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 Aftos more than 40 Companies from 10 countries were welcomed with individual lab trial sessions. The laboratory set up in our RD&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 three-dimensional Carbon-reinforced part, demoulded in less than three hours, 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.

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-nodulus elements will be mounted on the new “all-Carbon” Aventador supercar, recently launched on the market at Geneva Car Show 2011.

Cannon preformer for Lamborghini

The Energy Division developed more efficient burners to provide lighter 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.

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“Wind energy is a key solution in the fight against climate change, and the technology is on track to saving 30 Mt tons of CO₂ 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 turmoils – 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 sorts 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 traumas. Though the year 2008 ended with a record total of US$155 billion investment in clean energy, only a 6.5% growth in investment in clean energy, with more renewable power capacity increased, with a significant shift from one type of energy industry has had to put up with a lot of traumas. Though the year 2008 ended with a record total of US$155 billion investment in clean energy, with more renewable power capacity increased, with a significant shift from one type of energy industry has had to put up with a lot of traumas. Though the year 2008 ended with a record total of US$155 billion investment in clean energy, with more renewable power capacity increased, with a significant shift from one type of energy industry has had to put up with a lot of traumas. Though the year 2008 ended with a record total of US$155 billion investment in clean energy, with more renewable power capacity increased, with a significant shift from

Siemens Wind Power, a major manufacturer of wind energy plants very satisfied with the technical solution – supplied by Cannon Adros 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 Longdong near Shanghái, China, during the first half of 2010. Availability of a local Cannon unit played an important role 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 Shanghái 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.

This guarantees a continuous control over the injection of these liquid resins in the volumetric moulds that contain various layers of glass mat: the operation can last for 3 - 5½ hours, and the flow of material runs according to the desired filling achieved. A medium output beginning phase is followed by a progressively reduction of flow due to the resistance and friction caused in the mould – as well as the weight 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 slow 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)
• DCIP metering machines, for moulding small special 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 combining 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 invention, 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 new-coming – Companies who decide to install their production sites in countries where the right equipment for this technology is not available, or is properly supported.

Head into the wind, with Cannon you can make it!
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 in 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 de-localisation 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 weight 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 Citroën 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-closed 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 “Fast 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 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 weight 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 filters 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 new in production at Alenia Aermacchi in Venevogna, 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 millimeters, 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 different projects!

Easy mould-change systems, simplified service operations, off-line mould handling for difficult models characterise the latest Cannon Tecnos automotive seats handling lines.
High-pressure injection, in combination with very rapid demoulding times, can be produced at very reduced cycle times. An interview with Antonio Cossoio, Cannon Group's Product Development Director, details various aspects of this innovative application.

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

Antonio Cossoio: 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 and injecting a correctly formulated family of liquid Epoxy resin in a closed mould; this decreases demoulding times from up to 30 minutes to 2 – 3 minutes, maintaining optimum mechanical properties.

- Self-cleaning mixing heads eliminate the use of flushing or cleaning solvents, achieving significant economic savings and environmental benefits. They can be permanently fixed on the tools, speeding up the production and eliminating leakage problems from the injection points.

- High-pressure, closed-loop controlled metering systems, guarantee 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 leakages in the mould environment, no emissions from the mould, much lower scrap rate, etc.).

- Dedicated preformers provide repetitive and fast production of the preforms that can be permanently fixed on the tools, speeding up the production and eliminating the manipulation of the fiber’s substrates.

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

Cannon LVHT 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 the conventional processes.

- Presses and moulds generate ten times more parts per unit of production time. Production costs and scrap parts are significantly reduced.

- Production lines can be automated, making use of 40+ years of industrialisation experience maturity by other processes proportional to the total cycle time. High-pressure injection, in combination with a precise dispensing situation for those applications where any inclusion of a mixing head that fits a hole drilled in the mould. All the blended material whose diameter can be as small as 4-5 mm. The mixing chamber – whose diameter can be as small as 4-5 mm – is 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 the non-linear path provides the

- The mixing is obtained by pulverising – with appropriate injectors – the resin in the mixing chamber is operated hydraulically, the mixing chamber is operated hydraulically, the mixing chamber is operated hydraulically, the mixing chamber is operated hydraulically, the mixing chamber is operated hydraulically, the mixing chamber is operated hydraulically, the mixing chamber is operated hydraulically, the mixing chamber is operated hydraulically, the mixing chamber is operated hydraulically.

- 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 R & R mixes and other materials – the right combination, providing high reactivity but also the right viscosity over a wide range of temperatures 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 Avery R&D lab near Milan, Italy, using high-pressure metering and mixing equipment specifically modified to cope with Huntsman’s Epoxy’s behaviour and viscosities. Hardener and resin required very different processing temperatures, and chemical compatibility suggested the use of plunger-dosing pump for the hardener rather than the use of the conventional high-pressure pump for the resin.

Moulding cycles were run using progressively higher quantities of formulation, until a proper filling rate was identified and repeated for similar results using various types of moulds. Successful production of test plates was achieved with demoulding times of 15-20 seconds, compared to the 20-30 minutes of a conventional technology. The resulting neat plates are made to charactenisation in Huntsman Advanced Materials’ facilities in Basel, Switzerland, and provided the following results:

<table>
<thead>
<tr>
<th>Property</th>
<th>Traditional</th>
<th>Epoxy-based Composites</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow index</td>
<td>102</td>
<td>99</td>
</tr>
<tr>
<td>Viscosity build-up</td>
<td>771 51616 710</td>
<td>413</td>
</tr>
<tr>
<td>Viscosity at injection temp.</td>
<td>1162</td>
<td>878</td>
</tr>
<tr>
<td>Dynamic Modulus</td>
<td>663</td>
<td>541</td>
</tr>
<tr>
<td>Dynamic Damping</td>
<td>102</td>
<td>99</td>
</tr>
<tr>
<td>DMA</td>
<td>771 51616 710</td>
<td>413</td>
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These data confirm the success of the project. Mechanical characteristics of the composite material produced are excellent. Fully validated, Epoxy-based composites can be obtained by ESTRIM technology – used in combination with properly designed moulding machines, mould carriers, preformers and auxiliary equipment – with 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 production time, potentially with the same manpower.

- Production lines can be automated, making use of 40+ years of industrialisation experience matured by other processes proportional to the total cycle time.

- Production costs and scrap parts are significantly reduced.

- Production lines can be automated, providing high pressure Epoxy-based composites.

- Dedicated preformers for repetitive and fast production of the preforms that can be permanently fixed on the tools, speeding up the production and eliminating the manipulation of the fiber’s substrates.

- High-pressure close-loop controlled metering and injecting machine, and self-cleaning mixing heads.

- Dedicated preformers for repetitive and fast production of the preforms that can be permanently fixed on the tools, speeding up the production and eliminating the manipulation of the fiber’s substrates.

- Dedicated moulding clamps and moulds, in various lay-out configurations.

- Waterjet trimming equipment for the finished preforms.

- Storage system for the injection circuit for chemical components.

- All the auxiliary equipment required by the process.

Any local Cannon Office will gladly discuss with the interested Companies their specific manufacturing requirements, in order to offer them the most appropriate "ESTRIM solution".

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 2006” event, held on July 1st at their headquarters in Munich, BMW released the details of its all-electric car, the Megacity Vehicle (MCV) — the BMW Group’s 1st electrified production model. With the MCV, the BMW Group will offer an innovative solution for sustainable urban mobility which will be brought onto the market under a BMW sub-brand. A Cannon Preformer — specified and purchased in 2001 by BMW for their Landshut’s Innovation Technology Centre (LITZ) — is used for the production of all the Composite roofs of this innovative vehicle.

Purpose design — the LifeDrive concept. Lightweight design, however, is just one facet, it is a very important one, of the development work which goes into modern body construction. The full electrification of a vehicle gives 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. Similar to vehicles built around a frame, the LifeDrive concept consists of two horizontally-separated, independent modules. The Drive module — the aluminum 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 CFRP. With this innovative concept the BMW Group adds a totally new dimension to the areas of lightweight design, vehicle architecture and crash safety.

The eight strength in the right places. The secret of this high-strength material lies in the carbon fibers. In contrast to quasi-isotropic metals like aluminum or steel, which have equal strength in all directions, CFRP is anisotropic. This gives it very high strength, like a twill, 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 have to withstand. As in nature, where bones or plants use thicker structures only where really necessary, so the BMW Group engineers likewise tailor the thickness and fiber alignment of CFRP components to suit actual requirements, varying the quantity of fibers used and aligning them in the direction or directions along which loads will be exerted in the future product. There precisely gauged component parameters also help to minimise weight. Using CFRP is more than simply using aluminum in place of steel. With its special properties, this high-tech material also opens up the doors to completely new approaches and design concepts. Elastemic 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.

A completely new design
As the work on the MINI E and BMW ActiveE concept vehicle conforms, any approach that simply converts an existing internal combustion-engine 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” 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 CO₂-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 identification 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.

Final processing — a water jet cutter applies the finishing touches.
After resin injection and hardening, the production process is almost complete. Altogether it remains 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. Waterjet 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 workforces, its production equipment and its processes. It was only possible to achieve such a high level of expertise thanks to the unswerving focus on one overall 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 at BMW’s “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.
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 (PolyDicyclopentadiene) 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 thermostat material used to manufacture large and paintable parts requiring high impact strength, 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 (PUR) 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 component 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 without being constricted by tools.

Hutchinson uses a horizontal clamping press with a platens 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.

Telene, based near Paris, France, is a 100% owned by Rimtec Corporation, the Japanese manufacturer of PDCPD. From their Drocourt’s headquarters they are in charge of R&D and sales for the EMEA (Europe, Middle East & Africa) market. Their culture of “customer centrity” 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 when delivering a competitive performance advantage to their customers is the number one goal.

The PDCPD (PolyDicyclopentadiene) 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 polyurethane.

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 – 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, railway, buses and 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 nurtured in house in this specific process have allowed the Company to invest in large injection 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 (automotives, 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 ton bumper and a very complex 11.3 kg front grill for the Iveco Stralis truck, and an Aeroparts kit for Fiat weighing 13 kg.

Illustrating the PDPCD’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 temperatures – like -40ºC – , 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 vehicles. It is possible to produce very large parts with a relatively limited investment, and the material shows 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 it is in part 72.”

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 Sojita do Brasil (www.sojitabr.com). The worldwide-acquired expertise in the production of very large “body parts” allowed METTON’s specialists to take 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 area of technical solutions and information, provided by the São Paulo-based Cannon do Brasil branch. A “full optional” high pressure dosing machine “A-Compact 200 FC” – a fully automatic system for setting, dosing and controlling the mobility of the PDPCD process to work safely – was supplied. The dosing group consists in high pressure Cannon pumps, fixed output type, completed with inverters and magentic couplings. The closed-loop control of the pouring process allows the most advanced respect of required rate and output of the two components formation. In particular, due to the specific features of PDPCD’s material, injection is an essential key. Besides, a dedicated data collection software has been developed for the production certification.

In order to allow 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 tasked to assure an output from a minimum of 600 up to over 3,000 grammes per second. A wider production range can be obtained in the future by a simple and easy addition of extra mixing heads.

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 guarantee optimum surface aspect in the remotest corners. Therefore a proper mixing head is dedicated, 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 machine. Therefore a logic connection is required between a mould-identification device and the dosing machine’s and pouring machine’s feeding systems.

Nortec, in cooperation with Cannon Afros, the Group’s unit responsible for metering and mixing technologies, proposed a complete plant based on a 2x514 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 H0 dosing machine for glass-filled formulations; this metering unit is linked, through an aerial rigid piping, with two FPL mixing heads, specially armed to be admixture 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 mould 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 polymerized, the moulds are opened automatically and the finished profile is extruded. 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 1,300 m² plant can foam up to 60 profiles per hour, using two operators only.

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 !”

Idéalcombi, a family business founded in 1973, dispenses 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. The structural and thermal insulation properties ensure to the manufacture 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 requirement maintenance. 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.

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 Humlebæk, near Copenhagen, Nortec provides prompt, local technical service and a wide stock of spare parts, in addition to a very qualified technical consultancy in the defining stage of a complex project.

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Martur Group has selected Cannon Forma thermoforming substrate and a PVC foil. Sika (Sikatherm 4206 + Sikacure 4202), widely used for car adhesive is a bi-component PU water based, produced by only in a narrow process window of a temperature range. The heating cycle: it is covered by glue, plasma treated and active that were highlighting any excessive elongation. geometry engraved on the surface of the skin: small circles contaminations and formed without deformations or thinning. The formation accuracy and material distribution has been particularly demanding; in this particular case, due to the geometry engraved on the surface: 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 in a narrow process window of a temperature range. The adhesive is a bi-component PU water based, produced by Sika (Silatherm 4206 + Silacure 4202), widely used for car interior nms, especially designed for the limitation of dished boards, door panels and so on, made from ABS/PVC 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 minimal 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 thermal variation
  - embedded thermocouples to monitor actual temperature of heating element
  - feed back control on heating system
  - multiple pyrometer reading on substrate temperature
  - special designs of the structure of the machine to increase elongation 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.

As early as 1998 IAC Songjiang – a Shanghai-based manufacturer of automotive carpets and insomorisation 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 automotive 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 within 8 month after the signing an order 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 will works with Foam & Film technologies, so being 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 systems. IACSJ – former called “substrate” – had been equipped with a 2 component tanks (2 for Polyol and 2 for Isocyanate) with only 2 meters a day, 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, avoid possible contamination and guarantees foolproof interception 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 tailored co-operation relationship which stands firm and provides mutual benefit to all the involved players.

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 is a three-component format, contains a 4 component tanks (2 for Polyol and 2 for Isocyanate) with only 2 meters a day, able to handle alternatively the 4 components, for 2 different foam density systems.

More on the machine characteristic:
- Advanced programming on the type of PU system
- Double heating circuit and more pre-treatment of the PU skin
- Multiple pyrometer reading on substrate temperature

The two new foaming plants were equipped with a 90° tiltable lower platen plus a shiftable loading tray. Both moulds are designed to hold moulds for products of size up to 2,300x1,500x50mm.

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IACS Songjiang repeats orders to Cannon for a profitable manufacturing system