POLYPROPYLENE Chemical Resistance Guide

SECOND EDITION

PP CHEMICAL RESISTANCE GUIDE

Thermoplastics:
Polypropylene (PP)

IPEX
by aliaxis

Chemical Resistance Guide

Polypropylene (PP)

2nd Edition

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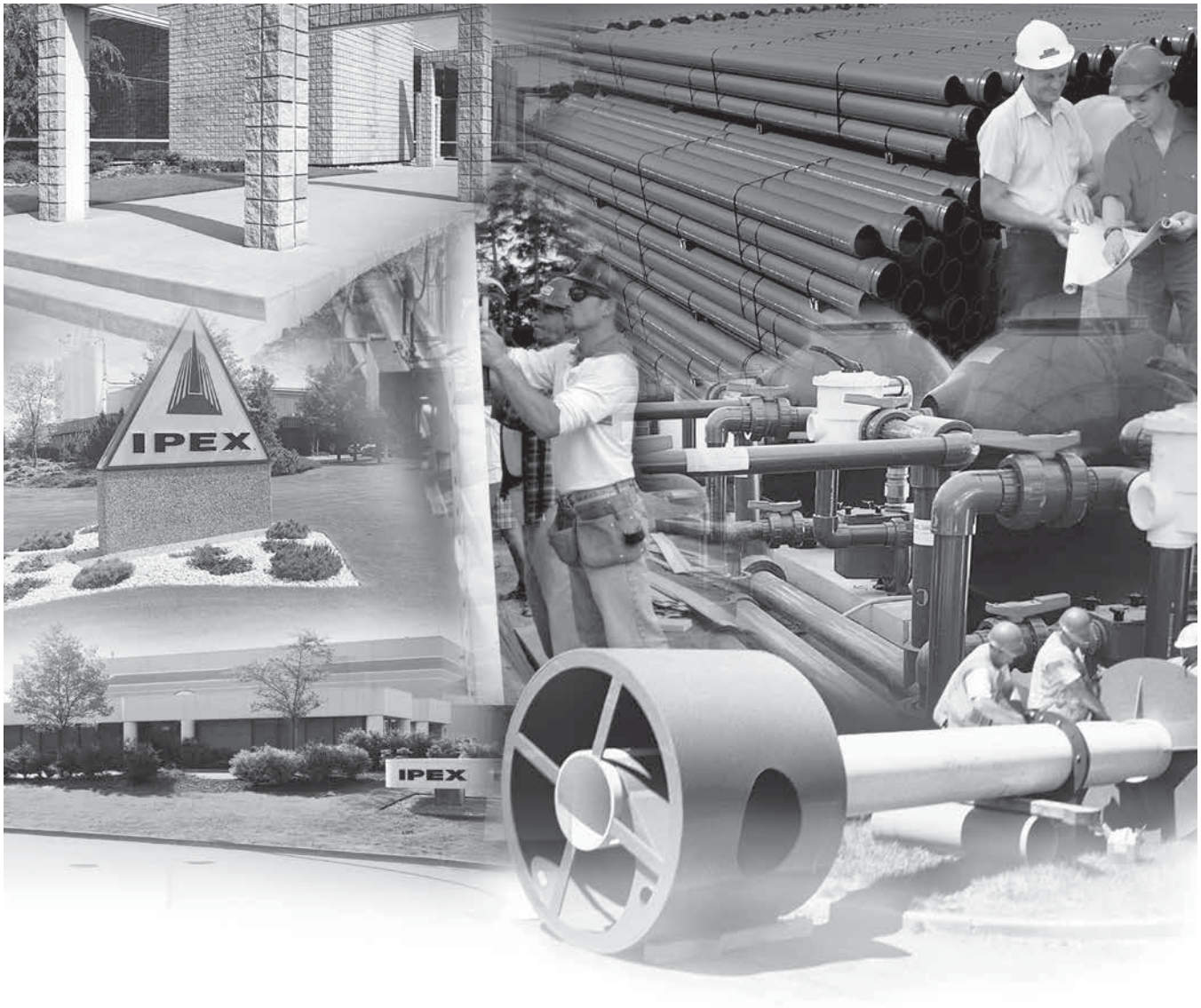

About IPEX

At IPEX, we have been manufacturing non-metallic pipe and fittings since 1951. We formulate our own compounds and maintain strict quality control during production. Our products are made available for customers thanks to a network of regional stocking locations from coast-to-coast. We offer a wide variety of systems including complete lines of piping, fittings, valves and custom-fabricated items.

More importantly, we are committed to meeting our customers' needs. As a leader in the plastic piping industry, IPEX continually develops new products, modernizes manufacturing facilities and acquires innovative process technology. In addition, our staff take pride in their work, making available to customers their extensive thermoplastic knowledge and field experience. IPEX personnel are committed to improving the safety, reliability and performance of thermoplastic materials. We are involved in several standards committees and are members of and/or comply with the organizations listed on this page.

For specific details about any IPEX product, contact our customer service department.

INTRODUCTION

Thermoplastics and elastomers have outstanding resistance to a wide range of chemical reagents. The chemical resistance of plastic piping is basically a function of the thermoplastic material and the compounding components. In general, the less compounding components used the better the chemical resistance. Thermoplastic pipes with significant filler percentages may be susceptible to chemical attack where an unfilled material may be affected to a lesser degree or not at all.

Some newer piping products utilize a multi-layered (composite) construction, where both thermoplastic and non-thermoplastic materials are used for the layers. Layered composite material pipe may have chemical resistance that differs from the chemical resistance of the individual material. Such resistance however, is a function both of temperatures and concentration, and there are many reagents which can be handled for limited temperature ranges and concentrations. In borderline cases, it will be found that there is limited attack, generally resulting in some swelling due to absorption. There are also many cases where some attack will occur under specific conditions, but for many such applications, the use of plastic will be justified on economic grounds when considered against alternative materials. Resistance is often affected (and frequently reduced) when handling a number of chemicals or compounds containing impurities. For this reason, when specific applications are being considered, it may be worthwhile to carry out tests using the actual product that will be encountered in service. The listing that follows does not address chemical combinations.

The information is based on immersion tests on unstressed coupons, experiments and, when available, actual process experience as well as data from tests inclusive of stress from temperature and pressure. The end user should be aware of the fact that actual service conditions will affect the chemical resistance.

Chemicals that do not normally affect the properties of an unstressed thermoplastic may cause completely different behavior (such as stress cracking) when under thermal or mechanical stress (such as constant internal pressure or frequent thermal or mechanical stress cycles). Chemical resistance data from immersion tests cannot be unconditionally applied to thermoplastic piping components subjected to continuous or frequent mechanical or thermal stresses.

When the pipe will be subject to a continuous applied mechanical or thermal stress, or to combinations of chemicals, testing that duplicates the expected field conditions, as closely as possible, should be performed on representative samples of the pipe product to properly evaluate plastic pipe for use in this application.

RATINGS

Ratings are according to the product and suppliers.

The absence of any class indication for any given materials, signifies the absence of data for such material(s) with respect to the specific chemical(s), temperature(s) and concentration(s).

Note: Chemical resistance data is found in a laboratory setting and cannot account for all possible variables of an installed application. It is up to the design engineer or final user to use this information as guidance for a specific application design.

If a material is chemically resistant to the concentrated form of a specific chemical, it should be resistant to the diluted form of that same chemical.

NOTES

xx: Max Recommended Temperature – Unsuitable / Insufficient Data A: Applicable in Some Cases, consult IPEX

POLYPROPYLENE (PP)

All Chemical Resistance data for Polypropylene (PP) contained within this manual has been obtained from Durapipe.

Material:

- Polypropylene (PP)

Chemical Resistance and Performance Data:

- Strong mineral acids
- Caustic and ammoniacal solutions
- Inorganic salt solutions
- Many organics
- Detergents
- Temperature range: 32°F to 212°F (0°C to +100°C)

Typical Applications:

- Hot chemical applications
- Acid waste drainage

Unsuitable for Following Uses:

- Strong oxidizing acids and halogens

* Note, temperatures given are for guidance only; please check before specifying

Classification:

xx	Max Recommended Temperature
-	Unsuitable / Insufficient Data
A	Applicable in Some Cases, consult IPEX

Thermoplastic Pipe - Guidance for Correct Usage: Chemical resistance is affected by the following factors:

- temperature
- fluid concentration
- aeration
- flow velocity
- turbulence
- duration of exposure
- pressure

Fire:

The use of thermoplastic material to convey flammable substances may be unacceptable due to fire hazard.

Foodstuffs:

A resistant classification does not imply absolute suitability (e.g. certain foodstuffs may require gaskets to meet organoleptic requirements).

Thread Sealants:

Some adhesive thread sealants can chemically attack some plastics and must not be used.

Please refer to Volume III: Acid Waste Piping Systems Technical Manual for further details.

Label Adhesive:

It is possible that label adhesives will contain stress cracking agents.

We recommend that other methods are used to mark pipe or that adequate checks are made to ensure suitability.

POLYPROPYLENE (PP)
CHEMICAL RESISTANCE DATA

Substance	Concentration	(°F)	(°C)
A			
Acetaldehyde	100%	104	40
Acetaldehyde	40% aq. solution	104	40
Acetamide	5% aq. solution	140	60
Acetic acid	10% aq. Solution	140	60
Acetic acid	30% aq. Solution	104	40
Acetic acid	60% aq. Solution	104	40
Acetic acid	80% aq. Solution	68	20
Acetic acid	100% (glacial)	68	20
Acetic anhydride	100%	68	20
Acetone	5% aqueous solution	68	20
Acetone	100%	140	60
Acetophenone	100%	68	20
Acid Mixtures		A	A
Aluminium chloride	saturated aqueous	140	60
Aluminium chlorohydrate	saturated aqueous	140	60
Aluminium fluoride	saturated aqueous or suspension	140	60
Aluminium hydroxide	aqueous suspension	140	60
Aluminium nitrate	saturated aqueous	140	60
Aluminium sulphate	saturated aqueous	140	60
Ammonium bifluoride	saturated aqueous	140	60
Ammonium carbonate	saturated aqueous	140	60
Ammonium chloride	saturated aqueous	140	60
Ammonium fluoride	saturated aqueous	140	60
Ammonium hydroxide	Sp. Gr = 0.88 (approx 32% solution)	140	60
Ammonium hydroxide	3% solution	140	60
Ammonium nitrate	saturated aqueous	140	60
Ammonium persulphate	saturated aqueous	140	60
Ammonium phosphate(s)	saturated aqueous	140	60
Ammonium sulphate	saturated aqueous	140	60
Aqua regia	1 part conc nitric + 3 parts conc hydrochloric acid	-	-
Automotive oils	100%	A	A

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POLYPROPYLENE (PP)
CHEMICAL RESISTANCE DATA

Substance	Concentration	(°F)	(°C)
B			
Benzalkonium chloride solution	up to 50% aqueous	104	40
Black liquor		140	60
Brine	typically up to 5% salinity	176	80
Bromine water	saturated aqueous	-	-
Bromine water	up to 20ppm aqueous solution (sterilization levels)	68	20
C			
Calcium carbonate	saturated aqueous or suspension	176	80
Calcium chloride	saturated aqueous	176	80
Calcium hydroxide	saturated aqueous or suspension	176	80
Calcium nitrate	saturated aqueous	176	80
Calcium oxide	powder	176	80
Calcium sulphate	saturated aqueous	176	80
Castor oil	100%	140	60
Caustic soda (see sodium hydroxide)			
Chlorine dioxide	saturated aqueous solution	-	-
Chlorine dioxide	trace levels for sterilisation	68	20
Chlorine in water	saturated (pH neutral)	-	-
Chromic acid	40%	-	-
Compressor oils	100%	A	A
Corn oil	100%	140	60
Cottonseed oil	100%	140	60
Cresol	up to 5% aqueous solution	68	20
Cyclohexane	100%	-	-
Cyclohexanol	100%	104	40
Cyclohexanone	100%	68	20
D			
Di-n-butyl phthalate	100%	68	20
Di-n-butyl sebacate	100%	68	20
Di-octyl phthalate	100%	68	20
Diesel (petro-diesel)	100%	-	-
Diethanolamine	100% or aqueous solution	104	40
Dimethylformamide		104	40

xx: Max Recommended Temperature – Unsuitable / Insufficient Data A: Applicable in Some Cases, consult IPEX

POLYPROPYLENE (PP)
CHEMICAL RESISTANCE DATA

Substance	Concentration	(°F)	(°C)
E			
Essential oils (contain terpenoid compounds)		-	-
Ethanolamine	100%	104	40
Ethyl alcohol (ethanol)	100% or aqueous solution	68	20
Ethylene glycol	100% or aqueous solution	140	60
F			
Ferric chloride	saturated aqueous	140	60
Ferric hydroxide	saturated aqueous	140	60
Ferric nitrate	saturated aqueous	140	60
Ferric sulphate	saturated aqueous	140	60
Ferrous chloride	saturated aqueous	140	60
Ferrous hydroxide	saturated aqueous	140	60
Ferrous nitrate	saturated aqueous	140	60
Ferrous sulphate	saturated aqueous	140	60
Fluorosilicic acid	35%	140	60
Formic acid	85 - 90%	68	20
Formic acid	50%	104	40
Formic acid	3%	140	60
Fructose	saturated aqueous	140	60
G			
Gasoline (spirit-based fuel)	100%	-	-
Glucose	saturated aqueous	140	60
Glycerine	saturated aqueous	140	60
Glycol ethers (cellosolves and carbitols)	100% and aqueous solutions	104	40
Glyoxal	40% aqueous solution	A	A
Green liquor		140	60
Gypsum (see calcium sulphate)			
H			
Hydrochloric acid	10% aqueous solution	140	60
Hydrochloric acid	25% aqueous solution	140	60
Hydrochloric acid	37% aqueous solution (concentrated)	140	60
Hydrofluoric acid	10% aqueous solution	140	60

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POLYPROPYLENE (PP)
CHEMICAL RESISTANCE DATA

Substance	Concentration	(°F)	(°C)
Hydrofluoric acid	30% aqueous solution	140	60
Hydrofluoric acid	70% aqueous solution	104	40
Hydrogen peroxide	3% aqueous solution (10 volumes)	104	40
Hydrogen peroxide	30% aqueous solution (100 volumes)	68	20
hydroxylamine (incl. hydrochloride and sulphate)	aqueous solution	140	60
hypochlorites (see sodium hypochlorite)			
hypochlorous acid (see chlorine in water)			
I			
Iodine	up to 10% aqueous or mixed solvent solution	A	A
Isopropanol	100% or aqueous solution	104	40
K			
Kerosene	100%	-	-
L			
Lime (see calcium oxide)			
Linseed oil	100%	140	60
M			
Magnesium carbonate	saturated aqueous or suspension	176	80
Magnesium chloride	saturated aqueous	176	80
Magnesium hydroxide	saturated aqueous or suspension	176	80
Magnesium nitrate	saturated aqueous	176	80
Magnesium sulphate	saturated aqueous	176	80
Methyl alcohol	100%	140	60
Mineral oil (refined)	100%	68	20
N			
Nitric acid	10%	104	40
Nitric acid	30%	68	20
Nitric acid	60%	-	-
Nitric acid	fuming	-	-

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POLYPROPYLENE (PP)
CHEMICAL RESISTANCE DATA

Substance	Concentration	(°F)	(°C)
O			
Oil (see automotive, compressor, mineral, vegetable)			
Oleum (see sulphuric acid - fuming))			
P			
Peracetic acid	up to 15%	-	-
Peracetic acid	residual traces in aqueous solution from sterilisa	68	20
Petrol (see Gasoline)			
Phenol	up to 10% aqueous solution	104	40
Phosphoric acid	85%	176	80
Poly aluminium chloride (see aluminium chlorohydrate)			
Polyelectrolyte solutions	manufacturers' recommendations	A	A
Polyethylene glycol	all concentrations and molecular weight ranges	140	60
Potassium bicarbonate	saturated aqueous	176	80
Potassium bifluoride	saturated aqueous	140	60
Potassium bisulphate	saturated aqueous	176	80
Potassium bisulphite	saturated aqueous	176	80
Potassium bromate	saturated aqueous	176	80
Potassium bromide	saturated aqueous	176	80
Potassium carbonate	saturated aqueous	176	80
Potassium chlorate	saturated aqueous	176	80
Potassium chloride	saturated aqueous	176	80
Potassium cyanide	saturated aqueous	176	80
Potassium dichromate	saturated aqueous	176	80
Potassium ferricyanide	saturated aqueous	176	80
Potassium ferrocyanide	saturated aqueous	176	80
Potassium fluoride	saturated aqueous	176	80
Potassium formate (alkaline solution)	up to 50%	104	40
Potassium hydroxide	≤ 50%	176	80
Potassium iodate	saturated aqueous	176	80
Potassium iodide	saturated aqueous	176	80
Potassium nitrate	saturated aqueous	176	80
Potassium permanganate	saturated aqueous	104	40

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POLYPROPYLENE (PP)
CHEMICAL RESISTANCE DATA

Substance	Concentration	(°F)	(°C)
Potassium persulphate	saturated aqueous	140	60
Potassium sulphate	saturated aqueous	176	80
Potassium sulphite	saturated aqueous	176	80
Potassium tetraborate	saturated aqueous	176	80
Potassium thiosulphate	saturated aqueous	176	80
Propylene glycol	100% or aqueous solution	140	60
Q Quaternary ammonium compounds (see benzalkonium chloride)			
S			
Sodium bicarbonate	saturated aqueous	176	80
Sodium bisulphate	saturated aqueous	176	80
Sodium bisulphite	saturated aqueous	176	80
Sodium bromate	saturated aqueous	176	80
Sodium bromide	saturated aqueous	176	80
Sodium carbonate	saturated aqueous	176	80
Sodium chlorate	saturated aqueous	176	80
Sodium chloride	saturated aqueous	176	80
Sodium chlorite	2% aqueous solution	68	20
Sodium chlorite	25% aqueous solution	68	20
Sodium cyanide	saturated aqueous	176	80
Sodium dichromate	saturated aqueous	176	80
Sodium ferricyanide	saturated aqueous	176	80
Sodium ferrocyanide	saturated aqueous	176	80
Sodium fluoride	saturated aqueous	176	80
Sodium hydroxide	≤ 50%	176	80
Sodium hydroxide	> 30%	176	80
Sodium hypochlorite	≤ 0.5% aqueous (alkaline) solution	68	20
Sodium hypochlorite	≤ 5% aqueous (alkaline) solution	68	20
Sodium hypochlorite	5 - 15% aqueous (alkaline) solution	-	-
Sodium iodate	saturated aqueous	176	80
Sodium iodide	saturated aqueous	176	80
Sodium metabisulphite	saturated aqueous	176	80
Sodium methylate	30% solution in methanol	68	20

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POLYPROPYLENE (PP)
CHEMICAL RESISTANCE DATA

Substance	Concentration	(°F)	(°C)
Sodium nitrate	saturated aqueous	176	80
Sodium nitrite	saturated aqueous	176	80
Sodium phosphate(s)	saturated aqueous	176	80
Sodium silicate	saturated aqueous	176	80
Sodium sulphate	saturated aqueous	176	80
Sodium sulphite	saturated aqueous	176	80
Sodium tetraborate	saturated aqueous	176	80
Sodium thiosulphate	saturated aqueous	176	80
Starch	saturated aqueous	176	80
Sulphamic acid	saturated aqueous	140	60
Sulphuric acid	≤ 10%	176	80
Sulphuric acid	10 - 30%	140	60
Sulphuric acid	30 - 50%	140	60
Sulphuric acid	50 - 70%	104	40
Sulphuric acid - fuming		-	-
Sulphuric acid	70 - 85%	68	20
Sulphuric acid	95 - 96%	-	-
Sulphuric acid	98%	-	-
T			
Tartaric acid	saturated aqueous	140	60
Terpenes	100%	-	-
Tetramethylammonium hydroxide	25% aqueous	140	60
Toluene	100%	-	-
Trichloroisocyanuric acid	saturated aqueous	68	20
Turpentine (oil)	100%	-	-
U			
Urea	35% solution	140	60
V			
Vegetable oils (does not include “essential oils”)	100%	140	60
W			
Water for injection	100%	176	80
Water, industrial waste	100%	A	A
Water, potable (drinking)	100%	176	80

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POLYPROPYLENE (PP)
CHEMICAL RESISTANCE DATA

Substance	Concentration	(°F)	(°C)
Water, saline (sea water)	100%	176	80
Water, ultrapure	100%	176	80
Water, water (from sewage processing)	100%	176	80
White liquor		140	60
White spirit (aka Stoddard solvent)	100%	-	-
X			
Xylene	100%	-	-
Z			
Zinc chloride	saturated aqueous	176	80
Zinc nitrate	saturated aqueous	176	80
Zinc sulphate	saturated aqueous	176	80

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SALES AND CUSTOMER SERVICE

IPEX U.S.A LLC
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About the IPEX Group of Companies

As leading suppliers of thermoplastic piping systems, the IPEX Group of Companies provides our customers with some of the world's largest and most comprehensive product lines. All IPEX products are backed by more than 50 years of experience. With state-of-the-art manufacturing facilities and distribution centers across North America, we have established a reputation for product innovation, quality, end-user focus and performance.

Markets served by IPEX group products are:

- Electrical systems
- Telecommunications and utility piping systems
- Industrial process piping systems
- Municipal pressure and gravity piping systems
- Plumbing and mechanical piping systems
- PE Electrofusion systems for gas and water
- Industrial, plumbing and electrical cements
- Irrigation systems
- PVC, CPVC, PP, PVCO, ABS, PEX, FR-PVDF, NFRPP, FRPP, HDPE, PVDF and PE pipe and fittings (1/2" – 48")

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