

WHAT DOES CHEMICAL RESISTANCE REALLY MEAN?

Thanks to their chemical structure, plastics as a pipeline are capable of resisting the effects of the atmosphere, of water and many other chemicals which corrode metals. For this reason, they are also employed as a corrosion protection coating for metals.

The sentence 'plastics have a high chemical resistance' is accurate but is too much of a generalisation. The standards, therefore, talk of a high capability for resisting chemicals. The complexity of this area is shown by the long lists issued by the producers of raw materials, specifying the behaviour of each of their plastics with regard to a large number of chemicals. These tables, of course, can only supply initial general indications. Please see our **Chemical Resistance Tables** for more information.

Although certain common features are applicable to the various groups of plastics – e.g. most thermoplastics have a high resistance to acids and alkalis – each individual plastic has its own distinct chemical characteristics. Closely related plastics can react to the same chemical substance in completely different ways with regard to the same chemical substance at different temperatures or different degrees of concentration. Additives can also have an effect on the behaviour of the plastic with regard to chemicals: e.g. plasticisers, stabilisers, colouring pigments etc. with which plastics are modified for particular areas of application.

Below we have outlined the general characteristics of **Polypropylene, Polyethylene and uPVC**. Polyvinyl chloride (PVC) is a flexible plastic while uPVC is rigid and it is this type of PVC we explore in greater depths in this paper.

To see a list of how each of these plastics react to over 300 different chemicals please refer to our **Chemical Resistance Tables**.

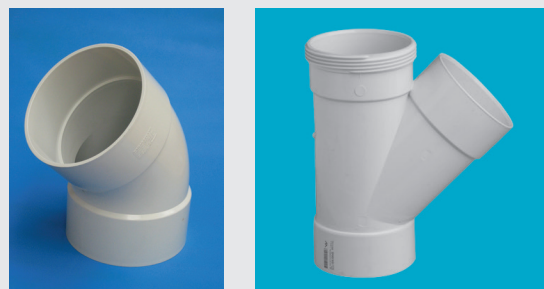
Polypropylene



Polyethylene



uPVC



WHAT ARE THE CHARACTERISTICS OF POLYPROPYLENE?

Some of the most significant properties of polypropylene are:

- **Chemical Resistance:** Diluted bases and acids don't react readily with polypropylene, which makes it a good choice for containers of such liquids, such as cleaning agents, first-aid products, and more.
- **Elasticity and Toughness:** Polypropylene will act with elasticity over a certain range of deflection (like all materials), but it will also experience plastic deformation early on in the deformation process, so it is generally considered a "tough" material. Toughness is an engineering term which is defined as a material's ability to deform (plastically, not elastically) without breaking.
- **Fatigue Resistance:** Polypropylene retains its shape after a lot of torsion, bending, and/or flexing. This property is especially valuable for making living hinges.
- **Insulation:** Polypropylene has a very high resistance to electricity and is very useful for electronic components.
- **Heat Resistance:** It can withstand high temperatures up to 90°C continuously and, for shorter spans of time, temperatures as high as 120°C.

WHAT ARE THE CHARACTERISTICS OF POLYETHYLENE?

Polyethylene is a thermoplastic polymer with variable crystalline structure and an extremely large range of applications depending on the particular type. It has 2 main types.

- High Density Polyethylene (HDPE) is much more crystalline, has a much higher density. has common applications in construction (for example in its use as a drain pipe).
- Low Density Polyethylene (LDPE) is widely used, for example, in plastic packaging such as for grocery bags or plastic wrap.

We are more concerned with HDPE, the characteristics are:

- **It is very hard and opaque.**
- **It can withstand high temperatures** up to 80°C continuously and, for shorter spans of time, temperatures as high as 120°C.
- **Resistant:** Water, solutions of inorganic salts, weak acids, strong organic acids, strong alkaline solutions, aliphatic hydrocarbons.
- **Has adequate resistance:** Strong acids, hydrofluoric acids, fats and oils.
- **Has limited resistance:** Lower alcohols, esters, ketones, ethers, aromatic hydrocarbons, mineral oil.
- **In most cases non-resistant:** Light naphtha, fuel mixture.
- **Completely non-resistant:** Unsaturated chlorinated hydrocarbons, turpentine.

POLYETHYLENE VS POLYPROPYLENE

- Polyethylene is generally more expensive than polypropylene.
- Polyethylene has a lower melting point compared to the higher melting point of polypropylene.
- Polypropylene is not as sturdy as polyethylene.
- Polypropylene is stiffer and resistant to chemicals and organic solvents compared to polyethylene.

WHAT ARE THE CHARACTERISTICS OF UPVC?

- **Excellent resistance to aggressive environments** both naturally occurring and as a result of industrial activity. They are resistant to almost all types of corrosion, either chemical or electrochemical in nature. Since uPVC is a non-conductor; galvanic and electrochemical effects do not occur in uPVC pipes.
- **For drinking water pipe distribution systems,** both main and supply lines. Being made of a tasteless and odourless material, uPVC pipes remain neutral to all transported fluids. uPVC is completely inert and is widely used for transporting liquids made for human consumption. Because of their mirror-smooth inside surface, uPVC pipes have minimum flow head loss.
- **Sewer and discharge pipe systems** - Due to its non-metallic nature, the material used is totally resistant to all forms of metallic corrosion. Aggressive water resulting from high sulphate soils and low hardness water will not attack uPVC pipes. There is also no build-up of inside deposits, a particular advantage in the construction of sewerage systems. The physical properties of uPVC pipes are not affected by neither direct sunshine, nor wind or rain.
- **Rigid PVC is not conductive to combustion** - In the event of a fire, flames are unable to travel on uPVC Pipes