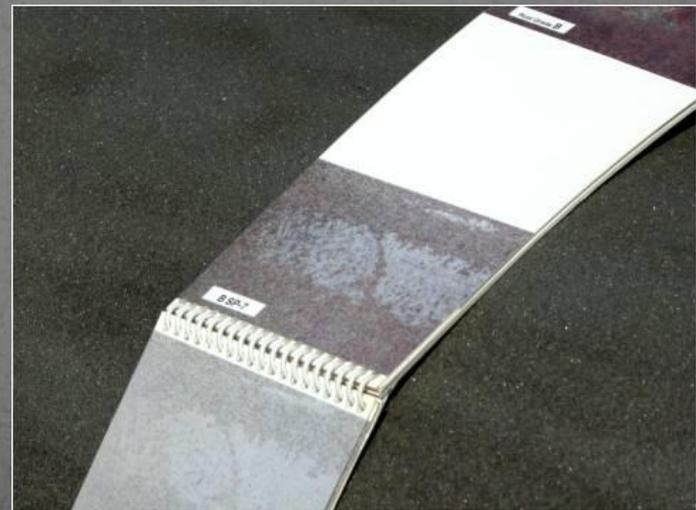


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The 3 "P"s of Coating Effectiveness

Preparation, Preparation & More Preparation!



Substrate Preparation Continued

Reminder! The product you are applying is only as good as your preparation.

- Follow application directions from the manufacturer.
- Follow structure owner specification if available.

Items such as: Atmospheric conditions: moisture, wind, humidity, temperature



Substrate Preparation Continued

Abrasive Blasting

Blast media is fired at the surface at high speed.

Black Beauty

Steel Grit

Steel Shot

Aluminium Oxide

CO₂ (Dry-ice)

The choice of media used depends on the material being prepared and the standard of preparation required.



Substrate Preparation



Conventional Grit
Blasting



Newly Developed
Bristle Blasting



"The (MBX) Surface Grinder you sold to us, to do our 588 bridges, is as close to sand blasting as we can get, without the mess to clean up and send to a type 3 land fill; no mess and a real big savings for the tax payers of Michigan. Time was one third the amount of time for the project using the Surface Grinder versus sand blasting." - Roger Kimble, Michigan DOT



Pneumatic



Electric

Substrate Preparation Continued

- **Cleanliness of pipe**
 - Standards by NACE, SSPC, ISO
 - Structure owner specification
- **Anchor pattern**
 - How aggressive?
- **Elimination of spurs and sharp edges**
- **Transition issues**
 - Overlap
 - Tapered edge



Substrate Preparation Continued

How clean is your air supply?



Substrate Preparation Continued

To achieve optimum traditional coating system performance and consistent coating life-cycle on metallic substrates, abrasive blast cleaning is required.

However, modern coatings offer a number of systems specifically developed for application to metallic surfaces without the need of abrasive blast cleaning.

Substrate Preparation Continued

Manual preparation can be carried out by the following methods:

- Water blasting (LPWC, SSPC-SP12/NACE 5, UHP or WJ4)
- Hand Tool (e.g. SP-2 Wire brush, Scraper etc.)
- Mechanical Tool (e.g. SP-3 Grinder, Needle Gun etc.)

Whatever method chosen, it is important that coatings are removed and the surface is free from contamination and all non-adherent rust.

Coating Options

Things to Consider When Choosing a Coating

The following findings are from an April 2010 independent survey of engineers, facility managers and contractors (8):

- Chemical resistance and permeability are the most important considerations of protective linings used in a corrosive environment.
- More than half the respondents said a product's performance history in similar environments was key in choosing one lining over another.
- Since multiple materials are often required in restoration projects, 76% of participants noted the importance of the products' compatibility with each other.

Things to Consider When Choosing a Coating Continued



Environmental Concerns

The U.S. is now the most conservative country regarding the number of VOCs allowed in coatings.

There are liquid epoxy and water-based acrylic coatings that comply with today's stringent VOC laws.

Benefits of Today's Coating Technology

- Reduces labor cost
- Minimizes waste
- Allows faster back fill
- Eliminates jeps without expensive equipment



Benefits of Today's Coating Technology

- Improves pipeline integrity to avoid dangerous and costly leaks
- Extends the life-cycle of your pipelines and tanks
- Offers low environmental impact

100% Solids Epoxy Coatings



A leading provider of midstream energy services was concerned about this petrochemical pipeline. This project entailed 4000 ft. of an 8" diameter pipeline.

100% Solids Epoxy Coatings



The pipeline was sandblasted to provide a surface profile for proper adhesion.

- ✓ Spray applied at 25 mils thick in one application (may be applied up to 40 mils thick)
- ✓ For use in cold weather conditions, tent the area and heat the pipe to 41°F.



100% Solids Epoxy Coatings



100% Solids Epoxy Coatings



100% Solids Epoxy Coatings



Manually prepared steel

- High performance epoxy coating
- Latest polymer technology
- Solvent free
- Minimal surface preparation
- Suitable for damp substrates (80-100% humidity)
- Corrosion resistant coating for steel and concrete structures

100% Solids Epoxy Coatings

Long-term environmental
exposure solutions for tanks
and pipes
Preserve buried and above
ground pipelines



Before



After





100% Solids Epoxy Uses

- As a patch material
- As a girth weld coating
- As an internal lining
- As a stand alone coating for pipe rehabilitation
- In a wide variety of other field applications where corrosion protection of metal is required

Coating Tips

Don't forget about the pot life of the product.



Man is my wrist sore.
Where is the power mixer?

Packaging



100% Solids Epoxy Quiz

What effect does heat have on 100% solids epoxies?

A coating is only as good as _____.

Name the 3 different formats in which a 100% solids epoxy coating can be applied?

Why is it important to have an anchor pattern?

What is pot life?

T/F Dry to touch time is the time at which we can backfill the trench.

What is the difference between mechanical bond and chemical bond?

What is the minimum mil thickness required for 100% solids epoxies for underground pipeline?

T/F To determine estimated backfill time for 100% solids at 75°F, you should read the manufacturer's technical data sheet.

100% Solids Urethanes

- ✓ High build in one pass; greater than 30 mils/760 microns
- ✓ Can be applied in temperatures as low as 14°F/-10°C, and up to 95°F/35°C
- ✓ Operating temperatures of :
 - ✓ 150°F/65°C wet
 - ✓ 212°F/100°C dry



100% Solids Urethanes

- ✓ 3:1 mix ratio
- ✓ Backfill at 75°F/24°C in approximately 35 minutes.
- ✓ Excellent CP performance
- ✓ UV tolerant



Petrolatum



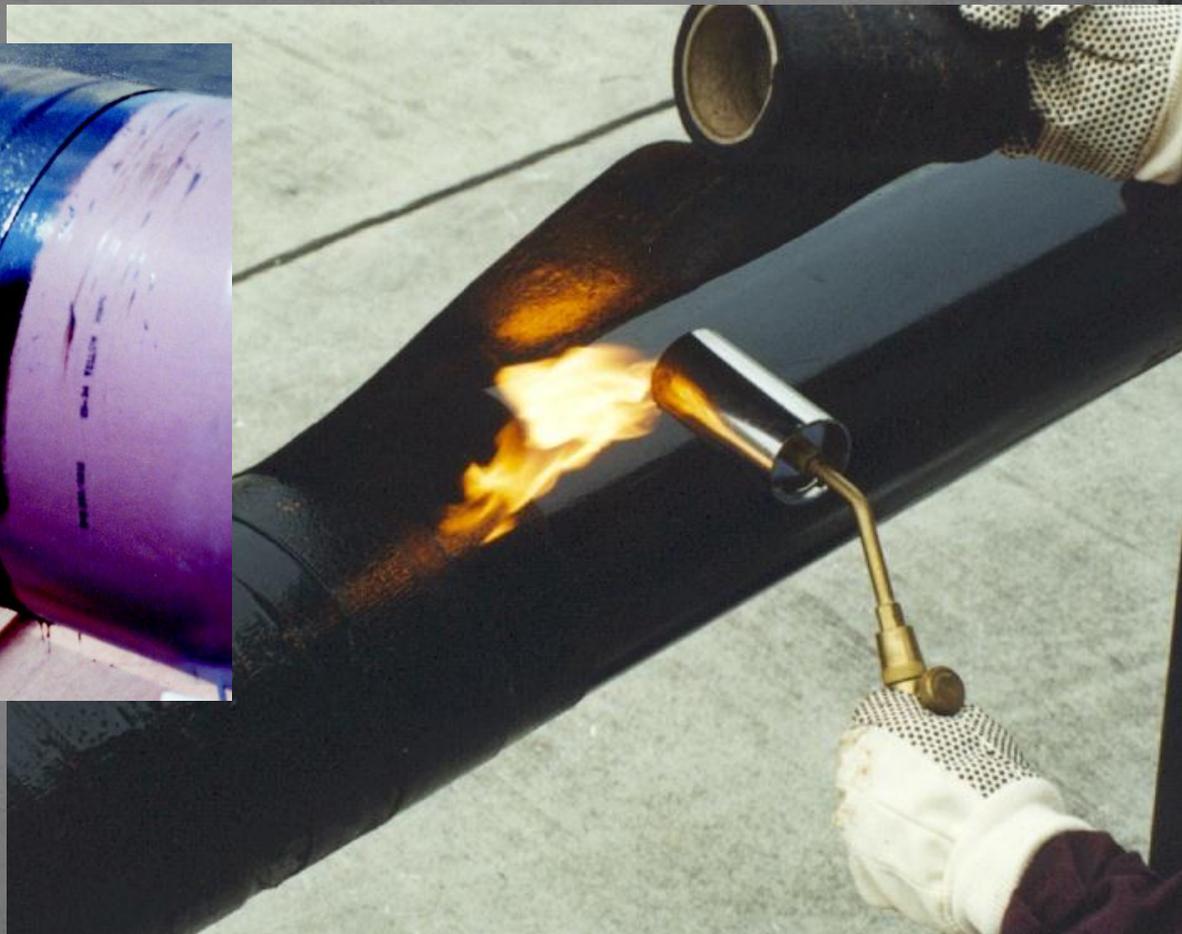
Protection of vault piping with petrolatum/ wax tape system

Petrolatum



Profiling Mastic used
for irregular profiles

Hot-Applied Bitumen Tape





60 Mil Cold-Applied Tape



Fiberglass Water Activated Glass Outerwrap



Remove roll
from hermetically
sealed foil
pouch.



Place roll
in water for 20 to
30 seconds.



Spirally wrap with a
50% + overlap.



Tank Protection

According to a two-year study by the U.S. Federal Highway Administration, the U.S. has approximately 8.5 million regulated and non-regulated aboveground and underground storage tanks that contain hazardous materials, mostly petroleum products. The total cost of corrosion for the storage tanks is \$7.0 billion per year.

(9)

Water-Based Acrylic Coatings for Tank Protection



GlaxoSmithKline – Solvent Recovery Tank- Before

Water-Based Acrylic Coatings for Tank Protection Continued



GlaxoSmithKline – Solvent Recovery Tank- After

- ✓ 36 tanks were cleaned using high-pressure water jetting.
- ✓ Rusty areas were patch primed using an anti-corrosive epoxy coating.
- ✓ Two coats applied by brush for a minimum dft of 350 microns.
- ✓ Steel and pipe work were also protected using the acrylic system.

Advantages of Water-Based Acrylic Coatings

- Single component
- 14 mils dft in one coat
- Easy to use; minimal mixing required
- One-coat encapsulated system vs. 3-5 coat zinc system
- Superior flexibility and adhesion
 - No mud cracking
- Optimum levels of UV and corrosion resistance
- VOC free

100% Solids Vinyl Ester Epoxies

17 to 20 mils in one coat

Excellent acid and corrosion resistance

10:1 ratio

Styrene odor during application and curing; apply in well ventilated area

Materials should be 50°F minimum before spraying

Substrate temperature must be above 50°F

Available in brush and airless spray grades

Always refer to Manufacturer's Technical Data Sheet for proper application specifications.

100% Solids Vinyl Ester Epoxies



Ideal for:
Tank linings
Exteriors of high temperature equipment
Concrete floors, trenches, pits, and sumps



Can be installed with integral glass flake or fiberglass mat for improved thermal shock and heat resistance

Been there, done that... not going back!



Viscous Elastic Coatings

Coat Wrap

- 70 mil tape system
- No sandblasting or primer required
- Only 10% overlap
- Sticks to Steel, Asphalt & Concrete
- 100% impermeable to moisture and gases
- Paintable



Viscous Elastic Coatings

This compressed air pipe was severely corroded. The company was looking for an economical and quick solution that adheres to strict EPA regulations.



Viscous Elastic Coatings

- ✓ 200 feet of pipe
- ✓ Hand scraped and abraded to remove flaking paint
- ✓ Viscous elastic wrap (painted in company's signature color)
- ✓ Viscous elastic coat wrap applied from the flange to the yellow jacket (about 7ft)
- ✓ Viscous elastic heavy-duty Outerwrap was applied as a rock barrier to protect during backfill.



Viscous Elastic Coatings



Heavy-duty PE outer pipe wrap

- 10-20 mil SPVC tape with adhesive
- Used over paste or coat wrap
- Excellent mechanical strength
- Abrasion, UV and weather resistant
- Highly resistant to corrosive chemicals



Viscous Elastic Pastes and Sealants



This paste is a mastic-like material with synthetic properties.

- Adheres to almost any surface
- No primer required
- No cure time required
- A permanent solution for water leaks
- Used with a wrap for tank chimes



Synthetic polyolefin sealant

- Stops active water leaks
- Adheres to any surface
- Prevents water infiltration



Viscous Elastic Wrap and Sealant



- Permanent flexibility & adhesion
- UV resistant
- CP compatible
- 70 mils
- Long term protection
- No primers required



Viscous Elastic Pastes and Sealants



Viscous Elastic Pastes and Sealants



Viscous Elastic Technology Quiz

T/F Is viscous elastic coating UV tolerant?

T/F Viscous elastic coating needs SP-2 surface prep.

T/F Viscous elastic coating can be applied in any weather condition.

T/F Was the above question a trick question?

T/F Viscous elastics can be used as a tank chime sealant/repair.

T/F Viscous elastics can be used as a casing end seal.

T/F Viscous elastics can be used on existing FBEs and coal tar epoxies.

What is the minimum overlap required?

Summary

- Correct selection of coating and application equipment with fully trained personnel can result in a fast, stress-free application, which in turn will result in a better quality finish.
- Informed decisions lead to better protection and reliability of your valued assets and minimize potential issues with the government or the public.
- Using proper coatings and equipment to combat corrosion will lower your company's life-cycle cost and increase corporate long-term profits.

Notes and Sources

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Thank you

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