KYRIOM GROUP

Facilities Service



www.kyriomgroup.com

PULTRUSION PROJECT

PULTRUSION TECHNOLOGY

PROFILES PULTRUDED IN COMPOSITE MATERIALS (FRP)

Dear Sirs,

Our Group which manufactures composite materials intends to open a start-up with a production base in Malta, with the functional purpose of supplying international markets.

DESIGN QUALITY

This business idea is the product of experience accumulated over 25 years in the building construction, Industry, Agriculture, Energy.

Production of high quality profiles, made of composites by pultrusion technology.

The objectives include offering a new, innovative and cutting-edge product to global markets, which are able to improve environmental quality as well as simplifying services.

DESCRIPTION OF THE PULTRUSION PROCESS

Pultrusion is a continuous process for manufacturing **composite materials** with constant cross-section.

The term is a compound word, combining "pull" and "extrusion".

As opposed to extrusion, which pushes the material, pultrusion works by pulling the material.

The pultrusion process is based on the balance between the pulling speed of the puller devices and the resin polymerization times: if the catalysis occurs too quickly, the material becomes hard within the heated mold (die), blocking the traction process .

On the contrary if the catalysis is too slow, the material will be released from the die yet gelled and the tensile force to which it will be subjected will cause the deformation of the profile.

So, to get quality productions, in addition to equipment of a high standard, it is vital the experience, dedication, focus and accountability in departments responsible for technical production.

The mechanical properties of the profiles depends on the quantity and type of raw materials (resins and fibers) that are used.

Many resin types may be used in pultrusion: both thermosetting (polyester, epoxy, acrylic, vynilester, etc.) that thermoplastic (PVC, polyurethane, polyethylene, etc.) and various type of reinforced fibers.

FRP profiles made with the pultrusion process have excellent mechanical properties (such as tensile strength) in the direction of the fibers, unlike the mechanical properties in the transverse direction that are low but may be improved with design features and contour.

To increase the mechanical properties in the transverse direction is possible to add reinforcing mats (with fibers arranged in two or more preferential directions) in the composite mixture.

With the "PULTRUSION" technology it is possible to obtain a constant section profiles by a continuous extrusion process with very complex geometries.
The mechanical characteristics vary in function of the amount and type of fibers and resins used.

These products can be colored in the mass or to get the best aesthetic result, a surface finish with veneer, in the commonly used materials such as PVC films or sheets of wood and can be painted.

For painting we have refined an innovative technology, unique in the world, which does not require mechanical abrasion of the composite support and thanks to a special chemical process allows the best results of adhesion and durability, greater than or equal to the powder coating used for aluminum.

MAIN PROPERTIES OF THE FRP PROFILES

1) **Thickness min/max :**

1,5/50 mm

2) **Maximum encumbrance of the profiles to be extruded:**

1000x2500(h) mm

3) **Raw materials used in pultrusion process:**

a - Thermosetting Resins:

- Polyester
- Vinylester
- Epoxy
- Acrylic

b – Reinforcements :

- Rovings
- Mats
- Reinforcing Mats
- Wovens

c – Fibers :

- Glass
- Carbon
- Aramidic
- Poliester
- Natural

d – Inactive positions :

- Calcium carbonate
- Quartz
- Kaolin

e – Fillers

f – Catalysts

FEATURES PROFILES COMPOSITE

- **PRODUCTION OF PROFILES WITH CONSTANT CROSS-SECTION ALONG THE LENGHT**
- **LIGHTWEIGHT**
- **SIGNIFICANT CORRIOSION AND CHEMICAL RESISTANCE**
- **THERMAL INSULATION**
- **ELECTRIC INSULATION (NOT WITH THE CARBON FIBER)**
- **ACUSTIC ISULATION, INSONORIZATION**
- **OPERATING TEMPERATURES FROM -40° C TO +120° C**
- **PROFILES CAN BE REALIZED IN VARIOUS SECTIONS, SHAPES AND COLORS**
- **MAINTENANCE IS NOT REQUIRED**
- **HIGH MECHANICAL RESISTANCE**
- **LOW ASSEMBLY AND TRANSPORTATION COSTS**
- **LOW COST OF FOUNDATION**
- **RITARDANTE FIRE**
- **ELECTROMAGNETICAL TRANSPARENCY**
- **RESISTANCE TO CHEMICAL AND ATMOSPHERIC**
- **PAINTABLE**
- **POSSIBILITY 'OF STRUCTURAL BONDING**
- **POSSIBILITY 'OF MACHINING**
- **COMPATIBILITY 'WITH ALMOST ALL MATERIALS**
- **EXCELLENT PERFORMANCE IN THE MARINE ENVIRONMENT**
- **NO OXIDATION**

The amount of the reinforcing fibers and the direction in which they are arranged inside the profile confer a structural strength similar to steel.

PROPERTIES	PULTRUDED Profiles	STEEL	ALUMINUM	PVC
Density g/cm^3	**1,75 – 1,9**	7,8	2,8	1,4
Tension Strenght MPa	**400-500**	370-500	200-400	40-60
Tension Modulus GPa	**30-35**	210	70	2,8-3-3
Tension Extension %	**1,5-2,0**	13-35	5-35	10-80
Flexural Strenght Mpa	**400-450**	330-500	200-400	70-110
Flexural Modulus GPa	**20-25**	210	70	2,8-3,3
Crash Resistance MP/m^2	**200**	400	200	85-95
Dielectric capacity KV/mm	**5-15**	-	-	40-50
Constant Dielectric	**3,5-4,5**	-	-	3,3-3,7
Thermal conductibility W/m°C	**0,25-0,35**	100-230	100-230	0,15-0,25

Pultrusion is a relatively new technology and for this reason the FRP profiles are still used only in few applications.

We are therefore in presence of a new technology with large opportunities of development.

The pultruded profiles can be certified:

- **according to the European standard EN 13706 as structural profiles ;**
- **according to the American standard UL94 V-0 for flammability of plastic materials;**
- **according to the European standard UNI EN 13501-1 for reaction to FIRE classification.**

APPLICATIONS ALREADY MADE

ELECTRICAL SECTOR

Thanks to the excellent properties of electric insulation is possible to fabricate:

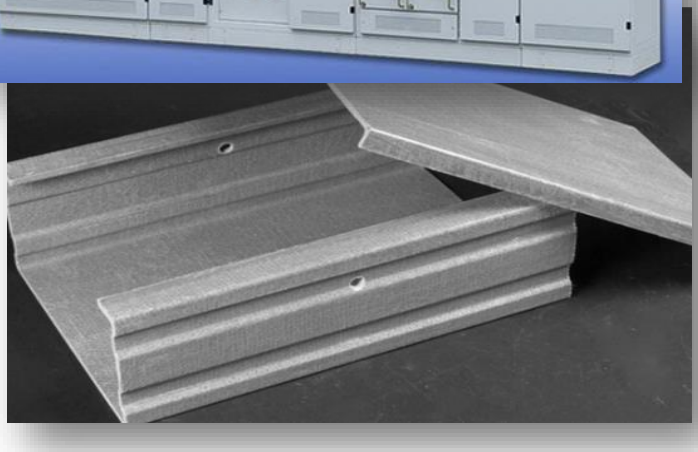
- Security ladders
- Cable glands
- Antennas
- Transmitters
- Electrical cabinet doors
- Lamp posts
- Electric Switchboards
- Scaffoldings
- Platforms











We made ladders, pipes, panels and electrical substations, poles, scaffolding with wheels: for companies operating in the electricity sector and high voltage.

Antennas, radio stations, cable ducts, poles: for television and radio broadcasters, for army, air force and navy .
Fixed scaffolding and wheels for sale on building warehouses and Brico Center.

AGRICOLTURAL SECTOR

The excellent durability properties are exploited and unassailable to chemicals

- Sostegni per fiori e piante Supports for flowers and plants
- Supports for drip irrigator
- Supports for wine plants





For fruit plantations and screw from grapes, we have provided round or shaped profiles of various sizes and length, supports for hail protection nets, channels for sewage for animal husbandry, pipes for drip irrigation for greenhouses and for roof gardens.

CONSTRUCTION SECTOR

The high mechanical properties, the lightness and the good chemical resistance make the application of the pultruded profiles extremely attractive especially in those areas where climate is very critical (for example: torrid heat, sand storms, extreme cold).

We have product or under negotiation, for Construction companies, of excavations and movement earth, ceramic and marble:

 profiles for reinforced concrete, rust-resistant and maintenance-free
 Sheet piling to lose at sea for containment of artificial islands,
 Profiles reinforcement of drilling for electrical conductivity risks for tunnels and mines
 Consolidation Structures soil
 Strengthen and earthquake-resistant structures for emergency and rescue services
 Raised floors for outdoor, ceramics industry of Sassuolo
 Exterior doors and windows
 Curtain walls and ventilated walls, etc ..
 Fences and structures for airports, military and civil airports
 industrial and civil buildings, prefabricated houses antisimiche in Miami Florida and a resort in an oasis in central Algeria (middle of the Sahara) with 125 houses-hotel

Facilities for curtain walls and ventilated



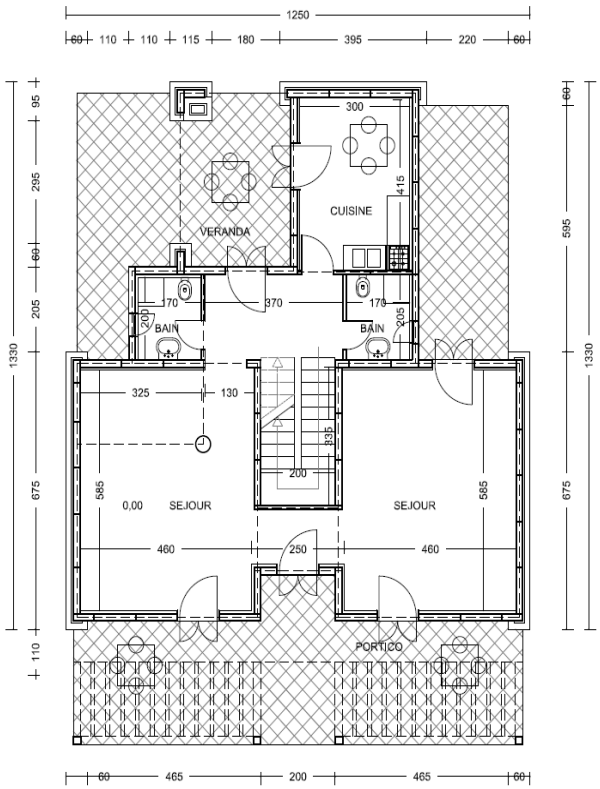
Modern villas (We also different architectures)

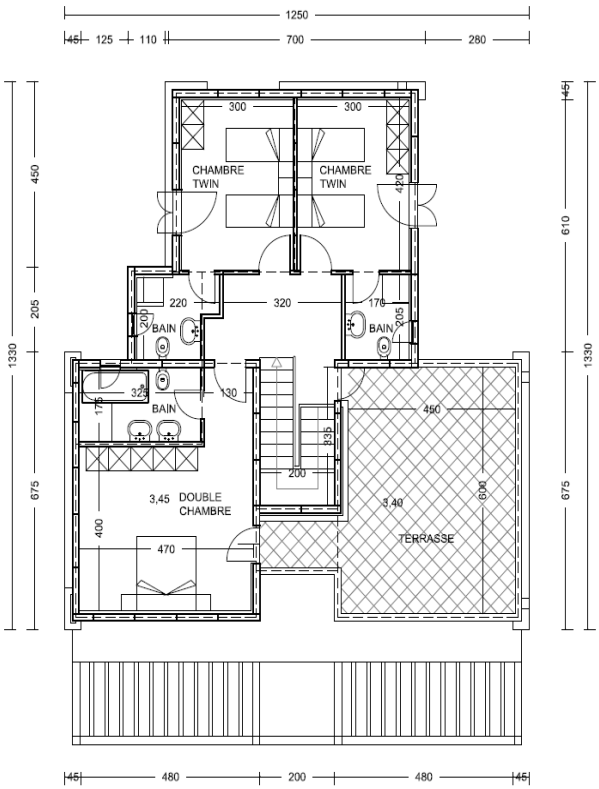


Houses - hotel with roof earth and grass



Different sizes with only the ground floor or first floor version





INDUSTRIAL SECTOR

- Gratings
- Cooling Towers
- Condensers
- Products for very harsh environments
- Reinforced parts for hobby tools (hammer handles, shovels, ecc)
- Bed slats
- Industrial doors
- Sewage discharge ducts
- Protection and anti-static grid
- Oil platforms
- Fences etc..



GANGWAYS



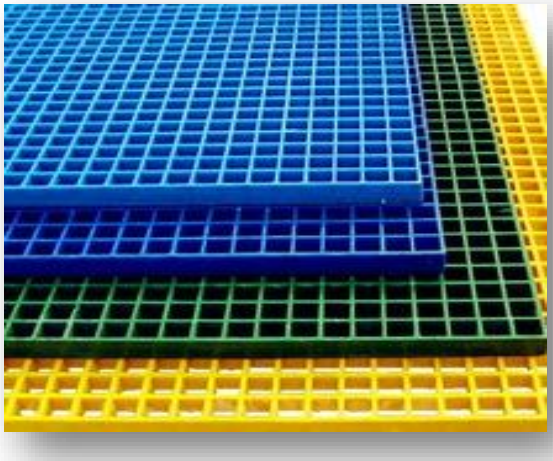
FENCES



BRIDGES

We made for the energy industry, petrochemical, textile dyeing and for the purification department, for oil rigs builders and prefabricated maritime piers and metal carpentry companies:

- Gratings antistatic safety, overhead structures, walkways and railings,
- Bridges in marine areas, with no need for maintenance
- pontoons and floating islands, for companies that produce floating docks





GRATES



CHEMICAL STORAGE TANKS



DUCT DISCHARGE SAV



COOLING TOWER

TRANSPORT SECTOR

- Profiles and panels for isothermal trucks
- Profiles for railways rails
- Buses body
- Reinforcements for boats
- Ports and ecological floating islands
- Licence plate crosspiece for trucks
- Transparent fences for the airports radar
- Acoustic barriers
- Protection and anti-static grid







For the transport sector: We made fences for airports transparent to radar, both for civil and military aviation.
Profiles for cars and grilles of human protection for high-speed rail,
Floating docks for leisure boats, structural reinforcement profiles in fiberglass boats.
Highway noise barriers for construction companies infrastructure.

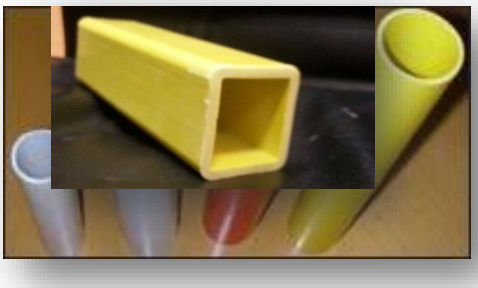
SPORT SECTOR

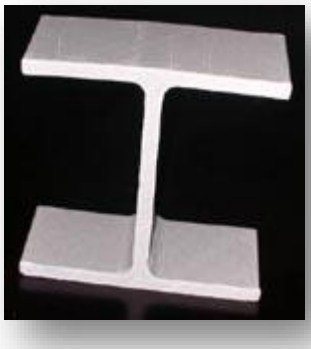
- Ski poles
- Poles for high jump





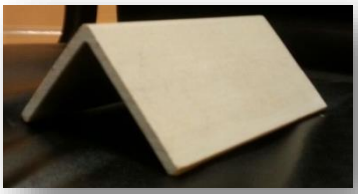
UPON REQUEST YOU CAN MAKE DRAWING PROFILES

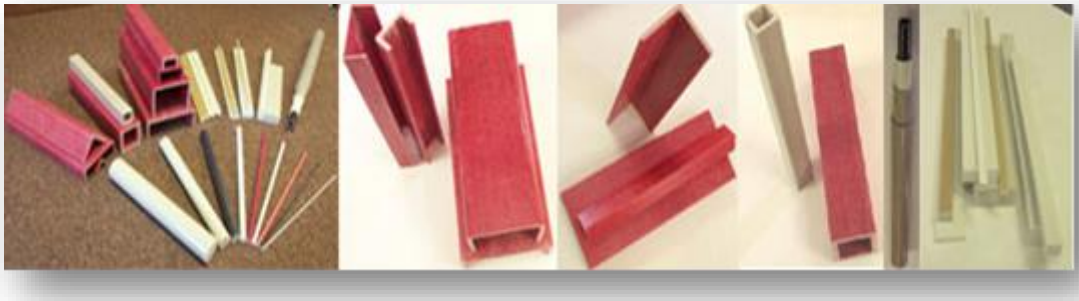












ECOLOGY AND SAFETY

- The products are to be absolutely non-toxic
- Any waste or production waste are classified, according to European standards, including those that can be treated as municipal waste.
- The plant is equipped with all the safety systems (caps, aspirations, etc.) according to the regulations in force.
- Low energy impact: the use of electricity is very limited compared to the main extrusion processes, in fact, in addition to the drive motors of the profiles, to the engine of the power cutter and other tools, a limited amount of electrical energy is used to facilitate and speed the curing of the resins which is the result of the chemical reaction of two or more components and which autonomously produces heat which would, theoretically, sufficient to the realization of the products.

MAIN FEATURES OF THE PLANT PRODUCTION

STRENGTHS

- Unlike the manufacturers of individual equipment, our company is able to provide the complete system with the formula "turnkey", the know-how and training of personnel, production managers in activities initiated, the supplier management.
- Bargain installation costs by using local workers.

NEW TECHNOLOGIES USED

- New extrusion system, PULLER
- Drawing programs CAD
- Extremely innovative system of heating of the matrices
- Simplified system of production management that does NOT require highly skilled personnel.

TECHNICAL SUPPORT FOR INSTALLATION

- The systems are built by us with highly qualified personnel
- The plant can be sold and installed in locations requested by the customer in EU countries or non-European
- The systems are installed with the local workers of average experience in the mechanical sector, provided by the customer, under the direction of a highly qualified Italian coach
- The training of local personnel Production takes place under the direction of one of our technicians highly specialized Italian
- The training of production staff will have a total duration of 60 days (see step 3 and step 4 of the following paragraph) and includes 30 days for testing and 30 training and start of production provided they are available on site all the equipment, matrices, raw materials, the plant suitably built and equipped with all necessary utilities

MAIN STAGES OF PROGRAM

Step 1 - 60 days to the definition of investors
Step 2 - 150 days for the design and construction of the plant
Step 3 - 30 days for evidence
Step 4 - 30 days for staff training and the start of production

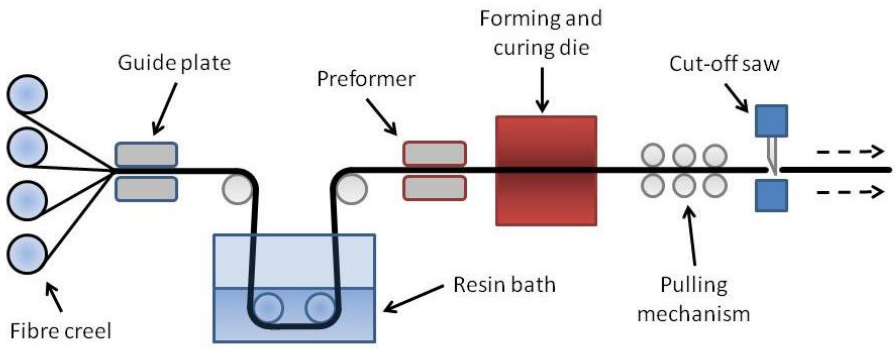
MINIMUM INITIAL OF THE ESTABLISHMENT (5 production lines)

Around 3000 m2 of floor area used as a local production (eg. 60x50 (optimal) / 70x40 / 80x40)
Approximately 500 m2 of external surface besides the space for the road
You have to assess local offices, warehouse, laboratory

FEATURES OF MACHINERY

- N. 1 extrusion line MOD. EN 1200 Power 22 TON
- N. 1 extrusion line MOD. EN 1000 Power 20 TON
- N. 3 extrusion lines MOD. EN 800 capacity 16 TON
- N. 1 Complete plant for the preparation of the mixture
- N. 1 suction system on the machine (except the general system)
- N. 1 plant for the compressed air machine edge (excluding general plant)
- Electrical system of the production line on the machine (except the general system)
- N. 5 test matrices
- Know-how for the production

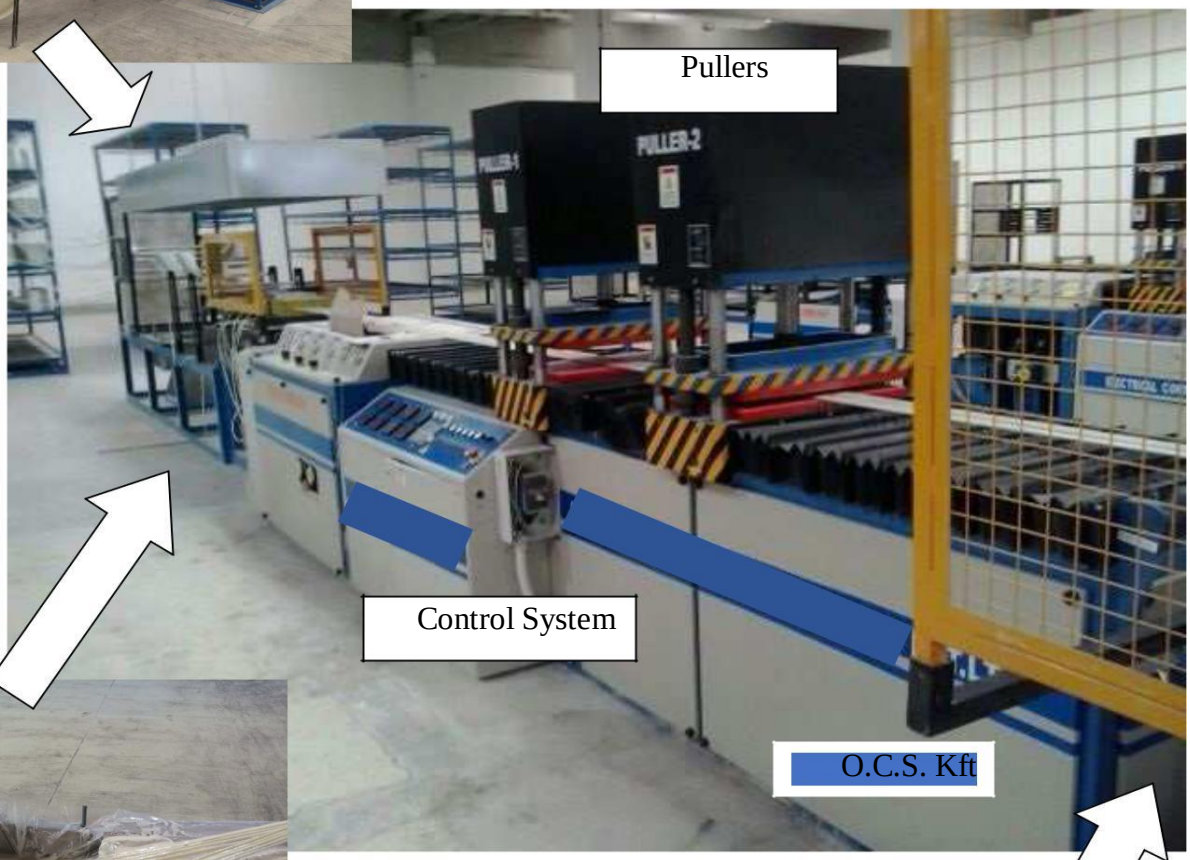
Station for the supply of wicks
Station guidance materials & mats rack
Impregnation station - a resin bath
Preforming impregnated fiber system
Mold heated
Computerized system for process control
Double shooting system Puller Synchronized
Cutting station SAW CUT OFF





Rovings tracks, mats track, material guides

Pullers



Control System

O.C.S. Kft



Resin bath



Cut-off Saw

N.1 Mixing plant at the service of the five lines including:

- Bearing structure with the positions for loading the products
- System for the transport of the resins to the mixer
- Weighing station
- Computer control system
- Weighing Manual additive system
- Containers, scales, work tables, basic equipment for the preparation of the mixtures.
- Connecting to the General of the establishment of various machine utilities such as: exhaust system, electrical system, compressed air system.

Know-how for the production :

- Processing of the profiles to construct
- Determination, use and calculation of the fibers
- Formulations and mixtures
- Use of resins, additives and inactive positions
- Use of the catalysts
- Training of technical staff Site
- Factory starter

PULTRUSION PROJECT

There are very few companies around the world which produce these materials, because of the cost of the facilities and the high level of specialisation and training required.

For these reasons, most companies manufacture products with medium/low quality standards, limiting their production to profiles for third parties using the clients' designs.

We are able to design and manufacture our own products with complete systems for the creation of complex projects such as pre-fabricated houses or continuous facades for sky-scrapers. We do not intend to only manufacture profiles designed by third parties.

The peculiarity of composite profiles is that, depending on their specific application, they can be personalised by modifying the standard mechanical and chemical properties.
With the insertion of multiaxial mesh made of fibreglass, carbon fibre, Kevlar, Aramid fibre, natural or mixed fibres, the mechanical characteristics can be improved.
By adding certain materials, minerals, additives and resins, the chemical composition can be made extremely resistant.
Structurally speaking, the profiles can achieve similar results to metal with just a quarter of the weight.

These materials are extensively used in airports because they are transparent to radars, and on oil rigs and in the electrical energy sector because they are completely insulating.
They are also commonly used in construction as an alternative to iron, in agriculture for their resistance to chemical agents and in restoration projects following earthquakes, and so on.

OPPORTUNITIES AND MARKETS

The global demand for composite profiles has seen an annual growth of 7% in recent years and predictions show that this positive trend is set to continue for many years yet, since demand is always greater than supply.

Today we are finishing the first phase of a project with the Government of Panama for the construction of social housing.

The first lot, out of five, will be in production starting in June / July 2017 with profiled products initially in Italy and subsequently in Malta.
We purchased the land for about 600 homes, but the overall project is to build and sell 1,500 homes over the next three years and the government sells us the missing land.

Additional markets of interest:
Miami (USA), now we have to implement, in partnership with a local company, owns the land and that is implementing the compliance tests to American standards, thirty-five prefabricated houses of medium to high quality.

With this realization and with the help of our local partners we entered the US market and we have officially presented our construction system to the authorities of the city of Miami, arousing great interest.

We had the first contacts to northern markets Europe, in particular Germany and the Netherlands but we are still in negotiation level with possible local partners.

Thank you for your attention and kind regards,

Kyriom Group Ltd
23, Hompesch Road - Fgura FGR 2010 - Malta
Mail info@kyriomgroup.com - Web www.kyriomgroup.com