

Glass Fibre Reinforced Products

for Industrial Applications



AMIANIT PIPE SYSTEMS

Amiantit – Group of Companies

The Saudi Arabian Amiantit Company (Amiantit) was established in 1968 in Dammam / Saudi Arabia and has grown and developed into a major diversified industrial group with operations spanning the globe. The Group's core business activities comprise:

- manufacture and sale of pipe systems
- ownership and sale of pipe technologies
- the provision of water management consultancy and engineering services
- manufacture and supply of polymer products

Today, Amiantit markets a wider range of pipe products than any other pipe manufacturer and provides a total solution to customers' fluid transfer needs that is designed to optimise the applied technology and costs. The Group serves industrial, municipal, civil engineering, energy, and agricultural markets worldwide, supporting global infrastructure development.

The Group comprises approximately 30 manufacturing plants, 6 technology companies, 9 water management companies and 4 materials suppliers. In addition, an extensive sales and service network caters for the needs of customers in countries around the world.

Amitech Industrial

Amitech Industrial, a part of the Amiantit Group, is located in different countries worldwide. It supplies a complete range of services for engineering and jobsite works. The division also designs and manufactures Glass Fibre Reinforced Plastic (GRP/GRE) and related thermoplastic/fluoro-plastic products for the mining, petroleum and chemical industries and gives individual support for special applications, installation and maintenance for many industrial applications. Amitech Industrial Spain is specialised in the engineering, design, delivery, supervision, installation and hydraulic testing of tailor-made spools and fittings and industrial pipe systems/applications. Their skilled staff and manpower have a wide expertise managing GRP installation projects in power plants, thermo solar plants, desalination plants, chemical industry, industrial sewage, fish farms, fire fighting systems or biodiesel plants all around Europe and North Africa. Amitech Industrial South Africa specialises in the manufacture of custom made GRP products for the chemical, metallurgical, mining, petrochemical and general industries where pressure, temperature and corrosion resistance are required. The company designs, manufactures and installs worldwide plants and equipment which include piping, ducting and fittings, process vessels, gas scrubbing plant and vessels, solvent extraction plant, water treatment, storage tanks and other process vessels. The product range also includes GRP overwrapped high specification thermoplastics & fluoroplastics for extreme conditions. GRP can also be applied directly onto existing rubber lining, steel and concrete substrates as a corrosion protection liner. The products and materials also incorporate the supply and installation of supporting steel structures, stainless steel products, lead linings and products.

Our product brands:

- GRP (Glass-fibre Reinforced Plastic) pipe systems are sold under Flowtite and Vectus brands
- GRE (Glass-fibre Reinforced Epoxy) Pipe systems are named Amipox
- GRP tanks, vessels, ducting, pipe & fittings are branded as AMIFIBRE



Industries and Applications

Thanks to their high performance, Amitech Industrial systems and services are of special interest for the chemical, petrochemical power, water treatment, metallurgical and mining industries:

Air Purification Systems

Environmental legislation is clamping down on “dirty industry” and there is an increasing need for air purification systems. These incorporate the interconnecting ducting, flow dampers, scrubbing equipment (mass transfer scrubbers, precipitators and cyclonic scrubbers), fan impellers and stacks.

All of the above are constructed in GRP.

A typical GRP scrubber comprises:

- Packing support plates / gas injection plates
- Packing for packed beds
- Bed limiters
- Liquid distributors incorporating weir and trough distributors, pan type distributors, spray distributors.
- Sparge pipes
- Demister sprays.
- Chevron demisters
- Pad demisters



GRP/GRE and allied thermoplastic products offer good chemical resistance at elevated temperatures and pressures and vacuum conditions to most acids, chemicals and other corrosive elements. The additional excellent mechanical resistance at pressure and the excellent product properties make Amitech Industrial products the most suitable material for transporting/storing fluids, dumpings and water at high temperatures.

The success of GRP/GRE equipment in a chemical and metallurgical environment also relates largely to the initial design. Amitech Industrial boasts some of the best design capabilities for GRP/GRE and thermoplastic process vessels and structures.



Desalination Plants

At present, 44% of the world's population lives in areas of high water stress. To create more freshwater, many areas are turning to desalination, in which seawater or brackish groundwater is purified, either through evaporation or by being forced through a filter under high pressure, a process known as reverse osmosis. During the last years, the desalination process has become more competent and also lower in cost, so many projects all around the world are under construction or in the planning stages.



Desalination plants must ensure the supply of potable water through sea water and must ensure uniformity and good potable water distribution. So they must be capable of supplying potable water to the required population and the network must be able to give freedom of use in consumption.



Flowtite GRP pipes are able to withstand both the operational loads and external loads coming from machinery, comply with local health requirements and assure a corrosion free system, no water loss, low head loss, low maintenance needs with very low life-cycle costs, as well as allowing high velocities.

Therefore, GRP pipes, as well as other special GRP fittings, are used extensively from the intake and pumping station to the internal process piping and subaqueous outlet (submarine emissary). GRP Flowtite pipes are the best choice for a desalination plant, due to their excellent corrosion resistance, good mechanical and hydraulic properties, together with the long life (minimum of 50 years design life) and very low life-cycle cost.

GRP Flowtite is resistant to sea water corrosion and also to the environmental conditions in which it is installed. The resins used in the manufacture of the GRP pipes provide a natural resistance of pH 1 to 10.



As hydraulic characteristics remain constant over time, there is no need for linings, coatings or cathode protection. Its extremely smooth bore results in very low friction losses and reduces pumping costs. In fact, many projects can use a smaller GRP pipe, while keeping the flow characteristics of a larger concrete pipe.

With complete piping systems and engineering and installation capabilities, Amitech Industrial can provide solutions for modern desalination plants worldwide.

GRP pipes in desalination plants are used in:

- Seawater intake pipeline to plant
- Brine discharge from plant
- Internal plant treatment pipelines (piping)
- Distribution network of potable water

All GRP/GRE products offered guarantee high security in case of fire and have often been used and planned in industrial systems with high fire risk, especially for buried lines in chemical and power plants.



Food and Agricultural Industry

Amitech Industrial GRP products have food certificates for the secure transport and storage of food related liquids. The sugar, wine, olive, brewing and canning industries benefit from the low thermal conductivity and the good resistance of GRP against aggressive acids, chemicals and cleaning liquids.



Industrial Sewage Treatment

Amitech Industrial Spain has developed this range of GRP products, achieving incredible results in industrial waste water treatment. This is the most complex sector in the sewage treatment field.



Treatment processes have been designed for different applications. Listed below are the most important areas in which Amitech employs its expertise:

- Neutralization
- Oxidation reduction
- Physical-chemical treatments
- Degreaser
- Biological treatments
- Flotation
- Conventional and laminate decantation
- Mud dehydration

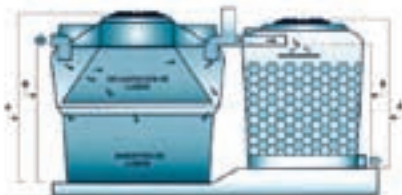
The range of product for these treatments are:



GRP Surface Tanks



GRP Underground Tanks



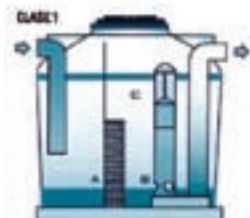
Biological Treatment Station



Sludge separators



Dispenser Tanks



Hydrocarbon separators

The “modular water purifiers” are the best solution for treating industrial waste water, achieving high performance with very low investment in terms of operation and maintenance cost.

Paper Mill Industry

Our GRP systems are especially recommended for the processing and the transport/storage of wood pulp, whitening agents, colouring and residues. In the printing works, they are commonly used for the transport of liquid residues with acidic and solvent contents.



Petrochemical Industry

GRP and GRE pipes and accessories are commonly used in the oil industry, not only for the transport of oil in the oil fields, but also for sewerage and brines derived from this activity. These materials are also used for transporting hydrocarbons and in fire extinguishing systems and this includes, as well as pipelines, tanks and processing vessels for petroleum products.



Power Plants

The increasing demand for energy requires the construction of new power plants or the renovation of old ones all over the world. All projects need to carry a big quantity of water, both for processing and cooling systems. The installation of a material such as Flowtite GRP pipes allows long-term confidence in the pipeline system, with low installation, operational and maintenance costs.

The water circulation system is the most common application for GRP pipes. The main aim is to cool the condenser using saltwater or freshwater. However, due to their excellent properties, Flowtite GRP pipes are widely used in many other processes inside a power plant, in both underground and aboveground installation.



The cooling process takes place in an open or closed circuit. In the first case, sea or river water is transported from an intake line to the condensers and is then returned to sea or river through the discharge line. The closed circuit requires cooling towers, where hot water coming from condensers is lowered in temperature before returning to the condensers.

GRP is extensively used for the intake, pumping station, main cooling system, discharge and subaqueous outlet (submarine emissary), as well other with special GRP pieces and water lines for auxiliary refrigeration. It is also employed in other systems, such as water treatment plants and fire fighting networks.



Rainwater storage

Nowadays, water is considered the most important resource everywhere, including the industrial sector, where it is used in their processes.

The AmiStorm Tank is the solution recommended by Amitech Industrial to store and treat the water coming from rain and storms.

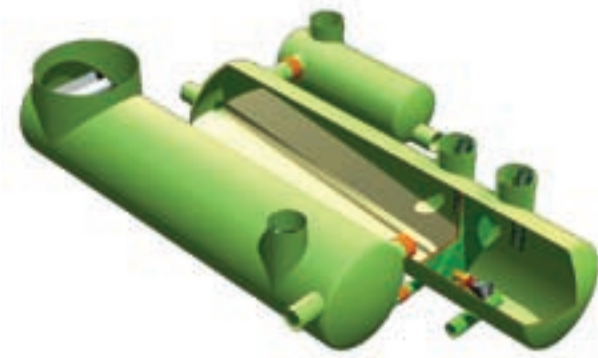
Many lines, also in big diameters with different lengths, can be placed in parallel, increasing the volume recovered from rainwater. Then the water is purified in the tank, and becomes useful for many industrial processes, such as manufacturing, maintenance or swilling tasks. Tanks are supplied in parts, with a cleaning system and all hydraulic equipment preinstalled.

Materials and Product Properties



Shipbuilding Industry and Off Shore Rigs

Their excellent corrosion resistance, lightness and fire resistance, make GRP/GRE products the first choice for cooling circuits, storage, transport and general construction.



Marine Water Treatment Systems

Commonly used in sea outfalls and intakes, large GRP structures are designed to provide long life and easy installation below sea. Water intakes, as well as diffusers, have been supplied up to 3.5 m in diameter, combining workshop and jobsite manufacturing. Large diameter wyes are also designed according to project specifications and provide great advantages during the installation as well as the operation of the pipelines.



Amitech Industrial's preferred material of choice is Glass fibre Reinforced Polyester (GRP) or Glass fibre Reinforced Epoxy (GRE). Depending on project requirements, the design work is also carried out using thermoplastic or fluoroplastic piping, vessels and equipment.

	Filament Winding (FW)	Contact moulded Hand Lay-up (HLU)
Glass content by weight (%)	65 to 75	28 to 35
Heat Distortion Temperature (HDT) in °C (pending resin system)	99 to 150	99 to 150
Coefficient of thermal expansion mm/mm/°C	21 x 10 ⁻⁶	21 x 10 ⁻⁶
Elongation (%)	1,5 to 5	1,5 to 5
Young's Modulus in MPa	12 000 to 35 000 (in hoop direction)	6363 to 12 000
Lap Shear Strength in MPa	7 (min)	7 (min)
Peel Bond Strength in MPa	5 (min)	5 (min)
Barcol Harness (Typical)	30 to 60	30 to 60
Tensile Strength in MPa	400 to 1000 (Pending direction of glass)	85 to 340 (Pending direction of glass)
Compressive Strength (random) in MPa	210 to 480	70 to 170
Thermal conductivity in W/m °C	0,2	0,2
Density in Kg/m ³	1700 to 1900 generally accepted as 1850	1350 to 1500 generally accepted as 1450

Typical values for VE resin laminates

GRP/GRE is a composite material which is characterised by the high strength of the glass fibre and the corrosion resistance of the resin. The combination of mechanical and chemical properties of the glass fibres, together with the different resins used, combine in the final GRP/GRE product to a tailor-made solution for many applications. The important selection of the resin, in combination with the glass fibres, determines the level of corrosion resistance and influences the product properties with regard to temperature and pressure.



Features and Benefits

Amitech Industrial products provide long term economic solutions to customers around the world. The long list of features and benefits add up to provide an optimum system of installation and life cycle costs.

Corrosion-resistance

- Long, effective service life materials
- No need for linings, coatings, cathodic protection, wraps or other forms of additional corrosion protection.
- Low maintenance costs

Light weight

(1/4 weight of ductile iron or steel; 1/10 weight of concrete)

- Low transport costs
- Eliminates need for expensive handling equipment

Long standard lengths for pipes

(6, 12 and 18 metres)

- Fewer joints reduce installation time
- More pipe per transport vehicle means lower delivery cost

Extremely smooth inner bore

- Low friction loss in pipelines means less pumping energy needed and lower operating costs
- Minimum slime build-up can help lower cleaning costs.

Low thermal conductivity

UV resistance



Certificates and Approvals

Amitech Industrial considers quality an essential factor for the success of the company. In addition, respect for the environment is an essential factor of our company policy. The satisfaction of customer's requirements and quality standards has top priority, and all products supplied are manufactured according to the standards and certifications required by the customer. Amitech Industrial complies with different certifications or norms depending on our customer's requirements.



Depending on product and location, our products or facilities are approved

- by UNE EN ISO 9001:2000
- by UNE EN ISO 14001:96
- as AENOR product
- by ACS (Atestacion de Conformité Sanitaire) for potable water use
- by CSTB (Centre Scientifique et Technique du batiment)
- by NSF (Standard No. 61) – United States
- by DVGW – Germany

In addition, independent associations have certified the compliance of our products. Among others these are:

- American Society for testing and Materials, ASTM
- American Society for Mechanical Engineers, ASME
- American Water Works Association, AWWA
- Factory Mutual Research, FM
- American National Standards Institute, ANSI
- International Organisation for Standardisation, ISO, BS, EN...
- by DIN EN 1796
- by DIN EN 14364

Product Range

Pipes

The types of pipes and fittings supplied are dependant on the required piping system for each application and project specifications. GRP/GRE pipes and fittings are manufactured by continuous filament winding or double helix filament winding. To cater for several industrial applications, the GRP/GRE pipe systems are produced with Polyester, Vinylester or Epoxy resins and can be supplied in a wide range of diameters and pressures.

Individual specifications are available according to customer's requests.

Diameter	25 to 4000 mm
Nominal Pressure	1 to 100 bar
Stiffness	1250, 2500, 5000, 10000 Pa
Corrosion resistance	According to resins used
Temperature	Up to 120° C

Pipe product range



Fittings

Amitech Industrial has specialized in the design and manufacture of fittings in GRP for all its range of pipes and applications. For metered fittings, a complete product range up to 4000 mm diameter and in all required pressure classes is available. Moulded fittings, also available in Polyester, Vinylester and Epoxy resins, are offered in diameters from 25 to 1200 mm. Among others this includes the following main fittings:

- Elbows 11°-22°-30°-45°-60°-90°
- Equal and reduced tees
- Concentric and eccentric reducers
- Full face and Stub / Backring flanges
- End caps
- Wyes

A speciality of GRP is the high flexibility with regard to shape and design. This allows the supply of tailor-made, special fittings, designed and manufactured according to the needs of your project.

Joining Techniques

All Amitech Industrial piping solutions have proven joining systems that ensure the correct functionality of the system through its whole estimated lifespan. Amitech Industrial supplies connections to other materials, connections to pumps, valves, vents and other accessories. The most common joining methods are:

- **Joint with elastomeric sealing rings** either as standard GRP coupling or bell-spigot end for the double helix pipes. Adding a locking device can resist axial forces.
- **Butt and strap joints** are permanent joints consisting of a laminate of glass mat and tissue with resin, especially used for strong axial forces.
- **Flanged joints** allow the regular dismantling of the installation and are also used as connectors between different materials. Available as GRP/GRE fixed or loose flanges.
- **Adhesive bonded joints** are commonly used in epoxy piping (GRE) and allow fast and reliable connections by gluing the shaped bell ends of the pipe.
- **Locked joints** are double bell couplings with rubber gaskets and additional locking rods to transfer axial thrust from one pipe section to another.



Tanks, Scrubbers, Vessels and Chimney Stacks

Amitech Industrial also designs, manufactures and installs customized GRP and related thermoplastic and fluoroplastic piping, ducting, process vessels, storage tanks, exhaust stacks and ancillaries.

This individually designed product range includes, for example:

- World's first patented **scrubbing system** including scrubber and quench vessels with internal diameters of 4.3 metres and overall height of up to 22 metres carrying internal weight in excess of 100 metric tonnes
- **Scrubber vessels** with internal diameters of 7.3 metres and overall height of up to 30 metres carrying internal weight in excess of 350 metric tonnes
- **Pulsation columns** for SX extraction with an internal diameter of up to 4.5 metres and overall length of 23 metres carrying an internal weight in excess of 250 metric tonnes
- **Double walled underground storage tanks** for petroleum storage with an internal diameter of 3.2 metres and overall length of 13.5 metres with a storage capacity of 104 m³
- **Chimney stacks** with an internal diameter of 2.2 m and overall height of up to 77 m
- **Complete piping and ducting systems** for electro-winning base metal plants
- Numerous **process vessels** including wet electrostatic mist precipitators, gas cooling towers, storage tanks, gas scrubbing vessels, including ducting, varying from 0.8 metres up to 2.4 metres in diameter

Services

Amitech Industrial offers outstanding experience and support in the design and development of solutions with composite material. Our experts support consultants and engineers in establishing the best GRP/GRE solution for their individual project.

Amitech Industrial offers the following services:

Technical assistance to designers and engineers for

- Project study and selection of the most suitable materials according to the conditions of corrosion, temperature and pressure
- Detailed project engineering
- Configuration of the installation and calculation of supports and anchorages
- Hydraulic calculations
- Stress and finite analysis for underground and aboveground installations using Caesars / Pro Engineering software.
- Drawing of plants, isometrics and production sheets in AutoCad and Solid Edge

Prefabrication

- Spool drawings for jobsite fast assembly
- Workshop pre-mounting of spools
- Special fittings manufacturing at jobsite

Installation

- Jobsite supervision
- Hydraulic tests
- Jobsite teams for product installation

Evaluation and Systems Maintenance

- Inspection and diagnosis of installed systems
- Maintenance plans for established networks and plants
- Repairing works and substitution of installations



References

Due to worldwide availability of its products, Amitech Industrial has established projects all over the world. The list below only represents a small extract of the references available.

For further information please visit our reference page at www.amiantit.com!

Project		Country	Diameters	Pressure
GRANADILLA I	Combined Cycle - Cooling System	Spain	DN 600-2000	6 bar
ESCOMBRERAS	Combined Cycle - Intake Line with GRP Tower	Spain	DN 3200-3500	6 bar
TIRAJANA I	Combined Cycle - Cooling System	Spain	DN 250-2000	6 bar
MELILLA	Desalination - Sea Water Reverse Osmosis Plant	Spain	DN 25-1000	10 bar
AS PONTES	Combined Cycle - Cooling System	Spain	DN 200-2800	6 bar
ASCOMETAL	Steel factory - Cooling System	France	DN 400-600	10 bar
TIRAJANA II	Combined Cycle - Cooling System	Spain	DN 250-2000	6 bar
BIODIESEL MOYRESA	Biodiesel - Process Piping	Spain	DN 450-600	10 bar
FERROL RCI	Fire Protection System (buried)	Spain	DN 100-350	16 bar
PERTH	Desalination - Sea Water Reverse Osmosis Plant	Australia	DN 25-1300	10 bar
GRANADILLA II	Combined Cycle - Cooling System	Spain	DN 600-2000	6 bar
EMILE HUCHET	Combined Cycle - Cooling System	France	DN 1400-1700	6-10 bar
MIRA	Fish Farm - Process Piping	Portugal	DN 200-2600	6 bar
IRSCHING	Combined Cycle - Cooling System	Germany	DN 400-2200	6 bar
ALCÁNTARA	Water Treatment Plant - Process piping	Portugal	DN 400-1800	6 bar
LARES	Combined Cycle - Cooling System	Portugal	DN 150-2000	6 bar
ALCUDIA	Desalination - Sea Water Reverse Osmosis Plant	Spain	DN 25-800	6-10 bar
PORT de BARCELONA	Combined Cycle - Cooling System	Spain	DN 150-2000	6 bar
FORUM BARCELONA	Combined Cycle - Cooling System	Spain	DN 100-800	6 bar
TORDERA	Desalination - Sea Water Reverse Osmosis Plant	Spain	DN 100-800	10 bar
MONTOIR de BRETAGNE	Combined Cycle - Cooling System	France	DN 150-2000	6 bar
MOSTAGANEM	Desalination - Sea Water Reverse Osmosis Plant	Algeria	DN 100-1400	6-10 bar
EXTRESOL I & II	Thermo Solar Power Station - Cooling System	Spain	DN 100-1100	6 bar
BAIX LLOBREGAT	Water Reuse Facilitie - Reversible Electrodialysis	Spain	DN 100-800	10 bar

Project	Country	Description
TMMiC/ LURGI	Taiwan	Manufacture and installation of sulphuric acid mist precipitators and corresponding GRP ducting
AMPLATS/ LGP	South Africa	Design, manufacture and installation of 7.3 m dia x 30 m high gas scrubbing towers, storage vessels and ducting and piping for platinum plant
CHEVRON/ TEXACO	Angola	Supply and installation of material and piping for pumping seawater for cooling purposes on oil refinery
IMPALA PLATINUM	South Africa	Design, manufacture and installation of 2.2 m x 77 m high GRP chimney stack, ducting, piping and sulphuric acid plant vessels.
SKORPION ZINC MINE	Namibia	Process piping (25mm to 2200 mm dia), Tanks, Ducting and Launderers for electrowinning cellhouse and Solvent extraction plant
MOPANI COPPER	Zambia	Design, manufacture and installation of sulphuric acid mist precipitators. Cooling towers, Gas scrubbers and piping and ducting
AFLEASE URANIUM	South Africa	Design, manufacture, erect and test GRP process piping for solvent extraction plant
SASOL	South Africa	Design, manufacture and erect HCL storage tank (157m ³)
UHDE for SASOL	South Africa	Design, manufacture and erect ECTFE lined GRP ducting for Wet Sulfuric Acid Scrubbing Plant
HATCH	DRC	Supply and installation of GRP equipment including electrowinning plant cell linings and extraction ducting
LESEDI NUCLEAR SERVICES	South Africa	Design, manufacture and erect GRP underground firemans for power station
RIOZIM	Zimbabwe	Design, manufacture and erect GRP stack
BATEMAN	South Africa	Manufacture of GRP Pulse Columns for solvent extraction plant
GROUP FIVE	Angola	Installation of GRP piping for oil refinery

Utmost care has been taken to ensure that all the contents of this brochure are accurate. However, Amiantit and its subsidiaries do not accept responsibility for any problems which may arise as a result of errors in this publication. Therefore customers should make inquiries into the potential product supplier and convince themselves of the suitability of any products supplied or manufactured by Amiantit and/or its subsidiaries before using them.

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