Innovation Enlightens Growth

Intellectual Property Defense SECURES IT
New FPL SR Mixing Head

The family of Cannon FPL SR mixing heads featuring the patented design consists of 6 different models, suitable for the widest range of polyurethane moulding applications.

- Outstanding performance in terms of laminar flow rate, due to the head’s longer nose.
- Extended life time (from 3 to 5 times) thanks to the single piece design of the bushing [Patented].
- Easy maintenance, as per Cannon FPL mixing head, thanks to the possibility to change bushing and plunger locally.

Cannon is confirmed as the world leader in mixing heads design and production with more than 35,000 mixing heads installed and more than 15,000 dosing units, in 5 continents.

Only With Us!
Globalization has redrawn the boundaries of the markets and has brought the interest of the various operators to countries where, until recently, the protection of Intellectual Property was not considered the best strategy to pursue in defense of their technologies.

The Cannon Group has been ahead of its time and has always protected its innovative technology even in countries where other competitors are only now moving. In fact, intellectual property rights are one of the most effective tools for obtaining, above all from the commercial point of view, a position of absolute importance in the market of emerging countries.
Cannon has been successful in defending in international Courts its intellectual property, obtaining favorable verdicts that recognize the quality of his innovation and award the hard work needed to protect it against counterfeiting and copy. Thanks to its constant research and development, the Cannon Group holds a significant portfolio of patents, especially in the technological fields in which it is a leader, and enhances its intellectual property heritage by offering its customers technologically advanced solutions.

Using technologies and tools covered by international patents is, in fact, a strategic step also for our customers; it is a benchmark of the adoption of the new technical developments that bring benefits to their quality products and to more efficient industrial processes. Solutions and improvements that can be applied and valued differently from those made by cheap competitors that can only utilize copied or faked solutions.

Superior quality of the finished parts, lower consumption on energy and of raw materials, a scrap rate reduced to nearly zero (with all the economic and environmental related advantages), cycle times significantly cut – providing higher plant efficiency and shorter payback of the investment; these are the results of a continuing, dedicated program of R&D that Cannon has implemented since its very early days, more than 50 years ago.

For our Group, the defense of exclusive rights constitutes one of the mission to be pursued in defense of our customers and also towards the behavior of some competitors. Contact Cannon for any question related with the use of patented processes and equipment.
PRODU
A Smart, Fast, Precise Head

THE CANNON AX22 MIXING HEAD HAS BEEN AWARDED WITH THE “TECHNOLOGY & DEVELOPMENT AWARD 2017” PRIZE FROM TOYOTA BOSHOKU, THE JAPAN-BASED PRODUCER OF AUTOMOTIVE COMPONENTS ACTIVE WORLDWIDE WITH FactORIES AND DEVELOPMENT CENTRES.

The winners of the 2017 edition have been awarded on April 18, 2018, during the event that is held every year in Nagoya, Japan, to gather all Toyota Boshoku suppliers for a general meeting, a commendation ceremony and a social party. This year 180 companies and more than 250 people attended this meeting.

The Toyota Group was represented by Mr. Shuhei Toyoda - TB Chairman, Mr. Takeshi Numa - President, Mr. Yoshihiro Ito - Vice president and more than 50 other top managers.

The “Technology & Development Award” has been assigned to Nippon Cannon for the AX22, the 6+1 component L shaped mixing head for Polyurethanes, now used in several TB factories to produce multi-hardness, multi-density flexible seats and backs for the vehicles of Toyota, that in 2017 has produced 9.1 million cars. The prize, presented by president Mr. Takeshi Numa, has been recommended by the whole Toyota Boshoku's Production Engineering team, with a motivation stating that “the high productivity, high flexibility, high quality and high stability of new AX22 mixing head brings TB huge advantage and benefit”.

Cannon News
Isao Naganuma, NCI Operation Manager, summarised the background of this award:

"The AX22 project started in 2013, with a 4 radial + 1 axial components configuration. Since a competitor had already a 6 components head available, the reaction from TBj was not excited. Subsequently, when the development of a 6 radial + 1 axial components model was initiated at Cannon Afros in August 2014, we shared this info to TBj and began to discuss more technical issues deeply. First we could catch up the gap with the competitors but, to win this game, higher quality and long-term endurance was essential. Afros and NCI began to review and check the head’s components one by one, with a great support of the TBj’s advices. Finally, in November 2014, the first AX22 6+1 components mixing head was delivered.

In December 2014, TBj, Afros and NCI worked well together and successfully gained significant technical data through the performance tests run at TBj lab. The main advantages shown by this head were the high mixing performance, laminar flow, short cycle time, easy installation and maintenance.

The advantages deriving from these performances became a standard reference for this type of head and allowed to develop a number of different sizes, today commercially available and performing very well. In fact, comparing the foaming performance of the AX22 with the previous Cannon mixing heads AX18 and AX24, at that time widely used and appreciated by TBj, the first noted differences were substantial and helped us to open the door for an industrial supply: in August 2015 TBj commissioned us the replacement of the AX24 head with a new AX22 at the Sanage plant. In the following 2 years we made constant improvements on a number of mechanical and hydraulic parts.

In 2016 we held a specialised training for all Cannon personnel involved in mixing head maintenance, in 2018 we activated for them a maintenance operator certification system.

In June 2017 our AX22 could achieve 2 million successful shots before any preventative maintenance and with Quality Indexes by far superior to the severe limits imposed by the client! This symbolic step lead us to close several further contracts with the TBj organisation in the World: one more head for the Sanage plant in August 2017, one in TB Mississippi, USA, plant in December 2017 and one in February 2018 in Guangzhou Intex, in China. TBj in France installed one AX22 during summer 2018."

Maurizio Cusinato, General Manager of Cannon Afros, commented:

"It has been a long, challenging project. The local support of a strong Cannon Unit in Japan has helped us to be successful. We learned a lot with this job and we have already transferred numerous of its experiences into the design and manufacture of other, more recent mixing heads."

Marco Volpato, President of the Cannon Group, commented this prestigious achievement saying that...

"I’m thrilled to hear about this prize. I remember the technical hard work as well as the several local interventions we have made in the years to be able to release this mixing head with the best performances. I want to thank all the NCI staff, but also all the other Cannon people who contributed to reach this result that competent engineers can particularly appreciate. During this four years period several members of our Group, including Maurizio Corti and Giorgio Molteni of Cannon Afros, in strict cooperation with Isao Naganuma and Kenji Serizawa of NCI worked very hard on this project. Let me praise also the work of our colleagues of Cannon Micromec, the makers of the heads, the technical staff of NCI who spent numerous hours at TBj labs and factories, and our speedy shipping and other related departments: this is a true Cannon Team’s success. And last, let me heartily thank TBj’s Production Engineering team for their kind and full support all the time!"
RELIABLE HEADS: THE CANNON DIFFERENCE

AFROS AND MICROMEC GUARANTEE THE HIGHEST PRECISION AND QUALITY TO CANNON MIXING HEADS

INNOVATION, QUALITY, RELIABILITY, SERVICE: THE WINNING FACTORS THAT GRANT TO CANNON AFROS A LEADING POSITION IN THE FIELD OF REACTIVE COMPONENT’S MIXING TECHNOLOGY. WE DISCUSS IT WITH MAURIZIO CORTI, TECHNICAL MANAGER, AND GIORGIO MOLTenI, ENGINEERING DEPARTMENT MANAGER AND MIXING HEAD SPECIALIST.

Cannon News: To assign the right dimension to this interview, could you tell us, Mr. Corti, what is the size of the mixing head’s business for Cannon Afros?

Maurizio Corti: Sure. Cannon Afros built in its 50+ years of activity at least 35,000 mixing heads, in various models, sizes and variants. We currently produce more than 1,000 heads per year, the largest part high pressure models, divided today in 10 families with at least 40 variants, for around 250 different “codes” of our database.

CN: This must represents quite a lot of work: how many people are involved in it?

MC: As mixing heads are our best qualifying product, around 50 Cannon people in the World are fully dedicated to them in development, production, maintenance and service of the mixing heads. And “fully” means true full time dedication: the number does not include the employees assuring the logistic or purchasing aspects of the business, since they also take care of other Cannon products.
CN: Which are the main sources of inspiration for a new head?
MC: A new model derives either from an intuition of our specialists, commercial or technical, that perceive a new possible application and start working on it, after an initial discreet market survey on its potential. Either from the evaluation of a new application, currently in the boiler's room of some of the major Raw Material Suppliers with whom we usually cooperate for developments. But, many times, from a client's need, trying to address a specific problem. Especially in this case, if there is a potential market behind a single request, we design a new head.

CN: How is the workload distributed at this point of the project, Mr. Molteni?
GM: A dedicated Technical Office that I lead at Cannon Afros converts into an industrial project a new mixing head model or variant that is, later on, further developed and tested by our R&D Department. The design is transferred to our Micromec sister Company, that optimises the sequence of mechanical machining operations of each single head's components. Micromec uses state-of-art CNC WorkCentres, grinders and lapping machines, as well as a brand new CMMs system for component's 3D measuring. Parameters like maintaining the perfect internal and external geometry as well as the simplification of transfers between different CNC machines are carefully analysed to optimise machining times, costs and prevent the accumulation of geometrical errors. Easiness of assembling and of maintenance are deeply considered and perfected.

When a prototype is made, it is tested and characterised in our R&D lab with chemicals, and a feedback report is done to apply the necessary improvements. Micromec corrects what is needed and proceeds then with the final machining and assembling. A very scrupulous series of geometrical controls are run on each head's element, as well as a complete hydraulic test on pistons and component's circuits, that result in a Micromec issue of a compliance certificate.

In parallel, samples of the thermally treated elements are sent to an independent Certification Authority to check and guarantee the quality certification that accompanies each lot of heads to Afros.

CN: What happens next, at Cannon Afros, Mr. Corti?
MC: Two different procedures are followed, according to the type of head: if it is a well-known model, the certified data are controlled and validated, and the head goes to the warehouse, available for Sales.
In case of a new model, instead, the head is re-tested in the R&D Lab and its features are fully characterised.
When everything fits the expectations and requirements, the head is loaned to an industrial Beta-tester that puts it under stress in real-life conditions, further reporting back results and problems. This phase is fundamental, since no better judgement can be expressed than that of the industrial end user. At the end of this long industrial testing the head is released for sales and publicised.

**CN: Right on the point of reliability: what has been the evolution of Cannon heads in the years, from a performance point of view?**

**MC:** There has been an important and fundamental evolution, both in terms of cycles and of performances. Once it was common, for instance for refrigerator cabinets foaming, to mount one head on each polymerisation jig. The head was working for several seconds every 4-5 minutes, at a medium output. Today, using chemical formulations much faster than before, a refrigerator plant can feature one mixing head travelling across 6-8 foaming fixtures, performing an injection every 20-30 seconds, at a much higher output! Mechanical stress, hydraulic work, output, everything has grown!

In spite of this, our heads last — as an average — up to eight times longer than thirty years ago!

We can guarantee, with a correct maintenance, an incredible number of shots, even if compared with only ten years back. Electronics and modern hydraulics assure faster operating cycles, allowing also to operate only one of the two head's pistons when a very fast sequence of shots is requested, etc. Every detail counts, In the search for a long lasting head!

**CN: How could this technically happen, Mr. Molteni?**

**GM:** There has been a great improvement of multiple factors, in the past 10 years: smarter design, more precise machining, stronger metals and new materials, dedicated sealing packs, more efficient surface treatments. All these steps forward have contributed to the production of components that generate better matching, lower frictions, thus less heat and less wear-and-tear effect.

Our AX22 head has obtained an award from Toyota for its quality, ease of use and reduced operative costs, after having been validated in mass production conditions. Imagine that, thanks to the recent design and construction improvements, our FPL SR series has obtained the ATEX Certification, confirming its total reliability against overheating or accidental production of sparks when using chemical formulations containing Pentane, a potentially explosive hydrocarbon used as physical blowing agent.

I'm not aware of any other head from our competitors bearing this certification!

**CN: What is the Cannon position concerning the use of repaired heads, Mr. Corti?**

**MC:** There has been a significant growth of independent Companies offering repair services for the mixing heads, with mixed results. Some know what they are doing, some don't. We say: “send them back to us by our local agencies. We use original spare parts and skilled manpower, your old or damaged mixing head can live a new, long life with a minimum refurbishing cost”. We dedicated, in our factory, a new technical area only for this purpose.

The latest generation of heads features so many dedicated and sophisticated solutions that only the manufacturer can assure a perfect refurbishing.

To provide fast and less expensive repair service we have organised internal training courses for our Locations, certifying a number of our local technicians to the refurbishing of our most evolve heads. Working locally, in many Countries of the Western and the Eastern markets, our local agencies can supply repaired heads in a very fast way, avoiding expensive and time-taking shipments to Italy. This local service has been a strong asset for Cannon, since its early years, very appreciated by its customers that, working with other machine suppliers not present locally with a Technical Service, are very often penalised for these repairing jobs by hefty Custom Duties and bureaucratic paperwork.
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BONO ENERGIA
for Food & Beverage Processing

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Taste Our Best:
- Safety
- Reliability
- Energy Efficiency
- Emission Reduction
- Technical Assistance Network

Cannon Bono Energia
www.cannonbonoenergia.com
UNIDO Supports VACUUM TECHNOLOGY in South Africa

Panel World is Successfully Using VAI (Vacuum Assisted Injection) for Refrigerated Truck Panels
UNIDO funded a Demonstration Project to assess the technical and economic advantages of the Vacuum Assisted Injection (VAI) in discontinuous panel's plant production. An existing foaming plant was retrofitted with dedicated equipment to allow to switch blowing agent, from 141b to Pentane with the help of vacuum during the foam injection and polymerization phases. The execution of the tests at Panel World, Frankfort, Free State, South Africa, demonstrated the success of VAI. The results of this Project offer a new opportunity for the conversion of the production process in order to phase out the use of HCFC-141b in the manufacturing of sandwich panels.

Background

In 2007, the Parties to the Montreal Protocol agreed to accelerate the phase-out of the Hydrochlorofluorocarbons (HCFCs) as the main Ozone depleting substances largely because of the substantive climate benefits of the phase-out. In the following years, Parties operating under the Montreal Protocol’s Article 5 (mostly developing countries) have formulated their HCFC Phase-out Management Plans (HPMPs) for implementation under financial assistance from the Multilateral Fund for the implementation of the Montreal Protocol (MLF).

The Executive Committee in decision 72/40 agreed to consider proposals for demonstration projects for low-global warming potential (GWP) alternatives and invited bilateral and implementing agencies to submit demonstration project proposals for the conversion of HCFCs to low-GWP technologies in order to identify all the steps required and to assess their associated costs. The use of the VAI technology for the application of alternatives to HCFCs fully fits the actual ExCom decision on Demonstration Project proposals as defined in ExCom decision 72/40. The project was approved for UNIDO implementation in the republic of South Africa.
Project Objective

- Demonstrate benefits from the application of the vacuum assisted injection in replacement of HCFC-141b with Pentane in term of insulation properties in the panel’s sector.
- Demonstrate the easy applicability of the technology and, consequently, the replicability of the results.
- Demonstrate that lower cost structure can be obtained by means of shorter foaming time, lower foam density, lower thermal conductivity.
- Demonstrate the advantages in terms of safety against explosion and environmental and health sustainability for the operators.
- Objectively analyse, if the incremental capital cost could be reduced overall in similar future projects by means of using VAI applied in the foaming process automatically used also for suction of flammable and harmful gaseous substances. Thus, providing means of reducing the cost of exhaust ventilation system in the hydrocarbon based plant conversions.

UNIDO requested that a bidder propose execution of a tests to demonstrate the success of VAI. Testing had to be done at Panel World, completed by December 1st 2017 with test results to be submitted by December 15th.

Company Profile

Panel World Products is a family owned business, originally founded by the three Muller brothers in 2000. Their core focus is on quality and delivery time and therefore Panel World has set a benchmark for all of its products that competitors find hard to match.

Panel World Group of companies is employing more than 50 staff members and are situated in Frankfort, with over 2,500 m² of manufacturing space available; 100m² office space; 1000 m² storage, assembly and stock area.

The company’s current production includes Polystyrene & Polyurethane panels, made using Polyurethane foam blended with HCFC-141b & Polystyrene foam blocks from a local suppliers. The panels are manufactured discontinuously in a Manni press. The production process is to a large extent manual.

Testing Organisation

In order to demonstrate technical and financial advantages of VAI, baseline equipment had to be fitted and existing technology to be modified. Cyclopentane was the preferred blowing agent, since it is a natural substance and represents environment and human health friendly and sustainable technology.

The parameters to be tested and verified were:
- k-Value
- Density
- Shot weight
- Adhesion
- Dimensional stability
- Visual Aspects
- Demoulding Time

The Demonstration Project was split into three steps:
- Step-1: Benchmarking to be done based on 141b panels. From existing samples and tests results.
- Step-2: Trials with Supplier 1 by using Pentane (without and with Vacuum) getting test results.
- Step-3: Trials with Supplier 2 (if needed to achieve further improvements) and main focus in fine tuning of the process to achieve the objectives of UNIDO project.

Testing Procedure

Panel World uses Pentane as a blowing agent which is dosed via a Cannon Penta EasyFroth 20 to the foam dosing unit, a Cannon A100 Compact Penta high pressure machine.

Foaming press is a Manni press set up for Pentane, 8.5m long, with 2x2 polymerization cavities system, equipped with additional Vacuum Assisted Injection hardware. The VAI production method applies into the press a depression surrounding the metal-faced insulation panel.

Prior to the foaming operation, a controlled degree of vacuum is applied between the press platen where the pre-assembled panel is positioned.

The reduced pressure applied during the injection and the expansion of the foam, facilitates the filling of the panel, providing substantial benefits.

Two panels were sampled using Resichem Polyurethane system containing 9% of Pentane and one panel was tested with a Dow Chemical system using 7% Pentane. Each panel was divided into three equal segments (Left-, Centre & Right) along the length of the panel. The test samples were then cut from the middle of each segment. This method allowed to assess the consistency of the results along the chemical flow path or panel length.

The tests done on the resulting foamed panels were: density distribution, compressive strength, thermal conductivity and foam stability. (Good dimensional stability results after production is a technical indicator for long term dimensional stability, temperature resistsants' and long-term panel quality).
Results and Observations on the VAI Technology
Foam Density & Distribution

Current Market Standard Without Vacuum.
Target density: 42 g/l
(Resichern Methyl Formate 6% of Polyol)

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Panel 1 – Target density: 38 g/l
(Resichern System Pentane 9% of Polyol)

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<tr>
<td>Differential</td>
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Panel 2 – Target density: 36 g/l
(Resichern System Pentane 9% of Polyol)

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<tr>
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<td>Differential</td>
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<td>3.2</td>
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Panel 3 – Target density: 38 g/l
(Dow System Pentane 7% of Polyol)

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<td>3.8</td>
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In all the panels the overall density was below the target by 1 g/l. The overall density was evenly distributed in all the panels. The density differentials were all below 4 g/l (typical for this application).
The compression strength results are within the following ranges:
• Panel 1 (at 41.5 g/l foam density)
  160 +15 kPa, (Resichern System Pentane 9%)
• Panel 2 (at 37 g/l foam density)
  135 +15 kPa, (Resichern System Pentane 9%)
• Panel 3 (at 37.2 g/l foam density)
  165 +20 kPa, (Dow System Pentane 7%)

Advantages, in brief
• Much better foam quality, aspect and dimensional stability
• Eliminated the fumes ventilation system
• Much cleaner and healthier working environment
• Replaced HCFC blowing agent with a more environmentally friendly one

Conclusions
REAC Chemicals, the Cannon Agents for South Africa, have been fundamental for the success of this project: their technical and commercial support has allowed to install efficiently this equipment and to apply on site all the necessary adjustments and fine tuning during different sets of trials.
All data shown in this article has been extracted from their final report to Unido.
The project objectives have been met; technical report has been submitted to the MLFS for the 81st ExCom.
An entire techno-economic replicability is confirmed: the VAI technology is globally applicable for any new installations as well as for retrofitting/upgrades.
The Cannon Group welcomes inquiries from the manufacturers of large insulation panels, either for the supply of new VAI foaming plants or for the retrofitting of suitable existing plants.
Keep Pressure UNDER CONTROL

TO REMAIN AT THE FOREFRONT OF THE FASCINATING FIELDS OF CELLULAR PLASTICS AND REACTIVE POLYMERS CANNON CONTINUOUSLY DEVELOP INNOVATIVE EQUIPMENT, PRODUCTION PROCEDURES, DEDICATED SOLUTIONS.

The high pressure mixing, or impingement, is the basis of the Polyurethane technology. Cannon Afros has recently developed a new remote control system for the automatic control of the components pressures, adjustable in closed-loop during the injection.

The main parameters influencing the mixing efficiency are:
- Kinetic energy of each chemical component
- Degree of turbulence inside the mixing chamber
- Flow shape of the injected liquids

The shape of the flow, and partly the degree of turbulence, mainly depend on the geometry of the injector used, as well as on the geometry of the mixing chamber. The size of the injector hole must match the expected flow range: neither too small nor too large.

Once the injector size has been established, the only variable that can still be controlled by the operator is the kinetic energy of each component: the greater it is, the
more effective is the impingement and therefore also is the mixing. Since the volumetric flow rate of the single component is dictated by the formulation and is ensured by the metering system, the only way to increase the speed of the fluid (e.g. its kinetic energy) in the mixing chamber is to reduce the nozzle hole's diameter. By partially closing the outlet hole of the injector with its pin, the velocity of the fluid is drastically increased up to over one hundred meters per second and as consequence the pressure before the nozzle increases.

Remote Control System
With a traditional system, a manual adjustment of the pressure is required, in case of important variation of output, if the working conditions get too far from the optimal ones. It is common that the mixing head works in a plant where it is impossible to adjust manually the injector. Therefore, a remote control system, to automatically preload the needles of the injectors, is necessary to better line up with requirements of the 4.0 Industry working method.

The automatic control can be simply figured out by replacing the preloading elements, represented by a screw/spring assembly, with a pneumatic or hydraulic piston. Both hydraulic and pneumatic control systems generate a force that axially loads the injector's needle.

New: the AiReco System
With the configuration of the new Cannon AiReco system, the components layout has been improved to achieve the best performance maintaining the fundamental simplicity: the spring, preloaded by a screw, now works together with the pneumatic piston. The result is a huge improvement on the control of the force acting on the injector needle.

The set-up of the system is very simple: the pump is brought to the maximum expected flow rate and, working without air, the preload of the spring is mechanically adjusted until the desired pressure is generated, or slightly less. When the flow rate is reduced, the spring is discharged and the pneumatic system increases its contribution step by step. At medium flow rates, and even higher, the contribution of the spring helps keep the regulation stable.

Performance Results
The pressure stability over the changing of the flow rate has been analysed and compared among several type of injectors. The test was carried out by setting the injector at 150 bar at a flow rate of 500 g/s and then changing the flow rate.

It can be easily figured out that the fixed injector, without any flexible component, has the worst performance result.

L'Orange injector has a wider flow rate working area without significance change on the working pressure. Nevertheless, the small inlet holes limit the extension of the working range.

The Leak Free systems are characterized by an extension of the working capacity with a smaller pressure variation, therefore they have a good response to the variation of the flow rate.

Advantages and Conclusions
The new Cannon AiReco is the recommended automatic pressure adjustment system for the producers of moulded Polyurethane articles – in flexible or rigid foams – that need to perform a sequence of injections in a wide range of outputs. Its main advantages are:

- **Quick and precise regulation** (±5 %) in 0.5 sec with optimal response to output variation
- **Preflow prevention, without slip-stick effect**
- **Reduced capital investment, optimal price/performance ratio**
- **Simple and reliable solution**
- **Reduced operative cost**, working with compressed air at 6 bar, available in any factory
- **Clean, oil-free, low-maintenance** method
- **Easy to install** on Cannon high pressure mixing heads.
The ART of COLOUR

The easy colourability of plastics has contributed to their success and diffusion in thousands of different applications. Coloured articles are, without any doubt, more attractive, easier to identify, more elegant than neutral or black ones.
Colouring Polyurethanes or other polymers obtained from the reaction of liquid components requires few specific technical procedures and liquid or paste colours: Cannon has developed colouring methods and equipment adapt for any kind of request.

**Large batch production**
Huge production lots of articles of the same colour are normally made adding a liquid colour to the dosing machine’s tank of one of the reacting components, usually the Polyol. To change the colour of the moulded parts the tank and the whole metering line must be thoroughly flushed, to avoid the contamination between the different tints.

**Small batch production**
Small lots of articles moulded with different colours are a frequent request from the manufacturers of automotive interiors spare parts, furniture, technical items. In this case the suggested method is the direct injection of colour in the mixing head, using proper hardware to minimise or remove contamination between different colours. This technique lead to the development of dedicated hardware for both the metering and the mixing equipment and procedures.

**Use of abrasive colours or of high-temperature formulations**
Some colouring ingredients can be very abrasive for the metal parts constituting the component circuit. Some dyes of mineral origin can be very heavy, requiring the continuous recirculation of the colour component to avoid the settling of the pigment in tank and pipes.

Modern formulations may require high processing temperatures for all the liquid components, including the colour. These specific needs demand appropriate equipment and working procedures. This table can help to select the currently available Cannon technical solutions.

Cannon developed several methods for the direct injection of colours in the mixing chamber of a mixing head, allowing to produce small lots of articles in various colours while keeping neutral raw materials in the dosing machine’s tanks. The following paragraphs describe in detail the characteristics, the performances and the advantages obtained using one of the available alternatives.

**CCS – Cannon Color System**
Patented in the early 1980s, the CCS represented a breakthrough solution for the Polyurethane industry. Produced in thousands of units, the classic CCS still is the best colour metering unit for those moulders requiring medium-small lots of articles coloured with a limited number of tints.

Various CCS units can be permanently filled with the colour paste, diluted with the standard Polyol used for production. They are connected and disconnected manually to the mixing head with an operation lasting less than 5 minutes. Precise metering is performed using a pneumatic piston-dosing system able to work even with very viscous colour pastes.

These are pumped directly in the mixing chamber of the high-pressure head through a tiny conduit carved axially in the small piston that controls the injection sequence.

The perfect blending of the viscous colour paste is obtained feeding it, axially and at a moderate pressure, to one mixing head featuring a “L-shaped” mixing chamber.
The paste is added right in the middle of the tiny chamber where a very turbulent action is taking place: here the two reactive components (Isocyanate and Polyol) are impinging at very high speed. Turbulent flow perfectly incorporates the diluted colour paste within the reacting formulation. When the mixture is transferred in the larger discharge duct of the head the turbulence is smoothed and the chemical blend assumes a more laminar flow, while the colour component gets evenly distributed across the whole volume of the injected shot of liquid.

Changing colour, when requested by the production schedule, is performed quickly, by replacing one CCS dosing unit with a similar one filled with a different tint. A small purging shot is requested before starting with the production, in order to clean the very small conduit (a volume of less than 2-3 cc) that brings the colour into the mixing head.

**Colour Switching Manifold**

Two CCS units can be permanently attached to one mixing head using a dedicated connecting manifold, containing a flip-flop switching valve. Featuring two inlets, fed from the flexible pipes of the two CCS, and one outlet, directly mounted on the mixing head, this reliable and economic solution allows for the on-the-fly change of colour. The operator simply switches off one unit and starts the second one, and the pressurized flow of new colour operates the switching valve allowing the new stream of colour paste to reach the mixing chamber. A small purging cycle is required to flush the tiny conduit carrying the colour into the mixing chamber, with a waste of less than 20-30 grams of chemicals.

**MCCS – Modular Cannon Color System**

An evolution of the CCS, the MCCS features a modular plug-in design that shortens the time required for the colour-changing operation and reduces the overall investment required to meter many different colours in sequence. The unit’s structure is split between a removable storage and metering section and a host frame where all the electric and electronic components, the hydraulic pack (with an oil pump driven by a frequency-controlled motor) and the temperature control unit are mounted.

The MCCS can be used for any kind of Polyurethane formulation and it is particularly suitable for RIM Coating applications where a thin, high-density layer of coloured Polyurethane (PUR) or Polyurea (PUA) formulation must be over-moulded on a support of thermoplastic resin. This operation is performed inside the injection moulding press where the plastic insert has just been formed. All these PUR or PUA Class A or matt coatings are characterised by high processing temperatures and the colours used are often very abrasive; both characteristics call for a special design of the metering equipment in contact with the colour component.

For these reasons the MCCS unit features a metering system based on an hydraulic piston, built with an hardened, abrasion-resistant metal alloy, to guarantee long lasting operations and constant metering precision. A transducer ensures perfect control of the colour flow to the head, adjusting it in real time in case of deviation from the set value.

The oil metering pump controlling the dosing piston is driven by a frequency-controlled electric motor, guaranteeing the immediate correction of output when required by the computerised control system.

The colour-change operation consists in a quick removal of one sliding support – holding the tank and the dosing piston of the first colour – replacing it with a similar second unit taken from a hot-swap parking station. Here the storage tank has been connected to a heating unit which keeps it at the exact temperature demanded by the injection process. This second unit is quickly inserted in the hosting frame.

<table>
<thead>
<tr>
<th>PROCESSING NEEDS</th>
<th>CCS PISTON DOSING</th>
<th>MODULAR CCS PISTON DOSING</th>
<th>CROMA FEED PUMP DOSING</th>
</tr>
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<tr>
<td>Non-abrasive colours</td>
<td>●</td>
<td>●</td>
<td>●</td>
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<tr>
<td>Abrasive colours</td>
<td>●</td>
<td>●</td>
<td>●(*)</td>
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<tr>
<td>High temperature processing</td>
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<tr>
<td>RIM Coating</td>
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<td>●</td>
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<tr>
<td>Recirculation required</td>
<td>●(**)</td>
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<tr>
<td>Connection to many colour injectors</td>
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<td>●</td>
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</tbody>
</table>

(*) available with pump made of hardened metal (**) discontinuous recirculation
where through quick automatic connections it is made immediately available for a series of new injections.
The electronic control automatically sets the injection rate and time, the hydraulic pack connects to the dosing piston, the colour feeding pipes – hooked to the mixing head through a QCC (Quick Colour Change) injector removable loosening one bolt – are replaced in a very short time.

**CromaFeed – Cannon High Pressure Colour Unit**

Several industrial users often require a centralised colour dispensing unit to feed many mixing heads mounted on fixed moulds. Others use colour pastes formulated with very heavy pigments that tend to settle in the tanks and in the piping, for which they need a continuous recirculation system to keep the colour more homogeneous throughout the whole day.

Some other users demand for an absolute colour metering precision, to guarantee total consistency of aspect through wide lots of products.

The Cannon solution for all these needs is CromaFeed, a closed-loop controlled, high-pressure colour dosing unit guaranteeing the highest consistency in colour dosing thanks to a frequency-controlled gear pump and a dedicated PLC control.

The system features an automatic closed loop on the control of the flowrate, if a flowmeter, available as an option, is added to the colour delivery line.

Able to dose precisely colour pastes of viscosity up to 3,000 cps in an output range between 0.45 to 32.4 g/s (the actual range of 3 different dosing units) this series of high-pressure dispensers can be connected to a distribution ring feeding several mixing heads.

To change colour various CromaFeed units can be permanently filled with different tints, to be connected and disconnected manually to the mixing head with very quick operation.

**Benefits of Cannon colour dosing systems**

- High quality parts, thanks to precise and consistent colour dosing and perfect colour mixing
- Reduced capital investment to dose several colours in fast sequence
- Very high plant’s productivity, thanks to the Plug&Play solution that provides very short colour changing time
- Reduced maintenance of dosing machines, containing only non-coloured chemicals
- Environmentally-friendly and cost-conscious, thanks to a minimum waste of purging material

**Mixing heads suitable for using colour**

The fundamentals of colouring technology for PUR and PUA liquid formulations are based on the direct injection of colour in the mixing head. Its mixing efficiency, internal and external geometries, the colour change system, the handling and maintenance procedures are fundamental parameters to be considered prior to the purchasing decision.

The comprehensive portfolio of colour-injection Cannon solutions includes numerous mixing heads designed for different needs.

These heads feature a special third component feeding line with an injector provided with internal recirculation circuit: the colour paste flows continuously through the injector, maintaining the material at the desired temperature all the time and avoiding any settling of the heavy pigments contained.

Working in closed loop control, this unit automatically adjusts the colour component's output according to the desired output value set for each mixing head, widening the range of applications also for those processors working simultaneously on moulds of very different sizes.
INNOVATIVE METERING SYSTEMS

New Cannon Solutions are available for Carbon Dioxide-blown Polyurethane Foams

The International Authorities Charged with the Phase-Out Task of CFCS and HCFCS Dictated by the Protocols of Montreal and Kyoto (i.e. UNIDO, Multilateral Funds, World Bank, etc.) Have Committed Throughout the Years Numerous Conversion Projects to Cannon, Which Has Been Recognized As Worldwide Leading Specialist with More Than 600 “Lines” Supplied, and More Than 250 Plants Retrofitted.

One of the available replacements for CFCS and HCFCS as a Blowing Agent (BA) for foams is Natural, Liquid Carbon Dioxide. Widely available at very convenient price, Carbon Dioxide (CO₂) requires dedicated procedures and equipment to be efficiently used as blowing agent for PU foams.

The Cannon solutions, used Worldwide

Every BA requires specific machine configuration that can make the difference between successful production and frequent stops of the line or poor foam’s quality. The choice of CO₂ has a great financial and technical impact on industries which care about quality, process and environment. After having managed in 1993, with the revolutionary CarDiO™ technology, the difficult task of dosing continuously large percentages of natural liquid...
CO₂ in continuous foaming processes, Cannon developed technological solutions to use liquid CO₂ for discontinuous PU moulding.

The added value of Carbon Dioxide as a blowing agent
Advantages of CO₂ as blowing agent range from process stability and design freedom to substantial cost reduction. Due to its chemical nature and availability, CO₂ offers numerous advantages:

• Low cost BA, reducing formulation cost,
• Non-flammable BA, reducing environmental impact,
• Reduces the use of water in the formulation, lowering the Isocyanate consumption and reducing Urea formation, providing an improved foam structure,
• Suitable for production of very low density foams, widening the grade’s portfolio,
• Produces foams with excellent sound insulation properties.

Cannon Technology for the use of CO₂: benefits for process and production
The Cannon solutions have been engineered to precisely meter and control pressure, temperature and output of CO₂, allowing for:

• Outstanding mixing quality
• Faster demoulding time
• High productivity
• Short pay-back time

The main applications that can benefit from the use of liquid natural CO₂ are for Automotive – for sound insulation, providing easier open mould pouring and excellent sound deadening properties – and Furniture, for cushions, sofa, armchairs, allowing to obtain the softest foam grades.

The Cannon portfolio of dedicated equipment for CO₂ dosing includes three systems:

• CarbOxide: to premix gaseous CO₂ in a buffer tank,
• EasyOxide: to premix liquid CO₂ with Polylol upstream the machine day-tank,
• CannOxide: to premix liquid CO₂ in line just upstream the mixing head.

CarbOxide – easy to use and very reliable
Batch system for an excellent premix quality of gaseous CO₂ directly into the day tank.
Cannon CarbOxide is the optimal solution for premixing low to medium percentages of CO₂ - fed as a gas from pressurised bottles – in the metering machine's day-tank. Mounted on a precise scale to keep its content easily monitored, the CO₂ bottle can be easily replaced when empty.

High-precision metering equipment, operating with a batch system, guarantees the perfect mixing ratio among gaseous CO₂ and Polylol or Isocyanate.
A precise mass flowmeter controls the output of the gaseous CO₂ in closed-loop, automatically adjusting the flow according to the ratio set between Polylol or Isocyanate and CO₂.
A dedicated static mixer has been engineered specifically for the optimal blending efficiency.

CarbOxide Advantages:

• Very high mixing efficiency to perfectly blend gaseous CO₂ to one component (Polylol or Isocyanate),
• A very suitable solution for retrofitting existing foaming plants,
• It can be connected to a central large day-tank supplying several metering machines with a proper distribution piping.

EasyOxide high performance solution
Batch system with a dedicated buffer tank for a very precise metering of liquid CO₂.
Cannon EasyOxide is the optimal solution for an extreme precision in pre-blending liquid CO₂ to one component (Polylol or Isocyanate) in real time.
Feeding directly the machine's working tank, it is a suitable solution for low-to-medium concentrations of CO₂. Each component of its circuit has been specifically designed to nucleate the desired CO₂ concentration in the buffer tank.
The booster group pressurises and cools down the blowing agent to guarantee the most precise metering of the liquid CO₂. A mass flow meter ensures precise and continuous measurement of the flowing CO₂, allowing the central computerised control to operate in closed-loop mode with the feeding pumps, thus guaranteeing constantly the desired Polyol (or Isocyanate)/CO₂ proportion.

A dedicated static mixer has been engineered specifically for the optimal blending efficiency, while a chiller unit mounted on board maintains the correct component temperature.

Cannon EasyOxide can be integrated into an existing dosing unit or supplied with a new one.

**EasyOxide Advantages:**

- Very high dosing precision to perfectly blend liquid CO₂ to one component (Polyol or Isocyanate)
- A very suitable solution for retrofitting existing foaming plants

**CannOxide**

**for high-flexibility production**

Online system with direct injection of liquid CO₂ into the mixing head.

CannOxide is the Cannon metering unit designed to inject liquid CO₂ directly into the mixing head. Suitable for low-to-high percentages of CO₂, it is a convenient solution also for using different blowing agents.

The direct injection method provides high production flexibility from shot to shot, since it is possible to quickly change the output of CO₂.

A booster group keeps the liquid blowing agent pressurised and cooled, to guarantee its precise feed.

The output value is continuously measured with a dedicated mass flowmeter, that sends the instantaneous value to the central computerised control, allowing for closed-loop control of metering.

The CO₂ injection valve is designed to fit all Cannon FPL mixing heads. The CannOxide unit can be easily integrated into an existing plant, using a specific CO₂ injection kit and a Cannon mixing head.

**CannOxide Advantages:**

- Very high production flexibility, being able to vary the CO₂ output from shot to shot
- Suitable for different blowing agents
- Adapt for retrofitting existing foaming plants

**Technological innovation from a leader**

Launched in November 1993 at the World Polyurethane Congress in Vancouver, Canada, the Cardio™ process for the use of Natural Liquid Carbon Dioxide in slabstock foams immediately found industrial applications in the whole World.

The method allowed the producers of flexible blocks of foam, produced with the continuous technology, to fully replace CFCs and Volatile Organic Compounds (VOCs) from their process, while obtaining high-quality foams of unparalleled low density and hardness.

The Cardio™ technology is successfully used today by more than 75 industries Worldwide.

Since its foundation, Cannon has been on the forefront for developing “green” technologies, to safeguard the environment and comply with international regulations.
The EPO has granted on July 2nd 2018 the European Patent EP 2767376 B1 to Cannon Afros for its family of FPL SR mixing heads.

The decision came after two years of technical confrontation deriving from a European opposition procedure filed by a competitor. The unique design of the FPL SR’s discharge duct had been already granted a patent in Italy in 2014 and one in the USA in 2016.

To improve the reliability on the long-term use, the potential head’s sticking problems provoked by modern high-isocyanate-index formulations have been solved using a more efficient design for the self-cleaning plunger.

Now designed as a “scraper” – a double-diameter cylinder whose only last part is in contact with the walls of the cylindrical discharge duct – the new rod provides a very efficient removal of the smallest traces of foam from the head at the end of each shot. The small surface of plunger in contact with the duct significantly reduces the heat generated by the friction of parts, thus eliminating the main cause of sticking.

Several advantages characterise the Cannon FPL SR series of high pressure mixing heads:

- **A much longer useful life** (from 3 to 5 times) of the mixing head, thanks to the single-piece design of the bushing.

- **A much lighter mixing head**, easier to handle and to be mounted on robots.

- **A doubled laminar flow rate**, thanks to a much longer head’s nose.

- **A simpler maintenance**, thanks to the possibility to change bushing and plunger locally.

- **A wider range of head models**, to properly size the ratios between the two chambers, suitable for the new chemical formulations currently still under development.

The family of Cannon FPL SR mixing heads featuring the patented design counts today 6 different models, suitable for the widest range of Polyurethane moulding applications.
TIPOS
Patents
New Mould Shutter

CANNON TIPOS (FORMERLY
KNOWN AS CANNON DMC) IS
THE GROUP’S COMPANY
DEDICATED TO THE
MANUFACTURE OF MOULDS
FOR VARIOUS PLASTICS
PROCESSING TECHNOLOGIES.

Based in Caronno Pertusella, north of Milan, Italy, Tipos cooperates with Cannon Afros and Cannon Ergos for the development of new solutions to improve the efficiency and the economics of their plants.

Holding Tight Under High Pressure
One perceived problem in the HPRTM (High Pressure Resin Transfer Moulding) field is the need to hold the injection head on the mould for the entire time of the polymerisation. The head, until now, could not be removed from the injection hole at the end of the shot, because the pressure inside the cavity would drop, spoiling the curing process.

Tipos has developed one method (engineered with various alternatives) to allow for the use in continuous sequence of one mixing head on multiple HPRTM moulds.

The system is designed to hold the pressure built-up in a mould after the injection, shutting the cavity with a mechanical device that separates the area containing the moulded part from the injection sprue. This pressure-tight separation allows to extract the head from the mould immediately after the injection, allowing for its use in rapid sequence on different moulds.

This method simplifies the design of a moulding plant, reducing piping, valves and the number of mixing heads, with evident economic and maintenance advantages.

One Solution for Two Technologies
The new system is designed for two main applications: compact HPRTM Composites (CFRP and GFRP) and expanded foams (PUR).

The new system, for which Patents have been applied, supports up to 100 bar of pressure gap and operating temperature up to 150 °C, making it suitable for the most demanding HPRTM technologies.

This solution has helped a major European manufacturer of composites to drastically reduce the investment for a complete production line: not only can use only one mixing head instead of four but – this is really good news for them! – only one polymerisation press instead of four!

The mould, fitted with the pressure locking device, can be mechanically kept closed and extracted from the injection press as soon as the liquid-to-solid reaction has started: the profile of pressures inside the locked mould remains unchanged if compared with the classic curing method. But the equipment costs’ influence on each moulded part decreases drastically.

For expanded foam applications the system can operate with multi-cavity moulds. In this case a similar locking device allows to fill one mould cavity at the time, for the sequential production of different parts in the same mould with perfect control of density.

The international distribution network of Cannon welcomes enquiries for this new, innovative method for the more efficient and more economic design of HPRTM and PUR foaming injection plants.
According to the recommendations issued in 1989 by the Montreal Protocol for the protection of the stratospheric ozone layer, the first temporary solution to ban and replace chlorofluorocarbons (CFCs) as blowing agents (BAs) in polyurethanes foams had been the adoption of HCFCs, hydro chlorofluorocarbons, because of their lower ozone depleting potential (ODP), ten times less then CFCS.

However, due to the high Global Warming Potential (GWP) of HCFCs, the Parties to the Montreal Protocol agreed in 2007 to accelerate the phase-out also of HCFCs, helping developing countries, through financial assistance, to convert the manufacturing processes to environmental friendly alternatives.

Because of their lower ODP and GWP, comparing with HCFCs, other blowing agents have been used in the latest years: among these, HFCs (Hydrofluoro-carbons), HC (Hydrocarbons) and plain water.

Now a new generation of blowing agents is available and gaining market position, Hydrofluoroolefins (HFOs): these chemicals have a very low GWP, are not flammable, and can impart to rigid foams excellent thermal insulation values.

New Blowing Agents: New Cannon Solutions
Cannon, since its foundation, has been on the forefront for developing “green” technologies, to safeguard the
environment and comply with the international regulation. This is why Cannon promptly defined dispersion and metering equipment suitable for the use of HFOs for discontinuous processes, where the blowing agent is pre-blended with Polylol, and continuous processes, where, instead, the BA is injected in line in the mixing head. Several alternatives are available.

**Cannon EasyFroth™** is a well-established technology, represented by a pre-mixing unit composed of two metering devices and one static mixer, specifically designed to keep the Polylol and the BA under pressure by using a double effect cylinder or pump, drastically reducing the solubilisation time of the components. This solution might bring the BA rate in the Polylol up to the 35%.

**A new generation of EasyFroth™**

The solution has become completely modular and configurable for the widest range of requirements, providing the capability to process either any BA or a combination of multiple components.

- **Penta EasyFroth™** - Designed to work with flammable BAs (e.g., Cyclopentane or other hydrocarbons).
- **Multi-Component EasyFroth™** - This modular system, fruit of Cannon's expertise for the usage of any kind of BAs, enables customers to equip their production lines for working with multiple BAs, either together or one at a time.
- **Multi EasyFroth™** - Designed to work with LBBAs and flammable BAs, leveraging the booster group or a heat exchanger on BA inlet to ensure it is fed in liquid phase.
- **Cannon DI EasyFroth™** - This configuration allows to inject BAs directly into the mixing head.
- **Cannon FlexiFroth** - This special premix unit enables to perform either the direct injection of the BA to the mixing head or to pre-blend the BA and Polylol upstream the dosing unit thus providing the best plant compromise in performance according to the new Energy Efficiency Rules that soon will be on the market.

In Europe, the major PU consumers are adopting the Pentane technologies, which seem to be the ideal solution in terms of foam performance and environmental impact. Cannon, with about 1,500 Pentane changeover success histories all over the World, provides the retrofitting PentaBasic kit for adapting existing plants to work with Pentane and also offers the NanoPenta, an “agile” solution to the small producers desiring to work with flammable formulations.

**Mixing Heads Solutions**

For DI EasyFroth™ and FlexiFroth™ premix units installation, Cannon has designed dedicated mixing heads providing the capability to perform a direct injection of the BAs:

- **FPL SR X/3** - A modified FPL SR mixing head with axial injection, including a recycling groove for the third component recirculation, used when the head is not pouring. An axial needle prevents the BA to flow into the mixing chamber during the recirculation phase.
- **FPL SR 3C-DI** - A mixing head with a dedicated injector for external recirculation of the BA stream, providing the capability to perform high pressure injection directly into the mixing chamber.

**Cannon Tools for Every Trade**

The EasyFroth™ family of premix units represent the technical solutions for all the BAs currently available on the market, including HFOs.

Direct injection of the chemicals in the mixing heads can be performed by the Cannon equipment using non-flammable chemicals. For Cannon, SAFETY is the most important feature they can offer to their Clients.
JetPreg

THE LIGHTEST SOLUTION

IN AUTOMOTIVE, AMONG THE MOST SIGNIFICANT INNOVATION THERE ARE THE COMPOSITE TECHNOLOGIES, WHICH MERGE TOGETHER SPECIFIC CHARACTERISTICS, AS LOW-DENSITY, LIGHTWEIGHT AND FLEXURAL STRENGTH.

Essential properties for big products like trunk floors, rear shelves, sky roofs, and others, whose manufacturing requires a reduced cycle time taking advantage of low-consumption process, both in terms of energy and materials.

In particular, “sandwich” panels, made by two layers of high-density glass fibre, reinforced with Polyurethane and divided by a lightweight core of paper honeycomb, present a light and structurally rigid component that, in time, have substituted heavier parts, made with more traditional materials.

Compared to other materials, paper honeycomb represents the optimal compromise for creating quite simple 3D parts. The renovation of the production processes of composite parts through the development of Cannon JetPreg (CJP) technology is helping to achieve this goal.

The sandwich of honeycomb and fiberglass is covered with sprayed Polyurethane: with Cannon JetPreg technology, the spraying process is sped up while keeping Polyurethane and the energy consumptions as low as possible. Keystone of this technology is the latest version of Cannon LS 10 mixing head.

Thanks to LS 10, in fact, an efficient distribution of sprayed material is achieved at a very fast pace and highly reduced waste. Furthermore, by means of a hydraulically operated stroke adjuster and washing valve, along with the redesigned geometry of some components, this mixing head can be flushed without solvent and less frequently.

Processes that allow lower curing temperatures are also possible: moulds operating at lower temperatures can be utilised, reducing the energy consumption involved in the process. Furthermore, the use of improved chemical formulations cuts processing time, requiring short and efficient spray stretches. Cannon LS 10 mixing head can reach more than 200 g/s flow rate, while maintaining the optimal mixing efficiency.

Larger areas can be covered with an optimised surface-spray tip distance, spray angle and flow rate. This results in a clean process and in saving of chemicals.

The Cannon Group’s two state-of-the-art R&D laboratories, at Cannon USA (Cranberry, PA) and at Cannon Afros (Carreno Pertusella, Va, Italy), are cooperating to develop this technology.

This allows to closely work with well-known raw material suppliers and mould manufacturers, continuously improving the technologies to keep up with increasingly faster productions and lower energy consumptions while, for the same reason, new chemicals are being developed.
Lightweight Composites Technology

No Limits for Cannon!

Looking for a reliable and affordable production line for Lightweight Composites?

- Preformers for Carbon and Glass Fiber Mats
- Impregnation Equipment for Urethane and Epoxy Resines
- Polymerisation Moulds & Presses with Control of Parallelism
- Solutions for the Industrial Use of Recycled Carbon Fibres
- Robotised Handling & Trimming Equipment
- Production Planning and Quality Control Programmes
- Worldwide Technical Service Centres

Ask Cannon for a complete package of technologies.

www.cannon.com
In brief, hollow HP-RTM composites, of irregular shape or containing fixed inserts, can be made with a CFRP skin and a drainable metal core. A patent is pending for this technology, that in the meantime has been industrialised and is available.

Past history

The Carbon Fibre (CF) composite impregnation technology has evolved in recent years, based on BMW’s need to produce tens of thousands of composite parts in an efficient and repeatable way, to build very light electric vehicles for a sustainable solution of the private transport in large urban centres. BMW and its composite parts suppliers have therefore invested heavily in the development of high pressure resin transfer moulding (HP-RTM) technology.

This involves the impregnation of the fibre by high pressure injection of the resin into a mould maintained at high pressure.

The resin, Epoxy or Polyurethane, has a high reactivity and is dosed and mixed in high pressure through a mixing head mounted directly on the mould.

The cavity reproduces the outline of the piece to be moulded. Normally this has a three-dimensional laminated structure with a shape that is not overly hollowed, to avoid wrinkles induced in the fibre when trying to obtain an important variation of shape.
The cavity is filled / padded with layers of CFR, woven or multidirectional, overlapped and held under several thousand tons (from 400 to 4000) pressure. Vacuum is made in the closed mould by extracting all the air; both in the cavity and in the fabric pack. The resin is then injected into the cavity by operating the high pressure mixing head, and it flows between the pressed web of the fabric until it is completely filled.

A small excess of resin is discharged from the mould joining borders, just to be sure that no air bubbles have been entrapped in the finished part. To run through the weft of the fabric, however, a pressure head must be formed between the injection point of the resin, where the mixing head stands, and the sliding front of the resin itself which is impregnating the fabric, to overcome the hydraulic resistance to the flow.

The pressure is monitored near the injection point and rises gradually during the diffusion of the resin until it reaches important values, typically up to a peak of 80 - 100 bar when the cavity is filled, but lately some customers already use peaks at 130 bar and require peaks up to 200 bar.

The final pressure is always higher because, on the one hand, the reactivity of the resin has been increased to allow the piece to be extracted after 100 seconds (they were 5 - 6 minutes at the beginning); on the other hand, the higher the peak is, the more compact the resin is in the moulded part, thus obtaining composite pieces with percentages of resin in volume around only 40% - 45% of the total. These percentages are now comparable with those obtained in an autoclave with pre-impregnated composite for aeronautical parts.

The Problem

Therefore, in order to produce CFRP with high-quality structural characteristics in HP-RIM, it is necessary to press the CF laminate with thrusts that guarantee at least 80 bar of specific pressure on the surface of the piece.

If the pieces are a mono-foil structure, the two mould shells solve the problem and require a press with the tonnage necessary to overcome the pressure on the surface. However, if the pieces to be produced are hollow – to increase their stiffness keeping the weight very low – then one must glue two half-shells or provide a light core that supports the pressure force without collapsing or using a removable, strong heavy core.

Light cores that cannot be removed (in balsa wood or foam) exist, but none can withstand pressures higher than 15 - 20 bars.

Removable cores exist, formed by a rigid porous conglomerate, whose structure – after demoulding the part – dissolves in water and disintegrates, allowing the powder to come out from small holes drilled in the CF skin. But even this "dough" does not resist to more than 30 bars.

There is the possibility of using flexible bladders filled with liquid, compensating the pressure of the liquid with that of the resin (when using fragile yet very deformable bladders, not bulky and easy to extract).

Thick bladders exist that are pre-pressurized at the peak pressure and which however are too heavy to be left in the moulded part or are difficult to extract from very shaped bodies, which also show a difficulty in reaching the remotest acute corners of the cavity.
The Afros solution

A metal core is created with the exact shape that leaves a mould cavity of the thickness desired for the CFRP part's structure.

The core can easily accommodate metal inserts or spacer pins incorporated in the casting. The core is made of a metal eutectic alloy and melts at temperatures that are not critical for the current limits of structural resins for CFRP (usually post-cured at about 130 - 140 °C, they can withstand up to 30 °C higher temperatures without risk of damaging the part).

There are several metal alloys whose melting point can start from slightly higher than room temperature up to 250 °C.

The metal alloy is poured into a mould in which the inserts are already firmly positioned. To avoid bubbles, shrinkages, and gluing problems, the mould is preheated to a temperature not far from the eutectic alloy's melting point. The mould is internally coated with a release powder and has holes with extraction pins and a sealing gasket, to avoid excessive burrs or uncontrolled melt losses.

Once the core has been formed, it is demoulded and de-burred, removing the release agent, checking the exact positioning of the inserts and making sure that it is free of bubbles on the surface or under the skin.

The core is then placed in the HP-RTM mould after placing the correct sequence of fibre layers in the mould half that houses the core. It should be noted that the fibre must be oriented (to better support the efforts on the piece when in operation) and must be pre-formed to the precise shape needed to be inserted into the mould. The core is pressed onto the lower layers of fibre and lined on its upper side with the other layers of fibre. Then the other half mould is closed, checking that its vacuum-tightness, and pressure is applied to support the push of the resin on the outer surfaces.

The mould is pre-heated to the curing temperature (around 130 °C) and the resin is injected with high pressure, monitoring the diffusion pressure with at least one sensor near the cavity inlet point and optionally some others in peripheral points, including some capacitive sensors of presence that feel the front of the resin arriving in remote or thin areas, more subject to critical filling. Once the peak pressure has reached the desired value (up to 210 bar), the head closes, going into recirculation mode. Once the cure time is over, the press opens and the piece is extracted.

At this point there are two options to proceed:

- Still hot, the piece is housed inside a template support and is placed into the oven, heating it up to the melting temperature of the eutectic with air, radiation or induction. The molten eutectic alloy flows from the template through pre-drilled drainage holes and completes emptying the hollow composite, leaving the inserts in the desired position and incorporated into the CFRP part.

- The second option is very interesting: the piece is cooled and its metal core is used as a reinforcement, allowing to perform all the mechanical operations necessary for finishing the part. The rigid core favours the placement of external components or the execution of cutting and deburring operations, creating a stiff piece that is not deformed and does not vibrate during processing. Once the mechanical work is finished, the piece is checked, put in a template and then in the hot oven to melt the core and recover the very low viscosity molten alloy, which completely drains even from very small holes.

In addition, these low melting temperatures (from 135 to 220 °C) make it possible to carry out emptying or rotating checks of the piece: the liquid eutectic can be removed from all the remote points that, with the baffle or other types of filling, could not be neither reached nor emptied. The eutectic flows into a tank under the melting oven, where it is recovered and put back into the crucible for the fusion of many other cores.

This technique also allows to produce hollow cores for very large pieces in which the cavity is formed with resin-based conglomerates: for example, in the lost wax moulds which resist perfectly at high temperatures but do not withstand the pressures (they can be removed by crumbling with vibrators or by immersing in water).

Cannon Afros welcomes enquiries from manufacturers of lightweight CFRP parts needing to produce hollow parts with an industrially-proven method. Numerous advantages and process details will be discussed with the interested prospects.

These parts can be, as a limited list of examples, moving elements of robot arms, transmission mechanisms, irregularly-shaped structural elements, non-cylindrical tanks and reservoirs for liquids and compressed gases.
Cannon has been manufacturing dedicated plants for the continuous production of flexible polyurethanes for over fifty years.

**Slabstock** foams, mainly devoted to furniture, bedding and packaging applications, can be produced with single **block** technology and with **continuous** or **discontinuous** lines.

**Car Dio** technology blown foams use natural carbon dioxide as an alternative-blowing agent in order to produce **low density CFC free foams**, with further advantages in quality and costs.
ECO-SLAB
a Compact Idea

THIS YEAR, AT FOAM EXPO EUROPE, CANNON VIKING UNVEILED THEIR LATEST DEVELOPMENT: THE ECO-SLAB CONTINUOUS FOAM MACHINE.

The new Cannon Viking Eco-Slab unit allows the operator to have a full formulation management, an automatic control of chemical metering, a closed-loop control with a user friendly interface and an historical plant information. Eco-Slab can be used to manufacture all types of Polyurethane foam, using either Trough, Liquid Laydown or a combination of both foaming systems.
Foam Expo Europe, the dedicated trade fair and conference for the technical foam manufacturing supply chain (16 – 18 October 2018; Hannover, Germany), is the occasion for Cannon Viking to introduce Eco-Slab: the new compact continuous foam machine.

Developed to meet the growing demand by the market for a short, compact continuous foam machine, capable of producing a wide range of high quality flexible slabstock foam blocks, the machine has been developed using the latest generation of metering process, computer controls and mixing systems, package together in a modular design giving the customer the ultimate flexibility to design a bespoke machine according to their foam requirements, and allowing for practical future upgrades.

For this reason, Eco-Slab provides unique advantages:
- Thanks to its latest generation of Omega Computer Controls, this system, developed and supported in-house, allows the operator to have a full formulation management, an automatic control of chemical metering, a closed-loop control with a user friendly interface and an historical plant information.
- Reduced energy and chemical consumption: thanks to the computer controls, the plant monitoring systems and the precise chemical metering system, Eco-Slab is particularly efficient and allows the customer to obtain an overall financial saving that can easily exceed 10% if compared to a conventional slabstock machine.
- Small machine footprint to reduce space and building costs: thanks to its small size, Eco-Slab can easily be integrated with previous plants.
- Flexibility to produce different foam types with different methods: Eco-Slab can be used to manufacture all types of Polyurethane foam including standard polyether foams, HR foams, visco/memory foams, super soft foams, semi rigid and rigid foams. It can also produce foam blocks using either:
  - Trough: the chemical reaction occurs within the trough before rising from the top onto an adjustable fallplate, which then leads the foam block along a metal slat horizontal conveyor for the completion of the foam rise and initial cure.
  - Liquid Laydown: this process gives an higher quality foam block, reducing the number pinhole because the chemical mix is introduced through direct foam laydown onto the pour plate.
  - A combination of both systems.

Eco-Slab represents Cannon Viking’s market philosophy: a flexible approach based on the listening to customers needs. The company, in fact, does not provide only standard machines but, starting from the specific client requests, can provide tailor made solution.

As Nick Wood, operations director at Vita Group, testifies "... [the Eco-Slab] has a small footprint, and while is capable of producing bigger volumes at high speed, it can manufacture bespoke, novel efficient foam. It has high level of flexibility with the ability to interchange different development additives easily. It has achieved what we needed".

The Eco-Slab shares many of the most popular and successful features seen on other Cannon Viking’s continuous machines whilst maintaining the highest standards of machine construction.

For more information, visit www.cannonviking.com
Growing Mark
Two more V.A.I. Plant for Haier

Haier, the world leading manufacturer of domestic refrigerator, purchased a Vacuum Assisted Injection (V.A.I.) cabinet foaming line for the zhongde plant, manufacturing special refrigerators.

The Cannon solution was chosen after seven years of positive results obtained with various V.A.I. plants operating in China and the recent one supplied to Russia, for which a doubling phase has been implemented: the seventh Cannon V.A.I. plant for Haier will be delivered in Tatarstan, CSI, later this year.

V.A.I. Technology for high-quality refrigerators

Energy efficient refrigerators are obtained through a smart combination of modern compressors and highly-efficient insulation. Haier has been producing them since 2011 with three Cannon foaming plants operating in Chongqing, Qingdao and Hefei, China, and one in Naberežnye Čelny, Tatarstan, CSI. A special feature of these foaming plants is represented by the use of vacuum within the refrigerator’s wall cavity during the injection of the foam and the relevant filling time. By applying vacuum into the complex mould cavity where a domestic refrigerator is filled with rigid Polyurethane, the V.A.I. technology facilitates the expansion of the foam into the cabinet, providing substantial benefits:

- Increased productivity per foaming station: thanks to the use of highly-reactive formulations that provide a faster demoulding time, a 135-second curing cycle is now the reference for a wall thickness up to 10 cm
- Optimised distribution of foam throughout the whole cabinet: a uniform density of 33 +/- 1 kg/m3 is constantly achieved.
• **Substantial foam savings**: up to 6% are regularly obtained in a fine-tuned plant.
• **Optimum insulation performances**: the foam Lambda value is as low as 18.5 mW/m °K with CycloPentane as blowing agent.

**Complex models made with V.A.I. in Zhongde**

Haier has concentrated in China, where their R&D Centres are located, the manufacture of the most complex models. Their new line of wide-body refrigerators is characterised by superior energy efficiency, also thanks to the use of VIP (Vacuum Insulated Panels) – special vacuumed boards of highly insulating material lined with a metal foil – that allow to obtain the highest grade of efficiency. But these panels, assembled between the plastic inner liner and the outer metal sheet, represent a further obstacle to the distribution of Polyurethane rigid foam which provides at the same time part of the thermal barrier and the main structural strength of the cabinet. The superior filling properties provided by the vacuum applied inside the cabinet cavity make the Cannon V.A.I. foaming technology an ideal solution for the injection of sophisticated rigid foam formulation in these geometrically complex and very wide structures. Cannon supplied, earlier this summer, a complete foaming line composed by six polymerisation stations for conventional models and eight wide-body stations for special refrigerators. To comply with the fast reaction time that characterises modern formulations, the widest cabinets require the simultaneous use of two mixing heads injecting Polyurethane at high output. This request generated a new type of mixing heads holder, carrying two Cannon FPL SR 26 side-by-side. The liquid formulation, in this case, is supplied by a double high pressure machine able to feed two heads simultaneously. The supply includes 3 Cannon A-System 200 PentaTwin machines, 6 Cannon FPL SR 26 mixing heads on 3 head holders, the whole premixing station to prepare the Polyol/blowing agent blend, all the electronics controlling the foaming plant and the complete set of safety systems across the plant to handle an hydrocarbon blowing agent.

**Haier to double the V.A.I. plant in Russia**

Haier’s Russian refrigerator plant, located in Naberežnye Čelny, 240 km east of Kazan, in Tatarstan, started producing in April 2016 with an initial capacity of 250,000 units/year. The factory mostly supplies the domestic markets of Russia and CEE with new models deriving from the successful line of energy-saving refrigerators developed in the past few years from the Chinese house-hold’s giant Company.

The plan was to double the capacity in a second-phase project, which has been initiated early this year: Haier confirmed their trust in this Cannon solution and ordered another V.A.I. plant with eight foaming and polymerisation lines, a complete premixing station to prepare the Polyol/CycloPentane blend, one A 200 PentaTwin dosing unit feeding two FPL SR 26 mixing heads, each one alternatively serving four foaming jigs. The supply includes the complete set of safety systems enabling to securely handle an hydrocarbon blowing agent. For both the new plants Haier will be using PASCAL, the special Polyurethane chemical formulation developed by The Dow Chemical Company (Dow) for this vacuum-assisted foaming technology.

For more info on V.A.I. and Pascal please visit:
www.cannonergos.com/refrigerators
www.dowpascal.com
The “Future Growth Project” is the second project developed by Tengizchevron (TCO) that is a Kazakhstani partnership which explores, develops, produces and markets crude oil, gas and other petroleum products. Discovered in 1979, Tengiz is one of the world’s largest developed oilfields and the largest producing oilfield in Kazakhstan. Located in a remote area of the Western Kazakhstan, the entire Tengiz oilfield area, including the smaller Korolev field, is estimated to contain 750 million to 1.1 billion tonnes of recoverable oil. TCO has operated in this Area since 1993 providing benefits to Kazakhstan maximizing the use of local goods, services and local workforce.

As the main equipment will be fabricated far away from the site, in Kazakhstan, South Korea and Italy, a modularization philosophy has been applied with equipment pre-assembled into large modules for transportation to Tenge for final assembly. For this reason a dedicated marine channel is being built to allow the modules-transporting barges to reach the site. This portion is called Cargo Transportation Route, in brief CaTra.

Cannon Artes, in partnership with Gateway, a Kazakh trusted fabricator and supplier of services and industrial products to the Oil and Gas industry, has been selected for an important package within the scope of the CaTra Project. Artes supplied a sea water filtration system based on self-cleaning filters.

Material selection was tough considering the corrosion effect of the high-salinity water coming from the Caspian Sea. Furthermore the climatic conditions in Kazakhstan are also extreme with temperatures ranging from -40 °C in winter to +50 °C in summer. Because of such conditions the filtration system had to be installed into an HVAC Container also fitted with a dedicated control unit, a power distribution panel and the firefighting system.

Such self-standing containerized system was designed and manufactured by Cannon Artes in its Oliveto Gas factory in Italy. Once again, Cannon Artes has proved the ability to deal with “complex” international projects located in the most remote and extreme areas: a proof of Artes’ experience and ability in the field of customized solutions for water treatment.
We Make It Easy

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.cannonartes.com

CANNON
DEDICATED INDUSTRIAL SOLUTIONS
SAPA STANDS FOR “SUPERIOR AUTO PARTS ALWAYS”, WHOSE DEVELOPMENT HAS BEEN, SINCE ITS FOUNDATION, THE MAIN TARGET FOR THE INDUSTRIAL GROUP BASED IN ARPAIA, NEAR NAPOLI, IN SOUTHERN ITALY.

Angelo Affinita started in 1974 an activity of galvanic treatments, oriented to the automotive industry. His human, technical and entrepreneurial skills have transformed a craft business into a consolidated and growing industrial reality, with 10 plants in Italy and Europe, over 1,700 employees and 300 million Euro turnover.

Today, under the management of his wife and his three sons, SAPA is an industrial group dedicated to injection moulding for the automotive sector, with direct supply to the major Car Makers in Italy and abroad (FCA, Volkswagen, CNH, Ferrari, etc.).

Their patented One-Shot® all-in-one method provides lighter and more economic parts for automotive interiors and exteriors, such as engine and pillar covers, window and trunk frames, ventilated wheel covers, innovative dashboards, special handles, covers and housings for rear-view mirrors or transmission belts.

All produced with innovative injection methods that allows to obtain in one operation what used to be the result of assembling multiple parts manufactured with different technologies. Less work, less waste, less energy spent, for a lighter and more rational end product.

SAPA's philosophy has always been based on farsighted vision: identify a value where others don't see it and propose it to a client before he asks for it.

With this strategy in mind SAPA has built a group of eight companies, five in Italy, one in Poland and two in Germany, specialised in specific car components.

Industry 4.0 Digital Approach
Using modern equipment, suitable for an Industry 4.0 manufacturing approach, SAPA is progressively applying a digitalisation process in all its factories. Interconnecting presses and peripheral equipment they can store the production programs and reports in a centralised system, that provides the tools to increase the efficiency of each
machine, to reduce scraps and to prevent malfunctions, using predictive and programmed maintenance programs. This innovative production method has been developed cooperating with the Universities of Naples and Salerno in Italy and of Cracow in Poland, followed by the implementation of the SAPA Academy training courses for management and operators. This approach has allowed to reduce by 30% the overall workflow, achieving for most parts a cycle time of 50-75 seconds, according to the size and complexity of the piece to be produced.

Innovative Cannon Polyurethane Equipment Chosen to Reduce Costs

When confronted with the need to innovate the design of the engine cover – an injection-moulded plastic part with a layer of expanded cellular material and an external aesthetic skin – to increase sound- and thermal-insulation especially in electric and hybrid vehicles, SAPA found at Cannon full technological support, while raw materials supplier BASF provided the right Polyurethane formulations.

Traditionally produced with three different processes and assembled manually in a fourth working island, this piece has been drastically redesigned, conceiving a One-Shot manufacturing method that unites the injection moulding of the thermoplastic shield with a back-foaming with Polyurethane foam. All the process happens in the same press, with a mould able to perform both operations in hidden time.

Cannon Afros supplied for this project a specifically-designed A-Compact 20 dosing unit equipped with an FPL10 mixing head, which is directly mounted on the mould portion dedicated to foaming. A separate metering system has been added to allow for the use of Liquid Natural Carbon Dioxide (CO₂) to be used for the expansion of foam instead of conventional, more expensive blowing agents. This innovative method allowed to increase plant’s productivity and to cut costs between 10 and 20 percent, improving the final cover’s quality by replacing a number of critical manual operations with less and automated procedures.
COMPANIES THAT UNDERTAKE A TRANSFORMATION IN DIGITAL FACTORY ARE USUALLY ASKED A KEY QUESTION: "WHICH ELEMENTS TO TAKE INTO CONSIDERATION IN ORDER TO MAKE AN OPTIMAL CHOICE?" THE FLEXIBILITY OF THE PRODUCTION SYSTEM IN THE CURRENT FACTORY TRANSFORMATION SCENARIO IS ONE OF THE MOST IMPORTANT ISSUES TO BE MET.

The final customer's requirement is to obtain a low-cost, high-quality product, while it is important for the manufacturer to increase efficiency with lower costs and higher quality of service. For a modern manufacturing company it is essential to implement a Flexible Production System, whose basis is the speed and ease of adaptation throughout the production process, to achieve higher productivity and better product quality.

The Italian National Plan "Industry 4.0" has given life to the transformation of the Industry of the future. Cannon Automata has developed and integrated, within its various Italian industrial clients, its Vertical and Horizontal Integration Systems, which allow companies to become part of the Fourth Industrial Revolution, giving rise to what is now affirmed as Integration 4.0.

This is the set of elements that guarantee the scalability necessary to accompany the company in the growth process: modularity and integrability of the system, useful for sharing all the resources with the different technologies and equipment already present in the company. The Industry 4.0 paradigm expresses the ability to produce customisable objects according to customer needs, in a
flexible environment, able to react to changes, both foreseen and unpredictable. To better understand the structure of a Vertical and Horizontal Integration System, the following case, recently implemented, illustrates the concept of Digital Factory and its application. The scenario is in the field of Composite materials, the CFRP – parts made of Carbon Fibre impregnated with Epoxy resins – for the automotive sector.

The case here illustrated brings together three Italian Excellences in a project where high skills and technologies are required:

- **The Customer**: a Company founded in 2007 in the field of Composite materials processing for different industrial areas: Racing, Automotive, Aeronautics.

- **The Plant Supplier**: The Cannon Group, with over 50 years of experience in the production of plants and machines with technologies and processes for plastics and composite materials.

- **The Automation Provider**: Cannon Automata, operating since 40 years in the field of automation and robotics.

The objectives set by the customer were very specific and practical: reduction of delivery times, increase of productivity, increase in machine utilization, higher reliability in delivery times, decrease in inventory level, increase in overall quality.

The responses of Cannon and Cannon Automata were equally clear and effective solutions, providing: machine flexibility, production flexibility, flexibility of routing, integration with the logistics system, traceability of production data, monitoring and historicisation of data. This flexibility takes on a decisive significance for the client’s goals:

- **The flexibility of the machine**: it covers the ability of the system to be modified to produce a new type of product (customisation) and the possibility of modifying the order and the operations executed on a component of the product. The factors on which the flexibility of the machine depends are:
  - Setting or switching time of the job
  - Ease with which the work programs can be downloaded on the machines (recipes)
  - Capacity to change machining methods and tools of the machines
  - Skill and versatility of the machine operators

- **Production flexibility**: it is the range of parts that can be produced by a production system with low costs
As a whole, the architecture of the factory integration and the key points that allowed for the Industry 4.0 certification of the entire plant comply with the legal requirements (5 basic requirements plus two additional ones) for certification:
1. Simple and intuitive man-machine interface
2. Control by means of CNC or PLC
3. Machine safeties
4. Automated integration with other machines in the production cycle
5. Interconnection to the factory information systems with remote loading of instructions
6. Continuous monitoring of process parameters
7. Remote Maintenance, Remote Diagnosis and Remote Control Systems

The functional heart of the system is the "Production Monitoring System", the production management software, which contains the database of production recipes and production parameters.

Through a dashboard it allows the visualisation of process data, their archiving and a graphical and tabular visualisation. Another key aspect of the software is the statistical process control, the creation of indicators such as OEE (Overall Equipment Effectiveness), the total efficiency of the plant (availability, performance, quality) and the creation and export of reports.

Functionally, once the job data or the production order have been loaded, the article to be produced, the quantity and the materials necessary for the production and the mould to be used are sent to the operator. At this point the operator has all the information to start production, the mould is taken and is read by means of a QRCode reader.

This information is sent back to the management system, verified in the database for the correct mould / piece matching to be produced and associated with the corresponding machine recipe. The information returns to the machine in the form of machine parameter settings and process data settings.

On the machine's HMI display panel the synoptic of the plant, the set-up of the machine, the options of the production cycle, the process parameters, the trends and the alarms are displayed.

The heart of the system is the gateway, produced by Automata, which allows the complete Integration 4.0, to communicate with the machine, with the other devices of the system and to manage the traceability through a QRCode reader and printer.

The gateway, in addition to data management and their processing for the OEE calculation, historicises alarms, process and production data.

To complete the traceability, a QRCode label is printed and applied to the finished product.

The system is totally remotely managed with the possibility to send data on external Cloud servers for supervision at various levels: Production, Maintenance, Material Procurement.

The solution provided has successfully passed the inspection carried out by the independent Certification Body, thus obtaining the Industry 4.0 certification that brings huge financial advantages in the very short term to the investing Company.

and time. It is determined by the production process and depends on the following factors:
- Flexibility of the single stations of the plant/machine
- Flexibility range of all stations in the system
- **Routing flexibility**: this consists in the possibility of assigning the operations to be performed to several machines for the realisation of a part or a component, as well as the capacity of the system to absorb changes in terms of production capacity and feasibility.

The new factory area is destined to the production of structures used in the racing and automotive world for car's frame and body, compression moulding these parts in short fibre Composite materials.

The Cannon supply included eight presses with a range of 300 to 5,000 tons, including three short-stroke presses of 300, 1,500 and 3,000 tons, one of which with a double shuttling platen for the R & D department; plus five presses, two of which of 1,500 tons, two of 2,500 tons and one of 5,000 tons, the latter unique in Europe, all short-stroke and fitted with double lower platens to decrease cycle time and consequently increase production capacity.
Partner in Automation

PRODUCTS
- PAC - PROGRAMMABLE AUTOMATION CONTROLLER
- HMI - HUMAN MACHINE INTERFACE
- FIELDBUS & INDUSTRIAL ETHERNET
- SOFTWARE
- I/O MODULES
- DRIVE

APPLICATIONS
- REMOTE MONITORING & ASSISTANCE
- MOTION & ROBOTICS
- MACHINE CONTROL AND PRODUCTION
- PREVENTIVE MAINTENANCE
- ENVIRONMENTAL MONITORING
- ENERGY EFFICIENCY

ENGINEERING
- CONSULTING
- DESIGN & SOFTWARE DESIGN
- IMPLEMENTATION
- COMMISSIONING
- ASSISTANCE
- TRAINING

Cannon Automata
www.cannon-automata.com
WHilst the furniture and bedding industry has been Foamco’s primary focus, they also produce in Australia a range of specialist foams for the healthcare, audio and packaging sectors. The purchase of the latest Cannon Viking Varimax equipped with Cardio™ CO₂ technology places Foamco at the forefront of the marketplace in green manufacturing.
Humble beginnings saw them operating mostly at the economy end of the market, but over the years they have grown to produce a wide range of products suitable for applications in the premium sector of an increasingly competitive market. Cannon Viking has been working with Foamco now for the past four years and have been excited to be a small part of their growing success.

All Foamco's foams are manufactured locally in Australia and they have distribution centres around the country, servicing the nation from coast to coast with offices in: Sydney, Melbourne, Brisbane, and they distribute also into Perth, Adelaide and Tasmania. For over 20 years, Foamco has been manufacturing and distributing their range of Polyurethane foams to a variety of Australian furniture and bedding businesses, providing them with value for money and quality foam products.

With their Cannon Viking Varimax plant Foamco display a commitment to the environment of the highest standard and the purchase of the machine places Foamco are at the forefront of the marketplace in green manufacturing. The Maxfoam Varimax plant is also equipped with Cannon's CarDio™ Carbon Dioxide technology for the production of low density foams without the use of ABA's and CFC's using liquid CO₂, the blowing agent instead. Foamco now has the capability to produce CO₂ blown foams with the maximum range of properties, including the use of fillers. The company are now also looking ahead to the next stage of their development with new upgrade additions to the existing Varimax machine to produce even more foam types and further develop their already impressive existing portfolio of foam products and continue to grow their business all across Australia.

Foamco also work together with their customers on recycling product off cuts and reducing waste. Being a local Australian manufacturer means that their Carbon footprint is lower than some foamers, saving the environment as well as freight costs. Foamco Industries embarked on a major investment and launched the new state of the art, fully computer controlled Varimax Omega CarDio™ CO₂ continuous foam plant which is built to the highest and latest specification.

Cannon Viking is the only supplier of Maxfoam machinery in the world today with their own integrated CO₂ system.

With the latest generation Cannon Viking Maxfoam, Foamco offers a complete range of polyether foams produced on the same foaming machine:

- Standard ethers
- HR (High Resilience) foams
- High hardness foams
- Supersoft foams
- FR (Fire Retardant) foams
- VE (Visco Elastic) foams
ORATE

news
CANNON USA

CELEBRATES 40 SUCCESSFUL YEARS IN AMERICA!

THE USA BRANCH OF CANNON CELEBRATES THEIR 40TH ANNIVERSARY OF ACTIVITY AND EXPANDS THE CRANBERRY, PA FACTORY: A NEW 2,500 MSQ HALL FOR MANUFACTURING AND SERVICE IS FULLY OPERATIVE SINCE SEPTEMBER 2018. AN INTERNATIONAL CORPORATE MEETING CELEBRATES THESE TWO EVENTS.

Cannon manufactures in the USA since 1978 metering machines, mould carriers and mould carrying systems for Polyurethanes and Composites, supplying the leading producers of domestic refrigerators, foamed parts for automotive and furniture, panels for thermal insulation, technical articles and hundreds of other applications.

There would have been no better way for Cannon USA to celebrate their 40 years of activity; as a consequence of a rising activity in the manufacture of foam’s and plastics processing machines and complete plants, a new wide space for manufacturing and spare parts storage is now operative in Cranberry Twp, 40 minutes north of Pittsburgh, Pa, doubling the current workshop space.

The new 2,500 sqm building is designed according to the latest eco-compatible standards, is lit only with LED light and over 40 skylights. The new extension is higher than the former structure and provided with a very high overhead crane, allowing for the assembly of larger equipment.

Fully operative since September 2018, this building is an extension of the 4,000 sqm existing one, built here in 1987 on a 18,600 sqm lot in Freedom Road’s industrial area. Also the original building has been recently modernized with a refurbishing of the offices, the extension of the overhead crane in the assembly hall and external improvements.

The new extension does not replace the second workshop utilized by Cannon USA to assemble the larger plants, a 5,700 sqm facility in Zelienople, few miles north of Cranberry.

Over 10,000 sqm of factories and offices are available to manufacture dedicated equipment – Proudly Made in USA – for the Group’s clients in North America and elsewhere.

Happy 40th anniversary, Cannon USA!

An international Corporate meeting has been organized by the Cannon management to celebrate both the 40th anniversary of activity in the USA and the new factory extension. The three-day event held in Cranberry at the end of October 2018, gathers young staff that never had before the opportunity to visit Cannon USA premises.

An international get-together during which the Group strategy, its local presence philosophy and the market dynamics are illustrated and discussed. Cannon USA present their technological capability and resources, to implement the most effective synergies with the rest of the Cannon Group.
TRAIN to Insulate

ANALYSING STRENGTHS AND WEAKNESSES AND FINDING NEW WAYS TO IMPROVE: THE AIM OF THE INSULATION TECHNOLOGIES TRAINING.

From 11th to 15th of June 2018, the Plastic Museum Cannon – Sandretto in Pont Canavese (TO – Italy) hosted the “Insulation Technologies – Technological & Commercial Training”, a five-days of meeting and team working for Cannon internal insulation technology sales force.

A very important event with the aim of aligning the whole Group on the Cannon insulation technological state of the art, exchanging experiences and lessons learned with all the 60 participants coming from 23 Cannon Local Units, on three main topics:

• **Discontinuous Panel**: Cannon Afros presented its proposal, underlying the effective collaboration with Manni, with whom Cannon has developed V.A.I., the vacuum-assisted injection method.

• **Refrigerators**: current proposal, recent implementation and possible developments have been discussed.

• **Continuous Panel**: the latest achievements.

Five days to analyse and work on our commercial strengths and weaknesses, and to identify and start new ways to make better.

Furthermore, hosting the event into the suggestive Plastic Museum Cannon – Sandretto in Pont Canavese was not by chance, but in order to underline the close link among culture, training and work.

A training for junior resources and an alignment for seniors, with a main goal: the awareness of the importance of listening.

All the participants have been able to bring their experiences and their know-how, and relying on the experiences of other colleagues, operating in other markets, find the way to improve.

“Corporate cultural training of technicians”
Alexey Malyshev, Cannon Eurasia.

“No interest in learning, no passion”
Francisco Rangel, MexiCannon.
BACK to SCHOOL

TRAINING IS FOR CANNON BONO ENERGIA ONE OF THE KEY TOOLS TO MAINTAIN HIGH LEVELS OF PROFESSIONALISM AND QUALITY, AND TO KEEP THE EXCELLENCE OF ITS OWN PRODUCT ALSO IN THE AFTER-SALES PHASE.

The boiler system integration with the smart services adopted according to Industry 4.0 principles, and a growing internationalization of the sector, are two of the components that are strongly characterizing the steam generators and their reference market in recent years.

This evolution of the product and of the sector requires companies to rethink training as a strategic element to offer an always better product, even in related services. Investing in training of service technicians, therefore, means bring the high quality of the product also in the after-sales phase.

The internal training and the annual technical meeting

For this reason Cannon Bono Energia has set up a School, a dedicated and structured training programme mainly for its authorized service centres. The most important milestone of this training is the annual Technical Meeting, a day of classes and practical exercises in the test area in Peschiera Borromeo. This year, the Technical Meeting took place on June 22nd and was focused on the recent developments of the control systems and the “Industry 4.0” compliant solutions for the “Smart” boiler room.

During the meeting, in fact, the new features of OptiSpark - the Cannon Bono Energia proprietary automatic control and management system for steam generators, developed by Cannon Automata - have been presented:

- Four new languages (Chinese, German, Slovenian, Czech), available in the user interface;
- The new “Advanced Smart Services”, OptiSpark’s plug in, which will allow to implement the remote management functions of the steam generator.

Through its school, Cannon Bono Energia provides authorised Service Centers with the tools to offer customers a better service.
**On-site and customised technical training**

But training is not just for internal personnel: Cannon Bono Energia organises, in fact, customised training for the client’s technical teams.

For some time, the company has been organising theoretical and practical training sessions with high technical content for those customers who request it: Cannon Bono Energia makes its leading experts available to create a path specifically shaped on the needs and functionality of the generators of steam purchased by the customer.

This training allows the client company’s technical team to obtain the tools to make a correct assessment of the possible problem occurring on their boiler, and to provide Cannon technical assistance with a precise description of the anomaly.

A quick and correct diagnosis therefore allows a quick and decisive intervention, avoiding heavy downtime.
THE CHALLENGE OF HIGH ENERGY EFFICIENCY

Cannon Bono Energia – Tradition & Innovation

AN OCCASION TO ANALYSE THE STATE OF THE ART OF THE INDUSTRIAL BOILER AND TALK ABOUT NEXT DEVELOPMENTS.

With the claim “Energy Efficiency First”, the European Union has signed the agreement on energy efficiency: new rules which will guide the European energy transition by 2030 towards the achievement of the 30% of energy efficiency binding target. But how is it possible to optimize energy efficiency of a power plant, and how this one can be improved by the automation evolution? These are the themes faced during the conference organized by Cannon Bono Energia on September 27th, 2018, "The challenge of high energy efficiency. Cannon Bono Energia – Tradition and Innovation", in which many guests took part.
An occasion to analyse, thanks to Antonio Landi (Cannon Bono Energia), the industrial boiler state of the art, result of 60 years of Cannon Bono Energia experience, and the results achieved with the application of Industry 4.0 principles. Dealing with future developments in terms of steam generators predictive control, was the core of the presentation of the project developed in collaboration with Luca Ferrarini, Electronics and Information Technology Professor of the Politecnico of Milan.

Also Cannon Artes, Cannon Automata and Ego power, among the leading Italian companies providing energy services, took part in the conference.

At the end of the morning a case history was introduced: Matteo Casti, Head of Corrugated Cardboard Production, talked about the Gheiffi Ondulati “Lean Project”, and the solution supplied by Cannon Bono Energia to help them reaching the goal of energy efficiency.

The conference was an important appointment to face the very actual theme of energy efficiency in industry: energy efficiency, in fact, does not mean only reducing running costs, but it also means reducing the use of energy resources and, therefore, the harmful emissions released into the atmosphere.

For a company, efficiency means improving itself: the introduction of new, less energy-intensive technologies leads, in fact, to a modernization of the plants, which equates to:

• Less maintenance costs;
• Greater reliability;
• More safety for operators.

Furthermore, the implementation of smart productive processes, thanks to digitalization, reduces waste and improves the product. Sustainability is not just a matter of image, but increases the value of the company and makes it more competitive on the market.

The event ended with the visit at the Cannon Bono Energia factory, where a show room had been set.
A TRIBUTE TO
JOHN DAVIES (1947-2018)

Our colleague John Davies passed away on January 28, 2018 in Manchester, his hometown. Working in the 70’s as Service Engineer for Viking (our competitor at that time) in 1986 he joined ESU (our UK Independent Agent, later merged to Cannon Viking). For 30 years John has been for Cannon an appreciated sales representative and technologist. His attitudes and skills have often involved him in the sale and design of special plants.

We will truly miss him a lot.
Marco Volpato, President of the Cannon Group, reminded him to the whole staff with a message which included the following statements: “I feel deeply sad to hear of John’s passing. In a flash I remember lots of moments I spent with him and the strong contribution he was able to offer in several decades for the Cannon Project. ... Discret, optimistic and smiling, John was able to simplify complex issues instilling confidence not only to customers but also to colleagues he was collaborating with. A real human and technical asset for Cannon! A friend! [...] On behalf of all Cannon people, both in Italy and abroad, I wish to extend our deepest sympathy to his family and to all his Viking friends. [...] I do not add anything else but I leave you with a "jewel" that Alexander Babkov of Cannon Eurasia sent us in memory of him. [...] I think that five minutes to remember John are a precious gift not only for those who have had the good fortune to know him and spend some time with him, but also for our younger colleagues who have the opportunity to understand the excellent contribution from many of us to get where we are now.

John is one of these and generated great value for Cannon. Thank you, John!”

At the "Course of Thought" that I attend, the new year was proclaimed a Year of Dignity and the last lesson was dedicated to this issue. We can hardly imagine how much staying under this concept, and under every other similar one, you turn on thinking of the matter.

By a strange (but not for one who studies philosophy) combination of circumstances, this theme, the theme of dignity, within less than a week came back to me. Unfortunately on a very regrettable occasion: one of my English colleagues from Viking company passed away. It was John Davies.

I cannot say I have known him well enough. Regularly we met each other on different corporate occasions such as shows, sales meetings, seminars... Italians and Italian language are more common to me while English... Having too few occasions to speak English I’ve nearly forgotten it. Mostly it has passed through to the passive part of my mind and memory and to get it out of there it always turns to be quite a hard deal. While people always choose the easiest way of doing things. This is why I always preferred to stay with my Italian-speaking colleagues.

While Davies... Alias John... He always stayed apart and only from time to time we exchanged some words. About the weather or something like this. As Englishmen like to do. About nothing...

Only once the fate or more precisely a common deal linked both of us together; John and I. Quite close, so close as a train compartment can be. For two nights as we were on our way to Yoshkar-Ola and then, a day after, back to Moscow. I am not sure John had ever heard this name, Yoshkar-Ola, but he accepted to go there without a word as well as hardly a word he spent having to stay in the same compartment with a guy whom he hardly knew.

In this regard the hero of the film "Lawrence of Arabia" comes to my mind. Passing across a desert and in a critical lack of water the last drops of this precious liquid Lawrence spent them... - yeah, yeah don’t get shocked - used to spend them on shaving... In the desert! Where you can hardly meet even Bedouins there! Last drops of water! In fact, for shaving! But still for this even reason I think he managed to stay alive, and then to win!

Our situation on board of the train was for sure much better and I think that even in a much worse condition John’s behavior would not be different and less dignified from that of his great predecessor and comrade.

Our business trip was a success.

We got the deal. We got an order for a quite specific machine of Viking. So specific that there is still only one machine of this sort working in Russia.

Besides John was a special type of man with all his common best traits of character that distinguish Englishmen as a race. At least as far as I understand them. Knowing their own value without any sticking out. Keeping firmly to their principles. Being imperturbable. Being highly competent on the matter and always ready to share their own knowledge with someone else. And still and always being decent and quite. This is what I would call – and call – dignity.

It sounds and seems to be an easy thing to do, but what a long and easy story stays upon all this! I mean history. A history full of horrors and tragedies and still glorious and victorious.

First but not least episode that comes to me is King’s George speech from Tom Hooper’s film with the same name. And right after...

Oh, how many things come to my mind immediately after: one by one, one by one making an endless chain of episodes and facts from English history!

After all English language and therefore English culture was my first choice. Still not properly mine, but the first. Not fully and completely spent... But still beloved... Another language as well as another culture do guide you and change you to be another man.

The Japanese even use to say they let you live one more life.

I am pleased and at the same time regret to think that if I had spent my life not with Italian but English language and if I had hooked not to Italian but to English culture I would have been like John... Despite this I did have learnt and still have to learn a lot from this guy. And dignity is not a less important lesson I’ve learnt from him...

Alexander Babkov
Cannon Eurasia
CANNON BONO ENERGIA celebrates the 60th birthday!

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