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1. Product Overview

1.1 If piping has been externally corroded to less than 80% of its original thickness and cannot be replaced due to plant shutdown issues or financial pressures then there is the option to refurbish the piping using our high strength glass reinforced plastic (GRP) FibaRoll composite. We have especially formulated a high strength grade within our range of Fibaroll products and have developed a proven application technique to meet the needs of pipe refurbishment that will bring pipe work back to its original design strength. Fibaroll also has the further benefit of having excellent weathering and mechanical damage properties to help extend the life of the pipe work.

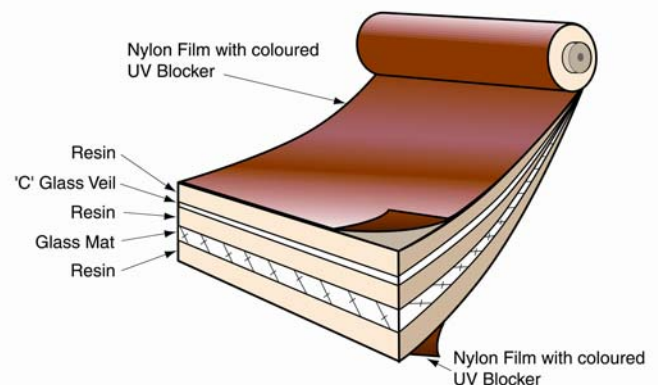


If all the technical details of the pipe are known then we can calculate, using Hoop strength calculations the appropriate Fibaroll grade and the appropriate thickness of material to use.

1.2 FibaRoll is technically known as a fully composed 'pre-preg' and when cured is a glass re-inforced plastic composite also known as GRP. In its uncured state FibaRoll is a soft, malleable, sheet material that is sensitive to UV light. It is supplied between two barrier films and when the bottom surface is stripped it reveals a tacky surface that readily sticks to a wide variety of surfaces.

1.3 FibaRoll is supplied with the top surface outermost on the roll and should **not** be applied back to front as there is a protective 'veil' near the top surface, which aids chemical resistance and weathering.

To retain these properties it is supplied on rolls wrapped in a black UV blocking bag to exclude any light. The roll core is supported at each end to prevent flat spots developing during storage. The storage bags are double ended allowing removal from either end. FibaRoll can be cut using a 'Stanley' style knife or scissors however please remember to keep the cut pieces out of daylight prior to application.



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A typical construction of FibaRoll is shown above. The veil is of chemical resistant glass and ensures excellent weathering and performance in immersion conditions. The barrier films prevent styrene vapour escaping, helping to ensure a safe and acceptable working environment. FibaGel is supplied in 2.5kg. cans and is essentially the same base resin that is used in FibaRoll. These resins are used as primers, fillers or as finishing coats.

2. FibaRoll and FibaGel products

2.1 Above ground applications

a) Pipe work service temperature below 100°C

FibaRoll ISO 1.5, 2mm- Isophthalic polyester – High Strength

b) Pipe work service temperature above 100°C

FibaRoll VECR 1.5 and 2.0 mm– Vinyl Ester Chemical Resistant- High Strength

2.2 Submerged conditions applications

a) Pipe work service temperature below 50°C

FibaRoll ISO HS 1.5, 2mm- Isophthalic polyester – High Strength

b) Pipe work service temperature above 50°C

FibaRoll VECR HS 1.5 and 2.0 mm– Vinyl Ester Chemical Resistant- High Strength

2.3 FibaRoll Material Description

2.31 FibaRoll VECR has excellent chemical resistant grade and is used where a material is required to have a high chemical resistance and excellent mechanical properties. This product has been used to protect underground pipelines, chemical tanks, vessel tops and a wide variety of applications within refineries and chemical plants. FibaRoll VECR has a maximum operating temperature of 150°C with peaks up to 220°C.

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2.32 FibaRoll ISO has good chemical resistant grade and is used where a material is required to have a good chemical resistance and excellent mechanical properties. This product has been used in a wide variety of applications within refineries and chemical plants. FibaRoll ISO has a maximum operating temperature of 100°C with peaks up to 160°C.

Please refer to specific data sheets for full information on the physical properties of each grade. Please note that all physical and chemical resistance properties quoted in the data sheets refer to **fully cured** FibaRoll products.

FibaRoll requires Ultra Violet (UV) light (wavelength 360 – 420 nm). For indoor applications where natural daylight is very low or non-existent a suitable artificial light source (a std. metal halide lamp, contact us for details) is required to cure the material.

2.4 FibaGel Material Description

Each FibaRoll grade uses its complimentary grade of FibaGel.

2.41 FibaGel VECR LV Cold cure (CC) is used as a low viscosity priming and coating material. FibaGel CC is supplied with a small bottle containing the necessary amount of activator and this must be stirred into the FibaGel until the blend is fully homogenised. FibaGel LV CC can be painted or rolled into place. At 25°C this grade has a 'working' time of 30 mins.

2.42 FibaGel ISO LV Cold Cure (CC) is used as a low viscosity priming and coating material. FibaGel CC is supplied with a small bottle containing the necessary amount of activator and this must be stirred into the FibaGel until the blend is fully homogenised. FibaGel LV CC can be painted or rolled into place. At 25°C this grade has a 'working' time of 30 mins. FibaGel coverage / thickness' are dependent on the substrate profile.

Storage conditions

FibaRoll and FibaGel products should be stored in cool dry and well ventilated conditions between 20 °C and 23 °C to maximise the storage life.

3.0 Surface Preparation

3.1. As with any other coating system applied to steelwork successful application is directly linked to the quality of surface preparation. The minimum required cleanliness standard (can be hand prepared) for all surfaces to be wrapped or coated should be to Swedish pictorial ST 3 and requires the surface to be clean, dry and free from any grease. Where client specification requirements dictate blast cleaning to

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Swedish standard SA 2.5 and the application of a two component epoxy / vinyl ester / polyester based holding primer should be undertaken.

Badly corroded pipe work with large pits must be filled with a FibaGel or an equivalent product to restore integrity and profile. The FibaGel or equivalent filler must be allowed to cure fully before further coating materials are applied. Recommended FibaGel primer thickness is a **minimum** of 75 microns however the condition of the pipe work may dictate a thicker primer coating.



4.0 Application methods

Spiral wrapping with a 55% overlap.



It is very important to choose a FibaRoll reel width to suit the width of pipe to be wrapped i.e. a 3 inch pipe would use a 50 mm reel whilst a 30 inch pipe would require a 150mm wide reel.

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4.1 Once all large pits have been filled and the filling material fully cured the pipe can be coated using a roller, brush or by spray application with FibaGel cold cure.

In spiral applications it is recommended to apply the FibaRoll onto wet FibaGel, in this way you ensure that air is not trapped as the pipe is wrapped.

4.2 Pipelines require spiral wrapping with a 55% overlap of material to ensure a sealed coating and a double thickness of protective material. To spiral wrap a pipe both top and bottom protective films require stripping as the FibaRoll is wrapped around the pipe. The spiral wrap is started at an angle (the smaller the pipe the larger the angle) and tension must be applied as the wrap progresses. This will exclude air from the wet FibaGel as the FibaRoll is wrapped into it.



4.3 When the pipe length is fully wrapped and cured a coating of FibaGel LVCC can be applied to the FibaRoll. This will seal all cut edges and when cured will give a hard tough , glossy finish and additional weather protection.



It is best practice to cure the coated pipe as soon as is practical. The coated wrap must be allowed to cure fully using natural UV light and in poor natural light conditions lamps can be used. The undersides of pipes and pipes in trenches require special attention and reflective foil or sheeting can be used to reflect light to underexposed areas. Typical curing times in good daylight for FibaRoll are 2-3 hours however curing times can vary depending on the light levels. FibaRoll requires Ultra Violet (UV) light (wavelength 360 – 420 nm). For indoor applications where natural daylight is very low or non-existent a suitable artificial light source (a std. metal halide lamp, contact us for details) is required to cure the material.

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4.4 Suggested / recommended tools

- a) To mix the activator catalyst into the FibaGel CC LV a stirrer ‘stick’ or an appropriate variable speed drill with a stirrer attachment.
- b) Brushes 100 –150 mm width, soft rollers of a similar width or soft edge squeegees / scrapers to apply the FibaGel as a primer to the pipe or a top coating to the fully cured FibaRoll.
- c) Disposable gloves.
- d) Seam rollers to roll down any seams that have lifted.

5.0 Application Conditions

5.1 The weather should be dry with the ambient temperature ideally 5 °C above the dew point and the substrate 3°C above. Light levels have to be assessed and if judged to be too low then appropriate lamps must be used, please contact FTi Ltd. for details.

5.2 FibaRoll and FibaGel materials **can not** be applied in wet conditions as the moisture affects the curing mechanisms. In dry conditions FibaRoll can be used up to 70 °C and down to –15 °C however any applications in extremes of conditions should be discussed with FTi Ltd.

5.3 To assess cure times vs light levels there is a simple daily test that can give a good indication of curing times in prevailing light levels. A small sample patch is taken and cut in two, these pieces are stuck together as you would an overlap joint to create a double thickness of FibaRoll. This test piece is placed in an area that has the poorest light levels and at suitable time intervals (30 minutes), checked by attempting to scratch the inside surface with a fingernail. When you can no longer scratch the surface of the material it is fully cured. This is your cure time for an overlap joint in an area of the least available UV light in those prevailing light conditions. Any areas that are in shadow, for example the bottom of a pipe in a trench, often require the use of some reflective material such as aluminum baking foil to reflect the light (natural or otherwise) into these areas. The weather should be dry with the ambient temperature ideally 5 °C above the dew point and the substrate 3°C above.

6. Health, Safety and the Environment.

6.1 Both FibaRoll and FibaGel contain Styrene and this is the chemical that one can smell when dealing with these materials. The emissions measured from FTi’s materials are well within the prescribed OEL levels. However some people find the smell unpleasant and in confined spaces or areas with little air circulation it is necessary that extraction be used and that there is a free flow of fresh air. In confined spaces we further recommend that concentrations of styrene are monitored.

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Both FibaGel and FibaRoll materials are sticky and applicators are advised to wear gloves when handling.

6.2 Any waste materials should be cured off fully and this then becomes inert and can be disposed of as non-hazardous.

When using lamps as a curing tool use appropriate protective glasses to reduce glare.

7.0 Application, integrity testing, quality and trouble shooting.

7.1 Once the complete protective coating has cured non-destructive testing should take place. A full and detailed visual inspection must take place with particular care to check seams and terminations. To ensure a uniform coating without holidays or pinholes a spark tester can be utilised at 3KV per mm thickness. In the unlikely event that any areas spark and there is evidence of pinholes in the coating these areas require to be abraded and a further gel coat or FibaRoll patch applied ensuring that the holes are fully filled. These areas must be further tested to ensure coating integrity.

7.2 If you find that the tackiness of the FibaRoll is reduced or the sheet begins to 'stiffen' then the sheet has been exposed to UV light and extra light protection is required.

7.3 In high light areas it is preferred to cut FibaRoll with the top facing upwards so that if any stray light catches the sheet it should not effect the tackiness of the side you want to stick to the substrate.

7.4 Whitening of the FibaRoll as its curing or in its 'cured' state indicates some form of inhibition of the curing mechanism has taken place. This may be due to the top film being stripped too soon or high levels of moisture present due to wet conditions or high humidity. Unless extreme this whitening does not effect the physical properties unduly, however it can be unsightly and should be avoided by keeping the top film on until fully cured or the atmospheric conditions improve.

As a registered ISO 9001 : 2000 (cert. No. 21354) company we have full trace-ability and would strongly recommend that on all applications the batch numbers and product codes should be noted down to comply with your quality systems.

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Technical Specification Data for FibaRoll VECR HS

Product description: A glass reinforced laminate based on an epoxy novolac vinyl ester resin system. The glass fibre will have both continuous and randomly oriented glass fibres. A “C” glass veil is used to extend weathering and chemical resistance.

Colours : White, Grey and Natural. Special colours can be available please contact FTi.

Delivered in rolls 600mm x 10m or as slit reels dependent on application.

Thickness : 1.5 , 2.0mm as standard.

Grade		FibaRoll VECR HS	
PHYSICAL PROPERTIES:	UNITS	VALUE	METHOD
Tensile Strength	MPa	190	ISO 527
Elongation at break	%	3.7%	ISO 527
Flexural strength	MPa	287	ASTM D790-03
Flexural modulus	GPa	9.0	ASTM D790-03
Impact resistance (Izod)	kJ/sqm	60	BSEN ISO 180
Hardness	Barcol	61	ASTM D2583
Water absorption	%	0.36	ASTM D570
Adhesion to steel	MPa	>1,000psi	
Coeff. of thermal expansion x 10 ⁻⁵ /°C		2.9	ASTM D696
Volume resistivity	x 10 ¹⁴ Ω.mm	5.9	IEC 93
Electrical resistance	kV/mm	17.2	IEC 243-1 1998
Styrene emission	PPM	4	
Operating temperature	Deg °C	150	
Heat Distortion Temp. Deg°C		>255	ASTM D648
Chemical resistance :		Excellent	Chem.Res.Chart

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Technical Specification Data for FibaRoll ISO HS

Product description: A glass reinforced laminate based on an isophthalic polyester resin system. The glass fibre will have both continuous and randomly oriented glass fibres. A “C” glass veil is used to extend weathering and chemical resistance.

Colours : White, Grey and Natural. Special colours can be available please contact FTi.

Delivered in rolls 600mm x 10m or as slit reels dependent on application.

Thickness : 1.5 , 2.0mm as standard.

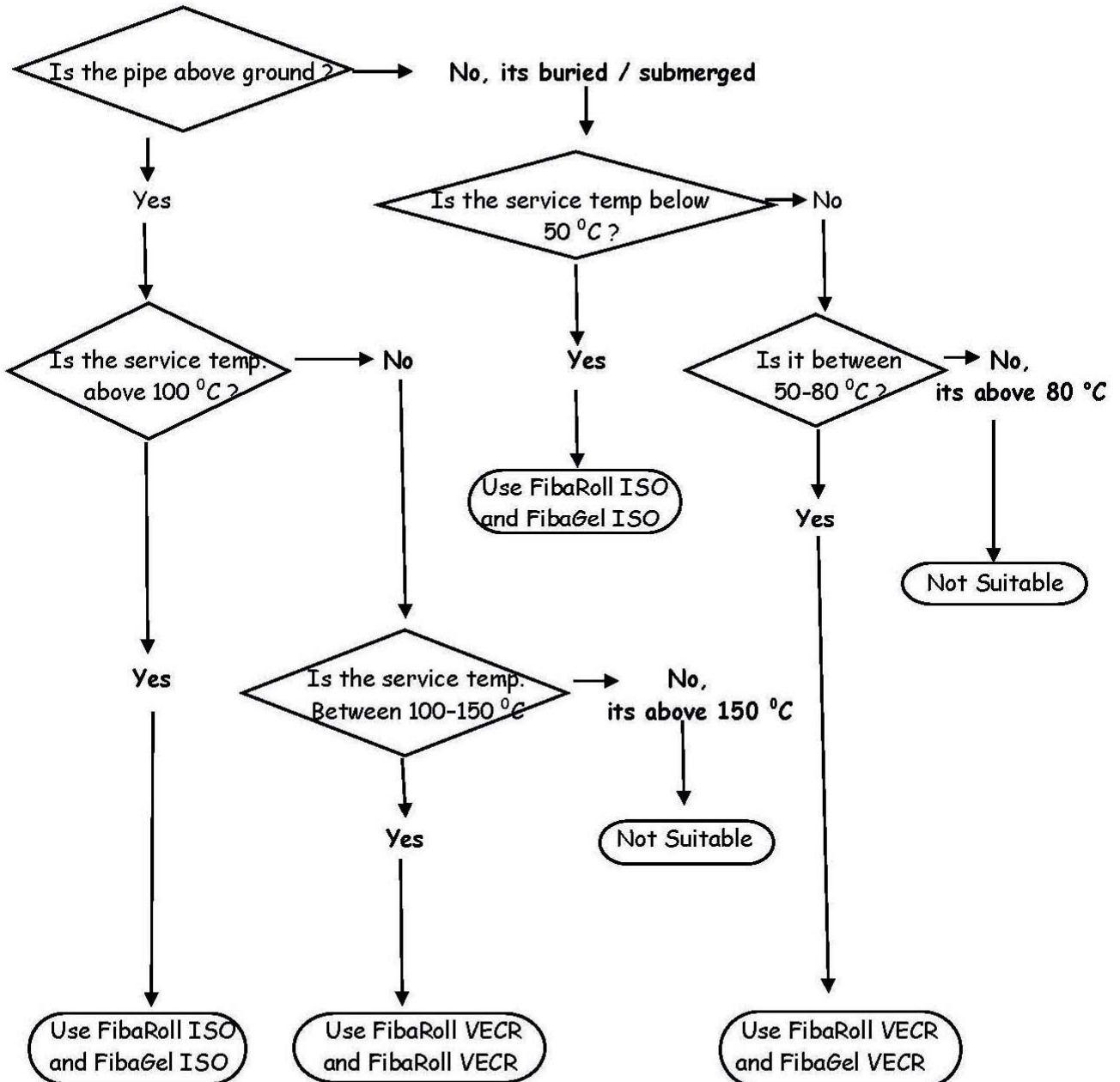
Grade		FibaRoll ISO HS	
PHYSICAL PROPERTIES:	UNITS	VALUE	METHOD
Tensile Strength	MPa	167	BS 2782-10
Elongation at break	%	1.5%	BS 2782-10
Flexural strength	MPa	258	ASTM D790-03
Flexural modulus	GPa	9.0	ASTM D790-03
Impact resistance (Izod)	kJ/sqm	60	BSEN ISO 180
Hardness	Barcol	56	ASTM D2583
Water absorption	%	0.36	ASTM D570
Adhesion to steel	MPa	>1,000psi	
Coeff. of thermal expansion x 10 ⁻⁵ /°C		2.9	ASTM D696
Volume resistivity	x 10 ¹⁴ Ω.mm	5.9	IEC 93
Electrical resistance	kV/mm	17.2	IEC 243-1 1998
Styrene emission	PPM	4	
Operating temperature	Deg °C	100	
Heat Distortion Temp.	Deg°C	>255	ASTM D648
Chemical resistance :	Excellent		Chem.Res.Chart

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Appendix 1

Selecting the Correct Grade of FibaRoll / FibaGel for Spiral Wrap Applications



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