



Characteristics

The GRP moulded grating, composed by glassfiber strings and thermosetting resin, is the ideal pavement for many applications. Chemically resistant and lighter than metallic gratings, this kind of material is a good choice to industrial, urban and domestic installations, with no need of maintenance.

This grating is manufactured in panels with a high resistance mesh that allows cutting in the application site, minimizing this way the waste. After cut or indentation is not required any additional treatment.

Moulded into one piece, the concave upper side makes it anti-slipping. In situations of superior demands it may be applied a fine grain anti-slipping layer.

The square mesh grating is the one with better resistance and major profits as well. It has square mesh with bars of equal sections in both ways, which allows its application without the need of continuous support.

A variant of this grating is safety floor. It is composed by superficially covered grating. On its surface may be applied an anti-slipping layer.

Properties and benefits

- High resistance, the moulded grating combines glassfiber strings with a specially formulated resin in order to obtain a high quality grating.
- Corrosion resistance. Grating may be manufactured with polyester and vinilester resins to obtain an excellent corrosion resistance.
- Impact resistance, it is possible to cyclically load grating without permanent deformation.
- Non-conductor, the excellent thermo isolation makes this material ideal to tension work platforms, floor and walkways.
- Resistance to slipping, the superior surface is concave is created during the manufactory process, in order to obtain an excellent resistance to slipping. It is possible to add silica to the surface to improve this characteristic.
- No deflagrate, is adequate to installations where hydrogen and other fuel gases may be present. Contrarily to the metallic grating that may cause fire from the sparks resultant of an accidental tripping of tools on grating.
- Maintenance free does not require maintenance costs, such as paint job, because the color is incorporated on the matrix.
- Easy installation, due to its low weight, around ¼ of steel's. Moulded grating is light enough to be handled without elevation means, which decreases the costs of

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ALTO
Perfis Pultrudidos, Lda.

Presentation

Since 1996, Alto – Perfis Pultrudidos, Lda, manages its production on composite materials area, where is specialist on pultrusion processes manufactory, hand lay-up, VARTM, infusion, moulding by contact and resin projection. These processes are fiber reinforced plastics exclusives, also named polymeric matrix composite materials.

Located in Oporto, Alto – Perfis Pultrudidos, Lda is a certified company by the ISO 9001 Standard.

We're a young team with a team of engineers open to new challenges. Innovation is a priority to this team spirit.

PULTRUSION



Pultrusion is the given name to the automatic process of continuous production of constant section products, being the major part of these products profiles and tubes. This process is applied exclusively to composite materials.

The process may be compared to conventional extrusion; the difference is that the force used to make the material go thru the spinner is applied after this one, thru a traction system that grabs the profile, while on extrusion the force is applied before the spinner.

As pultrusion is a continuous process, benefits of advantages from the process efficiency and effective control, resulting in uniform properties and good dimensional tolerance. Also, as a result of the continuous process, it may be manufactured profiles of any size, having as single limitation the profiles transportation. Is also usual to produce profile rolls of small section, this way is possible to have a few miles of length, what makes the transportation easier. It is possible to produce any section, which may be very even and very bright, although this kind of finish isn't usual request for industrial application.

Pultrusion is one of the greatest processes of glassfiber reinforced plastics (GRP), although other types of resins may also be used, such as carbon fiber and aramid fiber (Kevlar®).

The pultruded profiles stand out for:

- Maintenance free
- Excellent resistance to corrosion
- Lightness: around 4 times lighter than steel and 2/3 than aluminum
- High relation resistance / weight
- Excellent electric, thermal and magnetic isolation
- Dimensional stability which translates into a low thermal dilatation coefficient and resistance to intense heat or cold
- Color, its added pigments to obtain the desired color. The matrix is entirely the same color, which allows the camouflage of the scratches
- Easy handling. These materials are easily cut, drilled, glued, riveted or screwed using conventional equipments
- Excellent behavior to fatigue and fluency
- Transparent to radio frequency transmissions
- Large variety of possible sections, which allows design freedom and property choice as resistance, weight, color and flexibility
- Reproducibility in the manufactory process, the length of the profiles is only limited by the transportation. Small section profiles may be rolled up
- Good mechanical vibrations absorber

VARTM



VARTM (vacuum assisted resin transfer moulding) process, is indicated for series over 50 units. The piece manufactory consists on putting dried glassfiber inside the mould which is closed against another mould, also made of glassfiber, where injected low pressure resin and is vacuum assisted. This process allows obtaining regular pieces on both sides and a good finishing. The piece's thickness and weight are very similar for each produced piece. The cost of this mould is superior to the manual moulding process, but the obtained quality of the piece is a lot superior.

The glassfiber mass percentage in this kind of piece is inferior to 30% of the piece weight.

A good part of the exterior panels of "Metro do Porto" (Oporto's Metropolitan) were manufactured by this process, Alto was pioneer on the introduction of this process in Portugal.

HAND LAY-UP/INFUSION



Hand lay-up

The hand lay-up process is the most indicated for small series, usually under 50 units. The moulds, of an only face, made of GRP (glassfiber reinforced plastic), and are manufactured from a model, which may be of wood, polyurethane, aluminum, among others. These moulds are low cost.

The piece is manufactured on a mould applying glassfiber layers manually impregnated with resin. This process cannot obtain controlled thickness and it is difficult to guarantee an even thickness and weight of every piece. In this case it is possible to obtain pieces with the same mould geometry but with different thicknesses.

The glassfiber mass percentage in this kind of piece is inferior to 30% of the piece weight.

Infusion

The infusion process allows obtaining pieces with high mechanical properties, fiber percentages of around 70% of the piece's weight. This process, which was developed for the manufactory of aeronautical pieces of great dimensions, uses many disposable materials for the manufactory of each piece. The costs of these consumables have been lowering and nowadays this process is used to manufacture of many pieces with high mechanical demanding.

The process is identical to the VARTM process where the counter-mold is replaced by a flexible membrane. In this case it is applied maximum depression, squeezing the resin, guaranteeing a high concentration of glassfiber. In this case the consumable materials quantity for the manufactory of the piece is very high, consequently the price is higher. This process is used on the manufactory of technical pieces, standing out the manufactory of