THERMOPLASTIC FLAME SPRAYING POWDER COATING TECHNICIAN TRAINING
North America Headquarters
For Low Pressure, Portable Cleaning Systems
www.IBIXUSA.com
Key Learning Objectives

- Benefits of thermoplastic to concrete and metal
- Uses of thermoplastic coating
- Technical Information of the material
- Safe handling and storage of the materials
In Case Of Emergency Call 911
Fire Extinguishers Location
First Aid Box
Muster Points
No Cellphone during the duration of the training
Toilet
Coffee Breaks
PART II – ANTI-CORROSIVE COATING THROUGH FLAME SPRAYING OF THERMOPLASTIC COATING
Conventional coatings dry by evaporation of solvents and oxidisation.
High performance solvent free PU/Epoxy dry by reaction (base and hardener)
FBE powder is thermosetting (heat causes reaction)
Polyolefin are thermoplastic, heat melts them and then they harden on cooling (no chemical reaction takes place).
1.1 Traditional Paint

- Based mostly on “thermosets” such as polyester, epoxies, polyurethanes or acrylics.
- Differ from thermoplastics in that on heating they react with themselves to “cross-link” the molecules into a matrix that solidifies and will not melt again on reheating.
- It is this technology that is used in traditional powder paint coatings.
Title: Understanding the difference b/w Thermoplastic & Thermoset

video
1.2 Why Use Thermoplastic

- Barrier Properties
  - Vapour
  - Liquids
  - Chemical Resistance
- Electrical Insulation
  - Anti-corrosion
- Flexibility
  - 500-800% elongation
- No cracking or chipping

- Thicker coatings
  - Barrier properties
  - Edge and weld coverage
  - “Grip” and “warmth”
  - Impact resistance
    - Fluid dip, flame and flock spraying
      - 250 -1000 micron
    - Electrostatic spray
      - 150 -300 micron
- Food Contact
  - Low Toxicity

There is a large number of possible thermoplastic polymers - each can give additional benefits.
1.3 What Types of Thermoplastic Are Used In Powder Coating

**Functionalised Polyolefin Alloys (PHC - PolyHotCote)**

- Long term adhesion without need of a primer
- Excellent UV and salt spray resistance
- Contain only C, H, O
  - Food/water contact approvals
  - Low smoke/toxicity on burning
- Elastomeric / very flexible
  - Ductile impact properties
  - No cracking/chipping
- Temperature range -70°C to 70°C (100°C))
- Good chemical resistance
- Minimum recommended thickness - 300 micron
Chemical Resistance

- Ferric chlorides and sulphuric acid
- Swimming Pool - Fencing
- Sewage Tanks
- Battery Boxes
- Aggressive Environments such as heavy traffic, pollution, etc.
Under BS 476, PHC-A can be considered to be Class 0

PHC-A is composed almost entirely on compounds of carbon, hydrogen and oxygen. Unlike many paints, it contains:
- No reactive ingredients
- No phthalates
- No halogens
- No isocyanates
- No heavy metals

On burning, therefore, the fumes are principally made up of carbon dioxide and water.
- CO2 (34%), CO (7.5%), Water and non-volatiles (58%) - Total 99.5%
  - NF C20-454 France
  - CO2 (99.5%), CO (0.5%) - BS 6853:1999

As a result the toxicity of the fumes in a fire situation is extremely low.

Slower smoke generation, less smoke, lower toxicity = more time to get out!
Low mould growth and fouling rate

- Provides little or no ‘anchor’ for plants, fungus or sea creatures.
- Provides little or no food for plants or animals.
- Is not easy for spores and eggs to stick to.
- The rate of growth of algae, mildew, seaweed and barnacles is slower than many other coatings.
- Easier to remove than many other coatings.
2.1 Concrete – Typical Characteristics

Concrete is a composite material that deteriorates when exposed to normal environmental conditions.

At the casting stage, concrete is sensitive to climatic changes and absorbs gases present in the atmosphere.

We should not overlook the fact that concrete “breathes”, so it expands and shrinks with seasonable moisture and temperature variations, and this often causes cracking problems.

Other peculiar and negative characteristics of concrete are a non-uniform, changing surface morphology as well as the typical porosity of the finished body.
Concrete and Corrosion

Carbonation
- Carbon Dioxide in air reacts with calcium hydroxide in concrete to form calcium carbonate:
- Increases mechanical strength of Concrete;
- Changes the pH of the concrete from alkaline (pH10+) to acidic.
- Below pH10 the passivation layer on steel R-bars dissolves and corrosion will start to occur.

Chlorides:
Can be used to shorten setting time but can leach calcium hydroxide leading to loss of strength.

Sulphates:
Can lead to chemical changes in concrete and loss of strength.

Leaching:
Water flows through cracks in concrete dissolving minerals in the concrete.
Example of secondary efflorescence in parking garage exposed to diluted road salt from vehicles entering the garage during winter.

Example of flat piece of concrete having dislodged with corroded R-bar underneath.
Title: Understanding the difference b/w Cement, Concrete & Mortar

video
What is POLY-CON – Brand Polyfusision?

- **Polyfusision** is a coating providing an anti-osmotic barrier used to insulate porous substrates against the external agents the coating is exposed to.

- Generally speaking, the substrates to be protected are porous materials such as concrete, fiberglass, etc.
Polyfusion Vs Coating Resins such as polyureas and epoxies

Conventional Coatings:

- They do not guarantee a long-lasting protection when applied on concrete substrates since they present both applications and intrinsic problems;
- They have no control over ambient conditions when product is applied (air moisture, wet substrate, air and substrate temperature, etc.);
- They do not guarantee anti-osmotic properties as gases and liquids can pass through them (when these elements reach concrete, the result is early corrosion).
Chemical & Physical Characteristics

- Resistance to penetration of liquids (anti-osmotic characteristics);
- Enhanced smooth fluidity;
- Excellent resistance to chemicals (acids, alkali, solvents*);
- Excellent resistance to adverse weather conditions;
- Outstanding UV protection;
- Excellent behaviour in case of fire (material that would not easily catch fire);
- Stain resistance, there are no pores for calcium, rust or other staining agents to grab or imbed into;
- Anti-bacterial properties (special formulations).

*Contact IBIX® for specific chemical resistance requirements.
Mechanical Properties

- Excellent Adhesion;
- Abrasion-resistance (Taber ASTM 60mg/500g);
- Remarkable elastic properties (elongation at break: 500%);
- Excellent resistance to blistering, chalking, peeling, cracking and other signs of deterioration in normal use;
- Excellent flexibility, even at very cold temperatures;
- Resistance to cold (-50°C).

Appearance and Technical Characteristics

- Smooth, durable and long-lasting coating;
- Antislip version available;
- Colour and pattern uniformity which will last for many years to come;
- Easy to repair if accidentally damaged (Thermoplastic);
- Eco Friendly;
- No porosity.
Application Procedure

- Removal of existing coating;
- Surface Preparation: Inspect the surface for any delamination or hollow spots. If hollow spots are found they must be chopped out and repaired using appropriate repairing material;
- Sand and/or smooth existing surface to a flat finish with a sanding disc and/or a cement-based product.
- Blast to clean the surface;
- Apply a first layer of the sealing primer Polyres 505 at 50% diluted with acetone or solvents;
- Apply a second layer of Polyres 505 at 100% and wait until it dries (it should not cure, hence it should still be tacky);
- Apply Polyfusion System through Hercules Flame Spray System.
Concrete Substrates – Flooring
Concrete Substrates – Flooring

GNOSIS, Pharmaceutical Company
Switzerland – Repairing and coating of a 40sm concrete flooring due to the chemicals corrosion.

BEFORE
GNOSIS, Pharmaceutical Company  
Switzerland – Repairing and coating of a 40sq concrete flooring due to the chemicals corrosion.

AFTER
GNOSIS, Pharmaceutical Company
Switzerland – Repairing and coating of a 300sm concrete flooring due to the chemicals corrosion.

BEFORE
GNOSIS, Pharmaceutical Company
Switzerland – Repairing and coating of a 300sm concrete flooring due to the chemicals corrosion.

AFTER
• HMC produces copper cathodes.
• PHC Flame Spray Coating of concrete containment tank for H2SO4 tanks.
• Desert climate; area subject to marine salt spray.
• Thermal gradient -10°C +35°C.
• Surface subject to the following conditions:
  • Resistance to 95 % - 100 % sulphuric acid flow.
  • Kind of surface coated: new concrete.
Concrete Tanks

HMC Haldeman Mining Company
La Cascada - 120 km da Iquique - Región de Tarapacá, Norther Chile (Sept. ’09)

Coating thickness 1200 microns: first coat 1000 microns of PHC Black and 200 microns PHC Green topcoat. Thickness control by weight and witness; metal plate and certified thickness gauge.

Test period: 12 months.
Concrete Tanks

Albini Cotton Factory – Albino (BG)
Coating of a concrete tank meant for containing a fiberglass tank to restrain caustic soda 30% at ambient T°.
Concrete Tanks

Albini Cotton Factory – Albino (BG)
Coating of a concrete tank meant for containing a fiberglass tank to restrain caustic soda 30% at ambient T°.

Flame spray coating application of Plascoat PPA571 – Polyfusion version.
Concrete Tanks

Albini Cotton Factory – Albino (BG)
Coating of a concrete tank meant for containing a fiberglass tank to restrain caustic soda 30% at ambient T°.
Concrete Tanks

Saudi Arabia
Coating of concrete tanks in a ready mix concrete factory.
Concrete Tanks

**Saudi Arabia**
Coating of concrete tanks in a ready mix concrete factory.
Flame Spray Applications
Concrete Coating – Polyfusion: luminescent version
Concrete Coating – Polyfusion: anti-slip version

Jan 2016
Slaughterhouse
GAVAZZA, Asti.

Making of anti-slip flooring for allowing the cattle to walk down the hallways without slipping.

| BEFORE | AFTER THE APPLICATION OF ARDEX A 46 |
Concrete Coating – Polyfusion: anti-slip version

APPLICATION OF POLYFUSION – ANTI-SLIP VERSION

RESULT
Concrete Coating – Polyfusion: antimicrobial version

Jan 2016
Slaughterhouse GAVAZZA, Asti.
Coating of a tiled flooring using Polyfusion, in order to guarantee an easier cleaning procedure (it eliminates the problems related to the tiles grout-lines). Available in the antimicrobial version too.
Concrete Coating – Polyfusion: antimicrobial version

Refrigerating Room, Asti.

Coating of flooring and walls in a confined and closed area using Polyfusion. The new coating will eliminate all the hygienical problems related to the tiles of the floor.
Concrete Coating – Polyfusion: antimicrobial version

Refrigerating Room, Asti.
Coating of flooring and walls in a confined and closed area using Polyfusion.
The new coating will eliminate all the hygienical problems related to the tiles of the floor.
Food contact approved, seamless, coating

WORK IN PROGRESS
WARNING: Flame spray coatings indoors **MUST** have an air extraction and ventilation and suitable masks.
Title: Cotonificio Albini

video
2.1 Metals

- No need for a primer:
  - **Poly-STEEL** powders adhere directly to the prepared substrate.

- Anti-osmotic barrier:
  - For outdoor structures such as buildings / constructions, bridges, off-shore sector, nautical applications.

- Continuous dielectric insulation:
  - Protective coating against stray currents for articles to be buried;
  - Electrical and marine corrosion protection.

- Abrasion resistance:
  - Abrasion-resistant coatings, high mechanical strength;
  - Coatings for ducts to discharge mineral waste, process water, etc.

- Chemical resistance:
  - Anti-acid coating for tanks, containers, fittings, industrial plants, etc.
Coating of Metals

Application Procedure

- **Surface Preparation:** The substrate must be cleaned. Sandblasting is the preferred pre-treatment method, using a grain size which provides a 40-50 microns profile and SA 2.5 cleaning standard.

- **Preheating:** The substrate is preheated to approx. 100°C-150°C (normally the melting point of the thermoplastic coating powder used) using the gun of the flame spray coater (flame only, no powder).

- **Powder Application:** The powder flow is started by turning on a switch located on the gun itself or by pressing the gun trigger. Now the powder is propelled through the gun by dry compressed air and hits the preheated substrate and immediately melts adhering to the substrate.

- The coating thickness is dependent on the number of passes. The minimum recommended coating thickness is 300 microns.

- Additional coating or repairing will always be possible in time: while coating, after coating is complete, after some time or later.

- **The flame spray coating cycle is now complete.**

- *Usually, the substrate is air cooled. If needed, you can water quench the coated substrate.*
Coating of Metals using POLY-STEEL
Poly Steel – Polyolefin on Metals
Tank mounted on mining equipment, suffering filtration in the weldseams, due to constant vibrations. Solution: flex material with corrosion protection.
Poly Steel green
FLAME SPRAY protection
Thanks to the impressive elongation of PHC (800%), the seams have been sealed successfully.
Mining application

Chemical and electrical corrosión protection needed long term...

Catwalk in Copper Sulphate Plant

Epoxy Paint after 8 months
Completely corroded

PolySteel after 8 months
No visible changes!
Poly Steel for Chemical Resistance in highly corrosive areas...

Copiapo Mine, Chile
Metal structure carrying a conveyor belt in an acid plant
Poly Steel for Chemical Resistance

Metal structure carrying a conveyer beld in a acid plant
Flame Spray Coating of structural steel protection sulfuric acid.
POLY STEEL Flame Spray for British Columbia (Canada) MINES

Flame Spray Coating of supporting pilings
POLY STEEL Flame Spray Coating
For various Pipes long term protection
Flame Spray Coating with Poly Steel on Metal Structures of Hydro-electric Power Stations replacing wet painting which was failing
Project for ENEL:
Poly Steel for internal coating of water pipes
Metal Plates in corrosive environment
Flame coated with Poly Steel
Problem:

- Electrical corrosion (very strong magnetic fields);
- Very strong environmental corrosion (the plant is cooled down with Sea water spraying on top of the roofs -> dripping from the roof – 7/8 m high – of contaminated, salty water on the pipes).
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Flame Spray Coating of Fumes from aluminium extrusion plant at Hydro in Norway
Job phases

- High Pressure Washing;
- Sand blasting;
- Flame Spray Coating (first the welds for pinhole-free coating + coating of a pipe section, overcoating of welds);
- Damaged Areas (holes in the steel):
  - Washing + sandblasting;
  - “sealing” coating with PHC in the surrounding area;
  - Closing of the holes using UV-cured polyester films (by means of UV lamps);
  - Overspraying with polyurethane paint.
2.3 Benefits offered by the Flame Spray Technology

Long term protection

- Long Term Anticorrosion Protection (antiosmotic protection; electric insulation; chemical resistance): final solution to the problem for Hydro;
- System usable in any weather condition (hot – cold weather – rain – if the item is protected against direct rain – in this case with the scaffolding);
- One-step application cycle;
- Fast turnaround: immediate use of the coated items;
- No overspray -> no need to protect equipment, vehicles etc.;
- No risk to damage plants, vehicles, pedestrians;
- Ecologic system (no VOC, TGIC, plastifiers, hyocyanates, Halogens etc.);
- Easy touch up;
- Easy repair.
Three colour Thermoplastic Flame Spray Coating to easily check and control abrasion and damage

The damaged part can be repaired promptly thus restoring the coating to its original state.
New Development

Combined system to apply PHC to unreachable or restricted areas, into holes. Coating of complex structures, complicated shapes.
Acid Base Cleaner – Etching Tank

- HYDROFLORIC ACID 5 – 10 % concentration
- NITRIC ACID 10 – 30 % concentration
- No damage after 5 months in daily use
Flame Spray Coating after blasting with Ibix-Garnet System.

- Our Coatings offer improved release properties.
- More efficient high pressure washing to remove wet paint drops during painting process.
- Coating life: 2 months (8 high pressure washing operations @ 2000 bar).
Single-Operation coating (pre-heating – 1 Poly Steel application) is possible thanks to the properties of Flame Spray thermoplastic coating powders:

- Self-adhesion (no primer required)
- Excellent flow properties (smooth)
- Excellent viscosity/MFI (melt Flow Index) ratio
- Excellent particle size distribution (NO degradation)

Fast coating speed: 8 -11 MILS sq.ft. coating in about 35 seconds on pre heated Steel.
End of Class

Thank you for your attention

Any questions?