

# M.K. Plastics Coatings Fiberglass Characteristics & Corrosion Resistance Guide

## Fiberglass Reinforced Polymer (FRP)

Fiberglass Reinforced Polymer (FRP) is a material in which two or more distinct, structurally complementary materials, glass fiber and a corrosion resistant vinylester resin, combine to produce an extremely durable and structurally sound product. Fiberglass is capable of being molded into complex shapes at reasonable cost, whereas fabricating out of metal can be difficult. This is apparent in the Axijet High Plume Dilution Nozzle which involves a venturi configuration inside the bifurcated nozzle.



## The Advantages of Fiberglass Construction

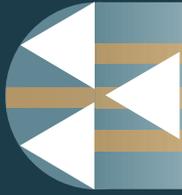
Corrosion can be a big problem in the HVAC industry, particularly in wastewater treatment plants, fume-scrubber systems, acid fume hood laboratory exhaust and galvanizing and etching processes, to name but a few. Although HVAC equipment can be made of coated metals, stainless steel or 'exotic' metals such as Monel and Hastelloy, fiberglass is an economical alternative as well providing superior resistance to the majority of corrosive elements.

Other than its primary function of providing outstanding corrosion resistant properties, fiberglass can also offer the following advantages -

- If properly installed and maintained, the life expectancy of FRP material can range from anywhere from 25 years to 50 years.
- Very high strength-to weight ratio. Pound-per-pound basis, FRP is stronger than steel.
- Extremely durable to impact or scratches, the surface will not corrode.
- Weighs up to 30% less compared to equipment made out of steel and metal alloys.
- Price advantage over stainless steel, Phenolic coated steel and Monel (can be as much as 50% savings in original cost, over long term).
- Less maintenance - no repainting required due to corrosion and rusting.
- ASTM B-117 Salt Spray Testing: 8,000 hours+ after testing, and no corrosion is expected even after 25 years (200,000+ hours).

## Standard FRP Fan & Blower Construction Features

- Fiberglass is constructed using Ashland Derakane 510-A corrosion resistant vinylester resins.
- Class I flame spread rate of 25 or less for all housing & wheels, per ASTM E 84 Flame Spread Testing.
- All parts in the airstream are coated in FRP, surfaces are protected with a minimum 8-10 mil thickness of chemical, ultraviolet and flame resistant resins, that conforms to ASTM D4167-97 Standard Specification for Fiber-Reinforced Plastics Fans and Blowers.



## Powder Coating Systems - for Laboratory Exhaust Applications

There are applications where the severity of the corrosive exhaust is not an issue. Factors such as rate of corrosion, concentration of fumes, exhaust temperature, the amount of moisture, a variety of available colors and of course initial costs can sometimes make a Polyester or an Epoxy Powder coating on metal or aluminum HVAC equipment an attractive alternative to all fiberglass.

### Why Powder Coating?

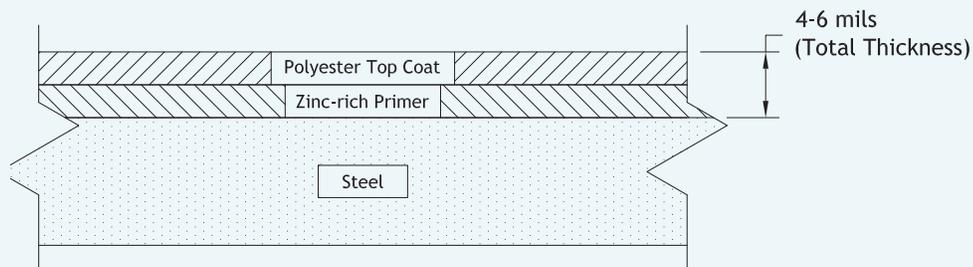
Powder coating is the application of paint in the form of a finely ground powder. The powder adheres by means of electrical attraction. After application, the coated part is heated to melt the powder then cooled so the melted powder forms a solid film. Powder coatings are the best choice for most applications and is a preferred method over the traditional Liquid Coating, which requires multiple coats to bring the mil thickness up to specification requirements. Powder coating has the following advantages:

- Excellent corrosion and chemical resistance
- Superior finish because of its uniform coverage and thickness
- Less tendency to trap airborne dirt, making for a smoother surface
- Better adhesion, especially on edges, crevices and surfaces difficult to reach
- Compared to liquid coating - no drips, no pockets and no streaks
- Powder coating requires less time to completely cure, which means quicker shipping times
- Powder coating has little processing impact on the environment
- Better hardness finish

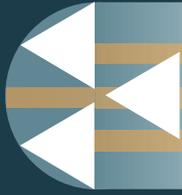
M.K. Plastics Plastifer™ high performing two-part electrostatically applied, baked, corrosion resistant polyester powder coating has excellent chemical resistance to a wide variety of chemicals including acids, caustic, solvents, and high moisture. It is far superior to standard 8-10 mil liquid epoxy that is more subject to running or sagging, is manually applied and has a non-uniform coverage over the surface. Standard finish color is M.K. Plastics light gray, and comes with a two year (2) warranty.

All steel surfaces are cleaned and prepared using a multi-stage process that includes phosphate washing to increase corrosion resistance, surface area and improve paint adhesion.

Coatings consist of a 70% zinc rich polyester primer and a polyester powder resin top coat that is electrostatically applied and cured. Final coating thickness is a minimum 4-6 mil for superior corrosion resistance, and includes UV inhibitors to prevent chalking from sunlight.



M.K. Plastics Polyester Powder Coating System is fully cured at 390°F, and a final pencil hardness of 2H+, has high humidity resistance (Humidity ASTM-D2247 = 4,000 hrs), and the coating also exceeds 4,000 hrs ASTM-B117 Salt Spray Test.



## Corrosion Resistance Guide

The Corrosion Resistance Guide on the following pages lists many different chemicals and compounds that can be used in HVAC exhaust applications. The guide is intended to assist the User or Engineer in properly selecting the most suitable corrosion protection or material for the air moving equipment. The information below is a compilation of chemical resistance characteristics claimed by the manufacturers of the coatings and resins.

### Material Guide

The guide is based on six main materials that the exhaust can come in contact with -

- FRP - Fiberglass Reinforced Polymer
- PVC - PolyVinyl Chloride
- Polyester Powder Coating
- Aluminum
- 304 Stainless Steel
- 316 Stainless Steel

### Nomenclature

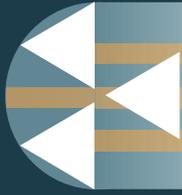
All concentrations are 100% or saturated solutions unless otherwise stated. For FRP and PVC the ratings are based on recommended temperature limitations.

N.R.	=	Not Recommended
-	=	No information available
*	=	Synthetic fiber surface mat recommended
G	=	Good
F	=	Fair
P	=	Poor

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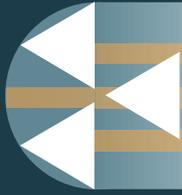


DHK Fiberglass Fan & Fiberglass Ducting at a Wastewater Treatment Facility Plant



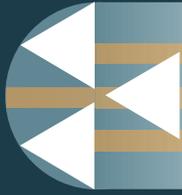
Maximum allowed  
temperature °F

Chemical	FRP	PVC	Plastifer™ Polyester Powder Coating	Aluminum	304 Stainless Steel	316 Stainless steel
Acetic Acid, up to 25%	210	140	F	F	F	G
Acetone, up to 10%	180	N.R.	F	G	G	G
Acrylic Acid, up to 25%	100	-	-	G	-	-
Aluminum Chloride	220	185	G	P	P	F
Aluminum Fluoride	*120	73	G	P	F	F
Aluminum Hydroxide	210	140	G	G	G	G
Aluminum Nitrate	180	140	F	G	G	G
Aluminum Potassium Sulfate	210	140	G	G	G	G
Aluminum Sulfate	210	140	F	F	F	F
Ammonia, dry gas	*170	140	F	G	G	G
Ammonium Acetate, up to 65%	100	140	G	G	G	G
Ammonium Carbonate	150	140	G	G	F	G
Ammonium Chloride	210	140	G	P	F	F
Ammonium Fluoride, up to 10%	*150	140	P	F	P	F
Ammonium Hydroxide, up to 10%	150	140	F	P	G	G
Ammonium Nitrate	220	140	G	G	G	G
Ammonium Persulfate	210	140	G	P	G	G
Ammonium Phosphate	210	140	G	P	G	G
Ammonium Sulfate	220	140	G	F	F	F
Ammonium Sulphide	100	-	F	F	F	F
Ammonium Sulphite	110	-	-	F	G	G
Ammonium Thiocyanate, up to 60%	*150	140	F	G	G	G
Amyl Acetate	100	N.R.	F	G	F	G
Amyl Alcohol	210	N.R.	G	G	F	G
Amyl Chloride	100	N.R.	F	P	F	F
Aniline Sulfate	220	-	G	F	F	G
Aqua Regia	*80	N.R.	P	P	P	P
Arsenic Acid	180	140	G	G	F	G
Barium Acetate	180	-	-	-	-	-
Barium Carbonate	*220	140	F	P	F	G
Barium Chloride	210	140	F	P	F	G
Barium Hydroxide, up to 10%	*170	140	F	F	F	G
Barium Sulphate	220	140	F	F	G	G
Barium Sulfide	210	140	G	P	G	G
Benzene Sulfonic Acid, up to 10%	210	140	G	P	G	G
Benzoic Acid	210	140	G	G	G	G
Black Liquor Recovery Gasses	220	140	G	G	G	G
Bleach Liquor (Pulp mill)	210	140	F	G	G	G
Borax	210	140	G	G	G	G
Boric Acid	210	140	G	F	F	G
Brine	210	140	G	G	F	G
Bromine, dry gas	140	150	P	P	P	F
Bromine, wet gas	100	150	P	P	F	F
Butyl Acetate	100	N.R.	F	G	G	F
Butyric Acid	100	73	F	P	F	G



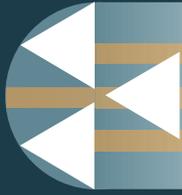
Maximum allowed temperature °F

Chemical	FRP	PVC	Plastifer™ Polyester Powder Coating	Aluminum	304 Stainless Steel	316 Stainless steel
Cadmium Chloride	180	140	F	F	F	G
Calcium Bisulfate	200	140	G	P	F	G
Calcium Carbonate	180	140	G	G	G	G
Calcium Chlorate	220	140	G	F	G	G
Calcium Chloride	220	140	G	F	F	F
Calcium Hydroxide	*210	140	F	P	G	G
Calcium Hypochlorite	*150	150	F	P	F	F
Calcium Nitrate	210	140	G	G	G	G
Calcium Sulfate	220	140	G	G	F	G
Camphor	80	73	P	P	P	P
Carbon Dioxide, gas	220	140	G	G	G	G
Carbonic Acid	210	140	G	F	F	G
Carbon Monoxide, gas	220	140	G	G	G	G
Carbon Tetrachloride, vapor	200	73	F	F	F	F
Caustic Soda	130	140	P	F	P	F
Chloric Acid, up to 10%	170	140	P	P	P	P
Chlorine, dry gas	210	73	F	P	P	F
Chlorine, wet gas	210	N.R.	P	P	F	P
Chlorinated water	210	140	P	P	P	P
Chloroacetic acid	120	73	P	P	P	F
Chromic Acid, up to 10%	120	140	F	P	P	F
Chromium Sulfate	180	-	-	-	-	-
Chromous Sulfate	200	-	-	-	-	-
Citric Acid	210	140	F	F	F	G
Coconut Oil	220	140	G	G	F	G
Copper Acetate	220	73	-	P	-	G
Copper Chloride	220	-	G	P	P	F
Copper Cyanide	180	140	F	P	G	G
Copper Florobate	170	140	-	P	P	P
Copper Nitrate, up to 30%	170	140	F	P	G	G
Copper Sulfate	220	140	F	P	G	G
Cresol, up to 10%	80	-	G	G	G	G
Crude Oil	220	140	G	G	G	G
Cyclohexane	110	140	-	-	-	-
Dechlorinated Brine Storage	180	-	-	-	-	-
Diallylphthalate	210	-	-	-	-	-
Diammonium Phosphate, up to 65%	210	-	-	-	-	-
Dibutyl Ether	150	-	-	-	-	-
Dibutyl Phthalate	200	N.R.	-	-	G	G
Diesel Fuel	210	140	G	G	G	G
Diethanolamine	150	-	-	G	-	-
Diethylene Glycol	210	-	-	-	-	-
Dimethyl Phthalate	170	-	-	-	-	-
Dimethyl Sulfoxide	80	-	-	-	-	-
Diocetyl Phthalate	210	N.R.	-	-	-	-



Maximum allowed  
temperature °F

Chemical	FRP	PVC	Plastifer™ Polyester Powder Coating	Aluminum	304 Stainless Steel	316 Stainless steel
Diphenyl Ether	140	-	-	-	-	-
Dipropylene Glycol	180	-	-	-	-	-
Ethyl Alcohol	120	140	-	-	-	-
Ethylene Chlorohydrin	100	N.R.	P	F	G	G
Ethylene Glycol	210	140	G	F	F	G
Fatty Acids	220	140	G	G	G	G
Ferric Chloride	210	140	F	P	P	P
Ferric Nitrate	210	140	G	P	G	G
Ferric Sulfate	210	140	F	P	G	F
Ferrous Chloride	210	140	P	P	P	P
Ferrous Nitrate	210	73	F	F	F	G
Ferrous Sulfate	210	140	G	F	G	F
Fluoboric Acid	*210	140	F	P	F	F
Fluosilicic Acid	150	-	P	P	P	P
Formaldehyde, up to 50%	170	140	F	F	G	G
Formic Acid	150	73	F	P	F	F
Fuel Oil	210	-	G	F	G	G
Gallic Acid	*80	140	-	G	G	G
Gasoline	180	140	G	G	G	G
Gluconic Acid, up to 50%	180	-	-	-	-	-
Glucose	240	140	G	G	G	G
Glycerine	210	140	G	G	G	G
Glycolic Acid	200	140	G	G	-	-
Green Liquor, Pulp MILL	200	-	F	F	G	G
Hexachlorocyclopentadiene	100	-	-	-	-	-
Hydraulic Fluid	180	73	G	G	G	G
Hydrobromic Acid, up to 20%	180	140	F	P	P	F
Hydrochloric Acid, up to 37%	170	140	N.R.	N.R.	N.R.	N.R.
Hydrocyanic Acid, up to 10%	170	140	-	-	-	-
Hydrofluoric Acid, up to 20%	*120	73	N.R.	N.R.	N.R.	N.R.
Hydrofluosilicic Acid, up to 30%	*120	140	N.R.	N.R.	N.R.	N.R.
Hydrogen Bromide, gas	180	-	-	-	-	-
Hydrogen Chloride, dry gas	220	-	-	-	-	-
Hydrogen Fluoride	*180	N.R.	N.R.	N.R.	N.R.	N.R.
Hydrogen Peroxide, up to 30%	150	140	F	G	G	G
Hydrogen Sulfide, wet/dry gas	210	140	G	F	F	G
Hydroiodic Acid, up to 10%	150	-	-	-	-	-
Hypochlorous Acid, up to 20%	110	140	P	F	P	F
Iodine (solid, solution and vapor)	170	150	P	G	P	P
Isodecanol	180	-	-	-	-	-
Isopropyl Alcohol	120	140	-	G	G	G



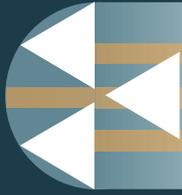
Maximum allowed temperature °F

Chemical	FRP	PVC	Plastifer™ Polyester Powder Coating	Aluminum	304 Stainless Steel	316 Stainless steel
Kerosene	180	140	G	G	G	G
Lactic Acid, up to 25%	210	140	G	F	F	G
Lauric Acid	220	140	G	G	G	G
Lead Acetate	220	140	G	P	F	F
Lead Nitrate	220	140	F	P	F	F
Linoleic Acid	100	140	-	G	G	G
Linseed Oil	220	140	G	G	G	G
Lithium Bromide	220	140	F	F	F	G
Lithium Chloride	210	-	F	P	F	F
Magnesium Bicarbonate	210	-	-	-	-	-
Magnesium Bisulfite	180	-	-	-	-	-
Magnesium Carbonate	180	140	F	P	G	G
Magnesium Chloride	220	140	F	P	F	F
Magnesium Hydroxide	*210	140	G	F	F	G
Magnesium Nitrate	210	140	G	F	G	G
Magnesium Sulfate	220	140	G	F	F	G
Maleic Acid	210	140	-	F	F	G
Mercuric Chloride	210	140	P	P	P	P
Merthyl Ethyl Ketone, up to 10%	80	N.R.	P	P	P	P
Methanol, up to 10%	180	-	G	G	G	G
Monochloroacetic Acid	N.R.	140	-	P	G	G
Nickel Chloride	210	140	G	P	F	F
Nickel Nitrate	210	140	-	P	G	G
Nickel Sulfate	210	140	G	P	F	G
Nitric Acid, 30%	140	140	P	P	F	F
Nitrous Acid	73	140	-	F	-	G
Oleic Acid	200	140	G	F	F	G
Oxalic Acid, up to 50%	220	140	G	F	F	G
Palmitic Acid, up to 10%	220	140	G	G	G	G
Perchloroethylene	100	-	P	F	G	G
Perchloric Acid, up to 10%	150	73	P	P	F	G
Phenol	170	N.R.	F	F	G	G
Phosphoric Acid, up to 85%	210	140	F	P	F	F
Phthalic Anhydride	210	73	-	G	G	G
Photographic Solution	80	140	P	-	P	P
Picric Acid	170	N.R.	F	F	G	G
Plating Solutions	180	140	F	G	G	G
Potassium Aluminum Sulfate	220	140	G	F	G	G
Potassium Bicarbonate, up to 10%	*170	140	F	P	G	G
Potassium Bromide	120	140	G	F	F	G
Potassium Chloride	210	140	G	F	F	G



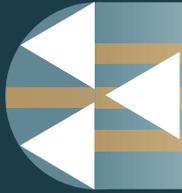
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Chemical	FRP	PVC	Plastifer™ Polyester Powder Coating	Aluminum	304 Stainless Steel	316 Stainless steel
Potassium Cyanide	220	140	G	G	G	G
Potassium Dichromate	210	140	F	G	G	G
Potassium Ferricyanide	210	140	-	G	G	G
Potassium Hydroxide, up to 25%	*120	140	F	P	G	G
Potassium Permanganate, up to 10%	210	140	-	G	G	P
Potassium Persulfate	210	140	F	F	G	F
Potassium Sulfate	210	140	-	G	G	F
Salt Spray	180	140	F	F	F	F
Sillicic Acid	220	140	-	-	-	-
Silver Cyanide, up to 5%	200	140	-	-	-	-
Silver Nitrate	210	140	G	P	F	G
Sodium Acetate	210	140	G	G	G	G
Sodium Benzoate	180	140	G	G	-	-
Sodium Bisulfate	210	140	G	F	G	G
Sodium Bisulfite	210	140	G	F	G	G
Sodium Borate (Borax)	210	140	-	F	G	G
Sodium Bromide	210	140	-	F	F	F
Sodium Chlorate	210	73	G	F	G	G
Sodium Chloride	210	140	G	F	F	F
Sodium Chlorite	150	N.R.	P	F	F	F
Sodium Cyanide	210	140	G	P	G	G
Sodium Dichromate	210	140	P	P	F	P
Sodium Di-phosphate	210	-	-	-	-	-
Sodium Ferricyanide	210	140	-	P	G	G
Sodium Ferrocyanide	220	140	-	P	G	G
Sodium Fluoride	*180	140	P	F	F	F
Sodium Hydroxide, up to 70%	*210	140	P	P	G	F
Sodium Hypochlorite	*125	73	P	P	P	P
Sodium Hyposulfite, up to 20%	210	-	-	-	-	-
Sodium Lauryl Sulfate	160	-	-	-	-	-
Sodium Mono-phosphate	210	-	-	-	-	-
Sodium Nitrate	210	140	G	G	G	G
Sodium Nitrite	220	140	F	G	G	G
Sodium Silicate, pH>12	*210	140	F	F	G	F
Sodium Sulfate	210	140	G	G	G	G
Sodium Sulphide	210	140	F	P	F	F
Sodium Sulfite	210	140	P	F	F	F
Sodium Tetraborate	180	-	G	F	G	G
Sodium Thiosulfate	180	140	G	G	G	G
Sodium Tripolyphosphate	210	-	-	-	-	-
Sodium Xylene Sulfonate	160	-	-	-	-	-
Sorbitol Solution	180	-	-	-	-	-
Stannic Chloride	210	140	G	P	P	P
Stannous Chloride	210	140	G	P	F	P
Stearic Acid	210	140	G	F	F	G



Maximum allowed  
temperature °F

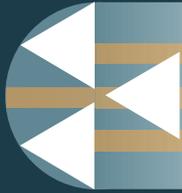
Chemical	FRP	PVC	Plastifer™ Polyester Powder Coating	Aluminum	304 Stainless Steel	316 Stainless steel
Styrene	80	-	G	G	F	F
Sulfamic Acid	210	140	-	P	-	-
Sulfated Detergents	210	-	-	-	-	-
Sulfite Liquors	200	140	-	-	-	-
Sulfonated Detergents	170	-	-	-	-	-
Sulfur Dioxide, dry gas	240	140	G	F	F	F
Sulfur Dioxide, wet gas	240	73	F	F	F	F
Sulfur Trioxide	220	140	G	G	G	G
Sulfuric Acid, up to 25%	220	140	F	F	P	F
Sulfuric Acid, up to 50%	210	140	P	P	P	P
Sulfuric Acid, up to 70%	180	140	P	P	P	P
Sulfurous Acid, above 10%	110	N.R.	P	F	P	F
Tall Oil	160	140	-	-	-	-
Tannic Acid	210	140	G	F	G	G
Tartaric Acid	210	140	G	F	F	G
Tetrachloroethylene	100	-	F	F	G	G
Tetrapotassium Pyrophosphate, 60%	150	-	-	-	-	-
Tetrasodium Ethylene Diamine	120	-	-	-	-	-
Tetrasodium Pyrophosphate	150	140	F	P	F	F
Toluene	80	N.R.	G	G	G	G
Toluene Sulfonic Acid	210	-	-	-	-	-
Trichlorethylene, fumes	170	N.R.	F	-	-	G
Trichloroacetic Acid, up to 50%	210	140	-	F	G	G
Trimethylamine Hydrochloride	210	-	P	P	F	F
Triphenyl Phosphite	140	-	-	-	-	-
Trisodium Phosphate	210	-	G	P	G	G
Turpentine, Pure Gum	150	140	G	G	G	G
Urine / Urea	150	140	-	G	G	G
Vegetable Oils	210	140	G	P	G	G
Vinegar	210	230	F	P	G	G
Water, Distilled / Demineralized	180	140	G	G	G	G
Water, Organic Vapors	175	-	F	G	G	G
Water, waste	180	140	F	F	G	G
White Liquor, Pulp Mill	180	140	G	G	G	G
Xylene	80	N.R.	F	G	F	G
Zinc Chlorate	210	-	-	-	-	-
Zinc Chloride	220	-	G	P	P	F
Zinc Nitrate	220	140	-	F	G	G
Zinc Sulfite	220	-	-	-	-	-
Zinc Sulphate	220	140	F	F	G	G



MVT Fiberglass Perchloric Acid Exhaust  
(Bearing Repair Facility)



DHK 6000 Fiberglass Exhaust Fan  
(Semi-Conductor Foundry)



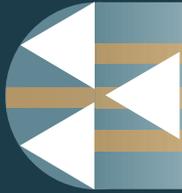
Axijet 4900 Coated Steel High Plume Fans  
(University Chemistry Lab)



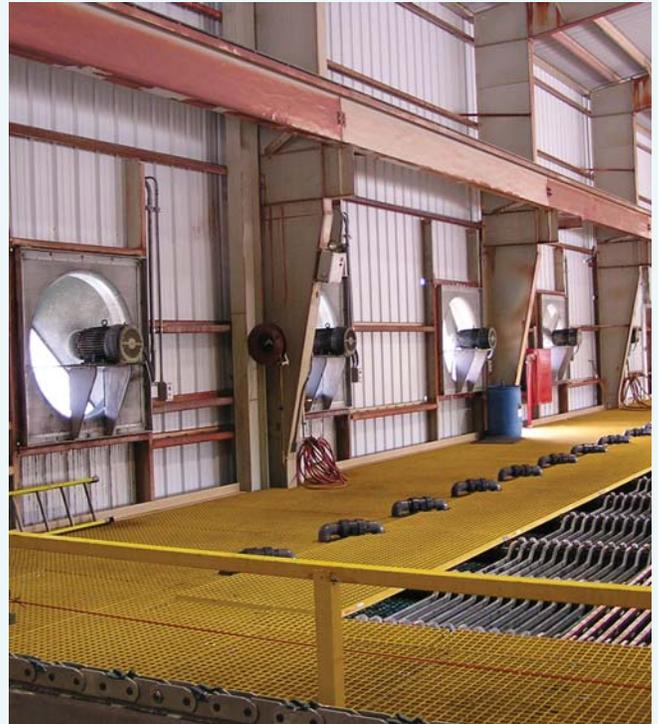
Axijet 4025 Coated Steel High Plume Fans  
(Forensic Crime Lab)



Axijet 2450 Fiberglass High Plume Fans  
(Pathogen Lab)



Axijet 6000 Fiberglass High Plume Fans  
(Wastewater Treatment Plant)



AXPR 54 Fiberglass Wall Panel Fans  
(Copper Mine Processing Plant)



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