FRP Pipe...Exceptional Strength to Weight Ratio

Primarily because of its resistance to corrosive attack from virtually every kind of chemical or compound, FRP piping and components received early acceptance from the Chemical Process Industry.

Today, although corrosion resistance continues to be an important benefit, the other unique advantages of FRP have won the material an ever increasing acceptance in a constantly expanding range of applications where corrosion resistance is not necessarily a primary consideration. This is especially true in applications requiring very large diameter pipe. One example of this is the 30 x 10 m long 1,200 diameter casings we provided for bridge building over rivers and estuaries where the pipe can be provided in the desired lengths as a former to pouring concrete piling's.

FRP pipe has exceptional strength to weight ratio, because pound for pound fibreglass is stronger than steel, as a result the pipes have a high tensile strength as well as good shock and impact resistance. They also have excellent flow characteristics as a smooth glass-like finish reduces material buildup and improves fluid transmission.

Maskell Pipe is available in standard diameters from 50 mm to 2.0 m, with larger diameters available on request. These are also supplied with a range of fittings, such as flanges, elbow, tees to suit the installation.

We have two methods of manufacture of our pipe. One method is by filament winding. That is, the pipe is manufactured with continuous strands of glass fibres. The fibreglassfilaments are continuously wound around a polished mandrel at a precisely controlled helix angle and under controlled tension. The angle of wind is such that the strands lie along the line of the resolution of forces in both the axial and radial directions, and are in pure tension, as apposed to hand laid pipe where the rovings lie at 90 deg to each other, and experience a shear force as well as a tensile force.

Simultaneously the fibreglass is impregnated with the carefully selected resin chosen to resist the attack of the chemicals the pipe will be handling and then wound onto the rotating mandrel. The result is a fibreglass reinforced plastic pipe of superior strength with a wall thickness substantially less than that of pipe made by other methods and materials.

maskell

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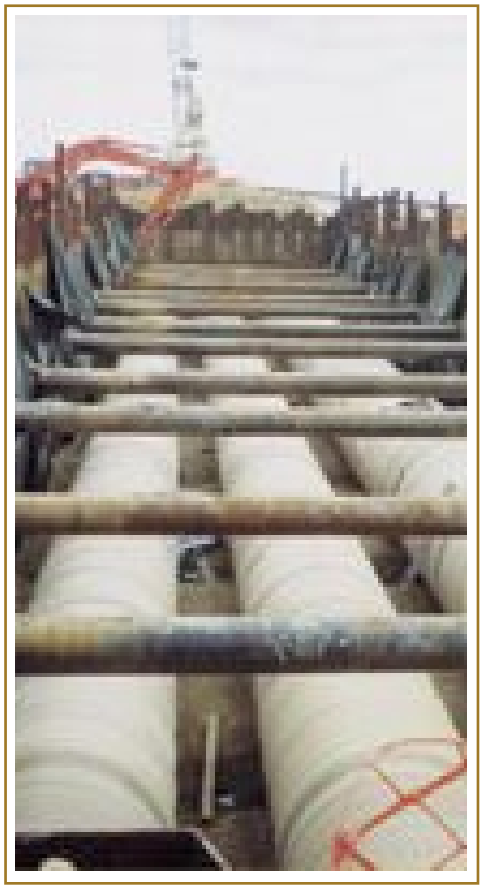
There are three basic layers to any FRP pipe:

1) The internal, or corrosion barrier has a high resin to glass ratio (75-80) and here the chemical barrier is set up and also the glass smooth internal surface is achieved.

2) The structural layer: Cover upon cover of this continuous filament is laid on top of each other until the required strength pipe is achieved, standard strengths include gravity pipe, 50 psi, 100 psi and 150 psi pipe, all have corresponding increasing wall thicknesses. Increased pipe strengths can be easily achieved on request.

3) The outer resin rich surface to protect the pipe from any external corrosion problems.

The following are some standard properties of filament wound pipe:



Property at 23 deg C	Test	Value
UTS	BS 5480 Part 2	
Hoop	Appendix M	275 MPa
Axial	Appendix P	140 MPa
Modulus of Elasticity		
Hoop	BS5480 and	24,138 MPa
Axial	BS2782	12414 MPa
Co-efficient of linear thermal expansion.		2x10-2 mm/MK

The other method of pipe manufacture is hand laid pipe.

After the corrosion barrier is laid on the pipe mandrel, successive layers of either woven roving and chopped strand mat or just chopped strand mat are laid on by hand until the required strength thickness is achieved.

This is not quite so cost effective as the bi-axial woven cloth provides the same strength in the axial and radial directions, when the axial stress is only half that of the radial stress (Pr/t as opposed to Pr/2t), so therefore needs to be as an average, 1/3 thicker than filament wound pipe for the same strength properties. It can however become advantageous when being used in very harsh environments when thickness is advantageous due to the physical environment the pipes are in. One example of this is the fertiliser companies, who usedphysical force to clean the sludge from the inner walls, and here wall thickness and impact resistance became the determining criteria when selecting manufacturing methods.

Hand laid pipe also becomes effective on small diameter pipework, or when the internal stresses become very low, for example when corrosive element is a gas.

The following are some standard properties of hand laid pipe.

Properties @ 23 deg	Test ASTM	Laminate thickness (mm)			
		3-5	6	8	10+
UTS - MPA	D - 638	60	80	90	100
Flexural strength - MPa	D - 790	110	130	140	150
Flex. mod of elasticity - MPa	D - 790	5000	5500	6000	7000

Using our licencee's experience and our own in house engineering knowledge each pipe we produce has our full engineering backup, so whether the pipe be buried, or hung above ground we are fully capable of designing systems detailed specifically to meet the customers requirements.

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