

POLYFLAKE®



POLYFLAKE® LLC Marine Corrosion Engineering

Tank coating system for aggressive fluids

Corrosion prevention solutions for new and existing tank

POLYFLAKE® LLC Marine Corrosion Engineering

HYDRAULIC CYLINDERS SERVICE

RAM reconditioning and repair

POLYFLAKE® LLC Marine Corrosion Engineering

HULL COATING POLYFLAKE® & POLYGLIDE® Underwater Hard-Coating Systems

High performance long term corrosion protection of submerged areas

POLYFLAKE® LLC Marine Corrosion Engineering

ER Crossovers revamping

Revamping & Improvement

POLYFLAKE® LLC Marine Corrosion Engineering

Marine & Corrosion Engineering

Corrosion prevention solutions for new and existing equipment

POLYFLAKE® LLC Marine Corrosion Engineering

Cruise Ships Swimming Pools

Revamping & Improvement Turn-key solutions

POLYFLAKE® LLC Marine Corrosion Engineering

Pumps repair, reconditioning, and reconstruction

Machinery & Equipment reconditioning and renewal

POLYFLAKE® LLC Marine Corrosion Engineering

Marine & Corrosion Engineering

Machinery & Equipment reconditioning and renewal

POLYFLAKE® LLC Marine Corrosion Engineering

EGCS - IGS Corrosion Protection

Scrubber Piping Alkali and Acid resistant coating



POLYFLAKE LLC

Company history

- The core business, developed since 1989, provides coating technologies to combat corrosion and abrasion in new and existing machinery and plants.
- The Headquarters of the Company, firstly established in New Zealand, then in Canada, has been finally moved, since 2007 in Miami.
- The proprietary formulations and application Technologies of the POLYFLAKE® Coating Systems Resins are all developed in house.
- Since 2014 POLYFLAKE starts to expand the range of resins families, the areas of applications, and the services to the industry with specialized Companies and Partners.
- Today, POLYFLAKE Group provides specialized services to the Maritime Industry and, via our Partners to the Mega-Yacht, Oil & Gas, Chemical and Water sectors.

Our Customers



Our Locations

The POLYFLAKE Group

- POLYFLAKE LLC
Miami - United States of America
- POLYFLAKE EU Ltd.
Ireland / Italy

POLYFLAKE production centers:

- United States of America
- European Union





POLYFLAKE Group - activities

POLYFLAKE[®] LLC

Activities

- **POLYFLAKE Coating Resins Dept.**
 - POLYFLAKE[®] Coating Resins System proprietary formulation and production for the protection from corrosion of submerged hull, aggressive fluid tank interior, and equipment.

- **POLYFLAKE Hydraulic & Mechanical Service Dept.**
 - Service to the Marine Industry in workshop and on-site for the repair and overhaul of:
 - Hydraulic cylinders up to 7.9m length and 509mm OD.
 - Large and medium size pumps refurbishment and reconstruction.
 - Marine equipment repairs.

- **POLYFLAKE Marine Contracting and Engineering Dept.**
 - Surface preparation, steel works and corrosion protection prior to the application of standard finishing (Bolidt, API, etc.).
 - Piping systems on-site refurbishment; ballast, bilge, sewage.
 - Swimming pool rehabilitation, coating, technical room refurbishment including automation and piping systems.
 - Pulper systems overhaul and repair.

Technical Partners



Mega-Yacht and Industry



Specialized labor supply



The offer

Professional advice on corrosion related problems.

- Materials corrosion modes.
- Coating technologies.
- POLYFLAKE® Hi-Quality formulation of corrosion resistant resins.
- Corrosive fluid tank and piping coating and lining; chemicals, acid, alkali; well proven on Scrubber system tanks, piping, OVBD and hull protection from acid plume.
- POLYFLAKE® and POLYGLIDE® Submerged hull hard-coating systems.
- POLYFLAKE® and POLYTUBE® Pipe Lining Solutions.



The services

POLYFLAKE's mechanical workshop, strategically placed in Miami, thanks to its set of machine tools permits the overhaul and repair of large machinery.

POLYFLAKE's Resins System grants the re-construction of impeller and casing considered unrecoverable.

POLYFLAKE provide service to mechanical and electrical parts of pumps and equipment.

- Large hydraulic cylinders overhaul.
- Centrifugal pumps, with double-volute split-case, vertical or horizontal, submerged type, multistage.
- Equipment coating for corrosion protection.
- OVBD pipe fabrication and coating.





Turn-key Projects

POLYFLAKE provides On-Site, Turn-Key projects for:

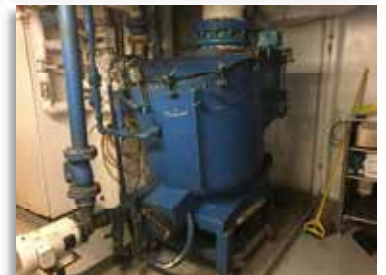
- On-site pipe systems GRP lining.
- New and old pipe spools coating.
- Steel-works for plates and stiffeners replacement on deck, bulkheads and pools.
- Corrosion protection of hull, deck, piping systems, machineries, and superstructures.
- Machinery and equipment overhaul or replacement.
- Surface preparation.

POLYFLAKE project is performed using advanced, specialized equipment and tools for:

- Removal of existing treatments.
- Surface preparation.
- Application of POLYFLAKE® Coating Systems Resin, or Customer's products.
- QC & testing of surface preparation, and coatings.

The Turn-key Project includes:

- Expertise and customized technical solutions.
- Management and logistic.
- Materials, and consumables
- Equipment, tools and instruments.
- Skilled labor.
- Quality control.





Supplies and Services Directory

• POLYFLAKE Coating Resins System Dept.

- POLYFLAKE® Coating Resins System
- POLYFLAKE® Coating Resins System for tank coating , alkali, acid, chemicals, process, bilge, sewage, galley
- Submerged hull “Hard-Coating” – POLYFLAKE® and POLYGLIDE®

• POLYFLAKE Hydraulic & Mechanical Service Dept.

- Repair and overhaul of:
 - Hydraulic RAM up to 8 meters length / 500mm OD.
 - Pumps - Centrifugal split case, double volute, horizontal or vertical; multistage, and submerged pumps.
 - Impeller (reconstruction), shaft (renewal/replacement), electric motor (coils re-winding).
 - Equipment & Machineries overhaul.
- OVBD and bulkhead penetration fabrication and coating.
- Machining Center – large units - turning, milling, honing.

• POLYFLAKE Marine Contracting & Engineering Dept.

- Decks surface preparation and anti-corrosion coatings.
- POLYFLAKE® and POLYTUBE® Lining Solutions for piping systems in-shop / on site.
- Pipe anti-corrosion– containerized reconditioning units for on-site application on pipes, scrubber piping, bulkhead and deck penetrations, OVBD discharge pipes, and diffusers.
- Anti-corrosion coating of structural and non-structural crossovers, and strainers.
- Swimming pool and Jacuzzi’s systems overhaul turn-key solutions – original coating removal, steel works, application of POLYFLAKE® coating NSF approved, pool's technical room refurbishment.





Specialized Resins Systems for aggressive environments in the maritime, oil & gas, chemical, water, and wastewater industries

Since 1992 the POLYFLAKE's mission is to combat chemical, mechanical and galvanic corrosion, providing hi-quality, long-life coatings able to reduce the maintenance cost and environmental impact.

POLYFLAKE® Coating Systems Technology is the solution for the protection of ship's submerged hull and superstructures, of the tanks, off-shore and in-shore structures, machinery, and equipment.

POLYFLAKE® Coating System is based on the proprietary formulation of hi-quality resins to resist chemicals and corrosion with superior mechanical properties.

POLYFLAKE® provides professional advice to the Customers suggesting the most appropriate resin and instructions for its correct application.

Resins are produced "on-order" and "on time" to guarantee the optimal performances.

POLYFLAKE® can provide the expertise for the correct application of the resin, or "turn-key" coating project including:

- Inspection and validation of the surface.
- Surface preparation with the most advanced technologies avoiding dust and limiting the production of noxious waste.
- The efficient application of the coating with proprietary plural-component airless spraying systems.
- The coating integrity testing.

POLYFLAKE® service is available directly or via POLYFLAKE® Certified Applicators.



POLYFLAKE® Coatings Key advantages

Environmental

- The coat is inert, doesn't release any harmful substance to the ambient
- Repairable, minimizes the production of noxious or hazardous waste during the entire operational life
- Application waste can be immediately neutralized as inert solid
- Reduces the use of energy and materials

Chemical

- Perfect in seawater; over 24 years in continuous operation without degradation
- Faces a wide spectrum of aggressive fluids at different temperatures and concentrations
- Faces alkali and acid in a wide pH range
- Is the corrosion resistant base for any deck finishing products.

Physical

- Undercutting resistance
- Permeation resistance
- Abrasion and corrosion resistance
- Impact Resistance
- Flexibility
- Self-Extinguishing and non-propagating flame
- Electrical insulating; protects from galvanic corrosion.



POLYFLAKE® Coating Resins System Dept.

POLYFLAKE® Coating Resins System
Resin families

POLYFLAKE® Coatings
Key advantages

Three main families of top-quality resins systems specialized for the applications in aggressive environments and in extreme operating conditions

Operational

- Most of the POLYFLAKE® Coating Systems Resins are reversible; years after the first application the worn or damaged surface can be renewed or repaired with the perfect bonding to the existing POLYFLAKE® resin; no need to remove the previous coating
- Rapidity of cure
- Machinability
- On-site or shop application
- Can fill or build-up parts to any thickness and applied to any surface extension

Commercial

- Competitive prime cost
- Lower steel cost
- Fast installation
- Reduces downtime
- Refurbishes old machineries, plants, and equipment
- Low Cost per surface unit /year
- Increase the operation efficiency minimizing the drag
- Reduce the cost of disposal of noxious and hazardous waste

General

- Replaces rubber, lead and stainless steel linings
- FDA Approved, suitable for use with food products
- Suitable for use in radioactive areas
- Can replace bricks and tiles

Vinyl Ester base *(1)		Novolac base	Silicon base	
Traditional 100' family	NSF certified	No-VOCS 1000' family	Low-VOCS 2000' family	Low-VOCS 3000' family
110 Tank, piping & Equipment	880 Potable water tank, piping & equipment	1110 Hull hard coating Tank & piping	2110 Coating Tank & piping	
Polyglide® 110T Low Friction Hull hard coating		Polyglide® 1110T Low Friction Hull hard coating		Polyglide® 3110 Hull hard coating
220 Improved temperature resistance		1330 Air ducts and air intakes coating		3220 High temperature resistance
440 Improved chemical resistance		New products families		
550 Improved chemical and temperature resistance				

*(1) 100% solids



POLYFLAKE® Specialized Resins System

for aggressive environments in the maritime, oil & gas, chemical, water, and wastewater industries

POLYFLAKE® Base materials bonding range

POLYFLAKE® Coating system Resins can be applied on a wide range of base materials, with minimal changes to the coating performances:

- Cast Iron
- Carbon steel
- Bronze
- Aluminum
- Aluminum brass
- Stainless steel
- Copper
- Copper nickel alloys

And a variety of surfaces as:

- GRP
- Concrete
- Rocks and woods
- Some Plastics

POLYFLAKE® Family and grade selection

POLYFLAKE® Engineers select the base resin to be resistant to the Customer's environment in which the lining or coating is going to operate.

The selection depends on the following main factors:

- Corrosion environment
- Operating temperature
- Mechanical considerations
- Application conditions

Application fields

Marine Industry

Hulls - Decks - Rudders - Rudder Skegs – Cooler End-Covers – Condenser End-Covers - Flanged Pipe Systems - Turbo Cooling Pipes - Propellers – Propeller Housings - Heat Exchanger - Bow-Thruster Housings - Multi-Stage Saltwater Pumps - Oil Cooler Covers - Sewage Tanks – Water Tanks (FDA Approved) - Kort Nozzles - Sea Strainers - Internal Piping - Butterfly, Gate and Ball Valves - Exhaust Housings - Sheet Pilings.

Chemical Process Industry

Pumps - Blowers - Storage Tanks - Pipe Systems - Bottom-Plates - Centrifugal Fans and Housings - Smoke Stacks - Ozone Tanks - Butterfly, Gate and Ball Valves.

Sewage Purification Plants

Water Box Covers - Pipe Systems - Sewage Pumps - Valves - Valve Cage – Cooling - Pumps - Basins - Tanks - Trenches - Concrete Tanks and Lining of Concrete Pipe Systems - Ozone Tanks - Digester Interiors - Clarifiers - Rake Assemblies - Catwalks.

Water Treatment Plants

Butterfly, Gate and Ball Valves - Pipe Systems internals (large and small diameter) - Water Storage Tanks (FDA Approved).

Power Station / Hydro Station

Water Boxes - Cooler End-Covers - Impellers - Centrifugal Pumps – Main Condenser Doors - Multi-Stage Pump Bowls - Vacuum Maintaining Pumps - Tube Plates - Penn Stock Interiors.

Transportation

Railroad Hopper Cars - Truck Chassis Containers - Container Platforms – Cask for Tankers (also for food transportation, FDA Approved).



POLYFLAKE® Resins Systems for tanks alkali, acid, chemicals, process, bilge, sewage, galley, potable water

POLYFLAKE® Coating System is based on hi-quality resins formulated to resist to impact, chemicals, and corrosion while protecting the metallic tank structure from the galvanic corrosion thanks to its very high electrical insulation.

POLYFLAKE's resin family 220' and 440' is the ideal protection for tank and piping in the marine **gas scrubber** systems.

It has been applied on open and semi-closed scrubber system piping and tanks including alkali tanks on:

- Oasis of the Seas
- Allure of the Seas
- Solstice class ships
- Pride of America, Norwegian Jewel, Gem, Pearl, Jade



POLYFLAKE® Coating System is the solution for the protection of tanks from aggressive fluids in the marine, oil & gas, chemical, water, and wastewater industries.

POLYFLAKE's Technical Department recommends, depending on the type and extensions of the surface, fluid, and conditions to face, the optimal combination of quantity, types, and grades of resin, and the most effective application cycle.

POLYFLAKE's basic supply includes:

- The requested quantity of resins, the catalyst, the cleaner, application cycle.
- The instructions for the personnel safety, application, and testing of the coating.

On request are available

- Products for surface's decontamination and preparation
- Surface preparation and coating application equipment and tools.

On-site supporting services including:

- Surface checking and validation.
- Practical instruction on the application and use of POLYFLAKE's equipment
- Intermediate and final integrity test of the coating

POLYFLAKE's turn-key supply includes:

- Surface validation.
- Surface preparation with the most advanced technologies to avoid dust and limit the residues.
- Efficient application of the coating.
- Coating integrity testing.
- Wear-layer long-term renewal, without the need to remove the entire coating.
- Local repairs to welding burns and mechanical damages.
- POLYFLAKE Service is available on board and in the field.



POLYFLAKE® Coating Resins System

for corrosion protection of tanks: alkali, acid, chemicals, process, bilge, sewage, galley, potable water

POLYFLAKE® Coatings surface preparation

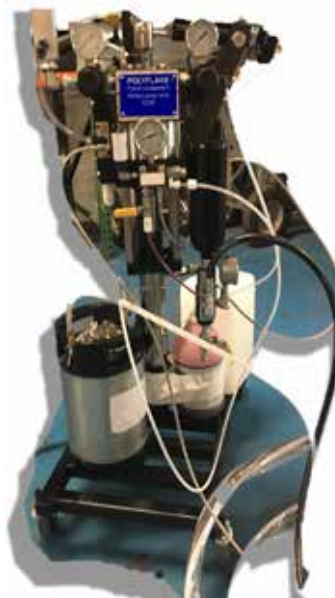
POLYFLAKE® resins do not require demanding preparation of the surface, but international standards as any other paint or coating.

- Steel preparation according to ISO standard P2 and P3.
- Surface preparation (optimal)
- Cleanliness SA 2.5.
- Roughness profile ≥ 75 microns.
- Dust test equal or better than grade 2.

The application above existing painting cycles is in most of the cases possible but must be previously confirmed by our Technical Department; in this case, the adhesion and the undercutting resistance will be limited to the performances of the residual existing coating.



POLYFLAKE® Plural-component Airless Spray System



POLYFLAKE® Resins Use

The resins can include up to #4 different formulations

Solid-charged structural resins

- **Base** - The light grey resin grants the exceptional adhesiveness and the undercutting resistance (when applied on standard surface preparation); NOTE: not to be confused with a primer.
- **Reinforcement** - The blue resin builds quickly thickness, fill pits; it is extremely resistant to wear; used for stripe coat and local reinforcement in high wear areas (as the fluid suction or intake areas).
- **Top** - The white resin provides the maximum resistance to the fluid, to the suspended solids and that can be easily renewed if worn-out or damaged.

Pure non-structural resin

- **Pure** - The dark red resin is used either as a base primer or as the top glossy finishing in non-mechanically demanding applications; the chemical properties instead remain similar.



POLYFLAKE® & POLYGLIDE® Underwater Hard-Coating Systems are a technological breakthrough in the corrosion protection of hull submerged areas.

Life expectancy in seawater of the POLYFLAKE® resins has a proven track record that is well over 25 years in continuous cycle 24h / 365 days year without intermediate maintenance⁽¹⁾.

Originally developed for the protection and reconstruction of equipment like pumps, condenser, heat exchangers and evaporators, the POLYFLAKE® Resin Systems has widened the range of applications to critical parts of ships like:

- Crossover pipes
- Tanks
- OVBD and Piping for gas scrubbers
- Rudder, Kort nozzles
- Thruster tunnels
- and all other applications that require effective and long-term protection from seawater, acids, alkalis, and severe problems with cavitation, erosion, and corrosion

NOTE*1: BC-Hydro - Burrard Thermal Power Station seawater cooling system



Key advantages

Operational

- Excellent friction factor, minimal drag
- Long life in seawater
- The bio-fouling takes a longer time to grow in respect to competitor coatings
- Barnacles, mussels and other biotypes don't damage the surface; moreover, their adherence to POLYFLAKE's Hard Coating is minimal, easing the periodical hull cleaning.
- The coating is repairable after years of service minimizing the maintenance cost
- The rapidity of curing minimizes the downtime; the inter coat time is 2 to 3 hours
- Seawater can be applied 24 hours after the last coat.
- In standing water can be applied a sacrificial top layer of antifouling product.

Environmental

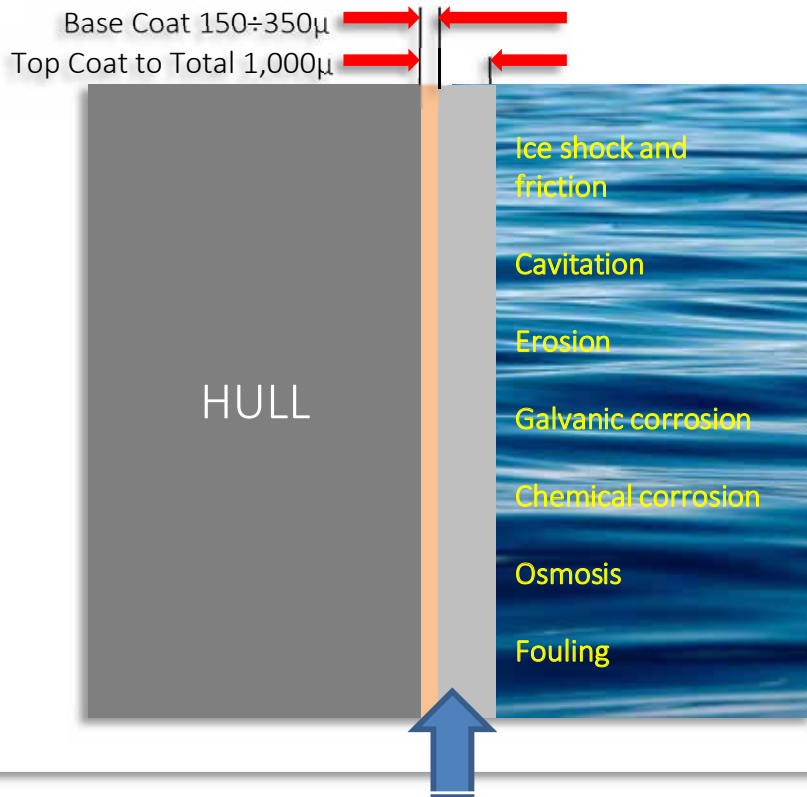
- The coating is inert, doesn't release any harmful substance to the ambient
- Minimizes the production of noxious or hazardous waste reducing the disposal cost

Physical

- Extremely high undercutting and permeation resistance
- Very high electric insulation stops the galvanic corrosion



POLYFLAKE® and POLYGLIDE Underwater Hard-Coating Systems



Case History

The first application of POLYFLAKE® Hard-Coat on the submerged hull, dated 2008, has permitted to repair large areas of the original coating on cruise vessels Disney Magic and Dream.

- During the periodical hull cleaning, the POLYFLAKE® & POLYGLIDE® Underwater Hard-Coating Systems shown, in respect to the original coating, a lower biological growth, a glossy efficient surface, easy to clean and resistant to the cleaning action without damages, no blisters, and a perfect adhesion to the hull. Savings on fuel has also been reported.
- The areas of application have been then extended to the whole hull and rudders.





POLYFLAKE® Underwater Hard-Coating Systems

POLYFLAKE® Coating Systems are a long term investment that reduces the maintenance cost of any structure in contact with sea water. The advantages are:
Low operational cost; repairs are limited to damaged areas by mechanical shock or wear. The entire surface can be renewed with the application of a new coat on top of the original coat. Environmentally friendly, no waste to dispose at repairs, the original coat remain in place; definitely less expensive.

POLYFLAKE® Plural-component Airless Spray System



Resins Quality

The core of the POLYFLAKE® Hard-Coating Systems technology is the quality of the base resin, a bis-phenolic vinyl ester.

POLYFLAKE® C-glass flakes

The 110 and 1110 base coat resins are charged with C-glass short flakes that dispose themselves in a random pattern providing strong equal mechanical properties reacting in all directions.

The top resins 110T and the NO-VOC 1110T top coats with the new proprietary formulation assures an exceptional low friction factor while the Vinyl Ester based resin grant the well know mechanical and chemical performances of the coating.

Osmosis Barrier

The glass flakes, finely dispersed, constitute a labyrinth that provides an extremely strong barrier to the osmotic permeability; water and oxygen cannot anymore enter in contact with the surface that is fully protected.

Undercutting resistance

The undercutting resistance, given by the extremely high adhesiveness, guarantees that in case of mechanical damage the corrosion is limited only to the affected area and will not propagate anymore.

Repeatability

The resin is reversible, therefore the top coat, as the base coat, can be repaired or renewed with a perfect bonding to the surrounding resin also after years in opera.

Extremely long operational life

This means that no complete removal is required of the existing coating back to the metal surface; only the repair of small spots and, in extreme case the cleaning, light sanding and the application of a new top layer of the coating is required limited to the worn areas.

Application method

The coating can be applied by airless spray, brush, roll, and in continuous with the POLYFLAKE® Plural-component Airless Spray System;



POLYFLAKE® Underwater Hard-Coating Systems

Submerged Hull Hard Coatings Suggested best application practices

Can apply on

- Bare metal

After a compatibility and adhesiveness check:

- On primer
- On existing coating

Surface Preparation

On existing coating:

- Remove blisters, and damaged coating.
- Clean the surface with high pressure water.
- Sweep blast or sand the existing coating found acceptable.

On bare metal:

- Grit-blast SA 2.5 Swedish Standard
- Surface profile 2.5 to 3.0 mils (75 microns).

Surface and ambient conditions

- Apply on dry surface.
- T_{amb}: 3÷5°C above Dew Point
- T_{surface}: ≥50°F (10°C)



Typical; Physical Properties 100' and 1000' families

Property	Value	Unit	Method
Specific Gravity	1.10 ÷ 1.30	Kg/dm ³	-
	62.43 ÷ 81.2	lb/ft ³	-
Tensile strength	68.95 ÷ 75.84	N/mm ²	-
	10,000 ÷ 11,000	psi	-
Tensile Elongation	0.8 ÷ 1	%	ASTM D.638
Flexural Strength	16,000 ÷ 18,000	psi	-
Flexural Modules	0.03	N/mm ²	-
	4.4	psi	-
Thermal expansion coeff.	6 x 10 ⁻⁵	per °C	-
Heat Distortion	79.5 ÷ 154	°C	-
	175÷310	F	-
Barcoll Hardness	45 ÷ 66	-	Model 934
Abrasion Resistance	0.2772	g/1000 cycles	ASTM E.96
Water Vapor Transmission (Specific Permeability)	0.08 mm/1000		ASTM E.96
	cycles 0.1-0.3		ASTM D.967
Salt Spray	No effect	20,000hours	ASTM B1117-5
Thermal shock	No effect	-	-
Tenny Cabin test	300. urs	-82°C	
Adhesive strength VOCs	Nil	-	ASTM D5087-91
Adhesive Strength:			
Carbon Steel	100	Kg/cm ²	
	> 1,500	psi	ASTM D1002
Aluminum	67.9	Kg/cm ²	
	970	psi	

Typical Electrical Properties 100' and 1000' families

Property	Value	Method
Dielectric Strength	625 V/mils	ASTM D.149
	45 sec (r. surface)	
Arc Resistance	62 sec. (s. surface)	ASTM D.495.58T
Volume Resistivity	30x10 MOhm-Ohm	ASTM D.257.58T
Dielectric Constant	K + 3.64	G. R. Air Cap.



Reconditioning of hydraulic cylinders for the maritime and Industrial sectors

POLYFLAKE® LLC, since 2014, provides the reconditioning of hydraulic cylinders with operating pressure up to 350bar (5,000 psi) and over. POLYFLAKE® cylinders overhaul program includes:

- Unit pre-inspection.
- Cylinder disassembly and checking including:
- External conditions and corrosion evaluation.
- Rod and body sliding surface check.
- Check of piston and rod bushing, sliding rings, and lip seal status
- Oil-ports check.
- Check of body and rod mechanical connections.

A detailed report is issued to the Customer for decisions before to proceed with any further repair.



The cylinder reconditioning includes, as appropriate:

- Body honing.
- Rod plating or replacement.
- Replacement of piston, rod and body sliding guides, seals, and lip seals; replaced parts are from primary suppliers or original manufacturers depending on availability or Customer request.
- Cylinder body side and rod side mechanical connections are renewed, reconstructed or replaced.
- Oil-ports rebuilt.
- Cylinder body is sandblasted and painted in the original color or coated with the POLYFLAKE Coating System Resin, to face aggressive environments as on weather deck application..

After the final assembly, the unit is pressure tested at 1.5 x Design Pressure,





POLYFLAKE® Hydraulic & Mechanical Service Dept.



Hydraulic cylinders range

- Cargo Access Equipment
- Cranes and davits
- Embarkation platforms
- Shell doors
- Ramps
- Elevators
- Car decks

The overhaul of hydraulic cylinders needs professional equipment to guarantee the disassembly and reassembly without damages to the unit



POLYFLAKE® LLC is the Cruise market Agent for NE-SEAL

- Mechanical Seals
 - New supply
 - Seal reconditioning
- Spiral Wound Gasket for high pressure and temperature application (steam service)
- O-ring's'
- Sliding rings
- Lips seals
- Mechanical packing
- Gasket supply and custom cutting

POLYFLAKE's cylinder bench can handle units up to:

- Maximum length – 26' (7.9m); base unit extension for longer cylinders is available.
- Maximum diameter – 22" (509 mm)
- Available torque - 40,000 lb./ft. (5,532 kg/m)
- Rod extraction force - 7 Tons



Hydraulic cylinders are pressure vessels!

After ten years from the first installation and then at regular intervals of not over 10 years, the cylinders, like any other pressure vessel, need to be inspected, bolts and seals must be replaced, and the unit submitted to the pressure test, to demonstrate its structural integrity.





Reconditioning of pumps and machinery for the maritime and Industrial sectors

POLYFLAKE®, since 1992, recovers equipment considered beyond-repair, reducing the operating cost.

The units are disassembled and inspected; a detailed report helps customer' decisions; the service entails

The supply or the reconditioning of the mechanical seals

The replacement of bearings, and lip seals.

Reconstruction of damaged shafts with hi-corrosion resistance special alloy specifically selected for this application.

Competitive lifecycle cost

The cost depends on many factors but, in general, POLYFLAKE® is competitive compared with alternative methods and in most instances, it compares favorably in terms of replacement costs and longer operational life.



POLYFLAKE® Coating System key advantages:

- Abrasion and Corrosion Resistance
- Impact Resistance
- Flexibility
- Reparability
- High thickness build and machinability.
- Long life; generally better than the original new pump.
- Increased operation efficiency (minimize drag)
- Environmental friendly (reduces the use of energy, materials and noxious waste)
- Replaces rubber, lead and stainless steel linings
- FDA Approved – Suitable for use with food products
- Suitable for use in radioactive areas





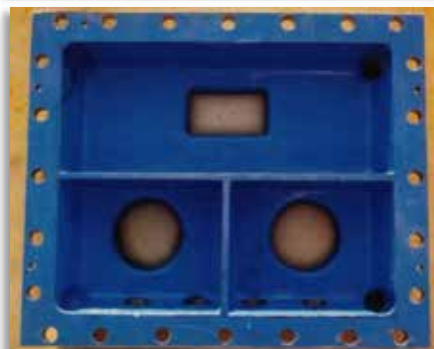
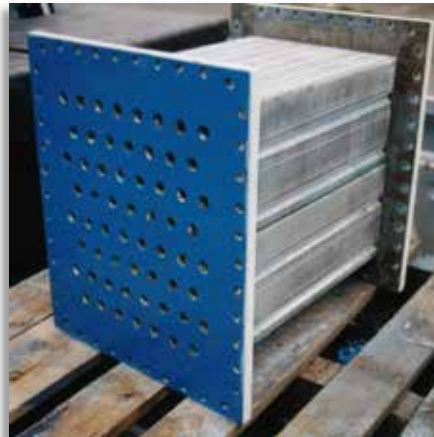
Reconditioning of pumps and machinery for the maritime and industrial sectors

Turn-Key Service

POLYFLAKE® provides a complete machinery overhaul service entailing:

- Machinery dismantling.
- Condition evaluation and reporting.
- New parts manufacture, line boring, fitting, turning, etc.
- Surface reconditioning via honing, polishing, metal deposition, and galvanic treatments.
- Surface reconditioning by honing, polishing, metal deposition, galvanic treatments or shot blasting.
- Rebuilding and protection with POLYFLAKE® Coating System Resin.
- Dynamic balance.
- Workshop test, spark test, pressure test, electrical Insulation, etc.
- Class Survey and Certification if necessary.

Full QA Documentation and Certification according to ISO9001:2010.



Accurate and comprehensive reporting





POLYFLAKE® Hydraulic & Mechanical Service Dept.

POLYFLAKE LLC offers a Machining Center & Workshop conveniently located at:

- 6500 NW 35th Avenue,
Miami, FL 33147 - USA

The Machining Center includes small, medium and large lathe and mills to perform works on large pieces of equipment and machineries. The Workshop provides Mechanics, Class Certified Welders, and in house NDT testing (Dye penetrants).



Machining center

Machine type	Max OD (Spindle on external Ø)	Max OD (Spindle on internal 50"Ø)	L/H "/mm	Bore "/mm
Horizontal lathe	15" 381mm	31"1/2" 800mm	22'6" 6,858mm	4"1/2" 114mm
	27" 685mm	43"1/2" 1,104mm	6"1/2" 165mm	4" 100mm
Vertical lathe	42" 1,066mm	55" 1,397mm	30" 762mm	NA
	L "/mm	W "/mm	H "/mm	
Mill	50" 1,270mm	10" 254mm	15" 381mm	NA
Boring and milling machine Horizontal table type	53" 1,350mm	36" 915mm	26" 660mm	NA





POLYFLAKE®'s Turn-Key Solutions

POLYFLAKE® provides “Turn-Key” solutions to the Cruise and Maritime industries based on proven procedures, skilled personnel, and advanced equipment.

The Turn-key Scope of Work includes:

- Evaluation and estimate
- Project organization
- Project management
- Working teams:
 - Team Leaders
 - Certified Welders,
 - Fitters,
 - Surface Preparators
 - POLYFLAKE Coating Applicators
 - Armaflex Fitters
 - GF+ Piping Fitters
 - Electrical Fitters
- Supply of materials and consumables
- Equipment and tools:
 - Containerized blasting and treatment units for pipes
 - Pipe in-situ GRP lining equipment
 - Plasma cutting
 - Welding SMAW GMAW GTAW
 - Air compressors, and receivers
 - Blasting units
 - Deck treatment removal and blasting equipment
- Testing procedures and instrumentation



In large and complex works POLYFLAKE® operates in venture with selected and reliable Companies, providing:

- Competitive quotations
- Common responsibility and guarantee
- Advanced design
- Deep knowledge of Rules and Regulations to facilitate the Class Approval of the installation
- Class Certified materials
- Controlled fabrication processes
- Planning and logistic



POLYFLAKE® offers on-site repair and overhaul of equipment and machinery like:

- Centrifugal pumps, double volute, split case, submerged, single and multi stage high pressure for Osmosis Fresh Water generators and steam boiler condensate supply
- Evaporators
- High pressure hydraulic cylinders, any size and application
- Pulpers



Deck and Superstructures Refurbishment Solutions

Surface Preparation and Anti-corrosion coatings

POLYFLAKE®'s "Deck Refurbishment Solutions" is based on proven procedures and advanced equipment.

The "Turn-Key" Scope of Work includes:

- The removal and demolition of the existing deck treatment
- The steelwork repairs
- The surface preparation
- The application of the POLYFLAKE Coating System hi-tech resins or of a Customer products)

POLYFLAKE's service provides:

- Evaluation and estimate
- Organization
- Management
- Working Teams
- Supply of materials and consumables
- Specialized equipment for hi-speed/hi-quality:
 - Surface treatment removal
 - Steel repairing works
 - Surface preparation
 - Anti-corrosion coating application
- Instruments for the check of the anti-corrosion barrier integrity.



POLYFLAKE® pursues the continuous improvement of the technologies for the corrosion protection; results are:

- Works on-schedule,
- Long lasting performances.



POLYFLAKE® applies pollution free blasting technologies.

- Closed loop shot-blasting self-propelled units for the fast and accurate preparation of large deck areas.
- Vapor-blasting in critical areas.



POLYFLAKE's Lining Solutions

Anti-corrosion coating and GRP lining for pipe systems.
Coating of structural and non-structural crossovers, and strainers

The POLYFLAKE® Coating System Resins Advantages

Corrosion occurs depending on the pipe material and the physical and chemical conditions of the contacting fluid.

POLYFLAKE's coatings operate with more than eight hundred different aggressive fluids including acids, alkalis, and seawater with temperature up to 185°F (85°C) and over.

- A carbon steel pipe coated with POLYFLAKE has better performances and is a cost-effective substitute for pipes made with:
 - CuNi , BzAl
 - Stainless Steel
 - High-alloy austenitic stainless steel
 - Super-duplex alloy
- POLYFLAKE's Coating is recommended for the re-use of pipes in CuNi, BzAl, and Stainless Steel also when are close to the Class minimum acceptable thickness. The coated pipe is more durable of the original pipe's material, is economically convenient, the application is fast, and in an emergency, or for small quantities, can be done on-site by the ship personnel; moreover is easily "repairable" after years in operation.
- A POLYFLAKE coated pipe can be flame cut and welded, the coating is self-extinguishing and non-propagating the flame; where the coat is burnt is enough sanding the area and re-apply the coating that will perfectly bond to the existing.

Old seawater pipes, lined with POLYFLAKE has shown to be in perfect conditions after 24 years in continuous operation (Thermal Power Station); the expected pipe lining duration (in seawater) is 20 to 50 years.



POLYFLAKE® Coating Application

Since years POLYFLAKE® is deeply involved in the development of technologies for the application of the POLYFLAKE® Coating System Resins to the piping systems. There are no "magic-formulas" or solutions good for "any" problem.

POLYFLAKE has the knowledge and experience to evaluate which technology or combination of technologies is the most suitable for the Customer's specific system to realize the work on-schedule and obtain results cost-effectively and to long-term.

The coating application technologies today includes:

- Filling and rotation
- Brush or roller
- Centrifugal
- Airless spray
- Continuous reverse lining





POLYFLAKE's Lining Solutions

Anti-corrosion coating and GRP lining of pipes
In-shop and on-site

POLYFLAKE's Lining Solutions

creates a resistant liner, strongly bonded to the inner wall of new or old pipes; the liner extends on the flange's face, or to the exterior of the pipe-end when sliding joints are used, creating a continuous barrier to the corrosion.

Application techniques vary depending on the size and shape of the pipe.

POLYFLAKE provides:

- Guidelines to help the piping designer to create spool of pipe "optimized for coating".
- Suggests the combination of procedures, materials, tools, and equipment most suitable for each application.
- Provides estimates and the "Turn-Key" application to the Customer's piping system.

POLYFLAKE Standard Lining System and **POLYTUBE® Reverse Lining System** are complementary technologies to efficiently solve the 100% of the pipe lining problems;



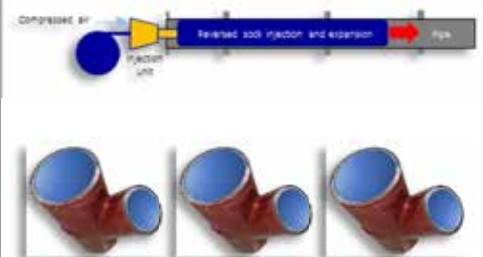
POLYFLAKE® Standard Lining System

- Suitable for pipes starting from 2", with no practical upper limits.
- Is the most suitable for complex pipe spools (3÷6m length – 10'÷20') including elbows, adapters, tees, weldolets, etc.; generally needs the disassembly of the spool of pipe from the line.
- The **POLYFLAKE® Coating System Resin** is applied by filling and rotation, by brush, roller, centrifugal spray, and airless spray equipment depending on pipe size and shape.



POLYTUBE® Reverse Lining System

- Ideal solution for pipe diameters from 2" to 12" on medium and long pipe lengths; works also in presence of more 90° elbows, and tees.
- The application is fast, up to 100m pipe in a single operation, injecting into the pipe the GRP sock that polymerize in place bonding to the internal pipe wall.
- Minimizes the disassembly of the pipes; it is only necessary to create the space to insert the liner injection unit and a minimal place on the other end of the pipe.



POLYFLAKE's Lining Solutions is a "Turn-key" service that includes:

- The pipe surface treatment.
- The anti-corrosion **POLYFLAKE® Coating System Resins**, and **POLYTUBE®** materials.
- The application equipment and tools.
- The test instruments for the validation of the application.
- The expert Applicators Teams.



POLYFLAKE® Marine Contracting and Engineering Dept.

POLYFLAKE's Lining Solutions

Pros' and Cons' of Traditional pipe renewal Technology vs. POLYFLAKE® and POLYTUBE® lining

Phase	Phase Description	Pipes Replacement	POLYFLAKE Lining	POLYTUBE Lining
Pipe UT thickness & inspection	For pipes at Class thk. limit	Replace	Re-use	Re-use
	For pipes below to Class thk. limit	Replace	na	Re-use
Pre operations	Pipe measure, 3D scan, isometric drafting	yes	on ship diagrams	on ship diagrams
	Material list	on-site inventory	on ship diagrams	on ship diagrams
Materials procurement	Material procurement pipe, flanges, fittings, fabrication, and installation	multiple suppliers	one supplier	one supplier
	POLYFLAKE resin and application	one supplier		
	POLYTUBE materials and applic.			
Materials transport & logistic	Material procurement	multiple suppliers	one supplier	one supplier
	Material delivery time	medium to long	medium - short	medium - short
	Material weight and nature	heavy and bulky	ligh - HAZMAT	ligh - HAZMAT
	Logistic	complex	simple	simple
Fabrication	Pipe disassembly and removal	yes	yes	extremely limited
	Pipe mobilization in the ship	yes	yes	extremely limited
	Pipe transport to the fabrication site	yes	on-site or on-ship	extremely limited on ship
	Pipe mockup fabrication on old pipe shape	yes	none	none
	Old pipes and materials disposal	yes	none	none
	Pipe cutting (flame, saw, etc.)	yes	none	none
	Pipe fitting	yes	none	none
	Pipe flanges and fittings welding	yes	none	none
Pipe optional treatment	Sandblasting	yes	none	none
	Primer application	yes	none	none
	Transport to hot dip galvanizing	optional	none	none
	Hot dip galvanizing cost and time	optional	none	none
	Pipe blasting and	optional	yes	limited
	Polyflake liner application on site	optional	yes	limited
	Pipe cleaning and	optional	na	yes
Polytube liner application on site	optional	na	yes	
Pipe installation	Pipe transport to ship	yes	If not done on ship	none
	Pipe mobilization in the ship	yes	yes	none
	Pipe Installation	yes	yes	limited
	Pipe adjustment on site	yes - 10 to 25%	none	none
	Touching to the treatment	limited	limited	extremely limited
Working Team(s)	In DD	teams for each area	one team of 6	one team of #6
	In Operation	One team of #8 - low productivity	good productivity	high productivity
Time to complete	In DD	long - non critical	non critical	non critical
	In operation	long - non critical	non critical	fast
Expected life in years	No treatment	2 to 5	na	na
	Primed pipes	5 to 8	na	na
	Hot dip Galvanized	7 to 12	na	na
	POLYFLAKE® Lined	20 to 50 years - repairable on site		
	POLYTUBE® Lined	20 to 50 years - repairable on site		



POLYFLAKE’s Lining Solutions

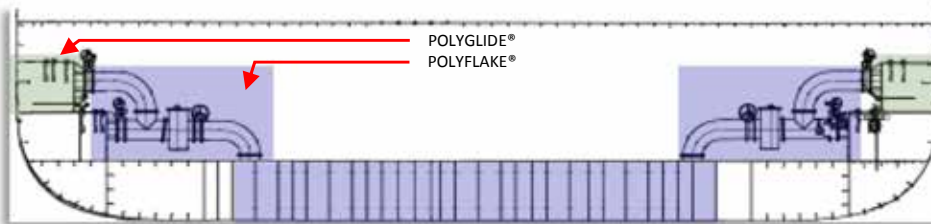
Anti-corrosion coating of structural and non-structural crossovers and strainers

The POLYFLAKE® Advantage

POLYFLAKE’s Lining Solutions solves the corrosion problems on any configuration of crossover ducts.

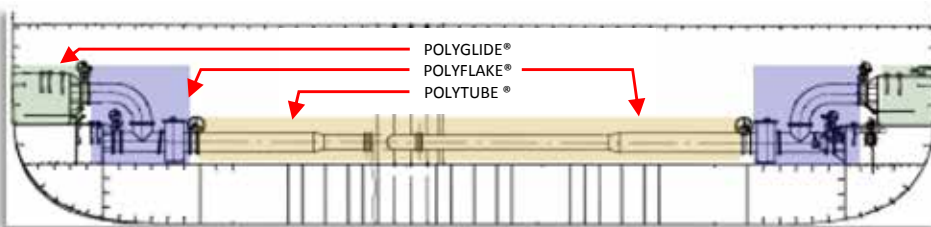
Sea-Chests is recommended are treated with POLYGLIDE® “Hard Coating” for submerged hull; this high efficiency coating is environmentally friendly, minimizes the drag, has an exceptional duration, biofilm, barnacles, and mussels barely adhere, making easy and effective the cleaning simply with high pressure water.

Structural crossovers, strainers, and the aggregated piping are taking advantage of the POLYFLAKE 110’ or 1110’⁽¹⁾ vinyl ester based resins having similar performances and an expected life well over 25 years.



Smaller section crossover, all configured with pipes, can be coated with the same combination of products suggested for the large structural one.

The main crossover pipe, depending on its size, can be lined with POLYFLAKE 110’ or 1110’⁽¹⁾ or, for the smaller non accessible section with the POLYTUBE® Reverse Lining System.

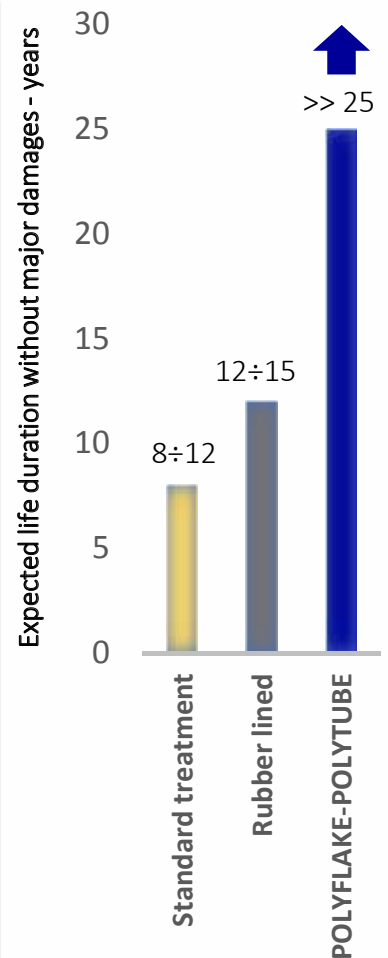


NOTE: *(1) POLYFLAKE® 1110’ is the no-VOC vinyl ester base resin, performances are close, but the traditional 110’ outperform the 1110’.

POLYFLAKE® Quality Long life & Cost-effective

The table compares the expected life of the coating technologies today used duration before major damages appear:

- Standard antifouling treatment
- Vulcanized rubber lining
- **POLYFLAKE® Standard Lining System and POLYTUBE® Reverse Lining System**





Swimming Pools and Jacuzzi's Systems Solutions

Pool overhaul and coating
Pool's and Jacuzzi's Technical Rooms refurbishment

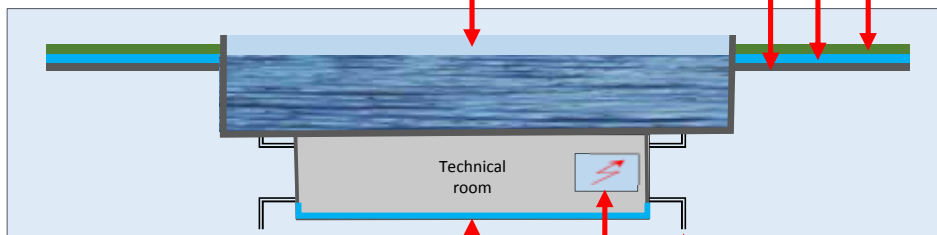
POLYFLAKE offers a Turn-Key Package for the revamping and improvement of the swimming pools area and technical room on Cruise Ships; specialists have come together to solve in full the swimming pools operational problems:

- Corrosion protection to extend the life.
- Renewal of the obsolescing equipment.
- Revamping of degraded areas.
- Full refurbishment with one responsibility and one guarantee.
- To keep the original architectural signature the final synthetic flooring remain at Customer choice and care.



Pool System

1. Synthetic flooring
2. POLYFLAKE® 110
3. Ship deck
4. POLYFLAKE® 880



5. POLYFLAKE® 220
6. Automation system
7. Piping

The full Turn-Key package includes:

- **Pool deck**
 - Removal of the existing deck finishing.
 - Steelworks.
 - Surface preparation.
 - Application of corrosion protection POLYFLAKE® Coating System Resin 110 (or the synthetic flooring manufacturer's primer at Customer's option).
- **Swimming Pool**
 - Removal of pool accessories and existing coat.
 - Steelworks.
 - Surface preparation and cleaning.
 - Application of NSF approved POLYFLAKE® Coating System Resin 880.
 - Finishing and reinstallation of pool accessories.
- **Technical Room**
 - Removal of existing deck coating
 - Steelworks
 - Surface preparation
 - Application of corrosion-resistant POLYFLAKE® Coating System Resin 220
- **Automation**
 - Replacement with state of art new units.
- **Pool and Field systems**
 - Field cabling and sensors validation.
 - Electric and automation systems check and repairs.
 - Piping repair, with POLYFLAKE® and POLYTUBE® Lining Solutions, or full renewal as applicable.



Swimming Pools and Jacuzzi's Systems Solutions

Swimming pools treatment cycles for an extended, low maintenance, new life

The key advantages of POLYFLAKE's treatments are:

- The extreme hi-resistance to the corrosion from chlorine, sea water, marine salted atmosphere, and sun light.
- The flexibility of the resins coat is able to resist to thermal excursions, vibrations and follows the ship structure deflections due to the motion and bad sea conditions.
- The reparability; using the original POLYFLAKE® repair kit the ship crew can take care during the night just in a couple of hours. Fast curing time minimizes downtime without affecting daily pool availability.
- In the case the pool needs a specific architectural décor, it can be applied directly on the POLYFLAKE® coating.
- Treatment life extends well beyond the original arriving to over 20 years simply renewing the top coat that will perfectly bond to the existing coat.



POLYFLAKE® technology

POLYFLAKE® technology is based on the NSF approved resin 880 charged with "C-flakes".

- Application is convenient.
- Coating results are measurable on all surface and can be tested and certified in field.
- Coat can be easily and inexpensively repaired on site by untrained personnel using original POLIFLAK® Kit and instructions.

Jacuzzi's Basement Coating

POLYFLAKE® Coating System Resin 110 provides the best corrosion barrier to the basements and deck under the Jacuzzi pools.





Swimming Pools and Jacuzzi's Systems Solutions

Swimming pools treatment cycles for an extended, low maintenance, new life

Common defects and pitfalls of standard treatments

Any discontinuity in the pool base shape is a potential starting point of corrosion.

Accessories, lighting fixtures and nozzles are the weakest points in the corrosion chain as mechanical shocks on the treated surface.



POLYFLAKE's protection technology is not expensive and pays for itself in no time

Traditional treatments shows immediate evidences of local cracks and coat deteriorations.

- All coat degradation areas and mechanical shocks are immediately marking the pool surface with unaesthetic shades and rust spots.
- Treatment patching is almost impossible and need sensible downtime with discomfort for the passenger in one of the most loved and frequented ship areas.
- The patches do not solve the problem of the water penetration; behind the coat inevitably starts to corrode the carbon steel structure with rapid reappearance of rust spots and shades and possible local damages to the ship superstructure.
- POLYFLAKE® treatments resolve definitely all those problems; higher resistance and easy repairable just in case.

1. POLYFLAKE® Top coat
2. POLYFLAKE® Base base
3. Swimming Pool base structure

The cracks fix needs few simple operations: clean and sand the area, apply the POLYFLAKE® kit resin with a trowel. After two hours the pool can recover the normal operability.



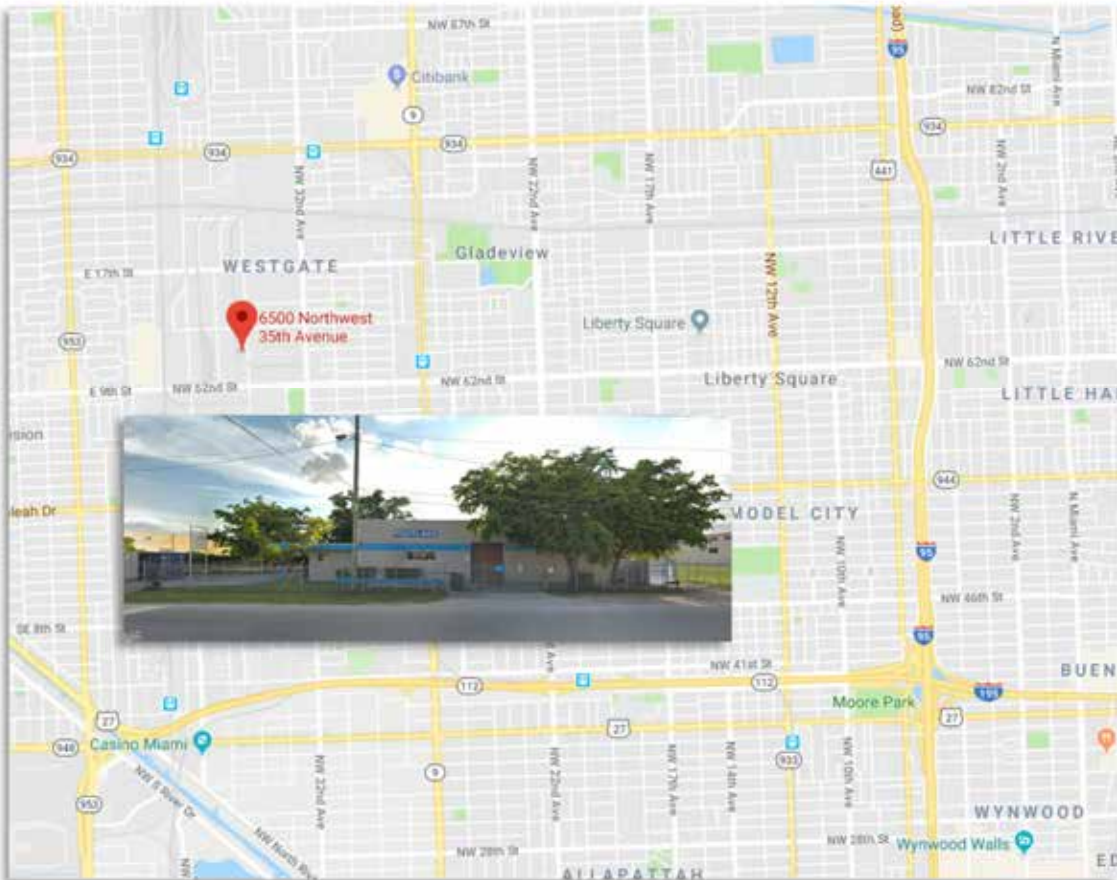
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Reaching us by car:



From I95:

- Exit on W 62nd Str.
- After 3 miles turn on N 35th Ave.
- After 0.1 mile Polyflake is on your left.

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