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Create attractive, innovative, practical, and economically viable products through Rotational Moulding

"ARMO and its Affiliates mission is to educate and inform the international design community of the possibilities that are becoming available using the rotational moulding process."

Welcome to the second annual edition of the ARMO (Affiliation of Rotational Moulding Organisations) Rotational Moulding Product Showcase. This publication has been created to show the world what a fantastic process Rotational Moulding is and how it can be used to create innovative, attractive, practical, and economically viable products.

With the invaluable support of our sponsors, this publication will be used throughout the world, both within and outside the industry, to raise the profile of rotational moulding. Inside is an overview of what is possible including what is the current state and advances in processing technology, materials, and technology updates. We take a look at how technology is opening up possibilities for designers and OEM's and offer examples of innovative products from around the world in our 'Product Showcase'.

The Rotational Moulding industry is beginning to engage the greater design community regarding the freedom the process allows in shape and form and for both aesthetic and industrial products. The ability of the process to manufacture one-part designs (that using other processes would require multiple parts and assembly), saves on time and costs, and allows designers to think in a very different way. This makes Rotational Moulding an attractive option for a wide range of product applications, as you will see inside.

ARMO and its Affiliates’ mission is to educate and inform the international design community of the possibilities that are becoming available using the Rotational Moulding process. We are also reaching out to the OEM's and demonstrating that with more efficient automated machines we can offer the consistency, quality, and cost effectiveness over and above that of other plastic processes.

New machinery advances include semi- and fully-automated machines that are improving the efficiency and productivity of the industry. Around the world, fully 'lights out' production cells are now fully operational in producing mouldings with no labour input. The increased use of automation is changing the image of the industry. The advances in machinery control and electrically-heated tools has opened a whole range of materials that have now become practical to rotationally mould. These include ABS, PVA, Polycarbonate, and Peek along with many others under development. These materials can offer infinite application and design possibilities for the future of the process. The advances in process control offer consistency in production, productivity, and finish that can lead to quality levels way beyond those associated with the Rotational Moulding process in the past.

The Rotational Moulding industry is expanding at an unprecedented rate with the total number of moulders probably having more than doubled over the last 10 years. ARMO currently has 12 affiliates around the world working together to advance and promote the rotational moulding process worldwide. This is giving us an ever-growing pool of entrepreneurial innovators who are expanding the possibilities of the process. ARM0, through its Affiliates, will continue to educate and inform industry, designers, and OEMs worldwide to ensure quality and integrity underscore the reputation of the process.

Sincerely,

Martin Spencer
ARMO Chair
AFR, an association founded in accordance with Law 1901, brings together rotomoulders, suppliers of materials, accessories and raw materials, engineering and design firms and centres of training and expertise. Its principal goal is to increase awareness of the rotomoulding process and to identify and promote new market sectors in the French-speaking world. AFR’s goal is to expand, to share its expertise, to interact with its members and to cater to their needs.

Anipac’s mission is to promote the integral development of the productive chain within the Mexican plastic sector, and also to produce tangible benefits to its associated companies through the necessary elements that assure its global competitiveness.

ARM promotes, educates, and inspires the rotomolding industry. ARM helps rotomolders make better parts and reduce scrap through on-line and in-person education. Our website offers members a wealth of on-demand training geared specifically to rotational molders. We are often told that ARM is unique in our members’ eagerness to share with one another.

Our mission is to do everything possible to help the rotational moulding industry and our members thrive. We will achieve this by working to contribute to the overall stability and integrity of the Rotational Moulding industry. By encouraging and promoting research and development within the Rotational Moulding industry. We will encourage and promote fair trading practices by our members. And liaise and cooperate with other organisations of a similar nature on a world-wide basis in the best interest of this associations members. We will promote the process of Rotational Moulding wherever an appropriate opportunity exists.
Matrix Polymers is an expert in rotational moulding materials and is committed to achieving global growth through innovation, teamwork and developing partnerships.

**Our Vision** - To ethically develop the rotational moulding industry through providing growth opportunities for our people and customers.

Tel: +44 (0) 1604 789100  
Sales: sales@matrixpolymers.com  
Technical: technical@matrixpolymers.com  
matrixpolymers.com
MEET THE ARMO BOARD OF DIRECTORS

The Nordic Association of Rotational Moulders (Nordic ARM) was founded in 2007 by a small group of enthusiastic Rotational Moulders. Nordic ARM was established to provide a forum where manufacturers, suppliers, consultants and others from the rotational moulding industry in Iceland, Denmark, Norway, Sweden and Finland could come together to exchange information, promote the market in rotomoulding and encourage the use of rotomoulded products in new applications.

Jon Backman
jon.backman@saeplast.com
Nordic Association of Rotational Moulders (Nordic ARM)
nordicarm.org

The mission of the 'ROTOPOL' Association is developing the rotational molding technology in Poland and in neighboring countries by supporting research at the universities and rotomoulding companies, promoting this method of polymer processing in the plastics industry and taking care of economic interests of association members. The Association also promotes the scientific and technical solutions resulting from the research inspired by members of the Association.

Dr. Marek Szostak
Marek.Szostak@put.poznan.pl
"ROTOPOL" Association
rotopol.put.poznan.pl

RPC-CPPIA’s mission is to stay with the industry policies, trend, and latest technologies at home and aboard, establish the most professional and high efficient sharing and communication forum for local members and worldwide counterparts, together, reasonably and smartly expand the industry and promote the healthy and sustainable development.

Peter Yan
peteryyx@163.com
RPC-CPPIA
chinarotomoulding.com

The mission of StAR is to engender the development and growth of a world class rotational moulding industry in India and the region by focusing on its members requirements for global knowledge, business and technical knowhow, education, awareness and networking; all to enable high-tech / high-quality rotomoulding helping to expand and grow the market for rotomoulded products and solutions it offers in the region by encouraging contacts, networking and interaction between its members; promoting goodwill and camaraderie for mutual benefits.

Ravi Mehra
MARAMEHRA@aol.com
Society of Asian Rotomoulders (Society of Asian Rotomoulders (STAR)
starasia.org
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**Oliver Wandres**
ow@maus-gmbh.de
ARM-CE - Association of Rotational Moulders Central Europe
rotational-moulding.de

**Wayne Wiid**
wayne@pioneerplastics.co.za
ARMSA - Association of Rotational Moulders Southern Africa
armsa.co.za

**Martin Spencer**
martin@uniqueroto.com
BPF Rotational Moulders Group
bpf.co.uk

**Katia Zoppetti**
katia.zoppetti@dramsrl.com
IT-RO Italia Rotazionale
it-ro.it

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**Association of Rotational Moulding (Central Europe) e.V.**

ARM-CE represents the interests of ARM-CE members towards national authorities and organizations. Maintaining a live linking to other national rotomoulding associations as to represent ARM-CE members interests and to keep members informed about global activities in the rotomoulding world.

**ARMSA**

ARMSA's mission is to serve, promote and grow the Rotational Moulding industry with integrity and commitment.

**BPF Rotational Moulders Group**

The BPF Rotational Moulding Group was founded in 1978 and represents and promotes the interests of all those involved in the rotational moulding process – these include small and large sized moulders, material suppliers, machinery manufacturers, ancillary equipment suppliers and service providers.

**IT-RO Italia Rotazionale**

The mission for IT-RO is to further the Rotational Moulding Industry and assist all its members in growing their businesses through quality education and resources. IT-RO’s objectives are to enhance rotomoulding knowledge in all its facets: raw materials, tooling, machinery, auxiliary equipment and complementary accessories; and to promote our technology to develop the market for rotomoulded products.
2018-2019 ARMO Rotational Moulding Product Showcase

International Conference 2019

Sun City, South Africa
16 | 17 | 18 September 2019

www.armo.co.za

See you in South Africa
2018-2019 ARMO Rotational
Moulding Product Showcase.
The QCat Mirage 7000 is a composite catamaran with a moulded hull that has been designed to perform in all conditions. Of critical importance is that the boat be unsinkable.

To achieve this, the internal hull cavity has approximately 5 cubic metres of 70kg/m2 high density polyurethane foam, which chemically welds to the internal hull surface and a full length structural aluminium space frame. This makes the hull incredibly strong and absolutely unsinkable. The effect of this also gives both a high thermal and acoustic value, making for an extremely quite ride i.e. no drumming or hull slap.

Designer and boat builder Michael Bennet has decades of experience in the marine industry, starting with high end kayaks and moving through to his latest QCat designs. Whether it be for leisure, fishing, water taxi or work horse, this craft satisfies the need for a 4WD of the waterways and its design responds to a need for "workhorse" sturdy vessel that is stable, reliable and uses the best of the rotational moulding process including highly technical moulded in metal frames and advanced foaming techniques to achieve strength and buoyancy.

Constructed from a composite of resins, polymer alloy, foam and quadraxial glass cloth to create a state of the art material, the QCat is in a class of its own.

Rotomoulded using a high performance polymer alloy, Bio TP Seal, developed by Total Petrochemicals and Refining SA/NV, manufactured under licence by Vision Plastics and supplied by local powder supplier Price Plastics. Moulded on a proprietary machine using a mould manufactured in house, one of the key aspects of this unique foamed product is the necessary addition of a chemical layer that enables the foam to bond completely to the composite resin hull.

https://www.quantumcat.com/au/the-qcat/
Plastic fuel tanks have gained widespread use and market share against metal fuel tanks. The main advantages of using plastic over metal is the weight saving, formability, and corrosion resistance.

Many lower volume automotive companies use the benefit of plastic by producing their fuel tanks via the rotomoulding technique. They cooperate with rotomoulders globally to produce their plastic fuel tanks. Attaching the environmentally important Adblue Tanks to Diesel tanks using the vast formability of rotomoulding technology gives an advantage to the OEM’s.

CNH is a global leader for the automotive and agricultural industry and through their 12 brands make vehicles that keep agriculture and industry growing. They have certain fuel tanks that are very challenging by not only the complex shape, deep and hard to heat areas and the number of inserts, but also require very tight tolerances with the Adblue tank attached to the Dieseltank.

Due to Floteks A.Ş. expertise in rotomoulding complicated technical parts, CNH let’s this product to be rotomoulded by Floteks. CNH’s standard is producing very high-quality parts and especially with this twin tank, higher specifications are required. One of their requirements is having a material with outstanding mechanical properties in impact resistance in combination with higher heat stability.

Floteks A.Ş., established in 1982, was the first rotomoulder in Turkey and is today a well-known company in this technology around the world. They are operating in the automotive sector as a sub-industry manufacturer since 1983 and are an organization certified with ISO 9001, ISO-TS 16949, ISO 14001, OHSAS 18001, and ISO-TS 22241-1 standards.

CNH specify in their design to use a material from: Schulman, the leading supplier of High Performance, Rotomoulding Powders in Europe with its trademark, and powder ICOENER. The grade provided is a crosslinkable HDPE based grade called ICOENER 1505.

This grade has a very high impact resistance, outstanding ESCR and excellent thermal resistance. The ICOENER 1505 is a unique cross-linkable PE due to its low odor and is less hazardous which makes it more safe to work with for the production workers.

www.persico.com
www.floteks.com.tr
Good product design doesn’t always mean cutting-edge tech and state-of-the-art design. It could be as simple as getting things where they are needed.

We are there when needed. A person can never imagine how bad a situation can be or understand the feeling of helplessness unless they are on site at a natural disaster. Natural disasters seem to be getting worse in recent years due to global climate warming.

Xiner has never stopped exploring peoples’ real needs during these extreme situations, which has led to the development of the company’s first generation rotomoulded Assault Boat. This boat, successfully put into production in 2011, was designed for blood rescue, equipped with a 40 HP outboard, and maximum speeds reaching 32 miles per hour.

The Assault Boat has gained its good reputation since the beginning with its robust body, unsinkable characteristics, and safety features — which holds true even in the event the situation causes a hole in the body.

A closer study, while the LB60 has been doing its work, has been determined that the LB60 is too big and inconvenient in some situations. The boats need to be able to turn around very quickly and reach the spots needed easily. The boat needs to allow for the easy loading of more people. Thus, Xiner’s new generation LB42 with 170kg with outboard engine that is 4.2m in length, can carry up to 8 people, and it incorporates drag wheels and steps on the sides. These simple, but efficient elements offer real-help features. The new generation is becoming a new star for Xiner this year.

The LB420 was well designed:

- It won’t capsize even if 8 people stand on one side of the boat.
- It has drag wheels to help get it to where it is needed.
- Its 4-layer design makes it still work even if it is cut into two pieces from the middle.

The outside layer is 3mm in thickness made in MDPE material; the second layer is 15 mm in thickness and the material is 6 times that of PE foaming material; the third layer is 1.5 mm in thickness and the material is LLDPE; and the rest of the spaces are filled with PU foam. The LB42) is rotationally moulded on Xiner’s standard rock ‘n roll machine.

www.xineryt.com

Assault Boat
A robust body with unsinkable characteristics and extraordinary safety features.
Designed and rotomoulded by Shanghai Xiner Boats Co., Ltd

Good product doesn’t always mean cutting-edge tech and state-of-the-art design. It could be simple as getting things where they are needed!
Deep Sea Fish Farming Cage

A system fully equipped with a fish net, lifter, feeding device, and on-shore controlling.

Designed by Shanghai Jiao Tong University and rotomoulded by Shanghai Xiner Boats Co., Ltd. – China

Rotomoulding is a small industry and little known process, but it never stops finding ways to be bigger and stronger. The newly developed Deep Sea Fish Farming Cage is one of thousands of examples of rotomoulded products quietly entering the market.

The complete fish-farming system, including the triangular units of the huge cage, was designed by Shanghai Jiao Tong University and developed and rotomoulded by Shanghai Xiner Boats Co., Ltd. A patent-pending product, the whole system has recently been completed and will soon be put to sea for function and reliability testing. The system is fully equipped with a fish net, lifter, feeding device, and an on-shore controlling system.

Seafood demand has increased rapidly in recent years as research has revealed that eating more seafood is good for human health. Hence, the marine-ranch has been fully developed, whereas the traditional marine ranch has normally been located offshore due to lower operating costs. This system makes it easier to build and easier to manage concerning bad weather and potential damages. However, the consequences are getting worse with timing, the spreading of animal disease, and accumulating marine excretions, and marine pollution.

The Deep Sea Fish Farming Cage concept was gradually influenced by the main marine sea food countries around the world. This fish-farming cage, that Shanghai Jiao Tong University has developed, adopted the traditional triangle unit, and specifically selected the rotomoulding process for its production, due to its less density and better corrosion resistance properties of PE material compared to steel. The cage can be easily dropped down below the sea’s surface through a lifter device to avoid weather damage. It can also be easily moved around to where the farmer wants it through an on-shore controlling system to feed the fish with real fresh sea water and farm real fresh seafood for human consumption!

The product’s diameter reaches to 9 meters and it is made of up of 180 triangular units, which are connected with each other with plastic screws. The total weight of product is 2760 Kg.

The triangular unit is rotomoulded on a 3.5-meter oven carrousel machine, utilizing aluminum CNC machining moulds, and the material is MDPE which is also produced by Shanghai Xiner Boats Co., Ltd.

www.xineryt.com
The idea of Gunner Kennels® was conceived by Addison Edmonds (Founder) in a duck blind, and inspired by his best friend and hunting dog, Gunner. Edmonds always felt uneasy traveling with him in traditional plastic crates, and was tired of replacing flimsy ones year after year. In order to create the best possible dog crate, Edmonds knew he needed to be innovative and use a technology that could withstand the worst conditions and protect his best friend. To achieve this, Gunner Kennels® partnered with Centro, Inc., the largest custom rotational molding company in North America.

The G1™ is the first (and only) 5 Star Crash Test Rated pet travel case, according to the Center for Pet Safety. The G1™ design was thoughtfully developed by Centro’s in-house design services, Centro’s engineering team, and Gunner Kennels® to incorporate a double walled, rotomolded top and bottom half. The design included several critical dimensional and cosmetic requirements. All in all, the collaborative process yielded a high quality, extremely durable product that made Edmond’s dream a reality.

The Gunner Kennels® patented design comes with a lifetime warranty, and the intermediate unit has been tested to withstand 4,000 lbs of force, a 12 gauge shotgun blast from 7 feet, a 200ft drop, and a 630lb weight dropped from 8’4”. No other kennel on the market comes close to providing this kind of protection for dogs. The double layered construction provides added protection making the kennel the most durable and safe product on the market. When designing the G1™, not only was it essential for Centro to create the rotomolded design to accommodate man’s best friend, it was also necessary to include all of the safety features Edmonds knew dog owners needed. Safety features include a paddle-latch door, with a keyed lock, as well as the back-up safety latches at the top and bottom, to prevent even the greatest escape artist from opening the door.

Other features include 4 non-slip rubber feet to prevent the kennel from moving during transportation. The feet also raise the crate off the ground, limiting heat transfer either to or from the crate. A wide base provides added stability. The kennel has 4 tie-down pins, which allow the crate to be securely anchored down during transportation. Side vents through the double wall construction are engineered to limit penetration of seasonal elements while also providing ventilation. The kennel includes stainless steel hardware, eliminating the potential for corrosion or component failure over time. For ease of cleaning, the kennel has a recessed floor and an oversized drain plug. In order to maneuver the kennel, it has two very strong lifting handles similar to those used on a kayak.

The partnership between Gunner Kennels® and Centro, Inc. has yielded a very high quality product line. Centro has been proud to partner with Gunner Kennels® to create a safe, functional kennel to protect thousands of pets and to provide a unique peace of mind for the invested dog owner.

Gunner Kennels® – www.gunnerkennels.com
Centro, Inc. – www.centroinc.com

No other kennel on the market comes close to providing this kind of protection for dogs.
Intimidator GC1K Series
A world-class side-by-side multi-terrain utility vehicle.
Manufactured by Centro, Inc. for Intimidator – USA

The new GC1K Series Intimidator side-by-side, 4x4 sport and utility vehicle, is the result of a great collaborative effort between Intimidator, manufacturer of world-class multi-terrain vehicles, and Centro, Inc., the largest custom rotational molding company in North America.

The GC1K Series Intimidator won the 2017 Association Rotational Molders (ARM) Product of the Year award and the Innovative State of the Art award during the 2017 Rotoplas International Exhibition held in Chicago in September.

The new GC1K utility vehicle’s exterior is one of the latest innovations for Intimidator. This beast of a vehicle offers a heavy duty frame, 11 rotationally molded components, 67 pounds of torque, and speeds of up to 65 MPH.

Intimidator approached Centro (an existing supplier of UTV components) with an interest in developing a cargo bed and tailgate for their new utility vehicle. During the design discussions, the scope of the project expanded to include the body panels and several other associated parts for the GC1K.

Rotationally molded parts for the GC1K include the front grill, front fenders, doors, quarter panels, dash, floor board, cargo bed, and tailgate. These parts define the look of the vehicle, meet demanding cosmetic standards, and provide key functional features. Intimidator believes their collaboration with Centro and the resulting transformation of the utility vehicle provides a competitive advantage in the marketplace.

In addition to the body being made of automotive quality components, the platform is a powder-coated, fusion bonded, solid steel bridge frame. The vehicle comes with 6-ply 14" and 8-ply 15" tires. The front and rear suspension is dual A-Arm independent. The steering comes in either rack-and-pinion or rack-and-pinion electronic assisted power steering. The vehicle has 4-wheel hydraulic disc brakes and a 2-wheel gear lock parking system.

The design of the Intimidator GC1K Series was a collaboration between Centro’s in-house design services, Centro’s engineering team, and Intimidator. Intimidator wanted a design that evoked the sport and recreational vehicle market while meeting and exceeding many expectations for the utility vehicle. This meant blending the aggressive styling of a sport vehicle with the functionality and utility of a work vehicle.

Centro held very tight finished part tolerances on each individual component of the vehicle. All vehicle parts are molded on a Ferry RotoSpeed RS 200 and RS 280 machines, each equipped with Ferry’s RotoCure software. The molds were manufactured by Avantech, including 10 CNC aluminum molds and 1 cast aluminum mold. ExxonMobil Chemical LL 8460.29 was the material used to manufacture the eleven rotationally molded components on the Intimidator GC1K utility vehicle.

Intimidator – www.intimidatorutv.com
Centro, Inc. – www.centroinc.com

This beast of a vehicle offers a heavy duty frame, 11 rotationally molded components, 67 pounds of torque, and speeds of up to 65 MPH.
Surface-Supplied Dive Equipment

A part that results in superior aesthetic appearance and impact resistance.
Manufactured in collaboration with Persico Industrial – Italy

For an innovative, surface-supplied dive equipment that provides freedom of tank-refills in shallow-water diving scenarios, this manufactured float integrates a pressure reservoir of breathing air. The function of the toroidal reservoir is threefold:

1. It provides flotation to the device on the surface.
2. It has balance compressor output with unequal breathing pattern of the diver.
3. It stores emergency breathing air.

Because of the use in marine environment and for diving purposes, the part has to meet very strict criteria and exhibits these features:

- It is made to very tight tolerances.
- It withstands 160 psi burst pressure.
- It is light-weight.
- It is made of high-tensile, impact-resistant, FDA-approved material.
- It is perfectly clean, mildew-resistant, and odourless.
- resistant to salt-water and UV light.

In addition to the challenging requirements, the design incorporates some intricate design features. The float was manufactured on a Persico Industrial Smart machine and molded with PC.

Thanks to Smart’s unprecedented features and Persico’s know-how, the designers and manufacturers found the perfect solution for PC under moulding conditions previously unattainable with traditional rotomoulding processes.

A wide range of materials can be processed, including materials sensitive to oxidation and high-temperature resistant engineering plastics.

The equipment controls the pressure and creates a vacuum inside the mould in order to achieve a virtual total absence of internal and surface bubbles on the moulded part. This results in superior aesthetic appearance and impact resistance.

www.persico.com
Delete Yourself Chair

A chair designed for communication, attraction, and performance.
Designed by French Designer Didier Faustino and manufactured by ROTOMADE – Luxembourg

It is suitable for art galleries, hotels, waiting rooms, airports, and many other creative spaces.

The Delete Yourself Chair is a simple structure, and possibly not where you would want to sit. But once you sit on it, you try to find a position, this becomes the moment of consciousness and social acting. This is not a chair just to sit in just to sit. Once you sit, you are acting: you are showing yourself through actions, and it’s part of the communication, the attraction, and its performance.

This innovative furniture has been designed specifically for a new restaurant. However, it is suitable for art galleries, hotels, waiting rooms, airports, and many other creative spaces. The chair is light and easy to move, creating a continuous interior landscape.

Delete Yourself Chair been designed by the French artist and architect Didier Faustino.

He was given free hand in the design of this project and decided to create this spaceship universe.

The chair is rotomolded 100% polyethylene, it has been created with one mold for two different shapes: one squared and one curved.

It took three months of study to produce the Delete Yourself Chair. It was challenging in terms of engineering: piece without seal lines, without deformations or defects, and without draft.

www.rotomade.com
Ponente

A sun lounger inspired by the architecture of bridges, allowing the product to cover large lengths.

Designed by Martinelli Venezia Studio and rotomoulded by SLIDE – Italy

Ponente provides the perfect equilibrium between soft shapes, typical of the creations obtained through rotational moulding, and thin thicknesses, which allow for the reduction of the physical and perceptive weight of a large object. Its design is inspired by the architecture of bridges, which allows the product to cover large lengths, in spite of reduced sections. Ponente is comfortable and welcoming, thanks to the adjustable backrest that accommodates different inclinations. Ponente can be used in gardens, pools, resorts, spas, and beauty centers. Its essential shape and playful colors are a must-have for around swimming pools.

Ponente is 200 x 68 x h. 34 cm. The material utilized is polyethylene and the product is rotational moulded. It is available for indoor and outdoor use.

Ponente was designed by Martinelli Venezia Studio, based in Milan and Palermo, founded in 2015 by the architects Carolina Martinelli and Vittorio Venezia. The studio specializes in furniture design, exhibition design, architecture, and interior design, exploring issues concerning the relationship between traditional and local culture, material properties, and the technical possibilities of manufacturing with the rotational moulding process.

Martinelli Venezia Studio’s work has been exhibited in galleries and museums such an Musée du Louvre in Paris, MAXXI Rome, and Triennale Design Museum in Milan.
In the Pop Scenario Series, SLIDE proposes two products designed by Japanese designer Kazuko Okamoto. WOW and DOUBLE U are funny benches and stools, that seem to come out of a Manga comic book. They are able to make every kind of setting happy.

The WOW bench and DOUBLE U stool, designed for indoor and outdoor use, are made of polyethylene and rotationally moulded. These products are a calligraphic pop bench and stool that create amazement and happiness. Their strength is in their expression. Both WOW and DOUBLE U are colorful design objects suitable for contract projects, private houses, and events. WOW can become also MOM if you turn the bench upside down. DOUBLE U’s unique shape comes from paper cutting, and can be put in various arrangements to provide a more wealthy expression.

WOW is 147 x 43 x h.43 cm and the DOUBLE U is 58 x 43 x H.43 cm Both are produced with polyethylene and rotational moulded.

www.slidedesign.it
The iconic Low Lita low chair was created by Italian designer Paola Navone. The Low Lita chair is one of the most popular products in the whole SLIDE’s production portfolio. Low Lita is made in polyethylene with the technology rotational moulding. Everyone falls in love with Low Lita for its linear and funny design. Its shape and its simplicity make the Low Lita is suitable for every kind of indoor and outdoor setting, such as gardens, terraces, or for contract with contemporary furnishings. Its comfortable seat and essential shape evoke relaxation and leisure.

The Low Lita low chair turned 10 in 2018, and presented its new nuances in black and white, which was born from the perfect match between Paolo Navone’s incredible creativity and deep knowledge the processing of plastic materials through SLIDE. The Low Lita Anniversary edition is unique as its black and white nuances are the result of the craftsmanship of rotational moulding. These nuances are not replicable, therefore each chair is personalized.

Low Lita low chair was originally produced in 2008 in matt and lacquered versions, all produced with polyethylene. Its dimensions are 79 x 80 x h.70 cm and its weight is 13 Kg.

www.slidedesign.it
Reusable Packing System for Carding Wires

A creative design that has created a WOW effect.
Designed by Satish Gokhale, Design Directions Pvt Ltd and rotomoulded by Consta Cool – India

A reusable packaging system for carding wires is a reusable design to save on packaging and rejection costs. The packaging is made in LLDPE and it is rotationally moulded. The design is intuitive and suggests that the unit has to be shipped in a vertical condition only. It has curves on the sides, which creates physical instability if transported in a wrong or horizontal position. A lot of considerations have to be taken into account for the person handling it including the right ergonomic area to grip to avoid hands getting caught under the heavy load accidentally. The new design is very effective and has created a WOW effect, commanded respect amongst the transporters, and helped to create a strong brand.

The Reusable Packaging System for Carding Wires was designed by Satish Gokhale of Design Directions Pvt. Ltd. for Lakshmi Card Clothing Company Ltd, which is based in India. Design Directions Pvt. Ltd. is an award winning design and innovation company from India. Lakshmi Card Clothing is part of the Lakshmi Group of companies that cater to complete solutions for the textile industry.

The rotational moulding moulds were made in Cast Aluminium and moulded by Consta Cool – India on a Reinhardt machine.

www.designdirections.net

A complete transport solution for the textile industry.
Cucun & Longchamp Boutique

Bright, colorful, and useful novelties for retail centers.
Designed by Lorenzo Bozzoli and rotomoulded by SLIDE – Italy

Slide furnishes the showcases and indoor spaces of retail shop and centers throughout the world including the sensational Longchamp Boutique in Via della Spiga 6, Milan.

During Milano Design Week 2018, Slide novelties met Fashion in the heart of Quadrilatero della Moda in Milan. Among the products of Slide’s new collection, the Cucun floor lamp, designed by Lorenza Bozzoli, enriched the showcases and the indoor retail spaces of Longchamp boutique. The iconic Slide products were used such as Cucun, Amore bench, Frame of Love frame, and Gelée pouf.

Cucun, designed by Lorenza Bozzoli, is a large floor lamp for indoor and outdoor, and was inspired by the simple and natural shapes of flowers, vegetables, and bulbs. The product is ø 77 x h.190 cm, made from polyethylene, and rotationally moulded.

Lorenzo Bozzoli was born in Milan. She attended the Academy of Brera, and moved to New York starting her experience inside the fashion field with the first self-produced lines. Back to Milan, she worked with Elio Fiorucci and companies like Basile, Camper, Sergio Rossi, and Plein Sud. Her interest shifted toward the world of design, articulating her own job through a wide series of collaborations with brands of international reputation.

www.slidedesign.it

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Page 36: Longchamp Boutique
Page 37: Cucun lamp
The Trail Shreda was designed in conjunction with the Crank Shop and was manufactured by Pioneer Plastics in Rosslyn South Africa. The product won the 2018 ARMSA Product of the Year Competition. The moulds are all made from CNC aluminium and were made in house by Pioneer Plastics.

Trail Shreda is the first pure indoor mountain bike training aid designed for mountain bikers as well as fitness enthusiasts. The Trail Shreda simulates real life riding conditions. Having to balance as well as steer while training with both bicycles wheels spinning, you exercise muscles you normally would not use on standard indoor trainers. The rollers are adjustable to allow for different bike types and sizes.

This product consists of 8 x rotationally moulded parts and a total of 51 individual parts assembled together. The rollers are moulded in Polyprop to be able to withstand the operating conditions. Under extreme conditions, the rollers rotate at 3200 rpm. There are 7 moulded through holes and 2 steel threaded inserts. There are various graphics as well as moulded engravings for branding and user warnings.

The product was developed in conjunction with the Crank Shop, a Pretoria based indoor cycling studio to create a product that gave more value to their clients as well as a product that can be used at home, at the office or when on holiday.
Get off the PE carousel! It's time to try polypropylene.
The combination of good stiffness and impact make RMPP141 polypropylene the ideal choice when toughness is needed, particularly at higher temperatures.

It has excellent scratch resistance, is tougher and offers greater versatility than polyethylene, it will also process easily on standard equipment.

A cost-effective solution designed specifically for rotational moulding is now available to you.

**PSD ROTOWORX**  
The new source for affordable polypropylene.

✉️ sales@psdrotoworx.com  
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Temporary Shelter for Disaster Events

Commodity, privacy, and security for victims of disaster.
Designed by Horacio Lobo, Versatilidad en Plásticos – Mexico

Every day a natural disaster happens somewhere on the planet, which affects hundreds of victims leaving them homeless. Losing your home and belongings generates a feeling of frustration, sadness, and grief, and the only option they are offered sometimes even for years, is a small tent which they clearly cannot call home.

Versaplas proposes to manufacture shelter housing based on commodity, privacy, and security for victims of disasters, who might wait weeks, months, or even years to rebuild their homes or be relocated.

More than an idea, this is the update of a project which started 32 years ago by two engineers, Rafael Ortiz and Horacio Lobo. The two designed and produced a 5m² rotomolded house, which included a molded-in floor, walls, ceiling, and furniture. Everything in the house is molded in one piece, accommodating a sleeping facility for up to two people.” The project was awarded the ARM Large Product award in 1986.

Today, Horacio Lobo and his technical team are reviving this project because they are certain that a much bigger, comfortable, resistant, and durable house can be built using their expertise and with today’s new technology in resins, machinery, and molds.

Designed to be assembled in 4, 6, or 8 pieces (to facilitate and reduce transportation costs), double walled, and with thermal insulation, it allows larger space from 15 to 38 m² to shelter 4, 6, or 8 persons. The dome gives it its own structure and makes it easier to assemble.

Because it is made out of plastic, it is light and can be assembled by the disaster victims themselves. Once its purpose has been served, it can be disassembled and stored in containers, ready to be shipped away to a new disaster area.

The potential for this project is huge, we foresee limitless applications for this product, from shelter housing to permanent housing with state-of-the-art furniture for new housing needs for future generations.

We are interested in launching this project in the disaster relief market, willing to work hand in hand with humanitarian institutions; we are convinced that this is a very good option to help and support disaster victims around the world.

This abstract is an invitation for companies interested in participating in this project to contact Horacio Lobo to see how this project can become a reality. Some companies have already shown an interest in participating. This can be a great opportunity for rotational molding to venture into the disaster relief market.

Versatilidad en Plásticos is a mexican company located in Querétaro, Mexico.

horaciolobo@versaplas.com
Ciotola Arena Flower Pots

A sophisticated design inspired by vinyl records.
Designed and rotomoulded by Teraplast™ s.p.a. – Italy

Arena flower pots by Teraplast™, as well as the other products of the company’s Groove Collection, combine both the aesthetic dimension of the vase and its functionality. Their design, inspired by texture of vinyl records, characterizes a stunning striped finish and a sophisticated design.

The Teraplast Arena flower pots present the possibility to create a water reserve in a few simple steps. The pots are rotationally moulded and available in six elegant colours to satisfy the needs of the most demanding customers. The flower pots come in six sizes (80 – 100 – 115 – 130 cm).

www.teraplast.com
The RotoVetti

A design following purpose.
Designed by Clive Robertson and rotomoulded by RotoFlo – South Africa

Clive Robertson, CEO of Rotoflow Holdings, required CAVALETIES for his grandchildren’s horse riding lessons. The commonly available, local, and imported units were found to be expensive, poorly designed, and also poorly finished.

During the design process, the “Lego Block” concept was considered, however, after testing, was found to be lacking stability from wind and impact forces.

Clive’s re-design of the CAVALETIES, produced the RotoVetti, an award-winning design that is dynamic and good looking. Its rounded corners, positive interlocking pins, and colourful options, ensure an affordable simple, safe, and light-weight (1.4Kg per block) product.

Ensuring safe riding conditions for the horse and rider, the RotoVetti allows to:

- build the walls and wings easily from a number of units
- colour coordinate obstacles and event branding

The RotoVetti was entered/displayed in the Association of Rotomoulders Southern Africa (ARMSA) Annual Design Competition. RotoVetti achieved a 2nd place award, thanks to the simple application of design techniques and practical approach to manufacture with rotational moulding.

The approximate 1500 units produced are serving to establish the RotoVetti as a market leader.

www.rotoflo.co.za

RotoVetti, an award-winning design that is dynamic and good looking.
All the World in a Spin

by Dr. Paul Nugent, MNOP - USA
It has been a busy 2018 so far: ten rotomolding events, five continents, one thousand participants. The global rotomolding community is prospering and connected like never before, strongly assisted by a backbone of rotomolding associations now serving all six continents. The associations provide not only a networking forum for molders but also allow direct access to the latest technology via a regular group of international speakers promoting the process. There are at least three more events taking place before the end of the year, including the largest events in Europe and North America, rounding out a very productive period for the industry. Molders who choose to participate are better informed than ever and new-comers to the process have an accelerated pathway to state-of-the-art technology and ideas.

Molder numbers by region have changed dramatically in the last few decades with a surge in participants – primarily in India, China, and Brazil. The graphic below gives an estimate of the total number of molders worldwide at around 3,000 companies, placing the industry in a specialized niche in global manufacturing terms. The distribution and growth trends mirror the broad population distribution of the world and generally reflect the primary end-use of rotational molding for water and chemical storage tanks. Growth in molder numbers in established marketplaces such as North America, Europe, and Australia appears to have somewhat plateaued, which may reflect something of a ‘glass-ceiling’ for the process due to a high dependency on polyethylene and a general standard of mid-level technical quality in terms of part finish and tolerances.

Material consumption has grown in a similar fashion to molder numbers although accurate data are notoriously difficult to obtain. The general indication for global rotomolding consumption is around 1.9 million metric tons, with the strongest growth in Asia, flat in Australia and Europe, and some growth in the US. The vast majority of this is polyethylene in its various forms and, based on estimated global production of around 98 million tons in 2018, rotomolding represents only around 2% of the polyethylene market: this means that grade development and general supply can be limited in certain regions as a result of relatively small levels of demand compared to other processes. Beyond polyethylene, low shear levels during molding limit the use of most generally available polymers which then require modification to suit the process. Few material
suppliers can devote significant attention to this and, as a result, the palette for molders remains stubbornly restricted and a frustration for those at the cutting edge of design and application development.

While there are leading molders and suppliers in every market developing new ideas, it is the technical prowess of the major European suppliers and molders which continues to drive cutting-edge technology for the process worldwide. Robotic systems, tight-tolerance molds, engineering grade bio-materials, process control and computer simulation systems continue to be actively pursued. Outside of Europe, North America has the broadest industrial base upon which rotomolders can draw for new markets and ideas – many other regions such as Africa, the Middle East, and even to an extent Australia, have limited OEM demand which slows the development of the industry.

As Chinese and Indian molder capabilities rise, however, their access to broader OEM industries and local consumer requirements will parallel their strong interest in export markets – these markets are expected to continue to grow for rotomolders.

The increased activity and development of new markets in the rotomolding world can be seen with a review of the conferences held in the various regions around the globe so far this year:

**SOUTHEAST ASIA**

At their annual event in New Delhi in January, the StAR group attracted 132 attendees from 80 companies (with a healthy 20% of those from overseas). There is a palpable energy about the industry as molded products are starting to evolve beyond water tanks and demand for industrial products for international OEMs continue to grow rapidly. Recent threats from blow molding for smaller water tanks have not threatened to take over the market completely but appear to have help push some of the more progressive molders into diversifying and rethinking old methods. The rotomolding industry there is still relatively young and small compared to the general scale of India (there are reported to be around 100-120 reasonable sized companies active and many more small ones in a population of 1 billion+) but it has the general support of the largest company in India, Reliance. They are promoting material and the process as plans for enormous infrastructure development spread across the entire sub-continent: a great prospect for rotomolding with all the tanks, connectors, piping and treatment systems that are ideally suited for the process.

**CHINA**

There are two competing associations representing molders in China; the RPC-CPPIA is one of them and held their annual event with around 120 attendees in Xiamen in April. The large increase in molder numbers (albeit most of them small) means there is a huge demand for information and support. However, much of the history of rotational molding research is inaccessible due to language and official barriers to sites such as Google so there are considerable opportunities for providing support and services to the industry. During a tour of a supplier after the event, one of my hosts described the Chinese people as 'boiling'. A very apt description of the pent-up energy and drive that exists in their millions of budding entrepreneurs, it captures the image of Chinese companies who excel at aggressive, in-your-face, competitive, do-it-at-any cost business. If they can find a way to enter your market space, they will. Rotomolding has long assumed that distance and the cost of shipping air would keep long-distance molding out of local markets but there are now dozens, if not hundreds, of molders supplying products to US and European markets. With the almost
exponential expansion of the industry from almost zero in 1980 to hundreds of molders today and the proposed One-Belt One-Road initiative connecting China to Europe along the old Silk Road routes, it is likely that it will rise even further. They also have 20-30 machine makers active now – Europe be forewarned.

SCANDANAVIA
The Scandinavian molding community has a distinct feel to it – quality minded, independent and slightly isolated from mainstream Europe, they use their annual events to maintain their Viking bonds and share. Their recent annual event (ARM Nordic) in February had a record attendance in balmy Oslo. There is a push for an industry wide recycling initiative to help support molders for both in-process and end-of-life reprocessing of materials and parts. Given the drive for the circular economy, it will be interesting to see where this goes. Overall the market appears quite healthy with fish tubs, boats and water treatment/recycling systems continuing to be strong, although some OEM sectors were reported to be slower.

AFRICA
Africa is the one continent that has lagged behind in terms of global economic development, particularly sub-Saharan. With a huge proportion of young people, it has all the makings for a major move upward and, as might be expected, Chinese and Indian investment is ramping up across the continent. Rotomolding is represented in almost every country (invariably for water tanks) but the only region formally represented is South Africa (ARMSA). This remote outpost of the rotomolding world is very congenial with an almost family atmosphere and their annual event in March attracted around 90 people. The industry is small with around 40-50 molders in the South African region but growing due to an unprecedented drought which has been ongoing for the last three years. The backdrop of African economics means that the depth of products needed (or can be afforded) by the local population means the industry is not as sophisticated as other areas but there are highlights. Being so far away from major markets has always given the South African people an inventive, can-do attitude which is reflected in how their leading molders approach their markets and processes.

POLAND
Poland represents an interesting interface: advanced as Western Europe but with the lower cost of the East, many European companies have chosen to establish satellite operations there to take advantage of the proximity of a low-cost educated workforce to Western markets. Almost half the 84 companies now operating there are subsidiaries, some of which are very advanced with automated molding machines and lean operations supplying high-end products for the German and other markets. Naturally this has generated wide-spread interest in the process and this is reflected in the creation of the other half – with almost all this growth in molder numbers occurring in the last 20 years. Once again, their annual ROTOPOL event attracted a strong attendance from Poland and across Europe with around 90 people at their meeting in May. An interesting side-effect of the Polish workforce spreading into Western Europe is that Ukrainian workers have moved west into Poland to fill the void. No doubt, once the rail connection is finalized, the Chinese will arrive too.

AUSTRALIA & NEW ZEALAND
Rotomolding operations extend even to the Pacific Islands with growth there driven by water storage needs for the remotest human outposts. The annual Australian association (ARMA and now RotoConnect) meeting held in Fiji in June was a nod to this expansion. The industry is fortunate to have the only full-time dedicated rotomolding

The entrepreneurial spirit that drives this niche and that has drawn me to the people involved remains strong.
association supporting them; ARMA help lobby government to protect the water tank market, provide training programs, industry standards and organize great conferences! Overall the Australian rotomolding market is where it was pre-boom (in the 00s) with around 55,000 tons of material consumed per year. Most of this is for the water tanks industry (mainly agricultural but with a good portion for domestic use). Beyond tanks, there are a few good technical molders who equally face challenges due to the relatively sparse OEM manufacturing sector. The last ten years has seen more molders trying to move into non-tank applications which means new materials, multiple layer designs and foaming are all being explored.

UK
The Queen’s University of Belfast was the chosen location for the annual meeting of the British Plastics Federation (BPF) Rotomolding Group. The molding community in the UK is quite large but typically not very active as a group. However, this event which presented the latest work at QUB was very well attended with around 100 people from all over Europe. Fundamental and industry focused research is the hallmark of this, the premier centre for rotomolding development worldwide and the presentations and workshops highlighted the innovations in progress. With access to European research funds and a multi-disciplinary plastics facility alongside the rotomolding centre, it represents a major asset for the global industry to help drive process and material development.

So what is next for rotomolding? As I travel between conferences, across multiple continents, and to molders and suppliers in every region, the answer is clear: the entrepreneurial spirit that drives this niche and that has drawn me to the people involved remains strong.

Growth in Asia will dominate the numbers for the foreseeable future and technology may arise from unexpected quarters but Europe will still be close to the centre. There will be healthy growth in traditional markets as the process expands across regions where infrastructure, sanitation, and water treatment are priorities. Automatic machinery will open up new possibilities of high-end molding and expose the process to products and people who had never heard of our versatile process. And for the forward-looking designers, molders, and technologists who want to push the industry to new heights, there is a striking need for new materials with the right processing characteristics and properties to allow molders to enter markets currently off-limits due to design, surface finish, or tolerance limitations. This is where the industry needs to focus and I am confident that the inherent entrepreneurial spirit of the global group will spot opportunities and demand the attention from material suppliers and developers to steer them in the right direction. After 30+ years, there is still a fascination and expectation for the ‘Cinderella’ process!

There will be healthy growth in traditional markets as the process expands across regions where infrastructure, sanitation, and water treatment are priorities.
Rotational Moulding and Design: The Perfect Match for Amazing Products

by Roberto Paoli, Designer and Slide Art Director
Roberto Paoli is an Italian architect and designer and he is specialized in little design creations. He became Slide’s Art Director two years ago. Paoli’s careful creative process combines his technical knowledge with a deep performance of materials to innovate and to give substance to products with high formal cleanliness. His studio deals with product design, interior design, and architecture, developing projects for housing, shops and showrooms, events and fair stands. From 2009 to 2012, Paoli won the Chicago Good Design Award for four consecutive years in a row.

Thanks to Paoli’s knowledge of production materials and the creative process, he along with Slide have developed a product collection where shape is created first along with considering the required material and the Rotational Moulding process. In the last two years, Gelée collection (made with injection moulding) has been realized and completed with the little armchair Gelée Lounge exhibited this year at the latest Salone del Mobile.

The Gelée Collection evokes softness at the first sight: made in soft polyurethane, its shape reminds of beloved jelly candies. Gelée collection is born, indeed, from Paoli’s continuous research into shape and material: Gelée collection is the perfect match between these two elements. It’s both ironic and elegant shape and the soft material make the seat comfortable and the design charming.

Along with Slide, now Roberto Paoli is working on a new polyethylene product that will become part of the already successful Christmas Slide collection. As well for the aforementioned items, product research was realized due to the material and the will of the designer to take a challenge even with the process of Rotational Moulding production.

Regarding Rotational Moulding, Roberto Paoli said: “This technology offers the opportunity to create very fanciful and large shapes, which with other techniques would be too expensive or even impossible. The thirty-year know-how of Slide and their local production near Milan has allowed me to work in close contact with the Design Department, not only during the production of the product, but also in actively following the creation of the mould. I was able to see with my own eyes how the low-density linear polyethylene was used for the creation of the product itself. This amazing product is also amazing due to its dimensions for large areas, which is only possible thanks to the Rotational Moulding process. Most of the time, polyethylene products can be lighted up, and this fact increases its already high reach potential.”

With reference to the project of the Slide’s Christmas products: “I decided to take on a challenge along with Slide with the process of Rotational Moulding production, after many cooperations with other companies to create furnishing objects which became magical thanks to the lighting element. Especially, I was inspired by all the Christmas lights that bring joy and a warm and festive atmosphere during the winter holidays.”

“This technology offers the opportunity to create very fanciful and large shapes, which with other techniques would be too expensive or even impossible.”
The Rotational Molding process offers design many advantages including the complete freedom to create shapes, and the countless possibilities of combination due to the different thicknesses, resistance to outdoor elements – all of these features make the Rotational Molding process a true support for designers. As a result, we are free to create products of every shape and dimension.

The fact that some famous designers, such as Karim Rashid, Lorenza Bozzoli, and Giulio Cappellini have had great success with this productive process makes it clear that polyethylene and the Rotational Moulding process are important for the design world.

I have created a lot of products utilizing funny materials for Slide. Beyond the Gelée line, I have realized the Tarta collection, a coffee table seat with an unusual combination between two different materials. The seat is in polyurethane, in its lacquered version, but it has wooden legs. The collection is wrapping and warm, but at the same time resistant and comfortable. Now, for the first time, I cooperate with Slide for the realization of a luminous furnishing complement that can bring magic to the Christmas holidays at people’s homes, and especially in shop windows and big contract projects. Indeed, polyethylene enables us to create design elements that can be beautiful, elegant, but also playful and colourful, big or small, and, as already stated, this material allows the designer’s mind to fly with their imagination and make ideas real.

Polyethylene also has practical advantages. The development of the technology and the incessant amount of research involved, brought the realization of an innovative polyethylene material. Thanks to the continuous study and know-how about the plastic material, new polyethylene powders can allow you to have a smoother surface, that is less porous and easy to clean. It is also more resistant to UV rays so that the colours can remain brighter longer.

Polyethylene products are appreciated not only for the contemporaneity and informality of their style, but also because their maintenance is simple, they are resistant to bad weather elements, and they can be cleaned easily. Moreover, this material allows to keep costs low and be eco-friendly. Low-density linear polyethylene is 100% recyclable and processed according to a zero-emission process, with a view to environmental sustainability.

Starting from the humble material of polyethylene, Rotational Moulding elevates it to a refined high quality design and elegant objects of art. Every object can be whatever the designers wants it to be, thanks to the many possibilities this process offers.
Design and Production Evolution

Collaborating for Success

A look at how 15 years of collaboration with industry partners has driven design and production techniques in the rotomoulding industry.

by Martin Spencer, Unique Roto – UK
The design freedom of Rotationally moulded product has progressed tremendously over the last 15 years or so. The benefits of new production technology, DTH (direct tool heating) by oil or by electric elements, new materials being developed along with progressive automation and the use of robots has opened a whole new world for the designer of rotomoulded product.

We would like to take you through a case study that involves a company innovative in design and production working together with a toolmaker and machinery manufacturer. They have collaborated for nearly 15 years pushing the limits of the rotomoulding process from a complexity, quality, and productivity point of view. The first of the two companies involved is Kärcher, a world leader in cleaning appliances headquartered in Winnenden Germany with manufacturing plants and distribution networks worldwide. The other company is long established Persico Spa a leader in engineering solutions for manufacturing including rotational moulding headquartered in Nembro Italy.

In 2004 Kärcher were buying rotationally moulded components from outside suppliers for their floor cleaning machines. They
were frustrated by variable quality and unreliable deliveries so decided to move their rotomoulded production in house. They purchased a conventional 4 arm carousel machine and decided to partner with Persico as one of their suppliers of cast tooling as ‘Persico had a good reputation and offered good quality, good technical support at interesting prices’. Some of the original cast aluminium tools supplied in these early days are still in use producing spare parts, having produced many thousands of mouldings.

As the industry developed CNC from Billet technology for aluminium roto tools Kärcher embraced this technology with Persico. In the words of Gunther Laube of Kärcher ‘We found a better quality in the rotomoulded parts in case of dimensions. The shape of the parts were more precise and followed more accurately the CAD data. As we use complex moulds with many parts, the parting lines were more exact than at with cast moulds and fitted together better. So we found a better part quality and less time in finishing operations. The mould price was higher than cast tooling, but the moulds and flanges were more stable and more robust than the cast moulds.’

In 2011 Kärcher had designed a new complex floor cleaner part that required producing in large quantities. They wanted to automate the production of these parts. The tooling required many separate pieces to produce deep cavities, undercuts and threads. Initially industry opinion thought that automated production of these parts with existing technology would be impossible.

Working closely with Persico using the ‘Leonardo’ technology of oil heated and cooled tools and fully automated demould and powder refill, they were able to realise their ambition. Kärcher installed two ‘Leonardo’ machines alongside their carousel machine in Winnenden. Today the ‘Leonardo’ machines and tools use this technology with full automation to produce lots of parts. The ‘Leonardo’ produces consistent high quality parts with even wall thickness including in and around deep cavities. The ‘Leonardo DTH’ technology saved up to 25% in the energy used per part and saving of 15% of the material required for each part was achieved.

With the product developers at Kärcher always pushing the limits of available technology they were looking how to take the advantages seen in the ‘Leonardo’ machine in energy and material saving and implement them with parts that were either too large for existing machines, did not require the high production numbers to justify the effort and expense of fully automating or so...
complex that automation was impractical.

Working again in alliance with Persico, the newly developed larger version Persico 'Smart' Machine (2.8m) was chosen to fill this requirement. The 'Smart' machine is semi automated using electrical elements for the DTH. This multi zoned heating allows very accurate wall thickness control using exactly the amount of material required in each area of the product to meet the user specification. The 'Smart' machine system also allows the internal cavity to be easily controlled using pressure, vacuum, or inert gas as required to help with tight tolerances and product shape.

With Kärcher's determination to stay as a world leader in their field and their product developer’s constant push to include more features in the rotational moulded components to reduced assembly time and keep down product prices, working with industry partners such as Persico and others has helped them achieve their aims. To remain successful manufacturing companies need to embrace new technology where appropriate and work with partners that are always working to extend the boundaries of the technology.

We are now seeing advances in rotomoulding technology offering new techniques in toolmaking, with more complex automation, new materials available and better process control. This opens up great new horizons for the part development using the process. This case study shows that forward thinking part developers working together with the production and the right partners in the industry over long periods of time have achieved success in innovative production techniques no one could have imagined 15 years ago.

In the words of Gunther Laube of Kärcher ‘With the Leonardo technology we were able to produce the tanks in the highest amounts with less cost and very good appearance and quality, so the production cost of our floor scrubber machines were lower.

With the Smart technology we have now more possibilities for rotomoulding, for example it is easier to produce parts out of materials other than PE. We always brought out of the rotomoulding technology all that was possible. Now with the SMART technologies we have new possibilities and options.

I think in the future we will develop and produce rotomolded parts we are not able to think of today.’

Product developers and designers should no longer be constrained by conventional industry thinking and should embrace these new possibilities. There are many moulders, toolmakers, material suppliers and machine manufactures around the world who are not constrained by existing ideas and are prepared to give new ideas and techniques a try. In the Rotomoulding industry ‘Impossible’ is a concept with boundaries that are shrinking everyday.

(Top) The complex multi part electrically heated tool for Persico 'Smart' Technology
You may recall that in the last edition of Showcase, there was an article about the Symba Paediatric Hospital Bed, developed by Jed Aylmer, who is a graduate from the University of Johannesburg. Jed was a second year student in 2013, and was engaged in rotomoulding project as part of his coursework. This exposed him to the process and also the possibilities of what could be done with it.

The Sasol sponsored Student Design Competition was started after a visit to the ARMA conference in the early 2000’s, where they were running a design competition for students. We thought that it was something which could be done in South Africa through ARMSA, with the initial aim of promoting growth in the local rotomoulding market. Sasol has been sponsoring the competition from inception. Little did we know how things would go, and what a success it would be.

The first problem was where to start. Would it be an open competition or something more targeted. We contacted the lecturers at Technikon Witwatersrand (as it was called then) running the Industrial Design course, and they suggested a project for the second year students. After some teething problems, we have reached a point where there are two universities that have a rotomoulding project for their second year students, i.e. rotomoulding is part of the curriculum at these two institutions, and who participate in the competition. The lecturers like the project because the brief is much wider than for other projects of which they are engaged. For example, a brief might be "Design a kettle", which is quite specific, whereas the brief for this year’s rotomoulding project is "Outdoors Sports and Recreation". This requires the students to think and research extensively.

The process that we go through each year is the following:

- between the ARMSA Committee and the lecturers we agree to a brief for the project.
- once a date is agreed for the start of the project one of the ARMSA Committee gives a lecture on rotomoulding to the students, providing them background information.
- the lecturer will normally organise a visit to a local rotomoulder so that the students can see the process, and ask further questions.
- the students produce the work for their project, which is assessed by the lecturers as part of their course work. However what has been done is their entry into the Competition. They do not have to do anything else.
- set a judging date, and this is attended by the ARMSA committee and the lecturers.
- once judging is done, the winners are announced either at the next ARMSA conference, or via a visit to the university, depending on the timing.
- there is, of course, prize money for the first three students, and sometimes we award commendation awards to those which we think warrant it.

One important thing that we do is to make sure that all the entries are exhibited at

The ARMSA Student Design Competition sponsored by Sasol

by Nick Aggett, Sasol Chemicals

[Top & Bottom – page 56] Designs on Display at the Conference
the conference. Not all the models are used, in case they get damaged, but all the renderings are displayed. This is important as it showcases the student’s work, but also there may be a moulder who wished to develop the design further with a particular student. Some feedback that we have had from the lecturers is that sometimes where a student has not been doing that well in the year, and they get something out of the competition, then it gives them more enthusiasm for their course.

An innovation introduced this year was that ARMSA sponsored the manufacture of a mould of the winning design so that a full moulded prototype could be shown at the conference. This proved to be very successful.

So, if Jed Aylmer had not been exposed to rotomoulding through the second year project, the Symba Bed would probably not have been a rotomoulded product. This is exactly what the competition sets out to do, make industrial design students aware of rotomoulding and what can be done with it.

Lastly, ARMSA would like to thank Sasol for their continuous support for this competition, as well as the lecturers at the universities, and the students who have given us some great designs.

The competition sets out to make industrial design students aware of rotomoulding and what can be done with it.
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In many ways, rotational moulding is the ideal method for making hollow plastic items. It involves pouring a fixed amount of plastic powder into a mould, which is heated to melt the powder and rotated about two axes to coat the interior walls with molten plastic. This method doesn’t require any pressure, meaning the mould can be simpler with thinner walls and cheaper to produce than moulds that have to withstand high pressure. This simple process is flexible enough to produce hollow items of almost any size, from tiny components for hearing aids to 70,000-litre storage tanks and everything in between, including toys, medical implants, kayaks and traffic cones. Because the moulds are economical to make, as are the rotational moulding machines, it lends itself to small production runs that would be uneconomical with a more expensive technique such as injection moulding or blow moulding. It also lends itself to producing items with comparatively thin walls, such as storage tanks. This is both because it naturally produces walls with a very consistent thickness and because the molten plastic tends to accumulate in the corners of the mould, producing thick external corners that aid rigidity. Rotational moulding has one important drawback, though: it is almost completely reliant on polyethylene, which accounts for 95% of the market for rotational moulding materials. This dominance of polyethylene has always kept rotational moulding as a fairly niche plastic moulding technology, consuming less than 1% of the global plastic production. But things are beginning to change, fuelled
by a growing recognition that rotational moulding has the potential to break into many new markets if only it can move beyond polyethylene.

OEMs, particularly in the automotive sector, are seeking polymers that can withstand higher and higher operating temperatures, whilst also looking for weight reduction in their rotomoulded parts at the same time. The main driver behind these demands in the automotive world is the need to meet more stringent regulations of CO2 emissions. This is leading to an increase in the temperature of engines and associated components. As a result, the temperature requirements for the fuel tanks are rising as higher and higher temperature fuels are being returned to the tanks.

To meet these higher temperature requirements, Matrix Polymers has now developed a new polyamide-6, also known as nylon-6, called Revolve “PA HIU”. This material can withstand operating temperatures of 140-150 °C and at the same time can deliver significant potential weight savings.

This material has also been designed so that it is easy to rotomould and it does not require any complicated processing, such as needing an inert atmosphere within the mould. Revolve PA HIU can be moulded on conventional rotomoulding equipment, with traditional steel or aluminium moulds.

As with any material it is important to find the right moulding conditions to achieve optimum mechanical and physical properties. It is best to monitor the internal air temperature in order to ensure that the polymer has fully sintered. Matrix found that optimum properties were achieved with a peak internal temperature (PIAT) of around 230-235 °C (see Figure 1). The moulding trials were carried out on a Ferry 190 carousel machine in the company’s Rotomoulding Technical Centre in the UK.
Ferry Industries, Inc. has supplied the best machines and support systems to the global rotational molding market for over 35 years. Ferry’s RotoSpeed rotational molding machines are the most productive and efficient machines on the market, helping advance their global customer base with high productivity, efficient energy usage, and advanced control technology. Ferry Industries has always supported and continues to support its customers by advancing and improving the rotomolding production work cell.

Ferry Industries helps customers advance work cells through integration of an assortment of equipment and integrated technology for a complete work cell system:

- New RotoSpeed rotational molding machines: Independent-Arm Carousels, Fixed-Arm Turret Carousels, In-line Shuttles, Giant Shuttles and Rocking Ovens - allowing standard mold swing capabilities up to 240” (6000mm) and weight capabilities up to 10,000 lbs. (4545 kg) per arm.
- RotoCure 7™ System Manager controls, standard on all Ferry RotoSpeed machines, provides for setting up process control for the machine, providing process trending, generating reports, annunciating machine faults and the ability to have remote monitors and remote access for troubleshooting.
- InfraRed Thermometry (IRT) with Ferry’s RotoCure 7™ System Manager control to continuously control the molding process — and recent enhancements allow events to occur during both the oven and the cooling cycles. This real-time cycle control management reduces over-cure or under-cure of parts virtually eliminating scrap. Daily start-up cycle, operator errors, ambient temperature variances, cycle interruptions caused by delays at the unload or load station are compensated for during ongoing cycle process.
- Infrared safety scanner systems and
mechanical guarding to aid operator safety within the work cell, allowing for improved focus on productivity of the work cell.

- Work platforms engineered to the customer’s needs to improve operator efficiency, productivity and ergonomics for the work cell and rotomolding machine: stationary platforms, moving platforms, integrated safety systems and “roll-over” gates to help reduce operator injuries.

- Automated Powder dispensing systems to improve material delivery efficiency local to the molds, reduce material spillage and waste, and improve work cell safety.

- High-intensity turbo mixers to yield better dispersion and vibrancy of the color onto the resin, while losing their “tails” and allowing the powder to roll better in the mold.

- Conversions and upgrades to existing Ferry RotoSpeed machines like RotoCure & IRT control systems, additional carriages and arms, gas train systems, new ovens and coolers.

The Ferry RotoSpeed™ product line is focused on improving value for the customer through accessibility of communication to the machine and from generation of reports, improved use of energy, and the improvement of processing speeds to enable its customers to produce more products at faster rates.

As the market leader, Ferry Industries helps their customers accomplish their rotomolding production goals through a committed focus to technical solutions specific to each customer’s needs to advance their production work cell, low to high volume, simple to technical parts.

Ferry Industries...When Performance Counts!

(Top) Ferry RotoSpeed RS4-4600 Work Cell
(Bottom) RotoSpeed Independent-Arm Carousel Under Construction On Shop Floor
Good evening, my name is Nathan Bell and we’d like to offer you a warm welcome to the Rotational Moulders annual awards ceremony for 2020.

We have a number of awards to present tonight in the category of best development applications with a polymer other than Polyethylene.

To get us underway, we’d like to give some meritorious awards.

Please welcome to the stage, Mason Cook of Weyland Pipes. Weyland Pipes have produced an underground pipe connector. Please explain Mason the issues you faced;

“Thanks Nathan. We had to mould the pipe connector so that it could be fitted with high compression rubber ring joints. This meant that it had to be moulded with very tight tolerances. The level of tolerance you get with injection moulded parts. We found Polypropylene enabled this to be achieved. With a lower shrinkage than Polyethylene at 1.5% we were able to mould Polypropylene pipe connector with an ID of 426mm and a tolerance of +/- 1mm.”

Next can we please have Jack Clifton of Hacking Industries. Jack and his team have moulded a school desk that is being used in many developing countries. I’ll let Jack explain;

“We needed to make a desk that had sufficient stiffness for the arm and table section not to flex under the weight of growing children. We found Polyethylene did not have the necessary modulus for this, so we looked to Polypropylene. Polypropylene not only had the required stiffness, but also gave enhanced gloss, hardness and importantly better scratch resistance. So we had not only a better functioning table, but an improved aesthetic piece of furniture as well.”

Thanks Jack. Can we now call upon Tyson Goodnight from Quimico Tanks who have...
made various chemical & underground tanks. Thanks Tyson;

"Quimico Tanks are delighted to be here with our range of chemical tanks, for both above and below ground.

Polypropylene has outstanding chemical resistance. While Polyethylene is often tested via standard ESCR testing, Polypropylene requires a more severe test, usually FNCT. Polypropylene resists acids, alkalies, moisture, and salt solutions.

We have moulded Polypropylene in tanks up to 25,000 litres with good results. For tanks of this size you need a good combination of stiffness and impact. This grade of Polypropylene was tailor-made for this.

For our underground tanks we required the tank to undergo a vacuum test. The tank in Polyethylene collapsed after 10 minutes. But the same tank in Polypropylene did not collapse even after 60 minutes.

Without Polypropylene we could not have met our customer’s needs for these chemical and underground tanks."

For the last of our meritorious awards can we please have Josh Thomson of Faraday Industries. Faraday Transport division have been producing electric vehicles for use in congested cities and have utilised Polypropylene rotationally moulded panels for their construction. Over to you, Josh;

"Thanks Nathan. We faced issues with some panels being quite large, with expansive surface areas. Moulding these without warpage was very challenging. However, changing to Polypropylene with its lower shrinkage and higher stiffness enabled us to mould flat panels. Polypropylene also gave us excellent gloss and hardness as well as better scratch resistance for these vehicle panels. Important for these parts.

Another requirement for which Polypropylene fits the bill, is in high heat areas. These could be near engine bays or also on roofs where high ambient temperatures were causing Polyethylene sections to buckle. Polypropylene was ideal.

Similarly for seats, where we need the extra stiffness of Polypropylene, so we changed these over too.”

And now we come to the major awards for the evening. We have three place getters for the NONPE trophy, awarded each year to the best example of a non-Polyethylene moulded product that solves problems for the end user.

This was a close contest and each product gained votes from the committee. However, we have to have a winner, and so starting in third place, can we call to the stage Simon Walker from Stork Industries.

Stork Industries are heavily involved in the automotive industry. They face challenging environments for their products, and met this...
head on with Polypropylene moulded parts.
Simon.

"Yes Nathan, under the hood in an engine bay is a hostile place. Not only are there high operating temperatures but also the presence of grease and oils. Such conditions are not the domain of Polyethylene. But, Polypropylene is up to the task.

We have been rotationally moulding air ducts for some time. And some of these have quite narrow and long flow paths. But Polypropylene, when moulded at correct temperatures produces good cured parts with good stiffness.

We also have switched our hydraulic oil reservoirs to Polypropylene. Following a long term immersion test, we were comfortable with the performance and now mould these in Polypropylene.”

Thanks Simon. So now we left with two. Unfortunately there can be only one winner. The runners up award for 2020 goes to Brodie Graham of Burns Industries. Burns have developed a Solar Hot Water Tank made in plastic to replace metal tanks. Thanks Brodie;

"Our team at Brodie recognised the opportunity for a rotationally moulded plastic solar hot water tank. As this required a material that could take operating temperatures close to 90C for some period, we had to rule out Polyethylene. We also needed a high modulus polymer as the stiffness of the tank is important. Both of these characteristics led us to Polypropylene. Because the outer layer is exposed to sunlight we needed UV protection, which the grade of Polypropylene we used has through its additive package.

Polypropylene also allowed us to mould with tight tolerances, as there are a number of glass tubes that enter the tank.

We are extremely pleased with our Polypropylene solar hot water tank – as are our customers.”

And so now please give a round of applause to the 2020 winner of best non-Polyethylene moulded part – and that goes to Shaft Systems for their range of underground infrastructure products, including tanks and manholes. Representing Shaft Systems is Scott Parker. Congratulations Scott;

"Appreciate this Nathan. It’s been a long road for Shaft Systems to get to this position, but one that was worth it. We recognised early on that the need for underground products for infrastructure was growing rapidly but with demands that could only be met by superior materials.

Old concrete manholes and pits are rapidly eroding and need replacing. Concrete has many issues, not the least the difficulty of installation due to its weight.

Modern materials and moulding techniques have now given us a better option.

Anything buried underground undergoes continual forces and this is exacerbated by...
water tables. So you need a material with excellent creep resistance. Polypropylene has that. Compared with Polyethylene, Polypropylene performs better after 20 years than Polyethylene does after 1 year.

So, in an application that requires stiffness, impact, creep and moulding tolerances we found our Polypropylene manholes more than satisfied our customer’s needs.

And in addition they are light which makes them more attractive for transport and installation."

This concludes our evening and our awards. We’d like to thank all the moulders and end users who made this possible by seeing beyond the Polyethylene wall and realising that Polypropylene is a material for rotational moulding and it’s enhanced properties allow for its use in demanding applications where Polyethylene cannot, or should not, be used.

NB: This article is a glimpse into the near future and paints a scenario that may well play out over the coming years as Polypropylene takes its place as a material of choice for many rotational moulding applications.

(Top) Solar Tank

(Bottom) (L-R) Manhole, Underground Tank
ARMO’s mission is to educate and inform the international design community of the possibilities that are becoming available using the Rotational Moulding process.

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If you are interested in having your product innovation featured in the 2019-2020 ARMO Rotational Moulding Product Showcase, send your products and information to info@arno-global.org
The Persico Service
If you have an Idea that may be able to use rotational moulding and need a reliable partner to guide you through the process then Persico is waiting to help. Persico works with their customers to refine the product design and check its suitability for purpose using FEA (finite element analysis). They then create the best quality tooling in either cast or CNC machined aluminium. Their tooling design team have many years of experience of solving potentially difficult problems with shape and surface finishes. Persico can also offer help with developing the correct moulding process conditions and helping chose the correct polymer to meet your product criteria. Persico have the right people with many year’s experience, who will always try to solve a problem rather than say no.

Established in 1976, Persico Spa is a family owned and run company headquartered in Nembro Italy. It has expanded to over 600 employees and has manufacturing and sales offices in the USA, Mexico, and China. The company now has divisions operating in the Automotive, Industrial, Marine, Aerospace, Healthcare, and Architecture markets. Almost since its inception, it has been a leader in the providing tooling and technology to the rotational moulding industry.

Persico have the right people with many year’s experience, who will always try to solve a problem rather than say no.
**Investment in technology and R&D**

Persico have worked with their customers in developing new tooling techniques for the roto industry from the early days when they developed new ways to produce patterns and cast aluminium tooling they have always been at the forefront of the industry. As CNC milling machines developed, they rapidly moved the majority of tooling manufacture to this technology. Machining tooling direct from aluminium billet gives much better precision. The tool can accurately reflect the CAD data supplied giving more accurate and robust joint lines. Surface finish can also be much better on a machined tool rather than a hand finished cast tooling. Initially this technology was more expensive but by continual investment in new machinery and software, Persico now manage to produce CNC tooling as economically or more economically than cast tooling for many of their customers projects.

**Automation**

Using their experience from their automotive business unit, Persico have also developed automated and semi-automated machinery for rotational moulding. In 2002, they introduced the 'Leonardo' machine. This machine was fully automated from filling with material, mould closing, heating cycle, cooling cycle, and demould. These machines did not have a traditional oven using oil for DTH (Direct tool heating) and cooling. This made them very energy efficient and much more productive.
than traditional machines. These 'Leonardo' machines could be combined with robots to give completely automated production cells producing 24 hours a day with little or no human intervention.

**DTH (Direct Tool Heating)**
The DTH technology offers many advantages one of which is the possibility to achieve much greater control over the wall thickness throughout the moulded product. With the ability to zone the heating channels, especially in deep cavities and difficult to access areas of the tooling, allows the wall thickness to be controlled either uniformly or differentially to suit product requirements. This in turn can lead to considerable savings in material as material is no longer wasted on thickness in areas where it is not required to ensure wall thickness in other areas.

**Persico 'Smart' Technology**
Seeing these advantages and others of this technology, Persico felt these could be improved upon by using electrical DTH rather than oil. This technology could then be applied to semi-automated processes as well as fully automated machines. The Persico 'Smart' machine was launched in 2011. This provided multiple heating channels giving the possibility of separate heating control and monitoring not only to different areas of the tool but to separate mould pieces and inserts along with flanges and joint lines.

The DTH system also allowed much greater control over other aspects of the process. Vents can be automated giving the possibility of introducing pressure, vacuum or inert atmospheres into the mould cavity whilst moulding. This in turn made possible a whole new range of materials that could be rotationally moulded easily and consistently. The comprehensive control software of the 'Smart' system allowed the whole moulding process to be accurately and continuously monitored by zone by zone throughout the whole moulding process. This gives unparalleled traceability and quality control of the moulded product.

**The Future**
The 'Smart electrically heated DTH is now being developed into fully automated Turnkey solutions incorporating robots and other machinery and technology. With fully integrated and automated production cells operating around the world in a variety of technologies Persico engineers have long experience in developing and providing these solutions.

**The Persico Commitment**
Persico is committed to continually developing and improving the whole rotational moulding process. It is currently developing new more economic DTH methods, better, faster and more economic tooling methods and full automation of the 'Smart' technology. It continually works with material suppliers to develop processing strategies for new exciting material that can be moulded.

Using their experience engineering capabilities and commitment, Persico aim to stay at the forefront of Rotational moulding technology. So whether you have a 'blue sky' idea that requires design, development, and production technology, or help automating you current production, or simply require a top quality tool for traditional rotomoulding machinery you should contact Persico. They are always there to offer help and advice and solutions on any aspect of the production process.

Fully automated 'Leonardo' production cell making insulated composters
SAVE THE DATE
ARMO 2019 "Methods, Processes & Technology for Industry 4.0"
16th – 18th September

ARMO 2019 will take place at the Sun City Resort in Rustenberg, North West, South Africa 16th - 18th September. The event will be hosted by ARMSA (Association of Rotational Moulders of Southern Africa), and it promises to be an event like no other.

Sun City has been specifically chosen since it caters for everyone’s needs...the Pilansberg National Park borders on the Sun City Resort, which is a Game Reserve with the “Big Five” for breath-taking Safaris. The Resort also boasts two Championship Golf Courses, a Casino, Waterworld (with a Beach), Crocodile Camp, and Hot Air Balloon Safaris, to name a few experiences!

For rotational moulders and suppliers alike, this will be a great opportunity to network, socialise, and learn in the warmth of South Africa. Exhibitions, Demonstrations, Seminars, Safaris, and Socialising – in no particular order gives you a great reason to join ARMSA South Africa for ARMO 2019.

Join ARMO 2019 for quality education and training, and also for good company and beautiful scenery. More detailed information, both for visitors and exhibitors/sponsors, can be found online at www.armo2019.com. Visit www.armo2019.com for more information or make contact at info@armsa.co.za

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Hamburg, Germany
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September 16-18, 2018
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Hamburg, Germany
armo2018.com

October 21-24, 2018
2018 ARM Annual Meeting
Montreal, QB
rotomolding.org/events

January 23-25, 2019
StAR 2019 Annual Conference & Trade Show
Kochi, India
starasia.org

March 25-27, 2019
ARM Executive Forum
Napa, CA
rotomolding.org

May 21-24 2019
RPC-CPPIA Conference
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September 6-18, 2019
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September 16-18, 2019
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Publisher
Publisher – JSJ Productions, Inc.
Chief Editor – Susan Gibson JSJ Productions, Inc. susan@jsjproductionsinc.com
Editor & Marketing Director – Jennifer Gibson JSJ Productions, Inc. jennifer@jsjproductionsinc.com
Designer – Anya Wilcox JSJ Productions, Inc. anya@jsjproductionsinc.com
Internet & Digital – Jason Cooper JSJ Production, Inc. jason@jsjproductionsinc.com
Distribution – Regina Rogers JSJ Productions, Inc. regina@jsjproductionsinc.com
Legal – Joseph V. Gibson, IV JSJ Productions, Inc. jvg@jsjproductionsinc.com

Editorial Contributors
Paul Nugent, MNOP paul@paulnugent.com
Roberto Paoli, Slide Design infor@slidedesign.it
Martin Spencer, Unique Roto martin@uniqueroto.com
Nick Agget, Sasol Chemicals nick.aggett@sasol.com
PSD Rotoworx THumpreys@psdrotoworx.com
Ferry Industries sales@ferryindustries.com
Matrix Polymers sales@MATRIXPOLYMERS.COM

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Inquiries
info@armo-global.org / armo-global.org

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A. Schulman USA & EUROPE
3637 Ridgewood Rd.
Fairlawn, OH 44333 USA
330.666.3751
info@aschulman.com
aschulman.com

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Association of Rotational Moulders Southern Africa (ARMSA)
PO Box 6966
Birchleigh 1621
Gauteng South Africa
+27 82 772 3769
info@armsa.co.za
www.armsa.co.za

63
Burmil Consulting
PO Box 85184
Mevaseret Zion
ISRAEL 90805
+972 2 5335651
mikiburmil@012.net.il
www.mikiburmil.com

3
Ferry Industries, Inc.
4445 Allen Rd.
Stow, OH 44224-1093 USA
330.920.9200
sales@ferryindustries.com
www.ferryindustries.com

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Jerico Plastic Industries, Inc.
7970 Boneta Rd.
Wadsworth, OH 44281 USA
330.730.6314
Minerva Plant: 330.868.4600
steve@jericoplastic.com
www.jericoplastic.com

2
Maag / Reduction Engineering Scheer
USA Headquarters
235 Progress Blvd.
Kent, OH 44240 USA
1.800.844.2927 / 220.677.2225
Maag.KEN.Info@maag.com
www.maag.com

Europe Headquarters
Ostring 19
63762 Grossostheim, Germany
+49 6026503 354
info@maag.com
www.maag.com

7
Matrix Polymers
The Priory Orchard Hill
Little Billing
Northampton, NN9 9AG
United Kingdom
+44 (0) 1604 789100
sales@matrixpolymers.com
www.matrixpolymers.com

40-41
PSD Rotoworx P/L
Suite 2, level 1
41-45 Pacific Highway
Waitara, NSW,2077
Australia
PO Box 838
Wahroonga 2076
+612 9412 3255
THumphreys@psdrotoworx.com
www.rotoworx.com

81
Persico Spa
Via R. Follereau,
4 - 24027 Nembro (BG) Italy
+39 035 4531611
info@persico.com
www.persico.com

9
Powder King, LLC
41780 N. Vision Way
Unit 120 Bldg. 2
Anthem, AZ 85086 USA
623.551.9897
sales@powder-king.com
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