Industry 4.0
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Cannon Deutschland and Cannon USA: Good Reports from Local Offices

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Refrigerators and Insulation Panels, Always a Cool Business!

Smart Thermoforming Equipment

Slabstock Foams, Leading the Way

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Hall 13 - Booth B76

The Cannon Group will be present at the K2016 Show with a special program focused on innovative multi-technical solutions, that will be introduced by a set of presentations dealing every day with a different technical issue.

Plan in advance your visit to the Cannon stand at K2016 and make it a live learning experience. An international team of specialists will welcome and show you how “Cannon Do It Better”!

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K2016 - WORKSHOP AGENDA  
12:00 and 16:00 - Every day

| Oct 19 | Polyurethane in Automotive Interiors |
| Oct 20 | New Generation of Insulation Panel Plants |
| Oct 21 | Industry 4.0 The Cannon Way |
| Oct 22 | Mixing Heads & Dosing Machines The Strength of the Leader |
| Oct 23 | R&D Shaping the Ideas |
| Oct 24 | Composites & Automotive Exteriors New Materials and New Applications |
| Oct 25 | New Developments from Flexible Foam World |
| Oct 26 | Thermoforming New Challenges with Cannon Machines |
Why “Cannon Do It Better”?

Dear reader,

when, in the Editorial Committee meeting, we asked ourselves how to title the most important Cannon News of the year – this number, distributed at the K 2016 show – we immediately thought to a straight message for our clients, those who make our success possible every day. Those clients who keep rewarding us and our commitment by choosing Cannon once more.

Why do they do this?

Because we are increasingly at their side with our Local Offices and our Global Customer Service? It’s not enough, even if we have in the past three years opened four new Companies in South Korea, Indonesia, Vietnam and United Arab Emirates only to improve our commercial and after-sales service in those areas, and we are today present in 33 countries with more than 120 Service Engineers.

Or because we are always available to study and solve the problems that our clients are presenting us, offering innovative and efficient solutions? Not only, even if in the past three years our R&D Team allowed us to propose innovations that are already milestones in the plastics processing technology:

- **VAI** (Vacuum Assisted Injection) – the technology that allowed Cannon to be the first using vacuum in combination with conventional and new blowing agents for Polyurethane foams.
- **JL Vector** – an innovative mixing head, revolutionary in the field of Polyurethane foam injection.
- **TRIPLO** – A Patented plate adjustment system for industrial thermoformers that allows an effortless adjustment of the moulding area at every mould change.
- **CRESIM** – The new frontier for recycled Carbon fibres; Cannon proposed already a series of eight projects for the industrial use of recovered Carbon fibres, with stunning structural and efficiency performances.

Or because we are always able to find the best solution in terms of Quality vs. Price ratio, to satisfy the needs of our clients?

May be, but that’s not the main reason.

The truth is that clients all over the world keep choosing Cannon because Cannon Do It Better!

We have understood that message, we are aware of it, we want to explain it to you while we thank you for your continuing preference.

During the K 2016 Show in Düsseldorf you will be able to attend, at our Booth B76 in Hall 13, a series of workshops pertaining to all the Cannon technologies in the plastics field.

See here, on the facing page, the detailed program of our meetings.

Come and see us, we will listen to your requests, present our solutions and find a satisfactory answer for your production needs... assisted by a good dish of original Italian food.

We are waiting for you, at K 2016!
Are You Ready For the Revolution?

THE INDUSTRY IS MOVING: SMART Factories, Intelligent Automation, Cloud Computing, Predictive Maintenance. The Polyurethanes Industry is Moving as well. Faster Production Cycles, Material Savings, Higher Attention for the Environment, New Applications. We discuss all of this with Francesco Abba, Sales & Marketing Manager of AFROS, the Cannon Group company specialised in metering and mixing equipment for Polyurethanes, epoxies and other reactive chemicals.

CN: These first 50 years saw big improvements in the field of Polyurethanes. Which are the latest ones worth to be mentioned?

FA: To reply to this question we must first of all look at the developments that the Raw Material Suppliers have done in the past years. Their research is allowing for faster cycle times, more thermally-efficient insulation foams, more comfortable flexible grades, new products. We must stay ahead of these developments, being prepared with new process technologies as soon as they launch their new formulations on the market. This is why we keep with all of them a very good relationship, helping them for trials in our R&D Lab or supplying their laboratories with dedicated equipment. Once we’ve said this, it will be very clear why we have developed in the past nine years at least 20 new models of mixing heads – including high flow rates, multiple components, very compact versions for in mould installation and fast moving types for high production rates – versus the 18 models developed in the first twenty years since our foundation. These new heads are making possible daily what we call the “Polyurethane miracle”!

CN: That would be?

FA: We keep saying this since ever: the mixing head is the heart of the system. There is no other reactive plastic or foamed material which is so heavily dependent on good mixing efficiency. Polyurethanes are unique from this point of view: all the performances provided by the chemical components of the formulation cannot be exploited if the blend is not mixed efficiently, and to obtain that you must have a mixing head with the right design. Almost each PUR or Epoxy application requires a specific mixing performance, and that’s the secret of our success: we can develop quickly a proper mixing solution, with the relevant metering circuit behind it, for almost any type of formulation. We cover an output range from 0.4 g/s to 10,000 g/s, with repetitive shot times that can be as short as 0.3 s. We offer heads for a range of component’s ratio between 1:1 and 1:24, the latter used for special applications. We are experimenting with extremely-high viscosity Polylols, up to 50,000 M Pa s, with success. For Epoxy HPRTM process we are experimenting heads working at 150 °C. We work with a 360° horizon, on mixing heads!

CN: Any recent example of this performance?

FA: Take for example the recent FPL SR series of mixing heads designed specifically for rigid insulation foams. Featuring brilliant technical solutions it allows for reliable long runs of production without maintenance or lubrication; it is particularly efficient in mixing gaseous blowing agents with difficult Polylols; its resistance to wear and blockages has been dramatically improved, thanks to the use of new materials; it allows for output rate change in real time, that can be achieved automatically and quickly with the Cannon Multi Injection process; the Variable Output Technology allows to do that also during the injection phase. This head is now an industrial success, panel and refrigerator producers love it because it’s the ideal tool for...
Cannon J L Vector has now been tested successfully in production for 18 months, and it works fine. It’s a new, simplified design of the former JL, with a more rational hydraulic circuit. It has been designed for those manufacturers of very large elements that require at the same time an improved foam laminarity during the injection and higher output values. We’re able to guarantee, with conventional Polyol viscosities, a laminar flow at 2.7 kg/s output, which is what is required to produce high quality foams with very fast-reacting formulations, free from voids and air traps. We can deliver now a 26 mm and a 7 mm diameter models, and the series will be extended to other sizes as needed.

CN: That head is on the market since three years, right? Any new entry in your head’s catalogue for the 2016?

FA: We have just announced our new version of the Cannon J L, the innovative head launched a few years ago for the large panel and refrigerator industries. The new

planned maintenance programme even for those components that seem to be working perfectly, but are already showing some deviation from their standard functioning. We can obtain this through the installation of special sensors on selected equipment – connected in real time with the central control, the operator and his technical manager’s PC or smartphone. All data referring to these checked functions (the wearing of a seal, a fluctuation in the electric consumption of a motor, an unusual performance of a hydraulic or pneumatic circuit, etc.) allow the operator or his maintenance fellows to see immediately on a connected device – operator panel, PC in the control room, smartphone – a graph explaining that specific situation. This saves a lot of
downtimes and repair costs. The machine becomes a combination of individual components with an individual life expectancy, not calculated in operating time but in terms of specific parameters (number of actions, electric consumption, mechanical tolerance, pressure of exercise, etc.) which constitute a bundle of information stored on the Cloud, made available by Cannon or on the client’s own one. With it the management has a continuous pulse of the manufacturing situation, this reflects in economic benefits and increased productivity. Another target, for the customer: to obtain production statistics based on complex data. We used for the past 30 years to collect, store and analyse average production parameters. Now modern electronics and faster data throughput allow to record these parameters during the entire event. All these data becomes part of the production statistic report, at the end of an injection, of a shift, of a production day, week or month, available in real time on the machine, not later on an exported Excel table.

CN: Thank you for your time, Francesco. Anything to add?

FA: We are designing the equipment for a new generation of producers, those who will work in a Smart Factory. We still like to talk face-to-face to Smart People, they stimulate our brain cells. Come and see us in one of our locations, around the world. Together we can make the Fourth Industrial

Revolution!
Continuing R&D efforts in the field of PUR mixing generate new, customer-oriented innovative devices. Maurizio Corti, technical director of Cannon AFROS, illustrates the latest injectors born from this activity.

**Cannon News: Some developments regarding a new series of injectors for Polyurethane mixing have been recently announced to the Cannon Sales Network. Can you illustrate them to our readers?**

Maurizio Corti: In order to explain these new developments I need to define some basic characteristics of these devices, that are a fundamental component of our technology.

The PUR processors would like to use injectors that are able, when a sudden output variation occurs, to self-adjust, without an external action, their internal geometry and maintain a constant pressure, doing so in a very repetitive way at every output variation. Until now such an injector does not exist in a simple version. The simplest injector is just a hole in a thin wall, another model, a bit more evolved, includes a manually adjustable needle that controls the flow of the liquid through that hole; a third, more efficient type of injector, includes a calibrated spring that allows to slide the needle backwards when a higher flow of component occurs or vice-versa when the output decreases, maintaining a rather stable pressure throughout these variations.

We have seen, in the past years, a certain tendency of clients and of formulations to forgive a minor lack of self-adaptation of the component’s pressures when their output changes suddenly. Formulations have become more “forgiving” and they only require a guaranteed minimum level of pressure during the mixing phase: when the pressure is higher than such a threshold, they perform well and the resulting foam is well structured and homogeneous. This fact allows us to look for solutions suitable for flow variations, which are mechanically simpler than in the past, providing to the end user the great advantage of simplicity in operations, reduced cost of consumables and consistent good foam.

**CN: How was this possible?**

MC: We concentrated on the design of a simple, reliable injector controlled by disc springs for a passive self-adjustment of the needle’s position when the flow of component varies. We used for decades the L’Orange injectors, which are very good for medium-low output values and viscosity of the components. Designed for the efficient pulverisation of Diesel fuel in passenger vehicles and trucks, these are real little jewels of precision mechanics, available everywhere at a reasonable cost. Unfortunately, they are not suitable for the very high output values demanded to the foaming equipment for the fast-reacting formulations that are increasingly popular, and when using very viscous materials. They are simply not available in the sizes and with the flow geometries demanded by the actual and future Polyurethane technology. Therefore we worked at the design of our own injectors, which we call “Leak-Free” because they overcome a major limitation of the L’Orange models, an internal leak of liquid which forced the use of a draining circuit to collect the leaked material. We mounted a seal on the shaft of the needle and that problem was past history. We then applied a different type of load to the needle, replacing the old springs with disc springs that provide higher elastic reaction and much greater repeatability than the former generation of injectors. We re-designed the annular section through which the liquid flows, having better control of the effect of the friction over the hysteresis of the needle.

**CN: Quite an academic work applied industrially, it seems. What is the practical result for the consumer?**

MC: We can provide these “Leak-Free” injectors in all the sizes currently requested by the market and the application, without any practical limitation in their internal geometry or size! We currently make a modular range of injectors with a nozzle diameter of up to 6 mm, able to pulverise very efficiently up to 4-5 kg/sec of A+B components. We worked very hard to identify NC machines able to match a perfect geometry between needle and nozzle, with perfect parallelism between the exit hole and the chamber where the needle works: this guarantees repetitive and homogeneous jets of pulverised material throughout the whole range of injectors, for an optimum mixing efficiency. We perfected two types of needle, with different tips, to achieve different performances.

- The conical design, looking like a sharpened pencil, generates a cone of pulverised liquid focused on a precise vertex. This generates a lot of kinetic energy in a single point of the mixing chamber, and is adapt for a wider laminar flow at higher output values.
- The cylindrical design, with the needle tip shaped cylindrically, produces a very open pulverised jet, with high mixing efficiency and a very good attitude to clean the injector’s hole.

**CN: To summarise, what benefits can a customer obtain from these new Cannon injectors?**

MC: The Cannon “Leak-Free” injectors based on disc springs are available in a range of sizes suitable for all the modern formulations. They provide a superior repetitive mixing performance when the user replaces a worn out element of the injector (usually only the needle or the terminal part, for an economic running cost of the mixing head). The performances are constant between injectors of the same size, and no time is wasted in re-calibrating the head’s parameters when changing injectors.

Two types of disc-spring injectors are available at Cannon, with different tips according to the utilised formulation.

A more linear response to pressure variations is the main characteristic of a disc-spring injector.

A disc-spring injector is controlled by a series of metal caps, rather than by a metal spring.
An increasing number of PUR processors is orientated towards spray foams for the production of lightweight Composites: one of the reasons is the lower investment demanded for a spray equipment versus an HP-RTM solution. This opportunity has generated numerous new products, commonly defined by the industry with the name of BayPreg®, ElastoFlex® or others obtained making a sandwich of a corrugated paper (an honeycomb structure) lined on both sides with sheets of a non-woven glass tissue, that is impregnated with a fast-reacting Polyurethane formulation and clamped to shape in a press, immediately after the application of the chemicals.

This technology has been developed nearly 15 years ago, but now, as pressure to lightweight increases in the automotive industry as a way to reduce emissions, this application is further growing, to pull weight out of vehicles. Typical lightweight parts obtainable with these structures are trunk load floors, hatchbacks, sun shades and entire roofs.

Chemical suppliers are developing faster formulations, and an appropriate range of metering and mixing devices is required to process them efficiently with a mass-production approach.

The possibility to distribute very evenly these fast-reacting PUR formulation over the entire surface of a large mould prior to the clamp closing operation – rather than forcing it in a closed mould by means of high-pressure injection – allows for significant advantages:

- There is no resistance, generated by the reinforcement in a closed mould, to overcome a flow of liquid chemicals, therefore the pressure needed to maintain closed the polymerisation press is much lower than that required using a classic high-pressure injection method; this translates in simpler clamping equipment, less expensive to buy and to operate.

- The Polyurethane foam is applied with an optimum distribution of densities, only where it is requested: this reflects in raw material savings. And, as a bonus, there is no mark left on the injection point, that sometimes is difficult to hide or remove.

The application of the foam can be run in hidden time, outside the press, while another part is clamped and polymerising: this provides significantly shorter cycle times and an increased production per working island.

In order to exploit all the advantages deriving from this spray foam technology it is compulsory to use dosing, mixing and distribution devices that provide the highest efficiency, otherwise the above described benefits are lost: in particular, a high efficiency is demanded during the foam application, avoiding to spend more time that it is necessary on each part of the mould.

Dedicated heads to optimise the job

Listening to the needs of the applicators and working in strict cooperation with the Raw Material Suppliers Cannon have developed JetPreg a special set of solutions for the use of industrial spray foams, that as usual starts with a very efficient mixing head, the Cannon LS10, that provides the performances required by the most
The new Teledoor production line is composed by a Dedicated Solution for Teledoor production of sandwich elements, according to the new standards in the fully automated individual opening technology, in combination have never stopped. The multi-daylight press with 30 years ago, the development of new innovative panel production systems – were the first manufacturers of Polyurethane equipment who presented the optimal multi-daylight press design. Since the beginning of their cooperation, more than 30 years ago, the development of new innovative solutions and the supply of larger and larger plants have never stopped. The multi-daylight press with individual opening technology, in combination with the use of the Cannon JL mixing head, is now setting new standards in the fully automated production of sandwich elements, according to the high standards required by the German market.

Multi-daylight Presses, a Cannon Manni Speciality
Polyurethane, as insulation media, again appears as an ideal partner for the manufacturing industry: any change in design and dimension of the products can be handled by easily adjusting some production parameters at the dosing unit. It is a well-known fact that the thickness of foam determines the demoulding time of the panel, which is directly proportional to the longer polymerisation time. To optimise the production cycles, two manufacturing concepts are well-proven for discontinuous panels: the use of shuttle presses and a multi-daylight design. Cannon and Manni – a long-time Cannon-Partner for the development and production of discontinuous panel production systems – were the first manufacturers of Polyurethane equipment who presented the optimal multi-daylight press design. Since the beginning of their cooperation, more than 30 years ago, the development of new innovative solutions and the supply of larger and larger plants have never stopped. The multi-daylight press with individual opening technology, in combination with the use of the Cannon JL mixing head, is now setting new standards in the fully automated production of sandwich elements, according to the high standards required by the German market.

A Dedicated Solution for Teledoor
The new Teledoor production line is composed by the following main components:

- **Multi-Daylight Press with 10 independently operating daylights**: 11 press plates, automatic loading and unloading system, fully automatic mixing head manipulator tri-axial, mounted at the longer side of press, automatic laser-guided system for a reliable detection of the injection holes, mezzanine platform for the entire wet part and all the hydraulic aggregates.

- **3-component High-pressure Foaming Machine, Cannon A-System 200 Servo - Penta Basic**: Dosing machine output up to 3,000 g/s. Mixing head Cannon JL 26, for automatic injection at the longer side of the press, premix station for Polyol + Pentane, type PEF 40 + 4, safety control for Pentane emissions, including IR sensors and ventilation.

**Independently Operating Daylights**
Several workstations have been integrated for the preassembly of the panels on special service trays and included in a tray-transfer system. A pneumatic loading system takes over the trays with mounted supports and foaming tools and passes them to the 10-daylights press. The press concept allows for the independent opening of the single daylights, so it is possible to simultaneously produce different panel thicknesses without the passive periods due to the longer polymerisation times of the thicker ones. After the automatic opening of the relevant cavity the tray with a foamed panel is extracted from the press and lowered to working height level. During this process new trays are simultaneously inserted and the daylight is closing. The new range of panels has been designed and produced by Teledoor according to the long experience matured in the cold stores business: their design required special technical specifications to the new press, and the teamwork between Teledoor, Manni and Cannon again worked perfectly.

**3-component Foaming Machine With a Smart Mixing Head**
The wet part of the entire line designed for the use of Pentane as blowing agent, can dose three chemical components. The premix unit automatically doses Pentane and Polyol according to the desired recipe. The resulting batch is supplied to the tanks of the high pressure dosing machine, a Cannon A-System 200 Servo - Penta Basic, equipped with a Cannon JL 26 mixing head. The injection of the reacting blend can be carried out in several injection holes, with the possibility to perform several injections in quick sequence. The fully automatic mixing head manipulator can be positioned precisely on three axes. The integrated laser system checks availability, position and dimension of the injection holes and grants permission for the introduction of the mixing head. The JL 26 mixing head is a self-cleaning, L-shaped high-pressure version, whose entire foaming cycle is fully automatic, without the need of final purging of the mixing chambers with air or solvents. In addition to numerous advantages in terms of foam quality and even distribution of material within the whole volume of the panel, the JL 26 mixing head features a self-cleaning 370 mm long nose: introducing the mixing head in the side profiles of the moulds to reach the cavity of the panels is a straightforward operation.

**A State-of-the-Art Control**
The whole production process is controlled by a PLC of the latest generation, a SIEMENS S7 – 1500, that handles the press operations with a status of master over the whole plant. The foaming machine is equipped with a SIEMENS control of the same series, which dialogues with the master PLC. All data for production is transmitted by means of barcodes to the master control of the multi-daylight press, for a completely automated and error-free process. As interface to operator (MMI) a Siemens “Touch Screen Operator Panel 2,15” is used. The on-board diagnostics -system makes debugging easier and a maintenance program allows to schedule important tasks routinely.

**A Successful cooperation**
The plant will be operative by the end of 2016. Installation and start-up phase will be fully executed by Cannon Deutschland Technical staff. The Teleservice assistance provided in real-time by the German arm of the Cannon Group ensures that the high standard of the supplied equipment can be exploited by Teledoor with maximum productivity, minimum downtime and an optimised consumption of chemical raw materials.
Cavity Filling for Exclusive Cars

Perhaps the exclusive owners of a Rolls Royce do not know that the quiet comfort of the vehicles they ride is partially due to small buns of soft foam hidden in the body of the car. And perhaps they don’t know either that those buns come out from a Cannon high pressure foaming machine model AP10, that Cannon sold to Rolls Royce in 2010. Since then Cannon has risen as one of the market leaders in this technology, called “cavity filling”: direct injection of fast reacting Polyurethane foam into hollow and tiny spaces of the car body.

Cavity filling – and we’re not talking of dentist’s practice – was once reserved to different kind of vehicles: high level cars produced in relatively high volumes (think to Audi’s A6 or Q5, both acoustically insulated by Cannon machines in China, Mexico and Brazil) or very high level cars produced in very small volumes (think to Rolls Royce). A quite small and fragmented market, characterized by a sort of continental divide between the two shores of the Atlantic Ocean. In North America cavity filling foams have mainly closed cells for waterproofness and they are dispensed in the lower part of the car body, to dampen noise coming from the road.

In Europe OEMs (mostly from Germany) prefer to upholster the pillars of their car bodies with very soft open cells foam, mean to dampen airborne noise. All this explains the scattered diffusion of cavity filling technology among Automotive OEMs. Not that they lack alternative technologies: soft baffles are widely used as acoustic insulators. These ready-made buns are placed in the car body and then they expand when the car body is heated in the oven at the paint shop, filling the cavity.

New Energy Saving Processes Demand New Cavity Filling Formulations

However the future of cavity filling seems today brighter than ever. Saving energy is a compelling need for everybody, including the producers of the most expensive cars; to reduce energy costs in the paint shop a new breed of paints, requiring lower baking temperatures in the ovens, is coming up. But at such lower temperatures conventional baffles will not expand.

That’s where Polyurethane cavity filling formulations step in successfully. And – guess what – Cannon is ready.

Cannon is currently the only worldwide supplier of machines for any kind of cavity filling Polyurethane formulations.
The impregnation and moulding stage is the heart of HP-RTM technology. A Carbon fibre preform is loaded into the moulding press and a high pressure injection of liquid matrix takes place. In order to exploit the fast reactivity of the new generation chemicals, the components of the formulation are kept separated and are mixed on demand, when the part needs to be injected. Being the reaction time very short, the viscosity of the chemical grows significantly within the injection window.

This results in a very severe pressure rise into the mould (this phenomenon gives the name to the process). Typical values in the industry go from 50 to 120 bar.

The mixing and subsequent injection of the matrix is performed through a dedicated dosing and injection unit. The unit is designed to bring the chemicals at the required temperature while guaranteeing a proper degassing and to dose at the correct flow and mixing ratio of the components. The machine is equipped with jacketed tanks, diathermic oil thermoregulator and heat exchangers that can bring the components up to 100°C. The tanks are equipped with dedicated vacuum degassing systems to degas the chemicals to avoid the formation of holes and voids in the final cured part.

The heart of the technology is the mixing head. Inside the mixing head the pressure energy that has been generated with the metering pumps is converted into kinetic energy through dedicated injectors. The injectors’ nozzles are placed into a mixing chamber where two or more streams of chemicals are collided one against the other. The collision generates a very severe turbulence that guarantees a proper mixing.

A Cannon E-System in Germany

A major German car manufacturer has equipped their development laboratory with a new Cannon E-System 5 Enhanced, the latest Cannon dosing unit specifically designed for HP-RTM technology. The three-component machine will be used to develop their next generation of Epoxy-based Composite parts. Their work on Composites generated a number of technological developments that have greatly influenced the design and the efficiency of modern passenger vehicles. In 2015 a project for a new dosing unit for laboratory use was started, specifying a number of innovative technical features.

A bid was launched among the most qualified competitors, Cannon Afros quoted accordingly and, thanks to a proposal that was both technically compliant and valuable, won the contract.

The machine supplied is an E-System 5 Enhanced with 70-litre stainless steel tanks and circuits for resin and hardener. The unit can meter from 15 to 140 g/s of a three-component formulation at typical process mixing ratios. The whole metering section for the resin is enclosed in a heated and thermally insulated box, allowing to work with a constant temperature.

The manufacture of Carbon Composite parts for Automotive applications relies more and more on Cannon wet and dry equipment, for both Epoxy- and Polyurethane-based formulations.
The Cannon LN 10 EPX mixing head has been specifically designed for Epoxy resins.

The part needs to be injected. Being the reaction exploited the fast reactivity of the new generation loaded into the moulding press and a high pressure energy that has been generated with the metering pumps is done very severely, that guarantees a proper mixing.

The mixing and subsequent injection of the matrix is performed through very severe turbulence that guarantees a proper mixing.

A newly developed dosing module has been designed to achieve perfect, uniform and repeatable premixing of the release agent into the resin. The components circuit is designed for an easy change of chemicals to allow for numerous trials to be run in a working day.

The dosing unit is equipped with a dedicated Cannon LN 10 EPX mixing head, designed to fit perfectly in a mould for small Composite parts to be produced with HP-RTM technology.

The machine is equipped with the Advanced Data Acquisition Package, an highly appreciated option of the Cannon E System Enhanced.

All the injection data are monitored in real time and saved on a database stored on machine Hard Disk. The data can therefore be displayed on the 21” touch-screen display and sophisticated statistical analysis can be performed directly on the machine’s HMI.

Components pressures, temperatures and flowrates as well as in mould pressure, mixing head status and mixing ratio are always under control and can be easily recalled and monitored on dedicated graphs to have a precise insight on the process.

Quality CFRP Parts Developed in Korea
A South Korean supplier of plastics raw materials has awarded Cannon Afros with a contract for the supply of a sophisticated dosing unit for HP RTM. A three-component Cannon E-System 5 Enhanced with 70-litre tanks, with the mixing head set up for Liquid Lay Down impregnation technology, will be installed near an existing press in their R&D laboratory. New formulations testing and prototyping will be the main use of the Cannon Epoxy dosing unit.

Fitted with the latest electronic controls and advanced DCSP Data Collection and Analysis software, the new unit will allow the R&D team to run their development work very efficiently, keeping a detailed record of all the injection parameters through the whole time of the injection, for an immediate evaluation of the process performances and of possible malfunctions. All statistic data will be also available from a remote location, through an App installed on smartphones.

A Large Part for a City Car, Made in Germany with PUR
A major Tier One supplier to the German automotive industry has committed to Cannon the supply of a dosing unit for a large structural part destined to an electric urban vehicle. The Carbon Composite piece will be produced using a Polyurethane formulation, providing all the mechanical properties required by its final use at a competitive cost. Further details might be available at a later stage of the project. Delivery of the Cannon machine is foreseen during 2016.

"Trade Winds" Keep Blowing for Cannon!

MORE REPEAT ORDERS FROM LEADING WIND BLADES MANUFACTURERS CHARACTERIZED THE 2016.
NEW DISPENSING AND GLUING MACHINES ARE BEING DELIVERED TO MAJOR INTERNATIONAL CLIENTS.

Cannon Afros range of dedicated machines for the production of eolic blades includes:
- The DX Series Epoxy infusion machines
- Dedicated degassing units for Epoxy resins
- The G-System to apply Epoxy glues

Some of the World largest blade manufacturers confirmed in 2016 their trust in Cannon:
At present time, 30 Cannon DX 35 metering units have been purchased by SIEMENS WIND POWER for their plants in Denmark, UK, USA and China.
The continuing machine’s business with SWP is a pride for Cannon and its international network of offices. Being repeatedly chosen by a world leader in a strategic sector confirms the quality of a whole Company, of its products and of its service.

SUZLON, an Indian leading producer ranked as the world’s sixth largest wind turbine manufacturer, has ordered in the past 18 mons close to 30 Cannon dosing units.

Suzlon appreciates the accurate dosing performances provided by the DX 35, whose actual output precision is guaranteed within 1% of the set value.

The Spanish GAMESA, ranked as World’s #4 producer of eolic plants, confirmed in 2015 a third lot of five Cannon DX infusion machines and two degassing units for Epoxy resins, adding other machines to those already in operation in their plants.

CARBON ROTEK, a large German producer of wind blades, also repeated an order to Cannon Afros for a very sophisticated and totally customized infusion system for resin mixing and distribution.
Especially for the production of small Composite parts and thin lacquer coatings Cannon Deutschland was assigned to deliver a mobile 2-component dosing machine type A-Lab 20, specifically designed for laboratory use.

The task was clearly defined – flexible use, dosing of small quantities, and fast change of materials without extensive rinsing.

The Cannon A-Lab 20 provides the following features and advantages to its users:

- Small chemical volumes, saving raw material costs both for use and disposal.
- Smart components circuit, for a clean workplace.
- Easy change of materials, allowing for multiple trials in a short period of time.
- Compact design, in combination with a movable wheeled chassis, saving lab space.

Two component tanks with a volume of 16 l and adequate drain valves for material exchange characterise the laboratory machine, that otherwise features a circuit and a configuration fully comparable to the “big” dosing units. Two small Cannon axial piston pumps with variable output, adjustable by hand wheel as well as additional frequency drive, ensure a reliable and precise dosing of components.

Maintenance works are reduced to minimum due to the installation of a magnetic coupling at both dosing pumps, which also ensures the required cleanliness.

The Cannon FPL 7 HP mixing head showed that it is ideally suited for smaller dosing amounts.

A 3 m hose package with electrical heating, as well as pressure- and temperature-measuring instruments close to the mixing head, ensure a safe and precise working atmosphere and reliable monitoring of the relevant parameters.

Cannon OVS for Process Data Visualisation, in combination with Cannon MD Link for data-archiving, offer reliable comfort for data processing in the laboratory work.

The Siemens PLC of the latest generation enables reliable function, while a Siemens Touch Screen Operator Panel with a 7” display is used to interface the machine with the operator (MMI). Monitoring of all parameters, as well as the comparison between SET and ACTUAL process values is carried out once per millisecond.

Initial test of the so-called “flooding” of a thermoplastic component, carried out in a nearby injection moulding machine with Turnover Board (external brand) already achieved the best results.

The first step for a prosperous partnership between the Chemnitz University of Technology and Cannon Deutschland was successfully accomplished. Both parties are gladly available for further projects and suggestions.
A Giant Press for European Composites

50,000 kN giant for European Composites

A major order was won in Europe, where a manufacturer of Carbon Composites has decided to choose Cannon Ergos as the unique supplier of a lot of six hydraulic presses for compression moulding. The progression of this customer in the field of Composites is stunning: the company ordered to Cannon Ergos in 2015 one 25,000 kN press with a double shuttling lower platen, for compression moulding SMC and Carbon fibre Prepreg, and one large Carbon fibre Preformer. Then, in the first quarter of 2016, their market outlook for Composites gave positive signals: production capacity had to be increased significantly.

Six short-stroke hydraulic presses with active control of parallelism were technically specified; the quotation submitted by Cannon Ergos matched the investment budget planned by the customer, who ordered:

- **One 15,000 kN press** with single shuttling lower platen, able to carry moulds up to 2.5 by 1.8 m with a daylight of 2 m.
- **Two 15,000 kN presses** with double shuttling lower platen, of the same size.
- **Two 25,000 kN presses** with double shuttling lower platen, for moulds up to 3.6 by 2.4 m with a daylight of 2.8 m.
- **One giant 50,000 kN press** with platens of 5 by 3 m, a daylight of 4 m and a double shuttling lower platen. The press, whose closing speed reaches 500 mm/s, allows to compression mould the whole floor of a large car. Due to its huge size – its pit will be 11 by 18 by 5 meters! – this large unit will be built on site.

Two is Better than One!

The double shuttling lower platen developed by Cannon Ergos has been adopted also by this customer as the most convenient solution for obtaining the highest yield from the plant, leaving the operators the time and the full lateral access to mould the parts, service the mould, load the new material to be processed and position numerous inserts. This method provides the highest productivity because it allows for fast and continuing compression operation of the press: being the most capital intensive part of the plant, it should not stay idle if the service chores are performed in the clamping area, reducing its hourly output.

The delivery of the large order is foreseen between October 2016 and December 2017, providing to the customer an enviable production capacity of compression moulded SMC and Prepreg Composites for the transportation industry.

THE COMPOSITES BUSINESS PROCEEDS AT A HECTIC PACE AT CANNON ERGOS, WITH NEW MAJOR CONTRACTS BEING AWARDED IN THE PAST MONTHS.

**After having received a large order for a Carbon Composites plant for Chinese electric cars, Ergos signed a contract with a European manufacturer for six hydraulic presses – including a 50,000 kN giant!**

Busy months at Cannon Ergos, during 2016!

The successful development of innovative solutions for the mass production of Carbon Composites has generated a flow of orders that is keeping well alerted all the teams of the Cannon Company specialised in large plants for Polyurethanes, plastics and aluminium die-casting processes.

Major orders taken in 2015 are now being delivered or installed: the first lot of equipment of the large plant sold to Kangde in China for the manufacture of Carbon Composite parts for electric cars has been shipped with 20 containers in July. This plant includes Carbon fibre stacks production (with a dedicated nesting software to optimize Carbon fibre yield and minimize handling), Carbon fibre stacks preforming system, HP-RTM (High Pressure Resin Transfer Molding) and LLD (Liquid Lay Down) production cells. The delivery of the second lot is foreseen within this year’s end.

Positive Signs from the Market

The Sales Department reports that, in spite of mild slow-downs of new investments in Europe (but not in every country), a rising ferment towards Composites is visible in the Far East, while an interesting growth of requests is taking place from the USA. Here a large pilot plant supplied in the first months of 2016 for an innovative project in the field of personal transportation has initiated producing the first samples, with a promising forecast for the industrialisation of the production. The supplied equipment includes a very large press, with platens of 4.5 by 5 meters, and a fully automatic Carbon fibre preformer of similar size. The project is still confidential but, when the line becomes operational, it will make the headlines not only of plastics magazines!

Large Carbon fiber preformer and a moulding press have been supplied to an American moulder for the production of Composite parts for an innovative transportation project.
A new generation of resins for Prepregs – the mats of Carbon fibre already pre-impregnated with Epoxy resins, to be used with the compression moulding technology to produce Composite parts – provides faster cycle times than those obtained with conventional methods. Their use, with an industrial process adapt for the mass-production of lightweight parts for the automotive industry, usually involves a two-step manufacturing approach:

- A **preforming operation** of the flat Prepreg sheet, to drape it in an almost final shape, ready to be precision moulded.
- A **moulding process** in a fast-acting press equipped with hot moulds and sufficient closing pressure.

This solution guarantees the best final moulding results when using an innovative product as a modern Prepregs.

**Prepreg Preformer: Efficient and Fast**

The Prepreg sheets utilized in this process must be softened, heating them, and duly shaped to size in a dedicated preformer press. Sometimes the desired preform features a deep draw, requiring special attention during the forming operation: the sheet of Carbon fibre should not be stretched too much – otherwise it can break or leave ample zones of too thin material – and should be able to generate a wrinkle-free preform, to avoid aesthetic and mechanical problems in the finished part.

The automatic Cannon preformer can work from either rolls to make conventional parts or pre-assembled sandwiches made from different fibres pre-cut in irregular shapes.

A customised energy-efficient heating station brings the fibre temperature up to 80-90°C in less than a minute, optimising the entire cycle time. Once pre-heated, the Prepregs firmly handled by two sets of Smart Grippers mounted on a shuffling support. These handling devices are built with a powerful grip – each one features more than 150 kg of traction force – and each of them can be individually controlled with independent movements on the three axes; movements and opening sequence can be easily programmed during the forming cycle to guarantee maximum repeatability even with deep-draw parts.

**THE HIGHER PRODUCTIVITY PERFORMANCES PROMISED BY THE SUPPLIERS OF TODAY’S INNOVATIVE PREPREGS CAN BE OBTAINED ONLY BY USING THE RIGHT PROCESS AND THE RIGHT EQUIPMENT. CANNON ERGOS PROVIDES THEM BOTH ALREADY TO LEADING MANUFACTURERS OF COMPOSITES IN EUROPE, CHINA AND USA.**

**The equipment designed to Preform and Compression mould Prepreg materials features special technical characteristics, peculiar to this processing method.**

**A special unrolling equipment has been designed specifically for this type of Carbon-based materials.**
This Cannon Patented solution allows for an efficient draping of the Prepreg sheet in the various sections of the mould cavity, avoiding the formation of wrinkles in the formed sheet.

The grippers, mounted on a shuttling frame, travel the whole distance from the heating press to the forming press and can transport efficiently the whole range of sheet dimensions. The Cannon preformer can handle – with the units supplied up to now – preforms up to 2.5 by 2.5 metres, with a clamping force of 3,000 kN, but larger solutions can be provided on demand.

The preforming press is a high-speed hydraulic clamp, with a thermal-regulation system that keeps the tools at the temperature specified by the Prepreg suppliers to achieve the shortest preforming time. Additional grippers are installed inside the forming press to increase the active control during the forming of the parts, by holding and draping the material from all four sides.

In less than a minute a complex preform is made, which is then extracted by a robot as the next hot Prepreg comes in from the heating station. The automatic unloading of the formed parts at the end of the cycle avoids any manual intervention of the operators within the press area. At this point the part can be extracted and trimmed to final size, using either a punching press or a robotic contour cutter, both trimming solutions available from Cannon.

This step is necessary to obtain a finished part after the following operation.

Prepreg Compression Moulding: a Cannon Specialty

For the compression moulding process of Prepregs, Cannon Ergos designed a press with dedicated features to combine the main requirements of a fast cycle with the specific processing needs specified by each Raw Material Supplier for their materials.

- One or two lower mould halves shuttling on the front, which allows for a fast loading of the Prepregs and the unloading of moulded parts;
- A revised hydraulic pack which provides both a fast approaching speed and a highly accurate control of the slower working speeds and pressures on the material. The two characteristics can be, when needed, combined with the use of a fifth central piston in addition to the traditional four on the press corners, which are equipped with a very precise Active Parallelism Control that guarantees perfect planarity to the mouldings.

For this technology a press with 25,000 kN of clamping force is available, usually with 3.6 by 2.4 m platens and 2.8 m daylight, with one or two lower platens shuttling on the sides.

A typical thickness of 2-4 mm characterizes most of the Composite parts made from Prepregs, that can be moulded in the largest sizes demanded by an automotive OEM. To ensure the full control of the mould, Cannon Ergos suggests the use of two additional dedicated devices: a sophisticated vacuum-control system for the accurate control of the in-mould vacuum and a thermoregulator able to keep the moulds at the high temperatures demanded by this process.

By using different resin grades, that demand typical mould temperatures of 150-160 °C or 190-200 °C, the current demoulding times for an average part vary from 15 to 5 minutes: an intense R&D activity is currently undergoing on new Prepregs, that aims to speed-up the curing, maintaining structural characteristics in the same range of moulded steel sheet or Aluminium. The Cannon press is already designed to perform a 3 minutes part-to-part cycle, including the service time on the shuttled lower mould half.

When, at the end of the curing, the mould opens, the part is extracted automatically and it’s ready for use. Its surface has acquired high gloss and the Carbon reinforcement is visible through a perfectly transparent layer of migrated resin. The only way to get an aesthetically perfect part is to respect the combination between mould temperature, clamping pressure and curing time.

Each type of commercial Prepreg provides a nice result only if all parameters are kept under the strictest control!

Cannon, being able to supply all the required technologies and equipment with a “single responsibility” contract, provides a One-Stop-Shop approach to the Companies that decide to invest in complete manufacturing solutions for Prepreg-type as well as for HP-RTM Composites. This is a unique offer in a competitive field where several producers of single pieces of equipment are simply not able to guarantee the success of the final result when a complex plant has to be put together!
**Industry 4.0**

**the Cannon Way**

The Industry 4.0 is a structured system that uses cybernetic solution and digital communication in industrial products and services. It is commonly also associated with the concept of "Smart Factory", a transversal process, irrespective of business area, that makes industrial production entirely automated and interconnected. Machinery, people and devices communicate/talk each other for an intelligent management system. Alessandro Mancini, GM of Cannon Automata, illustrates how Cannon is getting ready with dedicated hardware and software solutions to face this industrial scenario.

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**Cannon News: Can you define shortly what Industry 4.0 is?**

**Alessandro Mancini:** The Industry 4.0 is a structured system, that uses cybernetic solution and digital communication in industrial products and services. Commonly associated with the concept of **Smart Factory**, it’s a transversal process, irrespective of business area, that makes industrial production entirely automated and interconnected. Machinery, people and devices communicate/talk each other for an intelligent management system. The impact of digitization in the industry changes, day by day, the production system, making it even more dynamic: the speed of response increases, higher flexibility is now achievable to meet the market and the individual customer needs.

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**CN: We already get sometimes confused messages about the characteristics of this "Fourth Industrial Revolution". can you identify its most specific aspects, to differentiate them from a simple concept of Automation?**

**AM:** We can summarize the characteristics of Industry 4.0 in three keywords:

- **Digital Information:** in this scenario, at least one actor, among the sender and the receiver, is a machine.
- **Automatons:** logic systems must be used, that make possible the automatic operation of machines or entire plants.

Therefore Industry 4.0 should not be confused with a common system using static communications, that do not generate automatic actions, or a system with big latency in communication, or where the information or communication is not finalized to any automatic action.

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**CN:** Once we have defined its terms, can you tell us what is the state-of-the-art situation of Industry 4.0 at Automata?

**AM:** Automata has created vertical technologies, products and services able to integrate machines and plants according with Industry 4.0 concepts. The first embryonal smart system was the **Photo Voltaic Plant Monitoring**, implemented since many years on the roofs of some Italian Cannon facilities (Micromec, Afros, Automata). It’s a flexible application based on sensors measuring solar radiation, working along with inter-related information; an automatic solution that allows to verify the performance of photovoltaic plants. The system monitors in real-time the energy production, comparing it with a historical database of solar illumination data. It is capable to predict and prevent malfunctions, giving the possibility to check parameters, events and alarms directly on smartphones. Since then Automata has produced many solutions that
The Industry 4.0 is a transversal process that makes industrial production entirely automated and interconnected: machinery, people and devices communicate/talk each other for an intelligent management system.

allow Machine-to-Machine talking (M2M), reading information from the memory of the machine or plant CPUs, integrating them with data collected from the surrounding environment and means for Internet of Things (IoT) communication. Factory information could be stored in the Cloud and could be retrieved anywhere from any personal device in order to have real-time data, production data, maintenance status, and alarm on the go.

CN: Something immediately available to an industrial customer?
AM: Sure, I can give you some examples of applications developed, fully tested and available by Automata:
- F3 Net: an intelligent system that acquires, collects, stores, manages and processes in real time a large number of information and events, making them available even on mobile devices.
- Cloud service: it collects and manages machine information and makes it available remotely, in real time and at different levels such as Apps and web dashboards.
- Smart Robot: it provides high flexibility in the robot path’s programming activity, according to production requirements of the supply chain, either by operators or automatically.
- EDEA: a system developed to satisfy the electricity energy requirements, in terms of audit and analysis, allowing to know and keep under control the consumption of electricity. It creates a mapping of the inefficiencies of systems and processes and automatically implements efficiency improvements.
- Preventive Maintenance: starting with an accurate initial configuration, and using a limited number of on-board sensors detecting different phenomena, it is possible from a component malfunction, to prevent machine inefficiency. It would be possible to predict a component malfunction using sensors that analyze its physical behavior. As example, an anomaly in the analysis of the harmonics spectrum from a rotating element could indicate an incipient failure. A predictive system can intercept this fail and send an alarm message as well as an intervention request, much more before the system breakdown; preventing machine major damage and loss of productivity.

CN: Which benefits can an industrial user of these systems get?
AM: The integration of these applications generate different advantages, both in terms of process and project:
- Efficiency of the entire process increases, sometimes dramatically.
- Cost savings are immediately accounted for, referred to increased processing time, reduced use of resources, reduction of downtimes, that reflects in a lower cost of products.
- Flexibility, since it’s possible to adapt products according to the operator choice. The plant can adapt itself, integrating automatically parameter modification, according to the needs, reducing dramatically latency between the request from the market the new jobs production.
- Cross solution. The operator interaction is the same regardless the kind or type of control system architecture, the peculiarities of different plants are normalized through the Cloud Database; the uniformity of the information is the main benefit for the user and a basis for the economy of the plants.

CN: Automata works both for the Cannon Group and for the market. Which Industry 4.0 projects did you already implemented with your sister companies?
AM: Automata has collaborated in several intercompany projects for both the Energy and the Plastics Processing businesses:
- With Bono Energia we made an advanced emissions monitoring system, an application customized on F3 Net solution, giving the real-time availability of data on the web or to remote station.
- With Cannon Afros we developed a Data Collection system for the Polyurethane injection and Carbon fiber preforming and impregnation processes, including a continuous machine state of service. Data are collected from the machine, stored and made available for future analysis: graphs over time, statistical information and quality reports of the pouring process.
- To Cannon Ergos we supply the Robot Plant Integration, an innovative programming module integrated in the SCADA HMI Automata, for real time robot program input and modifications. This allows Companies using hundreds of different programs to save a huge quantity of time, money and human resources!
We conceived a number of dedicated solutions, for specific Cannon needs, by integrating in one unique control system different plant functions for the "wet side" (Polyurethane and Epoxy dosing units), for the "dry side" (carousels, presses, thermo forming machines) and for the robots (ABB, Kuka, GE Fanuc). We also provided an integration of controls, with which Cannon can enlarge its offer for turn-key solutions to the market, through the integration in the machine HMI, or in the plant production, of a control system able to manage along the production line different tools, such as RFID, Bar Code readers, cameras and vision systems, scales or QR printers.
Such integration of plant functions in one unique control and is the basis for making data available to the operators and to the Cloud, which is the main concept of I4.0; rather than having more controls dedicated to single functions not talking among them.

CN: Then, is Automata ready to make with Cannon the Industry 4.0 revolution?
AM: You bet! Just let us have the requests; some of the answers are available already... and the others can be easily developed!
Paolo Spinelli is CEO of Cannon USA since April 2003. Born and raised in Italy, holding a degree from Politecnico di Milano in Mechanical Engineering, he matured a solid background in Polyurethane foaming plants since 1982.

After several years spent in management positions with Cannon Afros in Italy, Cannon France and Cannon Viking in the UK, Paolo was selected to lead the North American branch of the Cannon Group. We learn from about his company, who will soon cross their 40° milestone.

CN: Which are your main markets?  
PS: I think that, amongst our competitors, we are the most widely present in very different fields of the Polyurethane industry and now also of the Composite areas: one third of our turnover comes from the Automotive industry, with a very diversified range of technologies, one third comes from the thermal insulation business, split between refrigerators and insulation panels, and the remaining one third includes a world of other applications. Flexible foams, filters, technical article, aerospace, sport items... you name it, we are in it. It’s easier to state where we are not present, in Polyurethane: roof spraying equipment, shoe soles, adhesives and coatings, TDI-based cast elastomers. The rest, we know.

CN: How do you cover such a diversified range of technologies and markets, from the organisational point of view?  
PS: With a sound staff, that has been streamlined, if compared with the situation of a few decades ago, reinforcing it with fresh, competent members. We have hired new, young forces in the Technical Office, R&D and Service groups. We regularly replace our retiring staff with new employees, which contribute with a modern mentality to our problem-solving approach. Our Sales forces have been reinforced, we count four specialists for the Automotive markets and three for Insulation. The R&D facility now counts a fully dedicated staff utilising a diversified range of equipment – four different dosing machines, one press and a robot – for various technologies. We use it extensively to run trials with our customers and the Raw Material Suppliers, both for testing new applications and for producing batches of prototypes.

Our “plus” factor has been the capacity to develop, and maintain, in the USA the know-how for design and fabrication of this equipment: this guarantees the definition of projects in full accordance with our client’s requirements, using locally available components and providing a fast and qualified tech service and spare parts supply. We daily cooperate with our Italian sister companies for the exchange of innovation and technology, working with them for the most complex jobs, those who require our European manufacturing resources. What makes us different is our capacity to serve and assist our customers with an important number of qualified technicians. Backed up by a staff of designers quite familiar with the processes and equipment. We have the solutions promptly available, without waiting for a European Headquarter to respond.

A Stronger Cannon USA for a Strategic Market
CN: What can you say about your most recent achievements, then?

PS: Talking of what we have designed, manufactured and installed fully in the USA, I remember, among others, some recent large contracts signed with Tier One suppliers of the Automotive sector. We have supplied less than two years ago a leading global producer of car seating and interior systems with a sophisticated moulding line able to inject tunnel covers in three different colours without any interruption between one colour and the following one, all with only one mixing head. The plant was composed by one dosing unit, three CCS (Cannon Color Systems) and one FPL 14 mixing head with a 4-component radial feeding, capable of handling the three colour streams in rapid sequence with a very small intermediate purging, with a dedicated stream for a non-mixable HFO blowing agent.

We made an 18-station oval track able to carry four moulds on each mould carrier, served by two robots that apply mould coating systems. We run a thorough industrial pre-production in our premises in Zelenopole, near Cranberry, in Pennsylvania, where we are based, working several days on three-shift basis together with our customer and his Japanese OEM, to fine-tune the plant prior to the delivery and installation in the factory. We added to this plant, a few months later, a third chemical’s feeding line allowing for the use of an HFO (Hydro Flouro Olefin) blowing agent. Another significant plant was supplied in the same period to another major Tier One supplier: a 40-presses carousel able to hold eighty moulds, this unit runs at 15 m/min speed. A complex “wet side” provides the formulation that produces automotive seating in this plant. Temperature control was a key requirement for this customer, and we installed extra heat exchangers to the high-pressure dosing unit to provide maximum constancy of performances. A dedicated software was written in Italy to easily program the pouring robot and to keep historical records for each and every shot, to provide quality control. We also regularly supply a world leading car maker’s US factories with robotised foaming lines to inject a foam against NVH (noise, vibration and harshness) in the pillars of their vehicles, directly in the assembly lines. We are specialised in this technology, providing proven solutions for both types of the trend-setting formulations: the 24:1 ratio supplied by Dow – which now has a 16:1 ratio version available – or the most recent 2:1 ratio type, based on a prepolymer. Special mixing heads must be used in these plants, due to the very tiny diameter of the injection holes drilled in the car pillars. We can supply either a TRIO7 or an LNS model, as we did recently in a sophisticated unit installed in the assembly line of a powerful hybrid sport car. For a major supplier of lightweight interior panels we have recently supplied innovative equipment for the spray application of Polyurethane binder over a glass-fibre-wrapped honeycomb paper. We developed specialised equipment for any type of these BayPreg-like formulations, providing numerous advantages over our competitors: faster cycle time, thanks to a lower number of passes of the mixing head; much less overspray, thanks to the perfectly triangular shape of our spray; a clean work place, thanks to our airless spray system; customised distribution of foam in the part, thanks to a smart control of the head. And we can prove it all in USA, in our Cranberry lab!

CN: That is quite an interesting collection of automotive references. Any significant recent activity in other applications?

PS: As I said before, rigid foams for insulation cover at least 35% of our sales. We – as Cannon – supply the world leading producers of white appliances. Refrigerators for domestic and commercial use are made in North America with Cannon foaming plants since decades.

We just supplied four dosing units to make insulation panels for refrigerated trucks, a business that we see expanding in the USA. We recently supervised the supply to Haier of four different production units manufactured in Italy and in the USA: two major foaming plants for cabinets and doors, and two large thermoforming machines for their plastic liners. Two custom-specialised high-pressure metering units, servicing multiple Cannon FPL SR 18 and 14 mixing heads, have been made by Cannon USA to provide the required chemicals to the cabinet and the door foaming plants, that were made in Italy.

We provided the installation service for the whole lot of equipment, including the large thermoformers made in Italy. One thermoforming specialist, with a vast experience in pressure forming applications, works for us in North America, cooperating daily with Cannon Ergos in Italy.

CN: Do you carry other joint projects in the USA with other Cannon companies?

PS: Many, with various levels of intervention, and not only in the USA! Both Cannon Ergos and Cannon Viking have a number of historical customers in North America, with whom they keep a preferential line of dialogue, very much dictated by the innovative solutions they are jointly developing. That is the case for some recent confidential projects developed in the Carbon Composites field, and for some special thermoforming jobs. In these cases we supply marketing assistance, logistic support, Service and installation aids. It’s always a strength for Cannon to be directly present in a country, and we represent this case a part of the solution.

Our specialists also spend time and resources abroad to support other Group Units working at projects for which we have matured specific skill and experience. For some special applications we developed our own technologies and equipment that we have even been able to export to China. We follow up all the transplant jobs of our US customers when they relocate their plants, in Mexico or in the Far East.

Think Global, Act Local – we have not invented the slogan, we just apply it successfully since almost 40 years!
Refrigerators, Always a Cool Business!

**Cannon News: The basic matters first: which are the current trends in the refrigerators industry?**

**Piero Corradi:** Increase productivity, optimise insulation costs, reduce gas emissions, use only environmentally-acceptable blowing agents. I could summarise all what the industry is looking for with these four targets.

**CN: How is Cannon facing these requests?**

**PC:** Delivering innovative equipment and performing production methods, as we have done for the past 50 years. We must work hand-in-hand with the Raw Material Supplier, because all the above needs are satisfied by an innovative chemistry.

We can only design the tools that transform liquid formulations into high-quality foams in the best possible way.

**CN: How is this chemistry evolving, then, and what is Cannon supplying to make it work efficiently?**

**PC:** Without detailing the strategies of each Raw Material Supplier that cooperates with us, we can resume the latest trends as follows:

- Increase the efficiency of the insulation media working on the size and shape of the foam cells,
- Optimise the use of chemicals, trying to achieve a more uniform distribution of foam density within the walls,
- Reduce the curing time of the foam using fast-reacting formulations.

All the chemical leaders follow these three paths. There are now three types of formulations that can be taken in consideration to reach those targets:

- **Microcellular foam cells**, with diameter around 8-10 micron, that are under development using Aerogels and other innovative approaches. These foams might be industrially available in less than 3 years.

- **Foams with small cells**, with diameter around 100 micron, that are commonly available, are very reactive and thus require a very fast injection. They could already be used for a “100-second demoulding” goal.

- **Conventional formulations**, with 200 micron cells: they are the most economic, so far, but cannot provide a fast demoulding performance.

**CN: What is Cannon doing for these three types of formulations?**

**PC:** For the microcellular foam project Cannon Afros is the partner of Dow Italia, a leading science and technology global company, and Whirlpool, the appliance-white goods global company, in the LIFE+ Project K-12, aiming to demonstrate and show-case an innovative refrigeration technology to significantly improve the energy efficiency and reduce the carbon footprint of the Cold Appliance industry.

The K-12 project connects new chemistry with technology innovations, avoiding any use of Green House Gases as blowing agents with a new appliance production technology driven by reducing the carbon footprint of manufacturing operations, addressing any technology requirements and regional needs. The 36-month project objective is to bring radical innovation to the manufacturing process of household appliances, insulated by a microcellular high-efficient Polyurethane foam able to achieve about 30% reduction of thermal conductivity, thus significantly improve the energy consumption of refrigerators and freezers.

**CN: What is the Cannon answer to the production needs of a fridge manufacturer using conventional formulations?**

**Andrea Orlandini:** There are other tools that we can utilise to increase productivity, even for conventional foams. We can play on the dry side of the plant, speeding up operations to provide a faster part-to-part production cadence. This is true for both cabinet and door foaming equipment.

We just released another innovative foaming system designed for customers requiring a compact industrial solution. It’s derived from the famous Drum, that Cannon invented in the early 1980’s, has been manufactured in thousands of units... and has been made also by several competitors, when its Patent expired! The Drum is a rotating polymerisation machine that features a structure composed by several sides, from three to twelve, holding the moulds. These moulds have always been filled with foam when they are parallel to the floor, fixed horizontally on the sides of the structure. We have now developed another method for foaming the doors, the VertiDrum, where the foam rises vertically and the advantages are numerous:

- With only two units and a conventional rigid formulation two complete sets of doors can be extracted every 30 seconds; it’s the
same productivity of a fast Paternoster system, on one fifth of its footprint, only 3 by 2 m each Drum, with access on the 4 sides.

- The foam rises vertically in the door cavity, with a positive effect on the thermal insulation: the elongated cell’s structure produces more cells within the thickness of the door than those obtained when foaming it horizontally, and placing more cells (thus more obstacles) in the direction of the heat transfer improves the Lambda value – the insulation capacity - of the door.

- All the air contained in the door cavity is rushed out through the narrow top side of the mould, avoiding any risk of air entrapment on one of the two aesthetic sides: The same good quality is available on both side of the door regardless of the way it is loaded into the mould. No more issues about plastic liner on top or bottom side, we talk now about left and right side.

- The distribution of densities within the foam is optimal, with a maximum difference of 0.5 kg/m³ between the heaviest and the lightest sample. This saves a lot of foam, at the end of the year! The VertiDrum is a real breakthrough in the industry especially when the reactivity of the foam is high and when the door shall contain additional inserts, moreover it can also be used for any kind of thin, rectangular insulating panel.

We just applied for some patents regarding a new production solution based on free-riding moulds running in a track where they are kept closed, during the polymerisation period, by a continuous series of steel rolls mounted on rails.

The line is conceived with a number of service stations, an injection point and a polymerisation area. Each station is dedicated to only one simple action that can be executed in very few seconds. Initially designed for a given polymerisation time, when the chemistry will allow for faster production cycles the line can be adapted simply removing a few polymerisation stations. Mould change can be performed in a dedicated station during the cycle time, without stopping or delaying the production. Fast, flexible, simple... the new system is now going into production at ElectroLux Mexico in their Ciudad Juarez factory, and we are constructing another plant for delivery by the end of this year.

**CN: Several news concerning the doors, it seems: anything new for the production of cabinets?**

**AO: No, nothing new in the past ... 6 months, I’m afraid! For the cabinet production we are consolidating the supply of our VAI (Vacuum Assisted Injection) system which makes use of vacuum during the injection of the formulation and the expansion of the foam in the cabinet’s wall cavities. This method provides a quick demoulding time, improved thermal insulation capacity, optimum adhesion of the foam to the metal structure and lower consumption of energy during the cabinet’s life.**

We built to perfection the VAI version of a RotoPlug 2 foamig fixture, that allows for a model change in Zero-Time: when one size of cabinet has to be temporarily replaced by another in the foaming process, the rectangular platform holding the male plugs, on the upper side of the station, rotates by 180 degrees. The new male plug, already thermally conditioned to the correct temperature, is brought on the lower position of the platform, ready to start its cycle of foaming processes. The plug going off-duty is sent on the upper side of the platform, where it can wait for its new cycle of injections or it can be manually replaced or adapted to a new cabinet design.

The adjustment operation on the upper plug can be executed while the lower plug is regularly producing. The major advantage of this system derives from the increased flexibility guaranteed to its users: a very small production series of a given model can be easily inserted with a very short notice without perturbing the output cadence. Stocks of finished cabinets can be dramatically reduced, since it’s no more necessary to produce numerous units of each model only to justify the loss of time deriving from a mould change operation.

And to finish with the innovation on cabinets, we supplied to Fisher & Paykel Thailand the Rotojig, a foaming station with a rotating platform that holds two fully-functioning polymerisation jigs, in its original VAI configuration, to work with vacuum. The service operations occur at the lower level, while foam injection and polymerisation are performed at the upper.

This innovative design allows for both types of foam injection: it can be used with face-down refrigerators with multiple heads on the top, or with single injection from the compressor side, made on the lower position of the Rotojig. Double productivity per meter square of factory! The rational design of our VAI foaming plant, including loading and unloading fast system and the mechanics of the jig have been so appreciated that we are asked to apply the same concept even for non-VAI production methods!
Cannon Chinese Technicians Meet

The Chinese engineers came from the Cannon Far East Offices of Singapore, Shanghai, Taiwan and from the Shinnon factory in Zhongshan. During these days (21 - 23 March, 2016) they discussed about the new technical development concerning the mixing heads’ new functions and maintenance procedures, as well as the most recent solutions for the Pentane-conversion of existing foaming plants. All the attendants had an hand-on experience as to the maintenance of the different types of mix heads.

During these three days they also discussed the most common technical problem faced in the Far East and shared with the Italian colleagues some of the latest solutions developed to solve them.

This Technical Meeting, which is being held annually, is an extremely useful occasion not only to transfer the latest developments from the Manufacturing Centres to field engineers but also to create a teamwork atmosphere between the various Units that mostly keep alive the personal relationship of Cannon with its clients.

Cannon AFROS, Cannon Far East and Shinnon held a joint three-day technical meeting in Shanghai in March 2016. The latest technical developments of the Cannon metering and mixing technologies were illustrated to 33 Chinese engineers from 3 colleagues from Cannon AFROS.

Numerous manufacturers of car parts in Europe, China and the USA use the latest JetPreg solutions to produce light Polyurethane-reinforced structures made with honeycombs.

(*) BayPreg is a registered Trademark of Covestro
(*** ElastoFlex is a registered Trademark of BASF Polyurethanes
Cannon dedicated water solutions

ARTES INGEGNERIA
Water&Waste Water Treatment

Artes Ingegneria is currently one of the global leading companies providing water & waste water treatment solutions in the Power Generation sector, Oil&Gas, Steel&Mining, Servicing End Users and EPC contractors. Water treatment system are designed by Artes’ engineers on its own know-how and on proprietary technologies providing full responsibility on process performance.

The entire range of technologies covered is:

- Membrane Separation
- Ion Exchange
- Chemical Physical Treatment
- Biological Oxidation
- Filtration
- Degassing

www.cannon.com
High-Speed Continuous Production of Flexible Faced Insulation Panels

Cannon Ergos is expanding the range of its industrial solutions for continuous production of insulation media offering complete plants for flexible-faced panels. Numerous innovative features provide technical and economic advantages to leading manufacturers.

The Cannon Group tradition in manufacturing continuous foaming plants for flexible-faced panels dates back more than half century. Paper-paper lined sandwich panels have been produced worldwide for decades with continuous laminators made by Cannon Viking and Cannon Afros in the 1970’s. The Cannon Group is focused to provide the right equipment for the construction industry: continuous and discontinuous equipment for metal-faced panels, insulated construction panels with paper and foil facings, air ducting, garage, sectional doors and entry doors etc.

Cannon Ergos and Cannon Afros are dedicating an intense R&D and manufacturing effort to offer innovative, patented solutions specifically designed for flexible-faced panels production, resulting in a higher panel quality and plant energy efficiency.

Compact F, The New Generation of Flexible-faced Panel Plants

Cannon Ergos specialists conceived a new generation of continuous foaming plants for high-productivity and high-quality flexible-faced sandwich panels. These new plants, commercialised under the Compact F name, are characterised by numerous innovative features:

- The high-pressure dosing machine metering equipment is engineered with a modular concept able to process in excess of 20 chemical components. The metering equipment’s circuits have been conceived for the use of the latest generation of expanding agents and of Polyols with a wide range of viscosities. This configuration allows to cope with the processing needs generated by the availability of new formulations including additives with very low viscosity, and new breed of flame retardants. Special arrangement has been developed to manage pulsation-free very low flow rates.
- The mixing heads, characterised by a well proven mixing chamber, have been designed exploiting nearly 50 years of experience in high-pressure impingement technology. New multi-component mixing heads are also available for special applications.
- Special distribution bars have been designed, to be fitted on the mixing head’s nose in order to evenly distribute the liquid formulation on the whole cross-section of the panel. Marketed with the tradename of Pug Beck these disposable plastic distributors guarantee a perfect lay down of reactive chemicals in a layer of constant thickness. This method provides the best distribution of density across the panel, even using very viscous or highly filled Polyls.
- Dedicated premixing and metering equipment are available for the use of solid additives: SoliMix can be used to precisely blend Polyol with a powder (a solid flame retardants, such as an intumescent product as Expandable Graphite, or Melamine, Aluminium Hydroxide, red Phosphorus and Polyphosphates) while SoliStream has been designed to mix the obtained slurry with the other reactive components within the mixing head. Cannon is at the forefront of solid-liquid mixing and metering technology: dedicated equipment and R&D personnel are available in Italy and the USA for the evaluation and testing of the most convenient solution, which can also be integrated in existing foaming lines.
- The double-belt curing conveyor is provided with significant innovative technical characteristics. The Patented worm gear design driving system combines a very smooth, pulsation-free continuous movement with an energy-conscious consumption. The new double-belt thermoregulation system, based on internal air circulation and on-board insulation, allows to save up to 20-30% of energy cost if compared with an equivalent competing type of conveyor.
- Load cells monitor the actual pressure exerted by the expanding foam to accurately define if a foam over-packaging is currently taking place, allowing for an immediate correction of the chemical’s output which reflects into a significant foam saving.
- The continuous webs alignment and dedicated tension control groups guarantee the facing centring and a constant production speed.
- The complete plant is integrated with specific hardware and software supervising solutions developed by Cannon Automata to provide maximum statistic and reporting capacity.

The latest significant achievements

A leading European Group manufacturing complete systems for industrial roofing and walls has decided to equip their German factory with a high-end continuous sandwich panels plant. Thanks to the innovative approach and solutions proposed, the Cannon
Group has been awarded the project, that included a stringent set of technical specifications. The scope of the supply includes the whole wet side, including: complete storage farm (made by Cannon Bono Sistemi), high-pressure multi-component dosing unit (by Cannon Afros), pouring and polymerisation section (by Cannon Ergos) and the supervision system (by Cannon Automata). A East European manufacturer of insulating panels for the building industry has recently ordered to Cannon Ergos a continuous foaming plant for flexible faced panel. A very customer-oriented plant configuration has been developed to match the client’s expectations. A European manufacturer of insulation panels made with Phenolic foams has commissioned to Cannon Ergos the construction of a new line, including a tailor-made multi-component dosing unit and the longest double belt conveyor ever made so far by Cannon. A very special new plant is on the drawing board at Cannon Ergos plant in Cannone Pertusella, north of Milano, Italy. Its most relevant feature is the width of the double-belt conveyor: 2,400 mm! Featuring three fixed mixing heads – fitted with the new Pug Beak distribution devices for optimum lay down of the formulation on such a large area – the plant is able to double the productivity of a foaming plant.

Special Solutions for Special Needs
The new generation of continuous foaming plants for flexible-faced insulation panels made by Cannon Ergos provides an industrially tested response to a rising need for special types of insulation media. Things are evolving fast in this dynamic sector and Cannon is ahead with innovative and profitable solutions: discuss with the nearest Cannon Local Office the specific needs demanded by your next panel project. A viable solution might be already waiting for you!

A New Head: JL Vector – Better Laminar Flow at Higher Output!

The never ending search for higher efficiency rigid foams for thermal insulation relies on a new generation of highly reactive formulations requiring a very fast injection. The consequence is that higher output values are demanded to the mixing heads, to deliver the right quantity of blended chemicals before the foaming reaction starts in the mould. These high-output heads generally bring along an increase of turbulence, which hinders the creation of a regular, bubble- and void-free foam. To respond to this increasing demand Cannon Afros mixing head specialists have designed the JL Vector. Built upon the experience matured since 2007, when the innovative injectors-free JL head was launched, the JL Vector presents a simplification of the hydraulic controls and a significant improvement of the mixing efficiency at high output values.

Special Geometry for Special Formulations
The mixing head geometry of the JL Vector is based on three separate mixing chambers of different diameters. A premixing step is carried in the first chamber, where two (or more) liquid components are fed through injectors, even at a moderate pressure (down to 70 bar). The impinged turbulent blend is transferred to a second mixing chamber, whose section is 3-4 times smaller than the first. Its design forces the blend through a long annular gate where it acquires speed, optimising the mixing and losing turbulence. At the end of this second mixing chamber a forced 90° turn brings the blend in a discharge duct that is 10 times wider: here the flow of the reacting formulation loses kinetic energy and turbulence; through a very long injection duct it is transferred into the mould (open or closed) with a very laminar flow, free from splashes, air entrapments or voids. Using the currently available head (called 15-8-26 from the diameter in mm of the three chambers) an injection with laminar characteristics up to 2,700 g/s can be obtained. As a comparison, a standard JL head of similar size provides laminar flow up to 2,200 g/s output.

Several advantages characterise the new JL Vector versus the JL or other models of high pressure mixing heads:

• Its design allows for direct calibration of the flows through the injectors, to manually confirm the output values indicated by the machine electronic control through the flow transducers.
• The hydraulic controls of the three mixing chambers are separated, to simplify normal operations and maintenance.
• A lubrication circuit has been provided on the largest piston, to easily get rid of the scrap foam which builds up on its shaft after a number of injections. Maintenance is simplified.
• The peculiar three-chambers geometry makes this head very suitable for extremely viscous Polyols: positive tests have been run with chemicals featuring 20,000 cps viscosity, measured after blending in a generous percentage of CycloPentane. These Polyols, in their pure state, can have a viscosity of 35-40,000 cps.

The performances of the JL Vector, fully tested in heavy-duty industrial environment for more than 18 months, allow Cannon Afros to envisage a specific target market of:
• Producers of large sandwich panels for insulation, made with the discontinuous foaming method with formulations requiring output values up to 3 kg/s and based on very viscous Polyols, such as aromatic polyesters and similar chemicals.
• Producers of large refrigerators for domestic and commercial applications, using fast-reacting formulations designed for a targeted 100-second demould time.
• Producers of special, miccellar rigid foams obtained with very viscous Polyols.

Available for the time being in one size, the head is currently being designed in a range of sizes more adapt to other industrial applications. Interested? Contact the nearest Cannon Office!
THE WELL APPRECIATED MINITANDEM CONCEPT, DEVELOPED BY CANNON 20 YEARS AGO, HAS BEEN NOW REDESIGNED FOR A VERY FLEXIBLE MANUFACTURING APPROACH: IT CAN BE EASILY EXTENDED TO DOUBLE THE PRODUCTIVITY, OR MOVED TO ANOTHER FACTORY, IF THE LOGISTICS DEMAND IT. MINIMUM DOWNTIME IS GUARANTEED FOR ITS INSTALLATION AND START-UP.

The Cannon MiniTandem was developed at the end of the past century (...it sounds old, does it?) to allow for high-productivity in production of large sound deadening elements made foam-backing an heavy layer (usually a filled EPDM) with a Polyurethane flexible foam. A shuttling double lower platen allows for external loading service on one lower mould half while a similar one is closed in a polymerisation press, curing a part injected few seconds before. Numerous of these plants have been supplied by Cannon in these two decades to the leading manufacturers of sound insulation solutions for the automotive and tracking industries.

**Repeat Order of a Satisfied Market Leader**

One of these clients – a major Tier 1 supplier producing parts worldwide for the most important car makers – after having experienced for many years the benefits of using Cannon wet and dry solutions for its Polyurethane plants, has just committed to Cannon Ergos a revised version of the MiniTandem for a hot forming application: dash insulators of 1,800 by 1,000 mm size. Working from large sheets of EPDM or PVC, picked automatically from palletised stacks, the equipment is pre-heating them at 160 °C prior to transferring them into the forming press. Here the dispenser unrolls the hot layer of thermoplastic over the mould, following carefully its three-dimensional profile with a vertical adjustment of the front part of the dispenser. This movement provides a high precision of deposition, needed to guarantee a crease-free moulded part, especially when it features a very deep draw. Once the heavy layer has been vacuum formed onto the lower mould, the shuttle enters the press for foaming. At the same time a second mould half enters in the forming area from the opposite side, ready to receive the deposition of a new hot sheet and to vacuum-form it. This method provides the highest exploitation of the forming press (the most capital intensive piece of the plant) limiting to one the number of preheating ovens.

**Let’s Move It, Quick!**

The client’s specifications were quite clear in terms of flexibility: the plant – initially composed by one hot press – had to be easily doubled in case of increase in demand, without perturbing the production. On top of that, the whole equipment had to be easily moved among the various production plants located in different European countries, should the demand of parts suddenly rise there.

**A Flexible Engineering Approach**

Cannon Ergos redesigned the MiniTandem according to both these needs, providing their customer with a very flexible plant configuration: when needed, a second forming press can be installed on either side of the existing one, according to the factory layout available at the moment. The whole set of interconnections between the various elements of the plant and the central logics and electric control panel, as well as all the mechanical fitting points, have been engineered with a Plug&Play concept, allowing for prompt dismantling and re-installation hundreds of kilometres away, in the shortest time possible and with minimum loss of production.
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A Plug&Play Plant for Dash Insulators

A revised version of the Cannon MiniTandem is used for the hot forming production of Automotive dash insulators, made with large sheets of EPDM or PVC.

Discover a world of solutions for NVH - Noise, Vibrations and Harshness - reduction in cars and trucks.

The Polyurethane chemistry provides today sophisticated formulations, designed to protect efficiently the passengers of a vehicle from noise and vibrations.

Cannon supplies the dedicated foaming equipment required to utilise these new materials for:

- Sound deadening carpets and mats
- Car body cavity filling
- Insulated roof liners
- Engine shields
- Wheel covers
TWIN SHEET TECHNOLOGY PROVIDES AN EFFICIENT SOLUTION TO THE PRODUCERS OF VERY DIFFERENT PLASTIC PARTS. WE LEARN MORE IN THIS INTERVIEW WITH ZVI RAPAPORT OF CANNON ERGOS.

Cannon News: Could you define in few words the Twin Sheet thermoforming technology?

Zvi Rapaport: It is a production method of manufacturing thermoformed parts by bonding two heated sheets of plastics in a single operation using a double female mould, resulting in a hollow three dimensional structural part. This space inside the part may remain hollow, contain structural inserts or expanded foam bonded to the hot sheets during the forming stage. Compressed air or gas can be injected and sealed after the part is cooled to create an actively responsive part.

CN: Which advantages can you highlight for this technology?

ZR: The structures obtained by the two bonded sheets can solve numerous functional and aesthetic problems, providing an industrial finished solution in a single process that often also has economic benefits. It is a smart alternative to blow-moulding, rotational moulding and other plastics processing technologies, since it allows for the positioning of inserts within the hollow part, allows for the use of different compatible thermoplastic materials in addition to the ability to use different thicknesses and colours on each of the side of the part.

CN: Could you illustrate the most recent achievements in this specific niche of the thermoforming market?

ZR: I can disclose some details of an interesting project we delivered this year to an Italian Tier One supplier of mechanical components to the automotive industry. Cannon Ergos was commissioned to develop a large and flexible Twin Sheet thermoformer for the manufacturing of custom industrial pallets. These custom-made rectangular structures are used to hold large mechanical components or bulk materials precisely and safely on their trip from the Tier One production plant to the OEM’s car assembly line. Thermoformed by Twin Sheet technology, they are composed by two sheets of HDPE (High Density Polyethylene) bonded during the forming operation. The hollow structure obtained is able to withstand the substantial weight and severe impacts while protecting a number of mechanical assembled components during the trip and in intermediate storage areas. The client manufactures these pallets in different sizes and shapes using a dedicated Cannon Twin Sheet thermoformer designed to optimise the cycle time while keeping high flexibility in terms of final product. This machine features a forming area of 2,500 by 1,500 mm and has a closing force of several hundreds of kN. The thermoformer is designed to handle plastic sheets in the 1 to 10 millimetres thickness range, this specific application typically uses 4.5 mm thick HDPE sheets. Two banks of halogen heating elements efficiently heat the sheets according to a user defined heating pattern. A precise, highly responsive, computer temperature control system guaranties correct temperature is maintained throughout the heating process. Dual sag control is achieved as the lower mould box and the volume between the two sheets are sealed and pressurized. An array of sensors monitors the sag of the sheets and opposes it by increasing the pressure in the sealed spaces. This feature is extremely useful to optimally heat the material and optimize material thickness distribution during the forming process. The forming clamp locks the two mould halves and a closing force of hundreds of kN is applied to bond the two sheets into a cohesive three dimensional structure. Pressurized air is blown between the two sheets, to ensure the best reproduction of the mould details and to provide an initial cooling effect. After cooling, the mould and the moving intermediate frame (the “cartridge”) open, to release the formed pallets.

A robot in the heart of the production cell unloads the formed parts from the machine and immediately puts in place another set of four pre-heated sheets to restart the cycle. A production cadence of 5 minutes and a generous working area – to simultaneously produce two pallets of 1,200 by 1,000 mm side by side – contribute to high production rates. Fast tool change is achieved by automatically adjustable reduction plates and clamp frames. All tooling has automatic quick locking systems. Servo movements with encoders and proportional valves for process control ensure the process is stored and retrieved when needed. The ability of producing single sheet parts complete the flexibility of the machine.

I can disclose only a few details of another project, a machine designed for high-speed, high-precision, extremely repeatable production. It makes small parts that require a high degree of accuracy. The machine uses two independent sheet transport rails with ample space between them. The independent transport rails allows for flexible forming sequence and the space allows the ability to place inserts inside of the Twin Sheet part. A robot places inserts inside the cavities of the first formed sheet while the second sheet is still heating in the oven. Once the inserts are placed the second sheets is transported to the forming area to be formed and bonded to the first sheet. The latent heat bonds the inserts.
to inside surfaces of each of the sheets. A closed-loop “live” heating control system controls heater output in real time ensuring the temperature of the sheets, cycle to cycle, is within 2°C. The heaters are divided into several zones per sheet to ensure each zone follows the target temperature throughout the process.

**CN:** Definitely promising applications indeed. Did you supply something else recently for automotive applications?

**ZR:** I can reply to your question only by hiding numerous details, due to the stringent confidentiality agreements signed with our major clients, but the fuel tank experience continues successfully for Cannon Ergos! Very advanced fuel tanks are mass-produced for several years using our Twin Sheet technology. With our solutions it’s possible to bond, firmly and quickly, two thick sheets of co-extruded thermoplastics made out of 6 or 7 different layers. We are currently supplying the third generation of complete moulding plants for fuel tanks.

The new fuel tanks are specifically made for electric vehicles. These are either PHEV (Plug-in Hybrid Electric Vehicles) or BEV (Battery Electric Vehicles with extended range Internal Combustion Engines), and their tanks are technologically different. In both types of EV the interruption of the flow of fuel – which occurs when the vehicle is running with the electric engine – temporarily seals the tank. This might cause implosion problems in case of a sudden drop of the external temperature, requiring a reinforcing pillar between the upper and the lower tank walls.

Our first two generations of Twin Sheet thermoformers already gave ample options for the quick and precise positioning of inserts – such as fuel pump, levels, valves etc. – within the tank prior to the bonding operation of two thermoformed half shells. The reinforcing pillar required for these new tanks compounded the robotised positioning problem. This demanded a further engineering effort to our specialists, to allow for fast, automatic and safe sequence of operations with our new equipment. The Twin Sheet thermoforming technology offers major advantages over blow moulding for these sophisticated, complex reservoirs full of electrical and electronic parts. It is much more difficult to fit them all, plus a reinforcing beam, in a plastic tank using another automated processing technology! The fuel tanks made with our turn-key plants are supplied to a major German Car maker, and please do not ask for more information because I can’t add another word on this subject!

The steady manufacture of single station machines constitutes the daily activity of Cannon Ergos Thermoforming Division. Built in various sizes and configurations, these machines cover most of the market’s demand for industrial thermoformers in five continents. Here are a few examples of the variety of applications.

**In Portugal…**

To thermoform the large base structure for camping tents to be mounted on the roof of a car, a Portuguese manufacturer ordered to Cannon Ergos one CREA 3020 – 06 machine.

With a max forming area of 3 by 2 m this full electric machine, delivered in August 2016, provides a fast cycle and a completely automated process, at a very competitive price.

**In Canada…**

Another CREA machine, a 2015 – 08 model, has been purchased by an existing Canadian client producing commercial refrigerators. Featuring a max forming area of 2 by 1.5 m, this full-electric machine is fitted with the Patented TRIPLO system to adjust the plates, automatic loading and unloading, precise low-inertia halogen heaters with closed-loop control of the temperatures. Already a customer for other type of equipment, this Company confirmed their loyalty to Cannon thanks to the excellent service and the competitive prices always received.

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**Thermoformers Flash News**

A VARIETY OF THERMOFORMERS FOR DIFFERENT INDUSTRIAL APPLICATIONS HAVE BEEN DELIVERED IN THE PAST FEW MONTHS BY CANNON ERGOS, CONFIRMING THE COMPANY’S ATTITUDE TO DEVELOP COMPLEX ENGINEERING SOLUTIONS FOR THERMOPLASTIC AND THERMOSETTING MATERIALS. WE SUMMARISE THE MOST INTERESTING ONES IN THE FOLLOWING PARAGRAPHS.
Delivered during September 2016 this machine is producing the inner liners of very large commercial refrigerators sold in North America. Fairly technical parts, the liners are formed from thick sheets with important draw ratio.

In the UK...
A UK-based manufacturer of sanitary ware ordered one CREA 2215 – 06 for the production of a variety of shower tray models. Another full-electric machine – the 5” from Cannon Ergos for this customer! – with a max forming area of 2.25 by 1.5 m this unit is able to form the whole range of trays in the client’s catalogue. The fast tool change solution adopted and the quickly adjustable plates Taylor made around the existing tooling, added to the prompt and competent service granted locally by Cannon Shelley were the main reasons to confirm this client’s trust in a Cannon thermoformer, that will be delivered in November 2016. This is another case where Ergos has applied the solutions to run two different moulds stably and consistently without affecting too much flexibility.

…and in the USA!
A long tradition in the production of in-line machines for domestic refrigerators characterises Cannon Ergos. Hundreds of fully-automatic units are installed in the factories of the most prestigious white appliances makers in the World. A global leader in refrigerators and freezers received in July 2016 in their US factory a LF 2113 -08 thermoformer able to produce every hour 90 liners for side-by-side and French door refrigerators. This large full-electric machine features a max forming area of 2.15 by 1.35 m, a 3-bar pressure forming system and includes post trimming and punching stations. The capacity of Cannon Ergos to supply a turn-key solution, according to the national standards, using locally available components at a competitive price – an experience already made several times by the client in various other countries – was the main driver for the decision in favour of Cannon.

A Parametric Design for the Widest Flexibility
Characterised by a high degree of automation for sheet loading and part unloading, closed-loop controlled heating system with optimised use of electric resources, a patented method for the fast adjustment of the plates, the Cannon thermoformers feature a modular, parametric design that allows for a wide degree of flexibility in supplying a bespoke model within the delivery terms which would be usual for a stock machine.

Trends and developments
A trend in the specifications requested by customers today is the high degree of automation, that leaves to the operator the duty only of the supervision. Several machines use now 6-axes robots for handling the material, even between multiple stations and used also in the case of various sheets in the same cycle (e.g. 2 off Twin Sheet parts made at the same time, making a total of 4 sheets processed together)
Other significant improvements have characterised heating control systems, where a “predictive” expert system can control in closed loop the heating behaviour of the material and can guarantee repeatability to reach set forming temperature in set time with extreme precision. This feature makes it possible to enhance dramatically for example in Twin Sheet bonding between the two sheets or between inserts and sheets.

Present Worldwide with Innovation and Service
Present with Local Offices and Agents in more than 50 Countries, the Cannon Group features the widest network of Sales and Service Centres for the processors of Polyurethanes, Thermoforming and Composites. This international presence and a high degree of integration between the various Group’s Units allows for the continuous updating of each of the technologies that Cannon deals with.

Talk to your nearest Cannon Office for your next thermoforming project; a Cannon specialist is always available to recommend the best solution – for you!
Two lower platens shuttling on the front and rear sides of the press allow for an ergonomic and precise service (part demoulding, visual inspection of mould and cleaning, positioning of Carbon fibre layers) on a lower mould-half while another is curing a moulded part, closed in the press. Cure time for HP-RTM parts can vary, increasing the mould temperatures, from 180 to 90 seconds, while injections are typically performed in less than 30 seconds, with a trend to reduce both values to increase productivity. The two-shuttle press design allows for a substantially higher efficiency, since the press is busy – i.e. it is closed – for most of the time, while one or two operators attend the service functions in the same time requested by the “press closing – resin injection – curing” sequence of operations. Through this advanced working island for HP-RTM this Italian producer, a very qualified manufacturer of high-end Composites for niche market applications, is now ready to enter in the very competitive arena of Tier One suppliers of CFRP parts for the Automotive industry.

Cannon, being able to supply all the required technologies and equipment with a “single responsibility” contract, provides a **One-Stop-Shop** approach to the Companies that decide to invest in complete manufacturing solutions for Composites. This is a unique offer, in a competitive field populated by producers of single pieces of equipment unable to guarantee the final result when a complex plant has to be put together!

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**RIBA COMPOSITES, AN ITALIAN LEADING MANUFACTURER OF STRUCTURAL PARTS AND COMPONENTS IN ADVANCED COMPOSITE MATERIALS FOR THE AUTOMOTIVE AND AEROSPACE INDUSTRIES, INVESTED RECENTLY IN A NEW CANNON PRODUCTION PLANT FOR HP-RTM AND PRESS MOLDING TECHNOLOGY.**

Specialised in autoclave and vacuum bags/oven productions for Composite parts destined to niche markets, the Faenza-based RIBA Composites company needed to expand their presence in the Automotive and aerospace industry. The production series and the unit prices common for the car industry being not compatible with the existing production equipment, the Company decided to explore the possibilities offered today by high-productivity technologies such as HP-RTM/Press Moulding.

Cannon ERGOS was consulted, with other leading suppliers of this kind of equipment, and quoted a complete production solution.

**High productivity HP-RTM press**

Cannon offer included the machines required for high-productivity manufacture of Composites using the HP-RTM process with Epoxy resin matrix and Carbon fibre reinforcement:

- A three-components E-System high-pressure dosing unit for Epoxy formulations with one LN 10 three-component mixing head and closed-loop control of output and ratio.
- A **short-stroke press** with 25,000 kN clamping force, 3.6 by 2.4 m platens and a very precise active control of parallelism for guaranteed planarity of the moulded parts.
CANNON VIKING LOCATED IN MANCHESTER, UK HAVE RECENTLY MANUFACTURED, INSTALLED AND COMMISSIONED A STATE OF THE ART, HIGH PRESSURE, LIQUID LAYDOWN, MAXFOAM OMEGA CONTINUOUS FOAM PLANT WITH VITA CELLULAR FOAM AT THEIR FACTORY IN MIDDLETON, MANCHESTER, UK.

The plant has been supplied to Vitafoam for the production of speciality foam blocks for their clients in the UK and European markets with the capability to produce their popular range of Reflex, Vasco and Revo Foams. The machine is also equipped and designed for the production of graphite filled foams for acoustic/industrial applications with the highest level of fire retardancy.

The new machine includes key features to maximise economy of chemical raw material conversion to produce optimum foam quality with fine cell, minimum pinhole with features including:

- Liquid Laydown with Cannon Viking Gatebar foam laydown.
- Maxfoam & Liquid Laydown Fallplate Unit for optimum foam block shape.
- High Pressure Metering Units & Mixing Head
- Mass Flowmeters with closed loop control
- Planiblock Top Paper System
- Omega Control and Monitoring System with formulation control and management with closed loop control.

All foam equipment suppliers were considered for this project by Vitafoam before the final selection and project award being granted to Cannon Viking.

The new Maxfoam machine will be used to produce a wide variety of foams and gives Vitafoam the ultimate flexibility in their production. The new machine is designed for short runs of speciality foam blocks where the volume required is not as high but the quality requirements remain the same. Vitafoam knew what they needed and worked with Cannon Viking to come up with the special Maxfoam machine which we hope will be the first of many more projects with Vitafoam group companies.

The foam plant is designed for the potential future upgrade and expansion to include the Cannon CarDio™ Liquid CO₂ technology - still the only Carbon Dioxide system proven to successfully run with fillers.

Vita Group CEO John Cheele (left) and Operations Director Nick Wood officially cut the ribbon on the new Special Maxfoam machine supplied by Cannon Viking.
Still Leading the Way in CO$_2$ Foam Production!

Since it's introduction over 25 years ago, Cardio™ has long been recognised as the most effective way to produce environmentally friendly, filled foams, especially Calcium Carbonate and Melamine using carbon dioxide as auxiliary blowing agent.

The Cannon Viking system remains incredibly popular for companies looking to avoid the use of Methylene Chloride in their production and is becoming increasingly popular with customers who wish to produce large volumes of filled foams on a CO$_2$ system.

The unique design of the Cannon Viking Airless Gatebar ensures trouble-free processing of fillers such as Calcium Carbonate and Melamine. Whereas competitor's systems simply block up because they cannot handle the increased particle sizes associated with the production of filled foams, the Cannon Viking Cardio™ system featuring the unique Airless Gatebar can handle and process particle sizes in excess of 120 microns.

The cost of chemicals is obviously the largest outlay for our customers and the use of fillers allows them to save on their most precious commodity. More and more customers are coming to Cannon Viking, as they know that Cardio™ is the only system they can have the confidence in to process fillers trouble-free.

In addition, with the advent of Melamine being used as a filler, in particular for it's fire retardant properties, more and more customers are turning to filled foams and need a system that can handle the larger particle sizes associated with filled foam production but simultaneously ensure high quality foams with an optimum yield and minimal waste.

The Cannon Viking Cardio™ system ticks all of these boxes and at present we are working on three separate Cardio™ projects for large European foamers who have turned to Cannon Viking to install a Cardio™ system onto their existing continuous foaming machines.

- Environmentally Friendly
- Able to process wide range of fillers
- Can process particles 10x larger than any other process
- Lower ‘consumable’ running costs - no need to frequently change filter pads
- Proven Production Worldwide - 70+ Plants
- Long Production Runs 4+ hours
- Higher Yield Per Kilo of Chemicals
- Lower Cost vs Methylene Chloride

As companies around the world begin to look at their environmental footprint and the use of Methylene Chloride is outlawed in more and more countries, the Cardio™ system ensures that our customers can fulfill all of their environmental obligations while maintain their production using fillers and achieve all necessary production and quality targets.

To date, Cannon Viking have installed in excess of 70 Cardio™ installations around the world on not just Cannon Viking machines but competitor equipment also. We are confident that Cardio™ technology will continue to evolve and we also look forward to the Cardio™ system pushing more boundaries over the next 25 years!
Transferring Corporate Culture, a Strategic Task

IN A MULTI-FACETED ORGANISATION THE TRANSFER OF KNOW-HOW AND THE DEFINITION OF COMMON CULTURAL TRAITS IS ONE OF THE MOST DIFFICULT TASKS FOR THE MANAGEMENT. CANNON GATHERED AT THE PLASTICS MUSEUM 100 OF THE YOUNGEST MEMBERS OF THE ITALIAN STAFF TO CONVEY FUNDAMENTS OF CORPORATE CULTURE AND THE GROUP’S STRATEGIC VISION FOR THE YEARS TO COME.

The charming environment of Cannon – Sandretto Plastics Museum in Pont Canavese, near Turin, Italy, hosted on July 4, 2016 a meeting of 100 young recruits bearing positions of responsibility within all the Italian Companies of the Cannon Group. Welcomed by the top Management, the participants had the opportunity to hear from them the fundamentals of Cannon philosophy – based in Internationality, Innovation, Independence and Integrity – and to learn from experiences speakers specific cultural traits of Cannon culture regarding the world of Plastics and Energy production.

Marco Volpato, President of the Group, shared the vision and the targets of Cannon for the next years, involving the younger generation of Cannon people in the achievement of an ambitious target, the transition between the Group of its first 50 years and the Cannon that will have to face the challenges of the future.

Bruno Fierro, Marketing and Communications Corporate Director, presented the latest figures and statistics regarding the Group’s activities and the whole promotional programme for the next 18 months. A guided tour of the Museum, whose seven restored rooms host a precious collection of ancient plastic parts, offered the unique opportunity to learn the history of the “Material That Nature Forgot to Invent”.

Cannon Director Appointed President of UCC


Born in Matera in 1955, Bruno Fierro, who holds a Degree in Chemical Engineering from Politecnico of Torino, is also a board member of ITABIA, the Italian Biomass Association. Selected by the Board to lead UCC until 2018, Bruno defined the path that he will follow in his new position, in compliance with the former leadership of UCC, stating: “My task will be to put the business at the forefront of our activities, providing, as Association, the tools required for the growth of its members. Internationalisation, Globalisation and Team Building are not only sound concepts, they are our target for the next three years. Today our Association is thriving on technical issues and regulatory update aspects of our activity. I would like to add a content-rich action focused on the business.

One possible way to increase our political presence, and our weight in the industrial compartment, is to offer diversified services. We can achieve this through a more organised presence to international trade fairs in target countries, through an increased dialogue between our associates, building an efficient “System of Companies”. The appointment of two new Board advisors in UCC – Alberto Zerbinato of ICI Caldaie and Simone Baietta of Tenaris – witness the renewed interest of the Italian producers of pressure vessels towards the function and the activities of their Association!”
T C Independence and Integrity – and to learn from based in Internationality, Innovation, them the fundaments of Cannon philosophy – participants had the opportunity to hear from We welcomed by the top Management, the all the Italian Companies of the Cannon Group. recruits bearing positions of responsibility within Italy, hosted on July 4, 2016 a meeting of 100 youngest members of the gathered at the Plastics Museum in Pont Canavese, near Turin, The charming environment of Cannon – Sandretto Christiansen, appointed CEO of ICI Caldaie and Simone Baietta of Tenaris – witnessed the renewed interest for the Group’s activities presented the latest figures and statistics regarding the Group’s activities as ITABIA, the Italian Biomass Association. Selected by the Board to lead the Association, Bruno Fierro, holds a Degree in Chemical Engineering from Politecnico of Torino, is also a board member of CANNON SPA has been appointed by the Board of Directors of CANNON, as their President UNTIL 2018.

The charming environment of Cannon – Sandretto Christiansen, appointed CEO of ICI Caldaie and Simone Baietta of Tenaris – witnessed the renewed interest in the Group’s activities. Bruno Fierro, holds a Degree in Chemical Engineering from Politecnico of Torino, is also a board member of CANNON SPA has been appointed by the Board of Directors of CANNON, as their President UNTIL 2018.

Meet Us @...

HEATEC - Shanghai, China
11-13 October, 2016 - Heating & Heat Power Technology

SAVE - Verona, Italy
19-20 October, 2016 - Automation

K - Düsseldorf, Germany
19-26 October, 2016 - Plastic & Rubber

ADIPEC - Abu Dhabi, UAE
7-10 November, 2016 - Oil & Gas

FEIPUR - São Paulo, Brazil
8-10 November, 2016 - Composites & Polyurethane

TECH BIZ EXPO - Nagoya, Japan
16-18 November, 2016 - Automotive

COMPOSITES EUROPE - Düsseldorf, Germany
29 November - 1 December, 2016 - Composites

POLLUTEC - Lyon, France
29 November - 2 December, 2016 - Environment & Energy

INTERPLASTICA - Moscow, Russia
24-27 January, 2017 - Plastic & Rubber

POLYURETHANE - Moscow, Russia
28 February - 3 March, 2017 - Polyurethane

JEC WORLD - Paris, France
14-16 March, 2017 - Composites

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Italians do it better

Cannon dedicated foaming solutions

The New FPL SR Head

The new Cannon mixing head features a longer lifetime and far higher laminar flow than a classic L-shaped model. An improved mixing efficiency allows for foam savings up to 3%. The scraper-shaped cleaning rod, limiting the friction heat, extends the life of rod and barrel. An easily accessible spacer and a redesigned self-cleaning section allow for a simplified maintenance. The FPL SR series is available in five models, with outputs from 90 to 4,400 cc/sec. Dedicated to low-density rigid insulation foams, this mixing head can be used for large and small items, from lightweight refrigerator doors to massive panels for insulated reefer containers and trucks.

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