BUILDING & CONSTRUCTION

COMPLETE PLANTS FOR SANDWICH PANELS

Foaming & Insulation Technology

- Continuous Lines for Large Productions
- Tailor-made Design & Configurations
- Discontinuous Systems for High Flexibility
- Presses for Open & Closed Mould Foaming
- Rigid & Flexible Facing
- Piping Insulation
Rigid polyurethane foam with its ideal strength to weight ratio, thermal and acoustic insulation properties, durability, and unmatched versatility, ensures high performance and exceptional energy efficiency in a wide range of applications: building, warehouses, prefabricated structures, roofs and walls, sectional doors, ducts and air conditioning systems, soundproofing cabins, cold stores, walk-in-coolers, pipes network for water/oil/heating distribution.

The Cannon Group supply the building and construction industry with a wide range of proven, reliable, economically and technologically advanced solutions based on discontinuous and continuous methods for the production of insulated boards, sandwich panels and insulated parts. The decision to choose one technology over another is mainly due to the production volume required, to the part complexity and to the level of investment.

Cannon design and offer a worldwide basis, anything from single stand-alone units up to complex and fully in-house manufactured plants with high degree of integration, technological synergies and automation (automatic loading system for raw materials, handling systems and packaging equipment for finished products, turntables and carousels, premixing units, chemical storage).

When manufacturing complex “turn-key” foaming systems Cannon adopt modular development criteria to offer unbeatable flexibility during configuration. This choice also means that the actual line can be expanded at a later stage with the addition of extra modules.

Sandwich insulated panels can be produced with a maximum thickness of 250 mm and either flexible (paper, cardboard and felt, centesimal aluminium sheet, etc.) or rigid facing (metal sheet, GRP, etc.) and using different types of insulating materials: polyurethanes, PIR, phenolic resins, mineral wools.

Panels with rigid or flexible facing can be part of the building structure and in many cases substitute traditional constructive materials offering better thermal and acoustic insulation properties.

These panels improve the look and utility of the building as well as its speeding-up construction and reducing the amount of expensive wood necessary for structural frames, saving time and energy and protecting natural resources as well.

Dedicated presses and foaming plants for the manufacture of curved panels are also available. Typically a sandwich curved metal panel insulated with polyurethane and internal micro-ribbed liner is used either as new roofing elements or for the replacement of fibre-cement slabs.

The continuous thickness of the polyurethane insulating material provided an excellent barrier against the dispersion of heat in winter and the entry of the sun's rays in summer, giving the panel a pleasant, elegant appearance.

Sandwich Panels for Building & Construction

Roof & Wall Panels

The ever-growing demand for insulated panels in building applications is driven by the new energy-saving regulations imposing significant reductions on power consumption, that can be achieved by the thermal insulating properties of the materials used.

Curved Panels for Roofing

Dedicated presses and foaming plants for the manufacture of curved panels are also available. Typically a sandwich curved metal panel insulated with polyurethane and internal micro-ribbed liner is used either as new roofing elements or for the replacement of fibre-cement slabs.

The continuous thickness of the polyurethane insulating material provided an excellent barrier against the dispersion of heat in winter and the entry of the sun's rays in summer, giving the panel a pleasant, elegant appearance.
In addition, it is important to point out that foamed-in-place insulation delivers the highest energy efficiency and creates a strong, well-insulated monolithic panel. On request, Cannon can also provide complete solutions for the production of insulated panels with an external curved, grooved facing from cement fibres.

The internal flat facing can also be made with either cement fibres or painted steel with a polyurethane core, with the possibility to produce models of different size and shape.

**Sectional & Garage Doors**

Sectional doors and garage doors are another interesting application niche where sandwich insulated panels are successfully applied.

The sectional door comes from a simple and effective concept that consists of dividing the door into panels to be lifted and lowered vertically or moved horizontally, making it modern-looking (attractive doors with various styles, shapes, profiles, finishing and colour options), extremely practical with the great advantage of a reduced space required for the opening/closing phases.

Commercial sectional door and residential garage door panels can be shaped with an attractive stucco embossed painted profile, natural look wood grain style, embossed surfaces, with shadow lines for added strength.

The panels are produced in both continuous and discontinuous processes: the result is a solid and aesthetically pleasing sandwich strong enough to bear commercial abuses. Foamed-in-place PU insulation is highly efficient giving these panels twice as much energy efficiency as polystyrene.

**Air Conditioning & Ventilation Ducts**

Typically, conditioning systems are made of simple trimmed metal sheet panels, presenting some negative aspects: the life-span of the parts is compromised by the formation of rust, acoustic and thermal insulation is very poor, furthermore, on forced air distribution systems, a quarter of the energy used for conditioning is wasted through intrinsic system losses close to ducts and junctions.

As an alternative to the standard machinery for insulated sandwich panels with metal facing, Cannon has developed a new production process for metal-free panels. Instead of using metal sheet, the structural external layer is made of formed composite sheets or glass-fibre-reinforced PU, resulting in a whole plastic panel characterized by its lightweight and excellent structural properties and unbeatable energy efficiency.

Polyurethane foam is a proven insulating material recognized for its reliability, durability and efficiency. Its outstanding insulation properties prevent heat loss, or alternatively maintain temperatures, over an extremely wide range of conditions, from extreme cold environments to ones of intense heat, without freezing or cracking.
The increase in production volumes and the variety of possible applications demands a higher production capacity. For these reasons continuous laminators are the best - and sometimes the only - possible alternative solution for large-scale production.

Roof and wall panels are made mainly of a metal section support and a polyurethane insulating mass, which assure a double barrier, one against corrosion and the other against thermal dispersion.

Therefore elective components, like zinc or paint coated sheets, are chosen to offer an effective barrier against atmospheric agents; the same for polyurethane or polyisocyanurate foams, the most efficient thermal insulators against heat transmission.

Cannon supports the customer with dedicated and tailor-made, on-the-job training courses. On request, training sessions can be organized at a production plant where on a daily basis the customer’s operating staff will work in close contact with our specialist in order to achieve a correct and optimal know-how transfer.
Double belt conveyor.

Sound deadened cabin for cutting equipment.

Handling system and cooling rack devices.

Pre-heating oven for formed metal sheets.

Wrapping machine for panel packaging.

Stacking area.

Bulk storage.
Unwinding Unit

Unwinding group is usually composed of four decoilers, two for the upper profile feeding and two for the lower one, which are equipped with an automatic loading and positioning system of the coil on the relevant mandrel (two is the minimum possible configuration).

The coilers are usually arranged in pairs in order to achieve fast production changes. When one coil is working the second one can be set for the new production.

For Mineral Wool Insulation

Rock wool panels are specially designed and require to meet "fire safety" requirements both for the construction of new buildings and the renovation of existing premises. When the insulation material is not self-adhesive, i.e. mineral wool, the equipment for sheet forming and panel cutting will not change, while in parallel to the metal profiling group, dedicated devices are integrated for mineral wool mattress loading, cutting (either in-line or off-line), handling and gluing.
This keeps the formed sheets at a desired temperature in order to achieve good foam adhesion and the final quality of the sandwich panels.

Roll Forming Machine

Profiling line for wall panels complete with micro ribbing device to shape the rigid facing and form the junctions.

Roof panels require deeper ribs and a dedicated set of forming rolls for the external sheet layer.

The main feature of the roll forming equipment is the number of roller holder shafts, which is related to the profile to be obtained.

The system is designed for fast replacement of the forming rolls (cassette system).

Typically the group is based on a two-levels configuration to separately profile the lower and upper layers.
Dosing, Mixing & Foaming

A high-pressure multi-component dosing unit (number of components according to chemical formulation) equipped with mass flow transducers and double diaphragm pumps. When hydrocarbon-based blowing agents (i.e. Pentanes) are used, the whole foaming equipment is specially configured with dedicated raw material storage, premixing unit, explosion-proof devices and active ventilation system to ensure the maximum safety.

The foamed insulating material, polyurethane, PIR or phenolic resins, is poured by means of a dedicated mixing head assembled and driven by a bar that slides transversally over the panel, giving optimal foam distribution.

For Phenolic Resin Insulation

When using phenolic resins, the dosing unit, storage for chemicals, mixing head and all the parts in contact with them have to be specially designed to handle corrosive and high-viscosity liquids. The resin component could also contain up to 50% in weight of solid fillers to improve the already excellent resistance to fire of these foams: but the operating viscosity of the component is expected to be around 50,000 cps!

Regularly-cut strips of mineral wool are fed between the two metal formed sheets, immediately following a station where a two component PUR adhesive has just been applied by spraying the inner metal surfaces using a double dispensing machine and two transverse mixing guns.
The double belt conveyor represents the most important part of the line. It consists of two conveyor belts aligned one above the other and capable of contrasting the pressure generated by the foam reaction and ensuring a perfect flatness.

The gap between the two belts is adjustable, allowing the processing of panels with different thicknesses. In order to obtain an optimum PU polymerization, the upper and lower sections are independently heated.

A Cannon patented, innovative drive fitted to the conveyor: two independent electric motors operate two endless screws mounted above and below the two belts.

This solution provides higher efficiency and more linear speed avoiding the “polygon effect” and is characterised by lower maintenance and reduced wearing of moving parts.
Cutting Equipment

Leaving the double belt conveyor, the sandwich panel enters a sound-deadened cabin where the cutting machine sawns the finished panels to the desired length.

The cutting group (available with single or double configuration) can be supplied with disk or band saw.

Handling Systems

To avoid heat accumulation, thus preventing wavy surfaces, bulges, foam tears and scorching; the high thickness panels need to be properly cooled before stacking.

To save space, Cannon suggests dedicated cooling rack devices that use air as coolant.
The finished panels are then stacked according to the set quantities requested, before being wrapped by the packing unit placed at the end of the line.

Being a solution provider as well as a worldwide supplier of complete plants, the Cannon Group is also able to offer a full package that includes chemicals and hydrocarbon blowing agent storage equipment.

Cannon satisfy a wide range of customer’s requirements: from simple chemical bulk storage, up to polyol/Cyclopentane blend storage, small bulk storage for hydrocarbons, complete pentane storage systems.

In particular, concerning the storage of hydrocarbon blowing agents, in the case of pilot plants or small production lines, storage containers can be installed immediately outside the production building in a naturally ventilated area protected against the sunlight by a cabinet. This open-air system is easy to inspect and maintain.
The characteristics of lightweight, easy handling, thermal insulation and easy use make the PU insulated sandwich panel a suitable element to meet the most widely diverse construction demands when creating walls, roofs, cold rooms, etc.

While continuous lines are particularly suitable for mass production, discontinuous processes are preferred for small orders, customized shapes, very thick panels and when it is also necessary to include moulding frames and camlock fixings in the foams.

In this sector, the Cannon Group has consolidated twenty years of technological partnership with Manni Presse, manufacturer of hydraulic presses for those specific applications.

Concerning flat panel production, different solutions are available, from a single foaming platen to multi-daylight presses, complete with automatic loading/unloading systems, hydraulic demoulding equipment and eventual tilting system.

The PU injection into the panel can be manually or automatically carried out either through a single injection hole or also with multiple holes positioned along the short or the long sides of the panels. Multi-point injection however will increase the foam’s quality and the additional use of a drawing technique will also enhance foam pre-distribution.

Other applications require open-mould foaming systems; in this case the foam is poured by a special pipe diffuser that is automatically driven along the entire panel overall length, obtaining an optimal foam distribution. Usually the plastic pipe is released and encased in the panel at the end of the process.

On the contrary, when it is necessary to foam inside closed presses, Cannon provides another filling system configuration. In this case the mixing head is fitted on a special automatically driven lance, which is introduced inside the panel along its total length.

The polyurethane pouring phase is carried out during the automatic lance retraction movement, achieving excellent and homogeneous distribution.

Working with discontinuous presses, Cannon demonstrated that the use of a special vacuum-assisted Polyurethane injection method made it possible to manufacture high-quality panels, gaining a 30% productivity increase of the entire plant over the conventional production method, with a better PU foam distribution and quality, and raw material savings.

Single or multi-daylight presses with fixed platens are a highly efficient and economically effective solution to produce several panels in one cycle.

Manni “1+1” or “2+2” presses, equipped with shuttling platens, are dedicated to the production of insulated panels for cold rooms, building applications and refrigerated trucks (max panel size up to 18,000 x 3,600 mm).

The name of the presses relates to the number of shuttle tables applied. With this configuration a typical production sequence ensures that while one panel is foamed and cured inside the press, another one is prepared outside, optimising the production process and skipping downtimes.

A wide range of book-opening presses for open-mould foaming processes is also available.
Book-Opening Presses

Single Multi-Daylight Presses

Multi-Daylight Presses

Tilting Systems

Loading/Unloading Equipment

Dosing, Mixing & Foaming
Most piping distribution service lines are laid underground and are typically made of a metal pipe surrounded by a polyurethane foamed layer, which is protected by a tubular casing of high-density polyethylene (HDPE).

PU is clearly the most effective material, being suitable for applications ranging from small plumbing pipes up to the largest heating pipes (from 10 mm to 2000 mm diameter and 250 mm of maximum insulation thickness), and also giving significant further advantages in terms of perfect adhesion to both metal and plastic casing pipes.

Furthermore, the closed cell structure of the foam inhibits penetration of water into the foam along the whole length of the pipe even if the casing pipe is damaged.

The common PU insulation processes for pipes foresees the use of low pressure dosing units and water blown foams; systems not always able to guarantee the required quality and reliability.

The Cannon technology is instead based on the adoption of high pressure mixing, being a more efficient and reliable technique for the production of homogeneous quality foams, and Pentane as blowing agent, which is an ecologically safe blowing agent having an ozone depletion potential (ODP) equal to zero.

In this way, crossing the extrusion area and positioning the head close to the casting cooling zone it is possible to avoid component degradation and obtain a better foam quality.

The flexible design and the easy and friendly management make these units a valid alternative to low pressure machines on which to begin the development of a technical solution able to meet the main requirements of this project.

Initially they provide the high-pressure technology that offers the opportunity to define an environmental friendly mixing process.

This means that the mixing chamber cleaning operation is no longer required, eliminating the utilization of toxic solvent, avoiding any ambient pollution caused by it and improving the quality of the working conditions.
High performance, mechanical and insulating properties, cost savings, manufacturing flexibility are of course fundamental issues.

One important aspect which still draws on development resources and is of public concern is the behaviour of finished panels when exposed to a flame: a higher resistance to fire and lower emissions of combustion gasses are a top priority, in both developed and developing countries.

To improve the flame resistance of insulated sandwich panels, special fire retardants have to be used. Traditional additives can be very expensive or harmful and so chemical suppliers have tested various alternatives in order to be ready should some of the more common fire retardants be banned. One of the most appealing alternatives is the use of expandable graphite (EG).

For a long time the flame-retardant properties of EG have attracted the formulators of PUR foam systems, but until now the difficulties of processing it - mostly the particle breakage, which affect its expansion properties - have prohibited its use in this specific application.

In recent years Cannon has developed reliable and affordable solutions for the addition of solid fillers to PUR formulations: glass fibres, iron powder, mineral fillers (expanded calcium carbonate, marble and quartz, granulate, barite, sand), recycled PUR etc.

These technologies have been fine tuned and adapted to dose and mix a wide range of solid, very efficient flame retardants, which include not only intumescent products such as EG but also melamine, aluminium hydroxide, red phosphorus and polyphosphates.

No small advantage, the use of EG offers a high flexibility in production because - using the right techniques - it is possible to obtain quick product changes by modifying the formulations “on the fly”.

As the main Polyol stream is left unfilled, it is sufficient to vary the percentage of EG in the premixing station to quickly obtain a foam fulfilling a different fire resistance specification.

To integrate the SoliStream kit and allow for rational preparation of the slurry, Cannon have designed a dedicated premix station with a special feeder for solid particles, which can be used for automatically feeding the kit’s storage tank. This electronically controlled, closed-loop-operated premix can be used for both continuous and discontinuous foaming processes.

Thanks to its properties, expandable graphite could be just the right solution to replace a wide range of flame retardant materials used to make fireproof foams, decreasing the problems caused by smoke, which normally occur in a fire.

Cannon SoliStream kit is a fully-automatic closed-loop dosing system that permits the use of a solid filler, such as graphite, into a discontinuous or a continuous PU foaming production process. It can be supplied as a kit for easy retrofitting onto existing plant, and includes the replacement of the mixing head.

Using appropriate methods for dispersion, mixing and dosing of the solid particles, the addition of expandable graphite increases the flame resistance performance of a standard PUR formulation without affecting the insulation and mechanical properties of the foam.

Reaction to Fire

Reaction to fire is the degree in which a material resists combustion. With regard to this, materials are assigned a class (0 through 5): the higher the class, the higher the degree of combustion.

Resistance to Fire

Resistance to fire is the ability of the building element to limit the spread of flame, and retain the integrity of the thermal insulation for a period of time. The performance of panel systems when tested is expressed in minutes from ignition to the conclusion of the test, which is determined as the failure point at which the panel ceases to comply with the requirements of the specific test.
Customer satisfaction is the mainstay of the Company business philosophy as well as recognizing new trends and creating products and services enabling customers to keep up with competition.

Machinery end-users must respond to ever-growing market demands for high quality products and services, which means that they need to update the production capability by adding new and technologically advanced equipment and to increase volumes while keeping costs low.

With a global network of sales and service operations, Cannon offer a useful and well-appreciated “plus”, such as: prompt local service and spare parts availability, laboratory usage for machine evaluation and trials, technical advice and consultancy, remote service connection, direct help-line assistance, periodical training courses.

The Cannon Group, with more than 10,000 PU metering machines installed worldwide, is the world’s leading supplier of polyurethane technologies and foaming equipment: mixing-heads, low/high pressure dosing units, turn-key plants for continuous and discontinuous processes for the production of:

- domestic and industrial refrigerators
- interior and exterior parts for automotive industry
- flexible foams and slabstocks for furnishing, padding and seating applications
- sandwich insulated panels for building, construction and cold chain industries
- reinforced and filled foams for structural parts
- insulated pipes for district distribution
- gaskets, sealants and insulation solutions for lighting and electronic components