Produced by:
Cannon Communication
Via Resistenza, 12 Peschiera Borromeo (Mi - Italy)
Published by: Afros S.p.A.
Via Q. Sella, 3 - 20121 Milano (Italy)

Editor: Max Taverna
Edition: 03/2011

communication@cannon.it
www.cannon.com

Welcome to JEC 2011!

Warmly welcome to Cannon, at JEC 2011!
Several new developments are on show, all of them aimed at the manufacture of parts fulfilling the "Smart Technology, Save Energy" concept described in our editorial, here on the right.
A complete set of technologies for Polyurethanes, Epoxies, Composites, Thermoforming and product assembly and finishing is today available at Cannon, supported by the widest Service network available in this industry. Solutions for the Automotive, Transportation, Aeronautic and Marine industries are available, all of them designed upon our Customer's specific requirement, engineered with his final product's properties in mind.

Epoxy composites - quickly!
Launched last year, **ESTRIM** - the new Cannon technology for high pressure injection of Epoxy-based composites - finds substantial interest throughout the manufacturers of lightweight parts for automotive and transportation industry. During the Open House recently held at Cannon Afros more than 40 Companies from 10 countries were welcomed with individual lab trial sessions. The laboratory set up in our R&D facilities north of Milano, Italy, has been provided with the most updated devices and specialised personnel, to develop technological competence and experience on specific applications. The new **E-System** dosing unit was used to mould a three-dimensional Carbon-reinforced part, demoulded in less than three minutes. This faster cycle, if compared with their traditional RTM process, and the quality of the moulded parts stimulated the visitors to further investigate the rentability of the new process, disclosing several new projects and starting negotiations for the relevant complete production plants. One complete manufacturing solution has been ordered by a major German developer and supplier of automotive composite parts, and will be in operation later this spring.
Composite production? Talk to us: We Know How!

Smart Technology, Save Energy!

Back in 1988-89 Cannon decided a **strategic diversification**, making acquisitions in industrial activities in the Polyurethane area, in Composites, in Thermoforming and in Energy and Ecology (the Bono Group of Companies). This decision stemmed from the vision of a Cannon Group able to provide to their customers a spectrum of new solutions for the **efficient production and the conscious use of energy**.

The need to find urgently an **alternative to fossil fuels** is today a well perceived priority in developed and developing countries. The need to **use smartly the energy** that we still produce with these non-renewable sources of energy is also of paramount importance everywhere. These two goals are today, after more than twenty years from that decision, actively pursued by Group's companies that have been totally reshaped – in size, mentality and structure – in order to respond to market needs that are in continuous evolution.

The financial results deriving from this intense effort in the field of "**energy production and energy saving**" have been fundamental, in the past three turbulent years of recession and crisis, to sustain the whole Group.
A major part of the revenues from the Plastics Division derived from large contracts for refrigerator, sandwich panels and insulated pipes. Significant orders have been secured in the field of wind turbines, windows frames, insulation of building elements. Lightweight composites are contributing to the manufacture of lighter, less fuel-hungry cars.

The Energy Division developed more efficient burners that provide higher combustion yield and lower emissions, biomass-fuelled cogeneration plants burning a wide variety of vegetal by-products, as well as dedicated solutions for the chemical synthesis of bio-fuels.

The solutions implemented by the Cannon companies to achieve these goals are the result of a diffused exchange of experiences and skills between the various Group's units. A better knowledge of one aspect of activity – say for instance the supply of large heating stations for oil pipelines – allows other members of the Group to design dedicated solutions for the insulation of the large pipes used by the same final customers. Synergies in marketing, business, technical development, engineering and procurement are regularly used by the various Group companies operating in the same industry. This "Group's culture" has become common and is quickly spreading throughout the Cannon people.

The major benefit for the customers is the possibility to acquire a wide spectrum of smart technical solutions from a single interface, a local person speaking – most of the times – the same language.

Examples of "Smart Technology, Save Energy!" are numerous in the following pages. Read the articles, talk to our specialists, either in one of the numerous trade shows and technical congresses that we have kept in our communication's programme or in one of our offices spread around the globe. Use a Smart Technology, and Save Energy! The next generation and the rest of the world will be grateful.

Cannon preformer for Lamborghini

A successful contact established at JEC 2009 secured to Cannon a prestigious order for a complex preforming line used by Lamborghini (Audi-VW group) for two different applications: the manufacture of their larger Carbon preforms and the moulding of smaller Pre-preg parts.

All these lightweight, high-modulus elements will be mounted on the new "all-Carbon" Aventador supercar, recently launched on the market at Geneva Car Show 2011.

Even turbulent economics can't stop the wind!

"Wind energy is a key solution in the fight against climate change, and the technology is on track to saving 10 Bn tons of CO_2 by 2020. This means that more than 65% of all emissions reductions pledges tabled by industrialised at the climate negotiations in Copenhagen could be met by global wind energy alone". The statement comes from the Global Wind Energy Council (GWEC), the international authority coordinating the policies and the activities of all parties involved in wind energy production. And – in spite of economic turbulence – the giant blades are rotating at full speed.

The GWEC's 2009 Annual Report illustrates well the situation of this booming market during a very turbulent year, 2009, when all sort of industrial activities have been severely knocked: "Since the financial debacle of 2008 and the subsequent economic crisis, the renewable energy industry has had to put up with a lot of knocks. Though the year 2008 ended with a record total of US$155 billion investment in clean energy, with more renewable power capacity added in the EU and US than fossil fuels and nuclear combined, a downward spiral had already started in the last quarter."
Throughout most of 2009 it seemed that investment in renewable energy was going to be far lower than in the previous five years of meteoric growth. By the end of the year, however, the sector had come back, and Bloomberg New Energy Finance reported US$145 billion in total investment in clean energy, only a 6.5% drop from the record year 2008.
And the report adds: "The world's wind industry defied the economic downturn and saw its annual market grow by 41.5% over 2008, and **total global wind power capacity increased by 31.7%** to 158 GW in 2009".
Reading the annual figures by country, we see that China leads the world in wind energy development and plays a significant role in combating climate change: The China Wind Power Report predicted in 2007 that "China's installed wind power capacity could reach 122 GW by 2020, equivalent to the capacity of five Three Gorges Dams" Well, it is a fact that **only in the past two years (2008-2009) 26 GW of capacity were installed in China**, 20% more than in the whole Europe, and that the figure forecasted in 2007 is already obsolete.

Cannon supplies worldwide the viable solutions
Cannon introduced at the JEC show in Paris in March 2009 the range of available products for the industrial segment of wind energy. Eighteen months later – in spite of the economic turbulence – also the report for this segment of equipment looks good: several **Epoxy infusion machines** have been sold and the output range has been extended. The countries of destination for these machines have also increased, with a significant shift from Europe towards the USA and – needless to say – to China.

Cannon DX80, a new larger version of the Epoxy Infusion machine studied for the wind power market.

Siemens Wind Power, a major manufacturer of wind energy plants very satisfied with the technical solution – supplied by Cannon Afros and their Nordic Countries local office **NorTec** – for the infusion of Epoxy formulations in the giant blades made in their **Danish plants**, have repeated orders for their **new plant in Fort Madison, Iowa** (USA) during 2009 and for their **new giant installation in Lingang near Shanghai, China**, during the first half of 2010. Availability of a local Cannon unit played an important part in securing the two orders. Cannon is present in the USA with a fully-owned subsidiary since 1977, and in China three Cannon Far East offices and one factory near Guangzhou guarantee prompt service and spare parts: only in Shanghai ten qualified Service Technicians are available, one hour away from the customer's factory! International competitors, supplying the same type of infusion machines to the Chinese market, are present with a modest number of service technicians and almost no spare parts available for a quick local delivery.

Special pumps are used for both Epoxy resin and hardener to guarantee high precision and reliability.

Cannon Epoxy infusion machines are now supplied in a range of output including 35 and 80 kg/min, with special configurations available on request. What makes them appealing to this specialised segment of the industry is the **precision in metering, the simple programming and the reliability** in critic operations: no errors are allowed in the middle of an infusion when you are transferring more than 3 tons of formulation into a 45-m long mould! **These machines are compact, transportable, fully-electric** dosing units equipped with **closed-loop control of output and ratio.**

This guarantees a **continuous control over the injection** of these liquid resins in the vacuumised moulds that contain various layers of glass mat: the operation can last for 3 - 3 ½ hours, and the flow of material varies according to the level of filling achieved. A medium-output beginning phase is followed by a progressively reduction of flow, due to the resistance and friction created in the mould – as well as the wetting of the mass of reinforcement. The need of filling the most extreme portion of the long blades with the same proportion of resin over the reinforcement raises the problem of a continuous change of injection rate, thus the necessity of a closed-loop control of the output of both components: keeping a precise mixing ratio is a fundamental precaution to avoid emissions of non-reacted chemicals at the end of the process. The currently available models of Cannon Epoxy infusion machines are able to **dose from 5 up to 80 kg/min** of liquid formulation in a wide range of mixing ratios between resin and hardener, using for the infusion in mould a long static mixer attached to a dedicated mixing head.

A wide spectrum of technologies and solutions
In addition to the Epoxy infusion machines Cannon are able to propose several innovative solutions for the wind energy sector, including

- **Polyurethane foam units** for moulding **light inserts** in Polyurethane foam (which are replacing the more expensive balsa wood ones)
- **DCPD metering machines**, for moulding special small blades in DiCycloPentaDiene resins without glass reinforcement.
- Automatic or semi-automatic **assembly methods** for large composite parts
- **Presses for Aluminium injection**, for the giant rotors constituting the electric heart of a wind generator

The availability of a wide range of different technologies and the capacity to integrate them into complete, turn-key solutions, makes the Cannon Group an ideal partner for the investors, small or large, working on a worldwide basis in this segment of market. The **broad network of interconnected Cannon sales offices and technical service centres** provides an ideal support to experienced – as well as to new-coming – Companies who decide to install their production sites in countries where the right equipment for this technology is not available or not properly supported.

Head into the wind, with Cannon you can make it!

Epoxy DX35T including thermoregulation unit for resin

President Obama visits wind power plant in Iowa

For the first time in the company's 163-year history, a U.S. president has visited a Siemens factory. On Tuesday, April 27 2010, during his tour of the Midwest, Barack Obama made a stop at the 600,000 sqft plant manufacturing components for wind power generation in Fort Madison, Iowa. The plant, which was opened in mid-2007 and has recently been expanded, has a workforce of 600 employees and produces 160ft-long rotor blades, weighing 11 tons each, for 2.3 MW wind turbines.
The injection of Epoxy resins in the blades, using a Siemens-proprietary technology, is made with Cannon dedicated metering and mixing equipment, specifically developed by Cannon Afros for this application.
Barack Obama highlighted the Fort Madison plant as a successful example of how clean technology can help revive a local economy.

Fly high, with Tecnos

Numerous, innovative and all focused on automation and savings in manufacturing: Cannon Tecnos' technical solutions are applied in automotive applications – and not only – all over the world. The most recent projects are described in this article by Massimo Castiglioni, Sales and Marketing Manager of the Tecnos unit.

Cannon News: For more than 25 years Cannon Tecnos has developed dedicated solutions for the production of automotive parts, using mostly Polyurethanes but also other plastics and other materials. Where is Tecnos focusing its business, at this stage of its life?

Massimo Castiglioni: The automotive still represents most of our business, for sure. In the past five years we have done more than 80% of our turnover in the transportation industry, dealing as usual with manufacturers of plastics parts for automobiles, trucks or buses.
The remaining 20% has represented our playground, where we have applied the acquired know how for new applications and new markets.
We applied, just as an example, AGV transports to the insulation panel industry and, this year, to the aeronautics.
To remain on the main subject, our lines of products for automotive and transportation today mainly deal with **flexible seats, noise & vibration insulation parts, composites processing and fuel tanks**. The car making business is undergoing an intense delocalisation process: if we compare today's production map with ten years ago we'll see a definite shift towards emerging countries, where the major car makers have invested heavily to produce at lower labour cost. Their tier one suppliers must follow them, and we do the same: fortunately we can do it, thanks to our sales and technical network. The desired cost reduction can be achieved with **more automation**, even in cheap labour countries. We are focusing on the design of new solutions that will allow for more automated tasks in their production processes.

CN: Can you be more specific about this? What do you offer?
MC: For the car seat's moulding lines we designed **easy mould change systems**, simplified service operations, **off-line mould handling** for difficult models. For instance we have developed industrial solutions for **in-situ foaming of seats and backs** that can contribute to the volume and weigh reduction of urban cars, a segment of market which is on the rise. Our **Pit-Stop** solution allows **Copo Iberica** in Spain (www.grupocopo.com) to attain very good results on their seat's moulding line working for Citroen and Peugeot. All time-taking or complex operations – such as part demoulding, mould cleaning, release agent application, fitting of the textile liner – are carried off-line, leaving the polymerisation carousel free to run at its optimal speed after the foaming station. Add to that the **reduction of the footprint** of our plants, thanks to new methods for handling a numerous lot of mould carriers, and you already get a significant saving.
Talking about **thermoformed fuel tanks**, an interesting development followed the purchase from the Magna Group of existing Cannon "Twin Sheet" thermoforming lines originally made for Visteon. They moved one line to manufacture the tank of the new Mini Countryman, and asked for a significant increase of its automation: we added an automatic loader for the two plastics sheets, the inserts positioning robot and a trimming station for the finished tank. Another complete plant went to Changchun, China, where Magna, in local joint venture, will

Cannon "Twin Sheet" thermoforming lines are used by mayor producers of automotive fuel tanks. Cannon Tecnos also provides them with moulds and prototyping service.

Above: Aermacchi - Alenia complex handling system designed and built by Cannon Tecnos to move the assembly jigs from one fitting station to the next ones where the fuselage of the new M-346 aircraft is assembled. Below: The new Aermacchi M-346 on the tarmac in Venegono Superiore, Italy.

The fuel tanks of the new Mini Countryman (above) and of the Audi A6 mounted in China are made with Cannon dedicated thermoforming plants.

manufacture the fuel tank of the locally-produced **Audi A6**.
In our factory we have carried the **prototyping service** for Magna and Daimler, forming dozens of tanks for their prototype vehicles.
The car makers love to use serial components for their vehicle's extended evaluation tests, to be sure that part's weigh and performances will be exactly matching the "real life" conditions of a serial vehicle. Only four months passed between the order and the delivery of the finished tanks!

CN: You mentioned composites and we already reported in another article of this Cannon News the BMW composite roofs story. What is your involvement and orientation, in this complex set of different technologies?
MC: We were involved in composites as far as 25 years ago, when we started with RRIM manufacture of bumpers and fascia parts. Since then we have improved the use of long fibers in Polyurethane formulations with the InterWet technology, and today we develop preformers for the automatic manufacture of PU and Epoxy parts. The **BMW M3 roofs** are preformed with our equipment, as you correctly say. We recently sold a similar **preformer** to **Lamborghini**, a prestigious brand within the **Audi Group**. Equipped with a Laser cutting system, it is used for the industrial production of carbon-based composite parts for both their Dry Carbon fiber and Pre-impregnated technologies.

CN: You said before that you applied AGV transports to the aeronautics: can you tell us more?
MC: This application is now in production at Alenia Aermacchi in Venegono, Italy (www.aermacchi.it), a world leader in the design and production of military training aircraft. For the structural assembly of the fuselage of the M-346, the all-new European LIFT (Lead-In Fighter Trainer). Aermacchi starts to use a **complex handling system designed to move the assembly jigs** from one fitting station to the next ones where the fuselage of the aircraft is erected. The junction of ready made subassemblies is done with great precision, few tenth of millimetre, in five working areas for the central fuselage, plus two used for the forward and two for the rear.

Our system is designed to guarantee the repetitive positioning of the jigs and the AGV that carries the aircraft subassembly to other relevant areas of the assembly process. No plastics processing or chemical dosing systems, in this project: it's pure precision handling, which says a lot about our capacity of delivering proper solutions for difficult projects!

Easy mould-change systems, simplified service operations, off-line mould handling for difficult models characterise the latest Cannon Tecnos automotive seats foaming lines.

Apply High Pressure - Get ESTRIM Results!

The Automotive sector is looking with great interest at the industrialisation of the injection process involving the use of Epoxy resins and Carbon or other continuous fibers, provided that this allows for typical part-to-part cycle time of 3 minutes or less. Until now this fast production has not been possible, for a number of reasons linked with the involved chemistry and with the manipulation of the fiber's substrates. Thanks to ESTRIM – a fast-demoulding, high-pressure injection technology for Epoxy resins recently launched by Cannon – lightweight, thin-walled composite mouldings of complex shape and medium-large dimensions can now be produced at very reduced cycle times. An interview with Antonio Cossolo, Cannon Group's Corporate Director for Product Development, details the various aspects of this innovative application.

Cannon News: Epoxy-based composites produced with high pressure injection: what can you tell us about the innovative aspects introduced by Cannon for this technology?

Antonio Cossolo: The innovation introduced by Cannon consists in providing the right mix of technologies able to achieve Automotive industry's production cycles for mass production of large composite parts:

- **High-pressure technology** for metering, mixing and **injecting** a properly formulated family of liquid Epoxy components in a closed mould: this **decreases demoulding times** from up to 30 minutes to 2 – 3 minutes, maintaining optimum mechanical properties and surface aspect characteristics.
- **Self-cleaning mixing heads** eliminate the use of flushing or cleaning solvents, achieving **significant economic savings and environmental advantages**. In addition, they can be permanently fixed on the tools, speeding up the production and eliminating leakage problems from the injection point.
- High-pressure injection, in combination with **closed-loop controlled metering systems**, guarantees optimum repeatability of the dispensed weight from shot to shot. This provides high standardisation of the moulded parts and avoids unnecessary overfilling of the mould, with all relevant advantages (material savings, no leaks, cleaner working environment, no emissions of vapours from the moulds, much lower scrap rate, etc.)
- **Dedicated preformers** provide repetitive and fast production of inserts to be manually or automatically positioned in the moulds prior to the injection, avoiding long manual preparation of the production tools and increasing the profitability of presses and dispensing equipment.

Cannon LN7/3 three components mixing head for high pressure injection of Epoxy resins in Carbon fibre composites.

CN: What does this mean in terms of advantages for the end user?

AC: A production rate up to ten times faster than that provided by RTM speaks for itself:

- Presses and moulds generate **ten times more parts per unit of time** (shift, day, month…) potentially with the same manpower.
- Production **lines can be automated**, making use of 40+ years of industrialisation experiences matured by other plastics processing technologies. Production **costs and scrap parts are significantly reduced**.
- **Multiple heads** can be connected to a single dispensing machine to serve several moulds in a row, **reducing the required equipment's investment per point of injection** and optimising the performances of formulation and dosing machine.

Automotive, transportation and aerospace industries can think in new terms the production of structural or decorative lightweight composite parts, since their production rates can be brought nearer to their assembly lines' timings and logistic needs.

CN: What is the "state of the art" for Epoxy-based Composites?

AC: Traditional manufacturing methods used until now for the production of composite parts in moulds – such as the Resin Transfer Moulding (RTM), whose typical field of application is the automotive industry – are characterised by long part-to-part cycles (20 to 30 minutes), deriving mostly from two basic obstacles:

- the long preparation phase of the moulds prior to the introduction of the liquid formulations, which require manual positioning of several layers of different reinforcing mats or tissues of glass or carbon fiber.
- the long polymerisation time, deriving from the intrinsically slow reactivity of the formulations, required to allow for a smooth and complete filling of the cavity with a liquid which is progressively growing its viscosity in the time immediately following the start of the injection in mould.

The lack of faster manufacturing methods has – so far – slowed the development of a wider number of lightweight structural or decorative parts which could be used by mass-production industries unable to cope with long processes still relying on heavy manual operations. The fast manufacturing cycles demanded by the automotive industry require demoulding times which are up to ten times shorter than those provided by the currently most used process.

CN: What kind of solution were you able to develop, then?

AC: The Cannon Group and Huntsman Advanced Materials have joined forces to develop an alternative process, designing production equipment and chemical formulations able to overcome the two basic problems described above. The experience grown by Cannon and Huntsman in another field of the plastics industry – the Polyurethanes, in which both Companies are recognised leaders – taught that fast demoulding is primarily depending on a very fast injection time. This is a direct function of three fundamental parameters of the process:

- the viscosity of the liquid formulation (which derives directly from the employed chemistry and from the temperature)
- the wettability of the reinforcing material (which depends upon the geometry of its deposition within the mould, and from intrinsic characteristics of the mat or the fabric)
- the pressure exerted on the mould's inner surfaces by the liquid, which progressively encounters resistance to its flow (due to the progressive rise of viscosity and to the presence of a solid mass of reinforcing material in each part of the mould cavity)

It is of paramount importance, therefore, to fill the mould before than the viscosity of the liquid formulation reaches an unmanageable value. Employed successfully for more than three decades in other reacting processes – such as Polyurethanes, DCPD and Nylon RIM – the **high-pressure metering and mixing technology** has allowed the industry to reach production rates and mechanical properties once unheard of.
The same approach has been used for Epoxy.

Cannon E-System, the dedicated high pressure metering equipment designed for the injection of Epoxy resins in Carbon and Glass reinforced composite parts.

CN: You say "High pressure": how does this work?

AC: The high pressure technology is based on positive displacement pumps able to reach pressures (measured at the head's injectors) above 200 bars: this provides the desired solutions for this problem. The chemical components are warmed in storage tanks up to the required temperature and are kept, separately, in continuous recirculation through the circuit of the dosing machine – up to the inner part of the mixing head – to ensure that their viscosity remains constant through the complete process. By increasing the temperature the viscosity drops.
The mixing is obtained by pulverising – with appropriate injectors or "jets" – the reactive components in a cylindrical mixing chamber, whose diameter can be as small as 4-5 mm. The mixing chamber – when not in use – is tightly sealed by a precisely-machined piston which avoids that the components get mixed at the wrong time.
The computerised control determines the precise amount of liquid materials required by each different mould and calculates a precise injection time in function of the pump's actual output. When the machine's control sends an injection command the piston sealing the mixing chamber is operated hydraulically, the mixing chamber is opened and the liquid components are conveyed through pressure-inducing pulverising nozzles: the chemicals meet and mix thoroughly in the small cylindrical cavity, converting their kinetic energy into turbulence. The blended liquid is forced through an "L"-shaped circuit within the head: this non-linear path provides a good conversion of turbulent forces into laminar flows – an ideal dispensing situation for those applications where any inclusion of air into a liquid formulation must be avoided.
This laminar flow of liquid leaves the head through an injection nozzle that fits a hole drilled in the mould. All the blended material is therefore quickly transferred into the cavity, without waste: at the end of the injection the control panel sends a signal to the hydraulic pack, which quickly closes the mixing head and brings it to the rest position. This quick action perfectly cleans out the cylindrical wall of the mixing chamber, removing any residual liquid. These heads, therefore, do not require any flushing with solvents or detergents. There are neither moving parts to be washed at the end of each injection, nor static mixers or plastic pipes to be disposed of. The injection is a clean operation, and the heads can be fixed on the moulds and left there for a long time: they can be dismounted periodically for routine maintenance or for cleaning the pressure-inducing injectors.
The positive pressure applied to the liquids by the high-pressure dosing pumps is kept constant throughout the whole injection process: this pressure allows for fast and complete filling of the mould, even where the mass of reinforcement provides a high resistance to the flow of liquid. Pressure within the mould's cavity is continuously monitored using a pressure transducer fitted in the mould's wall opposite to the injection hole. A pressure curve can be plotted and analysed to determine the best output and filling time values to be adapted to each different type of mould.

CN: "Dedicated preformers" seem to be a winning plus, for Cannon: can you tell us something more on these special machines

AC: Cannon Tecnos – the Cannon Group's Unit devoted to the development of solutions for the Automotive sector – have designed and supplied dedicated preformers for composites for more than three decades. Glass, Carbon, Aramidic and natural fibres of every type and consistency have been successfully handled and precisely dispensed in large or small moulds in dozens of different applications. The availability of these dedicated tools – in addition to a complete range of mould carriers, presses, manipulators and other specially-designed equipment – is a significant plus in the search for a complete industrial solution aimed at the automated high-yield manufacture of injected composites based on Epoxy formulations.
One of these preformers has been specified and purchased in 2001 by **BMW** for their **Landshut's Innovation and Technology Centre** (LITZ), within the frame of a major development project aimed at the production of a complete "composite" car. A fruitful joint cooperation with the prestigious client allowed Cannon to supply a state-of-the-art preformer: this sophisticated machine is now carrying the whole production of preforms for the composite parts manufactured in-house by BMW for their M3 and M6 models. See the annex article to get more details on this innovative project.

CN: For the success of this project a smart chemistry must have been used: what did you do in this case?

AC: The availability of high-pressure equipment for very fast injections of Epoxy opened a world of opportunities to Huntsman Advanced Materials: they were able to select – from a wide range of Araldite ® resins and Aradur ® hardeners and catalysts – the right combination, providing high reactivity but also the right viscosity at the injection temperature and viscosity build-up characteristics in order to cope with the performances demanded by this new process.

CN: How did you proceed with the development of the process?

AC: Several sets of trials were organised during 2009 and 2010 at Cannon Afros R&D Lab near Milano, Italy, using high pressure metering and mixing equipment specifically modified to cope with Huntsman's Epoxy chemical behaviour and viscosities. Hardener and resin required very different processing temperatures, and chemical compatibility suggested us the use of plunger-dosing piston for the hardener side rather than the use of the conventional high-pressure pump used for the resin.
Moulding series were run using progressively higher quantities of formulation, until a proper filling rate was identified and repeated with regular results using various types of reinforcing materials. Successful production of test plates was achieved with demoulding times as low as 2 minutes, with resin processed at or near 90°C and mixing ratio Resin/Hardener of 5:1.
The resulting test plates were submitted to characterisation in Huntsman Advanced Materials TS&D Labs in Basel, Suisse, and provided the following results.

Fiber	fiber vol fraction (%)	resin output (g/s)	injection time (s)	cure time (min)	Max pressure (bars)	resin temp (°C)	mould temp (°C)	perform weight (g)	plate weight (g)	ILSS (Mpa)	Tg by DMA Onset (°C)	Tg by DMA Peak (°C)	Flexural Modulus (Mpa)	Flexural Strenght (Mpa)	Tensile Modulus (Mpa)	Tensile Modulus (Mpa)
Glass	40	36	15	4	44	70	87	663	1031	42,1	79	99	17560	413		
Glass	52	24	17	2	> 50	90	90	773	1162	42,9	73	98	23271	434		
Carbon	48	24	17	3	44	90	90	541	878	59,5	79	102	44147	771	51616	710

These data confirm the success of the project. Mechanical characterisation of the specimen confirms that structural Epoxy-based composites can be obtained by ESTRIM technology – used in combination with properly designed dosing machines, mould carriers, preformers and ancillary equipment – with a production rate up to ten times faster than that provided by RTM technology.

CN:To summarise, then what are the benefits of this new ESTRIM process?

AC: The advantages over a conventional technology are evident:

- Presses and moulds generate ten times more parts per unit of time, potentially with the same manpower.
- Production lines can be automated, making use of 40+ years of industrialisation experiences matured by other plastics processing technologies.
- Production costs and scrap parts are significantly reduced.
- Multiple heads can be connected to a single dispensing machine to serve several moulds in a row, reducing the required equipment's investment per point of injection and optimising the performances of formulation and dosing machine.

CN: Where do you think that this process will be applied in the near future?

AC: Automotive, transportation and aerospace industries can think in new terms the production of structural or decorative lightweight composite parts, since their production rates can be brought nearer to their assembly lines' timings and logistic needs.
The Cannon Group can supply, as a One-Stop-Shop supplier carrying the whole responsibility of the line, all the equipment required by this technology:

- **High-pressure closed-loop controlled metering and injecting machine, and self-cleaning mixing heads.**
- **Dedicated preformers for repetitive and fast production of inserts**
- **Dedicated moulding clamps and moulds, in various lay-out configurations**
- **Water-jet trimming equipment for the finished preforms**
- **Storage tanks and distribution circuit for chemical components**
- **All the ancillary equipment required by the process**

Any local Cannon Office will gladly discuss with the interested Companies their specific manufacturing requirements, in order to tailor for them the most appropriate "ESTRIM solution" – just give us a call!

Fast demoulding and perfect surface aspect is obtained using well-tuned Epoxy formulations processed with high pressure technology.

A Cannon Preformer for BMW

During the "BMW Group Innovation Days 2010" event, held on July 1st at the their headquarters in Munich, BMW released the details of its all-electric car, the Megacity Vehicle (MCV) – the BMW Group's first electrically powered production model. With the MCV, the BMW Group will offer an innovative solution for sustainable urban mobility which will be brought onto the market by 2013 and sold under a BMW sub-brand. A Cannon Preformer – specified and purchased in 2001 by BMW for their Landshut's Innovation and Technology Centre – is used for the production of all the Composite roofs of this innovative vehicle.

In a comprehensive 40-page report* titled "**Mobility of the future**" BMW highlights the philosophy which drives the development of the all-electric car, which they claim is the "world's first all-new electric powered car". Stemming from environmental concerns created by climate change and global warming, growing scarcity of resources and need for sustainability, the author states the need for **new solutions for mobility** in Megacities characterised by an increasing urbanisation.

A Cannon Tecnos preformer was supplied in 2001 to BMW Landshut Innovation and Technology Centre for the development phase of the project.

The response from the BMW Group is defined in one word: Electromobility, or **E-mobility**. The BMW Group sees E-mobility as one possible way of meeting future demand for personal mobility. Here, one great advantage lies in zero local emissions. Since E-mobility involves electric current rather than fuel being converted into propulsion, no climate-harming gases are created during the journey.
E-mobility is an integral component of EfficientDynamics. With this strategy, the BMW Group has for some time now been very successful in reducing consumption and emissions through new generations of highly efficient engines, aerodynamic measures, the use of innovative lightweight construction and intelligent energy management in the vehicle – while at the same time achieving better performance. That is what made it possible, between 1995 and 2009, to reduce the CO_2 emissions of the entire BMW vehicle fleet by almost one third. Even today, through EfficientDynamics, the BMW Group is achieving additional consumption benefits through further electrification of the powertrain, right up to hybridisation. Taking the long view, EfficientDynamics means the transition to emission-free mobility – through the use of battery power as well as renewably generated hydrogen.

A completely new design
As the development work on the MINI E and BMW ActiveE concept vehicle confirms, any approach that simply converts an existing internal combustion-engined vehicle to run on electric drive (conversion car) cannot hope to harness the full potential of electric drive. Rather than being a "converted electric car" developed from an existing platform, the MCV is designed uncompromisingly and specifically around the needs and requirements of E-mobility. The MCV has a newly developed drivetrain and a revolutionary vehicle architecture that combines rigorous lightweight design with optimal space efficiency and maximum crash safety.
The drivetrain of an EV is far heavier than that of a vehicle with a combustion engine, full tank of fuel included; an electric drive system (including battery) weighs around 100 kg more. The battery is the chief culprit here. To cancel out the extra weight it brings to the vehicle, the BMW Group is working rigorously on the application of lightweight design principles and the use of innovative materials. By using the optimum material for each component, depending on the requirements and area of usage, the BMW Group engineers have succeeded in ensuring that the heavy battery barely carries any weight, so to speak. Fundamental in this process of weight reduction has been the replacement of all steel components of this full 4-seaters vehicle with moulded Carbon-fibre-based Composites or Aluminium.

Purpose design – the LifeDrive concept.
Lightweight design, however, is just one facet, albeit a very important one, of the development work which goes into modern body construction. The full electrification of a vehicle gave the BMW Group engineers the opportunity to completely rethink the vehicle architecture and to adapt it to the demands and realities of future mobility. With the LifeDrive concept they used purpose design to create a revolutionary body concept which is geared squarely to the vehicle's purpose and area of usage in the future and offers an innovative use of materials. Similarly to vehicles built around a frame, the LifeDrive concept consists of two horizontally separated, independent modules. The **Drive module** – the aluminium chassis – forms the solid foundation of the vehicle and integrates the battery, drive system and structural and basic crash functions into a single construction. Its partner, the **Life module**, consists primarily of a high-strength and extremely lightweight passenger cell made from **carbon fibre-reinforced plastic**, or **CFRP** for short. With this innovative concept the BMW Group adds a totally new dimension to the areas of lightweight design, vehicle architecture and crash safety.

The right strength in the right places.
The secret of this high-strength material lies in the carbon fibres. In contrast to quasi-isotropic metals like aluminium or steel, which have equal strength in all directions, CFRP is anisotropic.
This gives it very high strength, like a rod, in one direction, namely along the tensile/compression axis. This is its key advantage. The stress resistance of components can be optimally matched to the loads they will actually encounter in practice. As in nature, where bones or plants use thicker structures only where really necessary, so the BMW Group engineers likewise tailor the thickness and fibre alignment of CFRP components to meet actual requirements, varying the quantity of fibres used and aligning them in the direction or directions along which loads will be exerted in the future product. These precisely gauged component parameters also help to minimise weight. Using CFRP is more than simply a straight substitution, like using aluminium in place of steel. With its special properties, this high-tech material also opens the door to completely new approaches and design concepts. Electric mobility is a case in point, where CFRP offers great potential as a material for vehicle body components since its lightweight properties result in a higher power-to-weight ratio, and therefore an extended driving range. Provided that this material is properly understood, it can be strategically deployed to achieve vast improvements in a wide range of lightweight products.

Technological expertise in the BMW Group.
As early as 2003 the BMW Group introduced a next-generation production system geared to high-quality volume production of CFRP parts. This state-of-the-art process has very short cycle times, and it has been ramping up output ever since. Today the Landshut plant is even mass-producing roofs (for the BMW M3 and M6 models) and bumper supports (for the M6) in CFRP. The BMW Group's CFRP specialists have steadily refined and automated the CFRP production process at the Landshut plant so that, for the first time, it is now possible to mass-produce CFRP body components cost-efficiently and to a high quality standard. The process engineers at the Landshut Innovation and Technology Centre (LITZ) have thereby removed one of the main hurdles to increased use of carbon fibre components in vehicle body manufacture.

The Cannon preformer is in full production today supplying all the roof preforms required by the M3 and M6 models.

Preforming and preform joining – a component takes shape.
At the so-called "preforming" stage, the cut but still flat fabric begins to acquire a shape. During this process a heat source is used to give a fabric stack a stable, three-dimensional contour. The final shape of the component is already clearly visible. Several of these preformed stacks can then be joined to form a larger component. In this way CFRP can be used, for example, to produce highly integrated components with a large surface area, which would be extremely cumbersome to manufacture from aluminium or sheet steel. This has major benefits for vehicle body design and manufacture. For example, mounting parts or other features can be integrated directly into the component. Also, complex structural components and entire body modules with varying wall thicknesses can be produced in a single moulding tool. At both process stages – preforming and preform joining – the big challenge lies in ensuring good production processability of the

flexible fabric so that the preforms will maintain a stable shape and can be joined with maximum precision. Here, too, the BMW Group has acquired valuable expertise over the years. This precise and delicate operation is performed using a sandwich composed by various layers of carbon fabric, selected according to the mechanical resistance desired for the final, moulded part.

High-pressure resin injection with Resin Transfer Moulding (RTM).
The joined preforms are now ready for the next stage in the process: resin injection. This second major component in the composite structure – the resin – ensures that the preformed stacks permanently maintain their preconfigured shape. The resin transfer moulding (RTM) process involves high-pressure injection of resin into the preforms. Firm bonding between the fibres and resin, and the subsequent hardening process, give the material the rigidity which is key to its outstanding qualities.

Final processing – a water jet cutter applies the finishing touches.
After resin injection and hardening, the production process is almost complete. All that remains is the finishing work such as precise contour cutting and the insertion of any further openings that may still be required. At BMW Group plants this finishing work is performed by a water jet cutting machine. Since the finished CFRP component is already, following resination, very stiff and robust, ordinary milling heads would quickly run into wear and tear problems and would require frequent replacement. Water jet cutting and drilling on the other hand are wear-free.

Mass production was always the aim.
With the steady ramping up of output, and the development of innovative processes, the BMW Group has now accumulated a vast amount of in-house expertise and experience. This know-how is spread across its workforce, its production equipment and its processes. It was only possible to achieve such a high level of expertise thanks to the unwavering focus on one overriding goal: mass production of CFRP components.

(*) All the details of the project mentioned in this article have been extracted from a paper published by the BMW Group. The whole 40-pages report is available in BMW's website (www.press.bmwgroup.com).

A complete range of innovative processing solutions is available at Cannon for the manufacture of Composite elements – Carbon- or Glass-reinforced – using Epoxy or Polyurethane formulations.

Hutchinson Body Parts gets the largest PDCPD press in Europe

Based on thirty years of experience, the Hutchinson plant located in Ingrandes sur Vienne, France, designs, manufactures and delivers in sequence to the customer's assembly line composite body parts and semi-structural parts, for the transportation, aeronautic and industry markets. Body parts are moulded in material such as Polyurea, Polyurethane, and PDCPD – which allow for big dimensions. The new large horizontal clamping press recently put in by Cannon, with platens of 3,500mm by 3,500mm, will be used for the moulding of parts of over three meter long. Due to the giant size of the press a hybrid drive solution was put in place, with significant advantages in terms of cycle time and energy savings.

Early in 2009 **Hutchinson** contacted **Cannon France** to obtain a quotation for a turnkey package of equipment to manufacture commercial vehicle components using the **PDCPD (P**oly**D**i**C**yclo**P**enta**D**iene**)** process. The Cannon Group over the years have provided numerous plants to process this material and have a great deal of knowledge regarding the metering of the chemicals and the handling of the moulds.
PDCPD is a well established thermoset material used to manufacture large and paintable parts requiring high impact strengths, a collection of attributes required by Hutchinson's customers. Hutchinson is a major supplier within the industry of transport and have a great deal of knowledge in processing components in Polyurethane (RIM) and in PDCPD, with an established track record of quality and consistency. During the early days of the discussions between Hutchinson and Cannon France it was obvious that **very large parts** had to be manufactured and that the investment being considered would also in some way be used to allow even larger components production.
This in turn brought into question the design requirements of the metering unit and the mould carrier.
The following elements must be considered when proposing a mould carrier to be used in the production of PDCPD parts :

- Cycle time
- Operator access
- Power consumption

The typical mould carrier would be a vertical clamping type which has a down-stroking platen. However, in the case of Hutchinson, the size of the parts was so huge that a deeper reflection was required. **Cannon Solutions (UK)** – the Manchester, UK, based Group's manufacturing center that has gained the widest experience in designing, building and installing large mould carriers for PDCPD – responded to the request of Hutchinson to design a **horizontal clamping type press** because of the special characteristics required: a **platen of 3,500 by 3,500mm with a stroke of 3,600mm** and a clamping force of 230 Tons.

Since the calculation of power consumption in hydraulics is determined by the pressure required and the flow rate, to match the movement times achieved by the motor gearboxes on the platens would require a large amount of power. More over, to achieve fast opening or closing, considering the maximum tool weight per platen up to 15 tons, a tremendous amount of oil would be required.

For those reasons not only was the decision to go horizontal clamping but also to go "**Hybrid**", just like a car: using a mixture of electrical and hydraulic power **reduces significantly the total power consumption**
.

Hutchinson use a horizontal clamping press with a platen of 3,500 by 3,500mm, a stroke of 3,600mm and a clamping force of 230 Tons to process PDCPD (PolyDiCycloPentaDiene) resins.

The platens are opened and closed using electrical servo drive systems which allows for **fast stroke speed** and **stroke optimisation**, depending on part's overall depth and mould thickness. The clamping pressure is applied by large diameter independent hydraulic cylinders with a short stroke; each cylinder is electronically controlled to achieve positional accuracy.

The platen and the cylinders can also be moved together, thus reducing the cycle time. The design also offers a time window at which it is ideal to open the mould carrier and quickly allow the operator access to demould the part. The very long stroke allows **operators to walk inside the mould carrier** to access both platens without being constricted by tools.

The choice of the **correct metering unit** is also extremely important: the high pressure **Cannon "A-Compact" 200** is ideally suited to this process, being specifically designed to meter and mix the PDCPD chemical components in the precise quantities required. The combined output of the machine is 200kg/min., meaning it is ideal to produce mouldings up to 80 kg matching perfectly the characteristics of the mould carrier.

Safety is paramount in the design of Cannon equipment and the specification of the metering unit with the selection of ATEX certified components means that one can be assured that the plant is fit for purpose.
Quick and qualified **Technical Service** and local availability of **spare parts** played a major role in Hutchinson's decision to chose Cannon as supplier for this jumbo press and metering unit: Cannon France provides both services since 1978, as hundreds of satisfied customers in France and French-speaking countries of North Africa can witness.

With this new installation Hutchinson offers new facilities to realize huge PDCPD parts for all European customers looking for high quality and productivity rate.

Telene, the French Team for PDCPD

Telene, based near Paris, France, is a 100% owned by Rimtec Corporation, the Japanese manufacturers of PDCPD. From their Drocourt's headquarters they are in charge of R&D and sales for the EMEA (Europe, Middle East & Africa) markets.
Their culture of "**customer centricity**" is evidenced by the key developments and successes that have taken place through very close customer cooperation. A **strong team**, where everyone is ready to roll up their sleeves and contribute, works tirelessly on application and product development where delivering a competitive performance advantage to their customers is the number one goal. (**www.telene.com**)

PDCPD (Poly**D**i**C**yclo**P**enta**D**iene**)** is the most advanced solution for the manufacture of large parts, from low to high volumes, with a very large range of applications. Mixed under pressure, the chemical reaction of components A and B gives the thermoset polymer.

Reaction Injection Moulding (RIM) of the low-viscosity resins is the preferred method of production of PDCPD parts, which feature high rigidity, excellent impact resistance, as well as good surface appearance and corrosion resistance for a wide range of applications.

The PDCPD catalyst system makes it possible to **control** the starting point of the reaction. This opens up the processing window to the moulder by increasing the time available to fill the mould.
This makes it possible to make very large plastic parts (up to 100 Kg and over) in a very short time. PDCPD stands apart from all other liquid resin RIM systems because of the unique patented catalyst system.
This catalyst system makes it possible **to vary the gel-time** (which marks the start of the polymerisation) in accordance with the requirements of the moulder and the part to be moulded. Not only has the moulder full **flexibility** in production, but **new concepts** in engineering plastics have been made possible by PDCPD RIM resins.

INBRASP, a Brazilian Success Story

Inbrasp – Indústria Brasileira de Plásticos – specialises in processing techno plastic resins for the production of complex parts destined to a vast range of vehicles for automotive, trucks, buses, agricultural and earth moving applications. The Company pursues research and joint-development, together with qualified suppliers in Brazil and abroad, in order to develop new, innovative technologies, keeping - as the priority target - the quality of its products.

Inbrasp is a Brazilian pioneer in the field of **PDCPD** processing: this innovative resin provides several advantages over competing plastics, mainly in the field of impact resistance. The growing development of this technology and the increasing skill matured in-house in this specific process have allowed the Company to invest in large injecting equipment and polymerisation presses. Their production capacity, in terms of part' size, goes as far as 40 kg: this means that their moulded components are extremely attractive for the manufacturers of large vehicles (automobiles, trucks, buses, agricultural and earth-moving engines). A few examples of their most significant products include 40 kg parts for John Deere tractors, a 16 kg bumper and a very complex 11.5 kg front grill for the Iveco Stralis truck, and an Aeroparts kit for Fiat weighing 13 kg.

Illustrating the PDCPD's advantages Edson Rodrigues, the Group's Corporate Industrial Maintenance Manager in charge of all the manufacturing equipment, says: "*PDPCD exhibits very interesting features as high impact resistance and stiffness even at very low temperature – like -40°C –, good dimensional stability, high chemical resistance in acids and bases, a paintable surface and optimum compatibility with adhesives. Also, it has low density, which contributes for the weight reduction of the vehicle. It is possible to produce very large parts with a relatively limited investment, and the material show easy processability; its injection time is about 10 seconds and a fully cured part is obtained in 60 seconds. The typical part-to-part cycle time is 4 to 6 minutes. Usually, mould release is not necessary, as well as post cure.*"

The Company actively pursues a strategy based upon research and joint-development, with qualified suppliers in Brazil and abroad, in order to develop new, innovative technologies: for the **PDCPD chemical formulation** they have selected **METTON LMR** (www.metton.com), manufactured in Houston, Texas (USA) and distributed locally by **Sojitz do Brasil** (www.sojitz-br.com). The worldwide-acquired experience in the production of very large "body parts" allowed METTON's specialists to tailor the most appropriate combination of reactivity and polymer's mechanical properties, suitable for the full range of their mouldings.

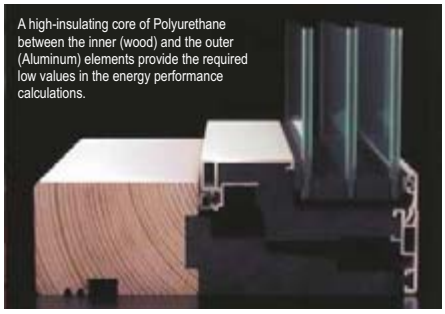
The **Cannon Group** was selected for the **equipment**, thanks to a vast array of technical solutions and a capillary local Service, provided by the São Paulo-based **Cannon do Brasil** branch. A "full optional" high pressure dosing machine "**A-Compact 200 FC**" – with all the necessary specific modification required by PDCPD process to work safely – was supplied. The dosing group consists in high pressure Cannon pumps, fixed output type, completed with inverters and magnetic couplings. The **closed-loop control** of the pouring process allows the most advanced respect of required ratio and output of the two components formulation. In particular, due to the specific features of PDCPD's reactivity, a perfect nitrogen inertization is an essential key. Besides, a dedicated data collection software has been developed for the production certification.
In order to allow to Inbrasp the maximum freedom in their future production mix, the dosing machine was supplied with **three FPL 24 PLUS mixing heads** mounted into three different mould carriers. Each mixing head is rated to assure an output from a minimum of 600 up to over 3,000 grams per second. A wider production range can be obtained in the future by a simple and easy addition of extra mixing heads.

Cannon has played a major role in the success of this process at Inbrasp, concludes Edson: *"Cannon machines bring great technological features, high performance and high yield"*.
By seeing the Company growth and the list of its satisfied clients, one understands how Inbrasp's motto – *Developing The Future* – looks absolutely appropriate. *Parabéns*, Inbrasp!

Futura + opens windows on the future

Idealcombi, a family business founded in 1973, disposes of the "largest window production under one roof" in Denmark, and has reached in Europe a leading position thanks to the variety of their products and to the quality of their windows. The high quality standards pursued by the Company derive from a mixture of solid Danish craftsmanship and tradition with state-of-the-art technology, providing solutions with the industry's best energy performances. They have selected a Cannon solution for their innovative Futura+ series of trendy windows.

Based in Hurup, in northern Jutland, Denmark, **Idealcombi** (www.idealcombi.dk) produces quality windows in a wide product series: five individual window's lines are offered to the European market, with technical characteristics that comply with, and often surpass, the energy efficiency standards set by the EC norms. The latest and most trendy series, the **Futura+,** combines **wood and Aluminium with a core of Polyurethane**, whose structural and thermal insulation properties ensure to the manufact longevity, strength and a uniform surface requiring no maintenance. Its slim profile, obtained thanks to the insertion of Polyurethane, ensure the largest possible glass section and allows plenty of light in the rooms, in addition to an extra heat gain and an elegant and modern look. The series has been designed to suit the requirements of modern and visionary new buildings, focusing on sleek functionality and energy-efficient solutions. The windows frames are designed with the exterior side finished in powder-coated Aluminium and the traditional interior in wood. Both materials have been retained in the product to offer all the advantages of a differentiated choice of colours both inside and outside, as well as minimum maintenance requirements. A high-insulating core of Polyurethane between the inner and the outer elements provide the required low values in the energy performance calculations. By combining Polyurethane with fine glass fibers Idealcombi has obtained a Composite structure which sets new standards for reducing cold bridges and energy loss.



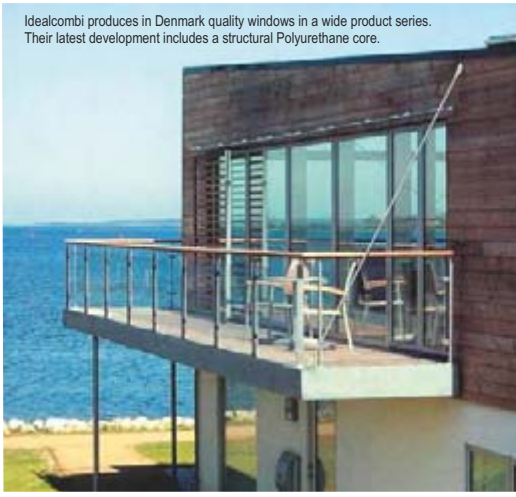
A high-insulating core of Polyurethane between the inner (wood) and the outer (Aluminum) elements provide the required low values in the energy performance calculations.

When confronted with the choice of a proper technological partner for this innovative project, Idealcombi selected **Nortec** (www.nortec-cannon.dk), the Cannon arm in Europe's Northern Countries for forty years. Based in Humlebaek, near Copenhagen, Nortec provides prompt, local technical service and a wide stock of spare parts, in addition to a very qualified technological consultancy in the defining stage of a complex project.

The peculiar design of the Futura+ series requires a number of specific solutions. The long and narrow design of the windows profile leads to the choice of an **open-mould pouring** solution, rather than a closed-mould injection that would not guarantee optimum surface aspect in the remotest corners. Therefore a proper mixing head is demanded, able to pour with a **laminar flow a viscous formulation**!

The length of the moulds suggests the simultaneous use of **two combined mixing heads**, pouring sidewise, starting from the center. The wide number of available profiles implies **numerous different moulds**, to be properly and precisely handled in an automatic foaming plant. Therefore a logic connection is required between a mould-identification device and the dosing machine's and pouring robot's foaming programmes.

Nortec, in cooperation with **Cannon Afros**, the Group's unit responsible for metering and mixing technologies, proposed a **complete plant** based on a 25x14 m rectangular **mould carrying transfer line**. In the middle of this area stands a chemicals' pre-blending and dosing station, based on a **double Cannon HE** dosing machine for glass-filled formulations; this metering unit is linked, through an aerial rigid piping, with **two FPL mixing heads**, specially armoured to be abrasion proof and provide long-lasting operations and laminar flow pouring. A **portal-type mixing head carrier**, positioned in one angle of the mould carrying transfer line, drives the two mixing heads over the nearly 7-meter long open moulds: foaming occurs starting from their center and moving outwards in the opposite directions. When foaming ends, the mould is automatically locked and moved forward, making space for the next one to be foamed.
When Polyurethane has polymerised, the moulds are opened automatically and the finished profile is extracted. A set of new Aluminium profiles is positioned in the mould, before this enters in a **pre-heating oven** where it is brought to the right temperature for the next application of Polyurethane. When the mould leaves the oven it travels briefly through a buffer station, then it goes under the foaming portal, and the cycle restarts. This 350m^2 plant can foam up to 60 profiles per hour, using two operators only.



Idealcombi produces in Denmark quality windows in a wide product series. Their latest development includes a structural Polyurethane core.

The new Cannon foaming plant will enhance Idealcombi's capacity of providing constructive solutions and knowledge as parts of a joint objective for sustainable buildings and good cost efficiency. Far more than a supplier of windows and doors, Idealcombi plays an active role in the overall building process, not just as a supplier but also as an active partner. The same can be said for the Cannon units involved in this sophisticated project. As the old Cannon slogan says, "**Together We Can Make It !** "

Cannon Thermoformers for the "Van of The Year 2011"

Forma (Cannon's thermoforming machinery manufacturing division – www.cannonforma.com) has recently delivered two thermoforming machines to the Martur Group, a tier one supplier to FIAT.
These machines are dedicated to the manufacture of sets of interior trim (co-ordinated dashboard, front and back door panels) for the FIAT Doblò model year 2010, that has been awarded of the title "Van of the Year 2011".

The production technology is "thermo covering", a special technique of thermoforming. An injection moulded insert (also called "substrate") in ABS is treated with reactive hot melt adhesives developed especially for the automobile's laminating processes. A PVC skin is thermoformed on top of the insert, which an operator places during the process on a carrier in the thermoforming machine. This carrier is clamped on the lower platen of the thermoforming machine, in the same place of a conventional thermoforming mould.
Special care has to be observed in the heating process both for the skin and for the substrate. The skin, according to the high quality standards defined in the automotive industry, has to be perfect in the appearance, free from any marks or contaminations and formed without deformations or thinning. The forming accuracy and material distribution has been particularly demanding in this particular case, due to the geometry engraved on the surface of the skin: small circles that were highlighting any excessive elongation.

In the same way, the insert need a precise control in the heating cycle: it is covered by glue, plasma treated and active only in a narrow process window of a temperature range. The adhesive is a bi-component PU water based, produced by Sika (Sikatherm 4206 + Sikacure 4202), widely used for car interior trims, especially designed for the lamination of dash boards, door panels and so on, made from an ABS/PC substrate and a PVC foil.

More on the process: **Vacuum Covering Lamination**. A wide variety of substrate materials are used including PVC and TPO-foils, textiles, wood and plastics. This process allows production of parts with the ideal combination: perfect surface with a structure giving mechanical properties and connections for the assembly.

More on the **thermoforming machine** characteristic:
- Production rate 110 sec on the PVC skin
- Automatic cycle and computer control of the process parameters and fast tool change facilities
- Working from reels, automatic material transfer
- Single station concept with servo electric plug assist for best movement control
- Grippers to pull material. Automatic cutting to length, special care to minimize material usage
- Manual loading of the substrate
- Substrate pre-heating and dedicated heating panel
- High degree of control of the heating system, by
  - high quality IR heating elements,
  - automatic control of heating power and compensation of the voltage fluctuations,
  - embedded thermocouples to monitor actual temperature of heating elements
  - feed back control on heating system
  - multiple pyrometer reading on substrate temperature and skin surface
- special design of the structure of the machine to increase ergonomics during loading and unloading

Martur Group has selected Cannon Forma thermoforming machines because of the state-of-the-art configuration for the specific application, the sophistication of the heating control and the reputation of the Cannon Group.

IAC Songjiang repeats orders to Cannon for a profitable manufacturing system

As early as 1998 IAC Songjiang – a Shanghai-based manufacturer of automotive carpets and insonorisation elements, (shortly: IACSJ) – purchased from Cannon the first carpet back foaming plant equipped with the Cannon-patented Foam & Film technology.
The satisfaction of the performance on the first plant pushed IACSJ to order a second foaming plant in 2009 and now a third one, installed in spring 2010.

Automotive market in China is enjoying a booming time. The foamed carpets produced by IACSJ – formerly part of the Lear Co. Group – were supplied to Shanghai General Motor for their car model Buick series as a start and later to Mercedes when they were present in Beijing. The existing plant, running at its maximum capacity with three shifts a day, could no longer meet the demand for the products. In the peak period the market growth rate reach 45%.
Therefore reliable and higher productivity plan was urgently needed to support the demand from the automobiles makers. Plan for a new plant with high productivity was made during 2008 and discussions with Cannon Team started with Cannon Far East and Cannon Tecnos in sequence. The team work of Cannon Tecnos and Cannon Far East saw the results of the first new plant being installed which achieved immediately a 3-shifts operation in mid 2009. The satisfaction of the performance on the first new plant soon saw the second plant, with more versatility in handling PU chemicals, ordered and installed in the first quarter of 2010. The supply included a retrofitting work to the existing old plant, which still works with Foam & Film technology, to bring it to a latest control technology and driving system.

The two new foaming plants consist of component tanks for fast reactivity PU system, all relevant high and low pressure pumps, gauges and control with closed-loop controlled system, one FPL24 mixing head and accessories monitoring features to complete a foaming system built around a "A-Compact 60" dosing unit. The metering unit stands on a mezzanine floor, near the hydraulic systems of the two mould clamps. The foaming arm is a ABB Robot designed to cover the furthest possible the corners of the mould for best foaming performances.
The two hydraulically-operated mould clamps, one on each side of the robot, are designed with a fixed upper platen and a 90° tiltable lower platen plus a shiftable loading tray. Both clamps work in tandem to maximize the productivity. The platens are designed to hold moulds for products of size up to 2,300x 1,500 x450mm.

Cannon Tecnos modular carpet back foaming plant featuring metering system, pouring robot, mould clamps working in tandem and complete set of safety system.

The basic design of clamps, foaming method with robot, layout etc. was the same for the two new plants, with more complexity required for the wet machine of the second plant: here the foaming system was required to have totally 4 component tanks (2 for Polyol and 2 for Isocyanate) with only 2 metering pump groups able to handle alternatively the 4 components, for 2 different foam density systems.
Hence, a carefully designed component circuit and switches minimise the material discharge, avoids possible contamination and guarantees foolproof interconnection during the switching of production. All this with a lower investment and reduced periodical maintenance for the pumping groups.

Since the installation the new system was running well and IACSJ was fully satisfied with the system performance. Up to date, the two new systems have been running on a 24-hours per day, 350-days a year cadence, with only 4 operators.

Since 1998 a successful and happy partnership among three parties, each specialized in his function, with IAC Songjiang as the end user, Cannon Tecnos providing the technology, backed up by Cannon Far East's strong local after sales technical service and spare parts support, designed a triangled co-operation relationship which stands firm and provides mutual benefit to all the involved players.

Small, Smaller, Extremely Small!

Miniaturization is one of the major goals in many areas, from medical devices to industrial components, to the consumer products. We are surrounded by objects ever smaller, the trend is towards compacting an ever increasing number and more complex functions in a minimum space. Consequently, there is an increasing demand for small and minute micro scale components often weighing only few milligrams: Automata provides the right solutions for your miniaturisation needs!

Micro technology and micro systems are growth markets. Identify potential and exploit market opportunities: with this mission in mind Automata developed what is a specialist injection control unit in its own, right to meet the requirements of **micro moulding**.
In the case of micro-injection moulding, Automata relies on a combination of quality efficiency, flexibility and cost-effective production. Its competence in this field is the outcome of more than 10 years experience in injection moulding controls. AUTOMATA proposes industrial automation control systems with modular design and construction, as well as the use of open architectures, and provides expandability and interconnection with other devices and business systems. In particular, they are marked both by efficient processing and I/O scanning, and by the variety of ways in which they can integrate with enterprise business systems with distinct characteristics of flexibility and efficiency to handle a huge variety of applications.
Automata's basic concepts are based on flexibility and modularity: in order to face these challenges **the new generation of programmable automation controller will incorporate innovative solutions in terms of control technology and field bus**. Important features are particularly related to **low power consumption** and **real-time systems, open and standard communication**. All these with the aim to reach the maximum integration within the factory at a lower implementation cost.
Today many moulders operate on three shifts, some of them on 365 days per year; they demand the maximum reliability of the machines, spare parts and service support. Automata provides full service worldwide, backed by highly skilled service team, advance spare parts logistics and multiple service levels to address a customer's specific needs. Furthermore, straightforward part repairs through comprehensive maintenance and extended warranties for high capacity utilization level, as well as training of personnel.Users of older machines often require to have them upgraded by Automata's retrofit service at fair prices: for instance they ask for state-of-the-art control software or for specialized injection moulding processes.
In short, you can rely on Automata for any support you need to complete your jobs efficiently and within your schedule!