# RMD News
## The Rotational Molding Division of SPE Newsletter

4th Quarter 2016 Volume 16 Issue


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ROTO POLYMERS
BEST ROTOMOLDING RESINS

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## In this issue:

# Chairman's Message

**Gary McQuay**

Greetings Fellow Rotational Molders,

The older I get the faster time passes. It just doesn't seem to fit Einstein's theory. 2016 flew by, and here we are preparing for the holidays. I hope everyone reading this had a year just as exciting as mine.

2017 is shaping up to be just as exciting. We are already starting to plan for our 2018 TopCon. We have polled our attendees on what they liked, what they didn't like, and what they would like to see in future TopCons. Our TopCon Chair is making a list and checking it twice, and I am sure our 2018 Top-Con will be one for the history books.

We are also planning a Minitec to be held on June 20, 2017 at Penn College. This Minitec will focus on product design and mold design for rotational molding. We are also planning a de-sign competition with the winners to be announced at the con-clusion of the program.

Before I sign off I want to express my sincere thanks to all our board members. Their untiring efforts and enthusiasm are in-spiring. And I want to wish everyone a very happy and safe holi-day season.

Gary

**Newsletter Comments/Questions? Contact:**

**Sponsorship: Russ Boyle at**
**russ.boyle@gulfviewplastics.com**
**or call (727) 379-3072**

**Editor: Melissa Inman at (919)-888-0940**
**melissa.inman@gulfviewplastics.com**

**Asst. Editor: Dr. Peter Mooney**
**PlasRes@aol.com or call (336) 998-8004**

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## In The News:

# The Evolution of Rotomolding Machinery Takes Time

During much of the 1990s and into the 2000s grass-roots research was carried out at Queen's University of Belfast highlighting significant potential savings and cycle time reductions that could be possible within our industry. These could be achieved through the application of various process- enhancing features, many of which were obvious and simple in theory but difficult to implement. They are well-known in our industry today – to wit,

- temperature-based process control
- ambient weather compensation
- powder preheating
- mold pre-heating
- internal air and water cooling
- warp-free parts
- consistent shrinkage in parts
- mold pressurisation
- multi-shot material loading
- automated demolding
- high-heat ovens
- rapid rotation speeds

The list goes on.

However, there were obstacles to their wide-spread introduction, and as such they did not make the front page of any machinery manufacturer's literature. The problem was such features required significant machine re-design such as the modification of arms, bearings and structures. This work would eventually impact on machine pricing, and that would have meant reduced sales. Although these modifications in their entirety were a risk, there were some manufacturers who introduced one or two features. But they were add-ons - nice-to-have, but not really delivering the full benefits with seamless integration.

After a short time, even within the research environment, it became apparent that the main hurdles lay in the design of the arms. Its restriction, through size and operating temperature, to the transfer of control signals and data, coolant fluids, and especially materials, meant the essential access to the mold that was needed for the addition of these features was not possible. Currently the arms - and in particular their minor axis-bearing housings - are made as small as possible to avoid stealing any oven space from the mold - valuable real estate for any rotomolder.

Another explanation for this arrested development is simply the demand was not there; no one would buy such a machine. The rotomolding industry had not developed to a position where it needed better process controls or faster cycle times or even the ability to mold engineering-grade materials for its markets. With few molders and little competition it was still possible to make polyethylene tanks and other tank-like products, constrained only by the imagination. This is a trademark of rotomolding – "*Aren't all hollow rotomolded articles imaginatively shaped tanks?"*

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## In The News:

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Certainly now, 25 years on, market demands have changed. Low-cost capital investment has allowed multiple new roto-molding businesses to appear more locally. Customers have more rotomolders to choose from, and with the introduction of new materials they have even started to think outside the 'PE box' and its associated shapes. For molders, then, to catch these customers and to remain competitive in the changing market, they must change too. Reducing costs is important, but only if through investing in high-tech equipment. Cost reduction through cutting corners will only force quality to drop and invite customers to go elsewhere. This is putting their feet in the blocks at the start of *a race to the bottom* (bottom price and bottom quality). Reducing costs along with delivering high-quality products with low monthly overheads is the target every time. This is the only thing that will secure successful rotomolding businesses.

**Common costs the rotomolder can do something about…**

It is helpful when analysing how to make cost reductions to first separate the costs associated with the process into well-defined categories. For rotomolding – as well as for all other plastics processing methods - they are as follows:

- labor
- materials
- machine running costs and capital repayment



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**Current labor costs and the way forward…**

The only way labor costs can be reduced and not impact negatively on quality is to *lessen the work* needed to complete the process or introduce *automation* – that is, replace labor. Automation can be applied to many areas in the process, but only if the process is controlled and does not change so often as to make the task of setting up for automation unprofitable. When we hear automation we immediately think of automotive production lines flanked with assembly robots. Even before we arrive at total automation there are many things that can and must be done to semi-automate our process right now:

- universal brackets with fast-mounting and de-mounting mold operations
- cooking and cooling that is automatically temperature-controlled and compensatory to the ambient weather conditions (mold temperature control)
- constrained opening and closing of the mold halves when servicing (e.g., hinges or guide rails)
- mechanical releasing of parts from the mold without the need to use pry- bars and cranes

…just to mention a few.

It is difficult, though not impossible, to introduce automation as a complete package - from the mounting of the mold, to the loading of the material, to the temperature controlling of the process, to the demolding of the part, and even to the finishing of the product. Altogether not a simple thing, but individually automating each task with the end-goal in sight it is a very worthwhile endeavor in reducing labor costs even now. *(The best place to start is often with work-flow procedures and then build on that. Look at each task and decide if it can be carried out in a better way - either to lower costs or make it simpler for the operators. Ask the operators!)*

**Current materials and the way forward…**

Materials are priced at the market rate, and although ways may be found to reduce the cost per weight, often these are short-range savings that can ultimately cost in long-term quality. The simplest way to reduce material costs is to use less of it. Of course doing that without sacrificing a significant amount of the material's strength is the challenge. Advancements in fillers, stiffer or stronger materials, and multi-layer materials are where the advanced rotomolder is looking now. The issue with fillers is they separate in the tumbling of the mold. When not equally distributed throughout the matrix, their gathering together acts as a weak point. Stiffer materials are available now, but they often come with a price premium and require better process control than that of standard polyethylene. This can sometimes be too complex a process for many molders. Multi-layer systems offer molders a way to use less-expensive materials in the center section of the part where such a substitution has less effect on mechanical properties. The issue with this approach is that more complex operator involvement is required; the mold must reverse from the oven to receive the further material shots, and the material must be fed into the mold. This adds significantly to the cycle times. It also raises safety concerns since operators are coming into contact with 200°C (392°F) hot molds. Often foams are used as a second layer to lower shot weights, but the act of using a thicker-layered foam means cooling times are also significantly extended.

The introduction of a machine that would facilitate the automatic transfer of materials directly into the mold would reduce the labor effort for multi-layered parts. Furthermore. integrated internal cooling combined with machine process control would permit the lowering of cycle times for multi-layer parts through faster cooling. Internal mold cooling ensures that fast cooling is applied. And with the use of correct temperature-controlled cooling the onset of warping is avoided.

**Machine running costs and the way forward…**

***Energy Costs -*** The highest cost associated with rotomolding machines is energy. Whether it is heated by gas fire or electricity, the fact remains the majority of the heat is lost to the environment. This is the nature of the current process. The only way to reduce energy cost is to reduce energy used. This means controlling the surface area and volume of the heating system.

With the *conventional bi-axial arm ovens* the volume of the molds when compared to the volume of the oven can be very

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low; there can be a lot of empty oven space! This is because the bi-axial rotation of the arm tracks out a spherical volume. Thus there can be times when part of that space within the oven is empty. Larger ovens can mean more of this wasted space and greater surface areas from which to lose heat. Often very draughty from poor door seals and open arm pathways in the oven walls, the process can lose heat to the factory environment.

The optimum condition in terms of energy usage is direct mold heating, and this is when the mold itself becomes the oven or the actual source of heat. This can be done with direct mold-wall heating through contacting electrical elements or hot oil pathways. However, this method does not always provide the flexibility that comes with hot air convection ovens, and in some cases it can prove to be more expensive.

***Hidden Costs?*** There are other costs that are hidden and which may be eliminated through upgrading to new machinery:

*Draughty ovens lose heat* to an already unpleasant working environment. This no doubt plays a major part in the high labor turnover rate and costly re-training observed in rotomolding across many parts of the world.

*Old-model, featureless machines* prevent cost-effective multi-layer molding, fast dual-sided cooling, basic process control, and ambient temperature compensation. Surely this is a factor when bidding for new work, endeavouring to reduce processing costs, and trying to remain competitive in the marketplace.

*Lack of automation* encourages dependency on labor, and dependency on labor encourages human intervention in processing and all the issues that come with that (e.g., variable quality and high costs).

***A common misconception?*** Often the industry considers the only costs associated with the machine are the energy bill and capital repayment. The reality is the true costs of using outdated, old-style machines are energy, capital repayment, increased labor content and lost revenue as well as the usual issue of increased maintenance associated with outdated machines.



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## In The News:

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**What would an evolved machine with advanced features look like?**

Technology stagnation comes from a combination of insufficient market demand on the part of the customers, insufficient imagination on the part of machinery and equipment suppliers, and insufficient risk-taking on the part of the processors . There have been forays over the years into high-tech areas. However, they have always been short-lived. In order to ensure its acceptance within an industry the evolution of technology is necessary to avoid these failed forays. It is the steady and obvious approach that often results in establishing new technologies.

Therefore, somewhere between the flexibility of hot-air ovens with their gross inefficiencies and the constraints of the directly heated molds with their super-efficiencies lies the answer. Somewhere between the automotive production robots and the labor-intensive hot-air ovens there must be the provision for basic cycle enhancing and reducing features such as these:

- temperature-based process control
- ambient weather compensation
- powder preheating
- mold preheating
- internal air and water cooling
- warp-free parts
- consistent shrinkage in parts
- mold pressurisation
- multi-shot material loading
- automated demolding
- high-heat ovens
- rapid rotation speeds
- any others that appear to raise efficiency

whilst still allowing:

- current, in-house tooling to be used
- continued access to and use of low-cost tooling
- efficient energy usage
- high equipment usage efficiencies

**The evolved machine**

Following on from our laboratory-sized rotomachine, 493K and its international partners have developed a production machine that delivers these advancements. After the completion of extensive production testing, the machine will be released to the market.

The ultimate benefit of this new machine design is to offer all these features to conventional molds, without the need for specialised *heat-source jacketed* molds and entirely new processes for the rotomollder to contend with. History has proven this is key.

The production machine is based upon the same concept used in the laboratory machine – the revolving oven. This simple facility provides unrestricted access to the mold for all services needed to optimise cycles and yield state-of-the-art moldings.

The machine currently sits in a footprint of less than 20 square metres. It can utilise any mold within a cylinder of 2.5m diameter x 2.5m high. The machine is best described as a hybrid of the conventional rotomachine, but with accessibility to the mold such as that offered with a rock-and- roll machine.

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Marketed as the K-KREATOR, rotomolders can know what is happening inside their molds and have unique controllability of their manufacturing in real time through the combination of the following unique features:

***Full ambient services direct to the mold:*** This machine provides a path to the mold for full access of ambient condition services without passing them through a hot arm. This means the transfer in ambient temperatures of gases, polymer powder (perhaps liquid polymers), water, power or signals. This will make new possibilities available to molders for new and advanced materials and products.

***Degree-by-degree rotational control :*** K-KREATOR's control of rotation provides an entirely new angle on rotomolding. With accuracies of one angular degree on both the major and minor axes, molders can decide precisely when and where they want the powder pool to be. Programmable wall-thickness variation provides molders the opportunity to thicken areas containing inserts, strengthen specific areas of the molding, and even help get powder to areas which are normally difficult to reach.

***Supercharged air flows****:* K-KREATOR recycles supercharged air to maximise heat transfer into the mold. High mold-to-oven volume ratios ensure that hot air is directed between the mold wall and the oven wall at high speed. The electrically heated model avoids exhausting gases. Therefore, all the heat generated is contained within the oven and insulated ductwork.

***Programmable cooling rate:*** During cooling the oven is retracted away from the rotating arm, closed off and tightly sealed to reduce heat loss. Fast ambient air fans and controlled misting are used to cool the mold in a temperature-controlled fashion. Temperature-controlled internal cooling in tandem with external cooling ensures even cooling throughout the wall, resulting in warp-free parts.

***Armless oven:*** The K-KREATOR heats only the molds. The revolving oven is mounted on the inside of a major C axis, and all supporting metal work for the molds is on the outside of the oven. There is, therefore, less energy required to heat the system on a cycle-per-cycle basis. This of course means there is no heat lost from the hot arms during the cooling.

***Supporting new markets:*** The automation that comes with K-KREATOR begins with the polymer process optimisation and works through to the stage when the part is ejected from the mold. Minimum operator involvement is promoted through smart design of fixtures and common elements, regardless of the mold type used.

Simpler rotomolding through the use of smarter machines encourages those not familiar to rotomolding to consider molding in-house, leading to possible market growth. New engineering materials such as polyamides will become more commonplace with the removal of the need for high-skilled operations. Automatic feeding of components for multi-layer parts will open further possibilities for new products.

***For now rotational molding is at an important crossroads. It is faced with competition from blow molding's ability to produce large water tanks. Fortunately, for now, the cost/benefit of low- volume production runs is still rotomolding's best defence. To better compete moving forward, a delicate balance of moderate capital expenditure for machines and molds with advanced processing capabilities is the key. For the industry to advance and remain competitive it still needs the experience of today's rotomolder. However, the rotomolder must be armed with machines that can deliver stronger, higher-quality, more technically superior parts. The best product, though, would be one that can only be made by a new, feature-enhanced revolving polymer processing machine.***

Dr Gareth McDowell, 493K Ltd

## Industry News: Press Release– Roto Polymers

# ONE OF THE LARGEST NATURAL RESIN SUPPLIERS AND COLOR COMPOUND MANUFACTURERS IN NORTH AMERICA

ROTO POLYMERS
BEST ROTOMOLDING RESINS

Roto Polymers positioned itself as a principal supplier of high quality natural resins and leading manufacturer of color compounds used in several types of rotomolding applications. In fact, Roto Polymers is one of the largest natural rotomolding resin suppliers and color compound manufacturers in North America, supported by an infrastructure that supplies a volume of over 200 million pounds per year in over 30 countries.

If the name Roto Polymers is new to you, that's because the company is rebranded from its previous incarnation as Polimeros USA. The new name is part of a rebranding effort in North America that describes the evolution and growth of the company, and shines a spotlight on the high quality resins and compounds they provide. The rebranding was officially revealed at the 2016 ARM National Convention in New Orleans.

### Quality Polymers

The quality of Roto Polymers' resins meets and exceeds industry standards. The resins are UL Certified, tested and meet all recognized standards.

### Product Line

Roto Polymers' rotomolding resins are produced into five distinct polymer products: ROTOLENE®, ROTOLENE HIGH FLOW®, ROTOLENE INDUSTRIAL®, ROTOLENE HD® and ROTOLENE BLACK ULTRA®. Each one of these products is uniquely formulated to have specific properties and characteristics that fit a host of end applications. Here is a breakdown of the Roto Polymers product line, complete with *Density* and *Melt Index* data for each product:

**ROTOLENE®** -- A hexene copolymer linear medium density polyethylene recommended for general purpose applications and products which require excellent mechanical properties. When used for inner layers, Rotolene provides a smooth finish and texture. Rotolene is available in natural and color powder or pellets, and is a fully UV8 stabilized resin.

ROTOLENE®

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| TEST | ASTM | UNITS | RESULT |
|---|---|---|---|
| DENSITY | ASTM D1505<br>Reference<br>MA-01<br>Own Method | $gr/cm^3$ | 0.935 |
| MELT INDEX<br>@190°C/2.16 kg | ASTM D1238 | gr/10min | 5.0 |

**ROTOLENE HIGH FLOW®** -- A hexene copolymer linear medium density polyethylene specifically designed for applications requiring exceptional processability and aesthetics, low warpage and good mechanical properties. Rotolene High Flow is fully heat and UV8 stabilized for intermediate bulk containers, toys, general purpose custom molding, agricultural storage tanks, water tanks, marine parts, indoor consumer articles and complex parts. Rotolene High Flow's qualities include low viscosity, outstanding impact strength and stress crack resistance. This product is available in natural and color powder or pellets.

| TEST | ASTM | UNITS | RESULT |
|---|---|---|---|
| DENSITY | ASTM D1505<br>Reference<br>MA-01<br>Own Method | $gr/cm^3$ | 0.935 |
| MELT INDEX<br>@190°C/2.16 kg | ASTM D1238 | gr/10min | 7.0 |

**ROTOLENE INDUSTRIAL®** -- A hexene copolymer linear medium density polyethylene recommended for large, stronger parts and applications. Products made from Rotolene Industrial include industrial tanks, large cisterns, agricultural tanks, chemical tanks and applications requiring excellent chemical resistance, impact strength and ESCR resistance. Molded parts exhibit smooth surface finish. Rotolene Industrial is available in natural and color powder or pellets, and is a fully UV8 stabilized resin.

| TEST | ASTM | UNITS | RESULT |
|---|---|---|---|
| DENSITY | ASTM D1505<br>Reference<br>MA-01<br>Own Method | $gr/cm^3$ | 0.938 |
| MELT INDEX<br>@190°C/2.16 kg | ASTM D1238 | gr/10min | 3.5 |

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## Industry News: Press Release– Roto Polymers

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**ROTOLENE HD®** -- A hexene copolymer high density polyethylene designed for products requiring superb processability and aesthetics, low warpage and good mechanical properties. Rotolene HD is fully heat and UV12 stabilized for large agricultural tanks, intermediate bulk containers, potable water, chemical tanks and industrial products. Rotolene HD's qualities include unbeatable impact strength and stress crack resistance, and is available in natural, black and several colors in powder or pellets.

| TEST | ASTM | UNITS | RESULT |
|---|---|---|---|
| DENSITY | ASTM D1505 Reference MA-01 Own Method | $gr/cm^3$ | 0.942 ± 0.005 |
| MELT INDEX @190°C/2.16 kg | ASTM D1238 | gr/10min | 2.0 ± 0.5 |

**ROTOLENE BLACK ULTRA®** A copolymer linear medium density polyethylene consisting of great mechanical properties, heat resistance, minimal porosity and a tremendous homogeneous molecular structure. Black Ultra is a recycled polyethylene compound typically used to produce small parts, trash containers (or garbage bins) and applications that require lower cost and great quality. Available in black powder, is fully UV8 stabilized and is a recycled product.

| TEST | ASTM | UNITS | RESULT |
|---|---|---|---|
| DENSITY | ASTM D1505 Reference MA-01 Own Method | $gr/cm^3$ | 0.937 ± 0.008 |
| MELT INDEX @190°C/2.16 kg | ASTM D1238 | gr/10min | 5.2 ± 0.8 |

### Rotomolding Applications

Roto Polymers supplies natural rotomolding resins and manufactures color compounds that are used by customers to produce an assortment of rotomolding end applications. Ranging from industrial to commercial products, these applications include:

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## In The News: Press Release– Roto Polymers

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| | |
|---|---|
| **Industrial tanks** | **Large cisterns** |
| **Agricultural tanks** | **Chemical tanks** |
| **Bulk containers** | **Water tanks** |
| **Marine parts** | **General purpose custom molding** |
| **Trash containers** | **Outdoor chairs** |
| **Kayaks** | **Coolers** |
| **Hot tubs** | **Outdoor playhouses, slides & swing sets** |

### Value Added Services

Manufacturing world-class compounds, Roto Polymers is an expert in the rotational molding industry. Therefore, Roto Polymers is in the unique position to be able to provide the following four key services to help customers and other organizations in the rotomolding industry streamline their rotomolding operations:

**Process Optimization**
Roto Polymers provides process consultation to optimize a rotomolding company's efficiency and profitability with their resin products.

**Personalized Attention**
Roto Polymers helps rotomolders solve the most complex rotomolding project challenges. Their highly qualified staff understands plastic resin needs and builds customized solutions.

**Project Consultation**
Roto Polymers works closely with customers to develop innovative methods to improve production.

**Logistics**
Roto Polymers' global logistics team manages the entire rotomold powder and pellet delivery process from start to finish. They make sure the integrity of their rotomolding resins and compounds is preserved during shipping and arrives at its destination in a timely manner.

Contact

Meet Roto Polymers and discuss your custom rotomolding needs! Roto Polymers is active at industry meetings and trade shows. Look for their booth at the following events in 2017:

ARM/ARMA Joint Executive Meeting (March 26-28) in Maui, Hawaii
Rotoplas International Rotational Molding Exhibition (September 26-28) in Chicago, Illinois

If you are ready to take your rotomolding business to the next level, call Roto Polymers at **(844) 765-4637** or email them at **info@rotopolymers.com**. Be sure to visit **rotopolymers.com** for more information.

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## In the News: Dr. Peter J. Mooney Updates PCRS Guide to NA Rotomolders

# *Back by popular demand --- The Updated PCRS Guide to North American Rotomolders*

By: Dr. Peter J. Mooney

Elsewhere in this issue of the newsletter you have an excellent, candid and compelling analysis of the current and possible future state-of-play of the rotomolding machinery business submitted by Gareth McDowell ("The Evolution of Rotomolding Machinery Takes Time"). Some of his arguments are conventional whereas others are controversial. Ideally Gareth's article will provoke equally thought-provoking letters to the editor, pointing to areas of agreement and disagreement.

One point which I would make is Gareth perhaps understates the part design freedom of contemporary rotomolders – certainly those in North America. Obviously the process is ideal for the production of seamless hollow parts. This is true, as he says, of tanks. However, he goes too far when he says, "Aren't all hollow rotomolded articles imaginatively shaped tanks?" In his mind we're still at the evolutionary stage of "the PE box".

I have been conducting single- and multi-client market research programs covering the North American rotational business since 1995. These projects are generally light on the technical aspects and heavy on the economic/market aspects. I confess I simply know enough to be dangerous regarding the nuances of the modern rotomolding process.

Yet I have no doubt that most rotomolders in this region have acquired the expertise in machinery, molds and materials to produce parts of considerable sophistication. The era of tanks, toys and not much else is over.

I say this since I am currently engaged in a 3-month effort to update the "PCRS Guide to North American Rotomolders" which I prepared and published in 2011. This new directory follows the previous format of providing profiles of hundreds of U.S., Canadian and Mexican companies with rotomolding operations. In virtually every case I will have made telephone contact with officials to confirm the current nature of their operations. Each company profile will contain the following information:

location of the company headquarters and plants
company website and phone number
nature of the company operations (captive, custom or proprietary)
major market(s) addressed
recent annual sales
official to contact with email address

Submit your news story or technical article to the RMD Newsletter !

*The submission deadline for the next addition is March 1st.*

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## In the News: Dr. Peter J. Mooney

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As I review the company websites and communicate with officials I'm constantly amazed at the wide range of parts and final products which the contemporary rotomolding process makes possible. Here's a sampling:

aerospace parts
children's slides
displays and exhibits
floor care equipment parts
gas station pump parts
MRI parts
musical equipment cases
outdoor lighting
skylights
spas and spa steps
spill pallets
spine boards
traffic doors

None of these applications are hollow or tank-like. They are curvi-linear. Note they could all be produced by means of heavy-gauge thermoforming. The fact that they're not speaks to the cost-competitiveness of the rotomolding process – machinery, molds and materials. And many of these applications call for higher-performance properties than polyethylene can offer.

So are there rotomolders content to rely solely or largely on the production of kayaks, toys and tanks? Of course, because there is a market for these products, and rotomolders are ideally placed to satisfy those needs. Yet many regional rotomolders have ventured into applications where they must compete against blow molders (e.g., medical mannequins), injection molders (e.g., electronic and medical equipment enclosures), pipe extruders (e.g., pipe rotolining), and profile extruders (e.g., porch columns). Others have invested in alternative plastics processing capabilities (e.g., composite manufacturing) in order to complement their rotomolding operations.

My goal is to have this updated guide to North American rotomolders available by February 2017. If any regional rotomolder wishes to contact me to ensure their company is included, I would welcome hearing from them.

Dr. Peter J. Mooney
Plastics Custom Research Services
Email: plasres@AOL.com Phone #: (336) 998-8004

## Designer's Corner

# DESIGNER'S CORNER

Part #7

# RESTRICTED CORNERS

By: Glenn Beall

Editor's Note:

This is the 7th in a series of twenty-six articles that will review how to design rotationally molded plastics parts and products. We look forward to publishing these articles over many issues. This is a great opportunity for newcomers to the community as well as an always appreciated chance for review of important information.

The challenges associated with designing rotationally molded parts with closely spaced parallel walls were reviewed in the last Designer's Corner article. Another parallel wall consideration that affects the flow of the powder and wall-thickness uniformity is the angle between two intersecting walls. As the angle between two walls becomes less than 90°, the open space between them is reduced (Figure 11).

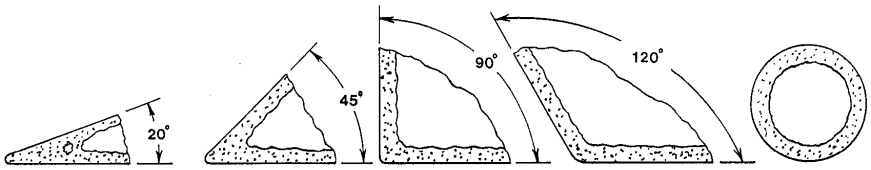


Figure 11 Corner angles of less than 45° produce thicker walls, voids, and increased shrinkage.

With angles of 45° or less the two walls begin to act like closely spaced parallel walls. These converging walls violate the minimum allowable space between parallel walls before they meet at the corner of the part. This makes it difficult or impossible for the powdered plastic to flow all the way into the corner. These corners are difficult to coat uniformly, and they often contain thick sections and internal voids, as shown in the part in Figure 12.

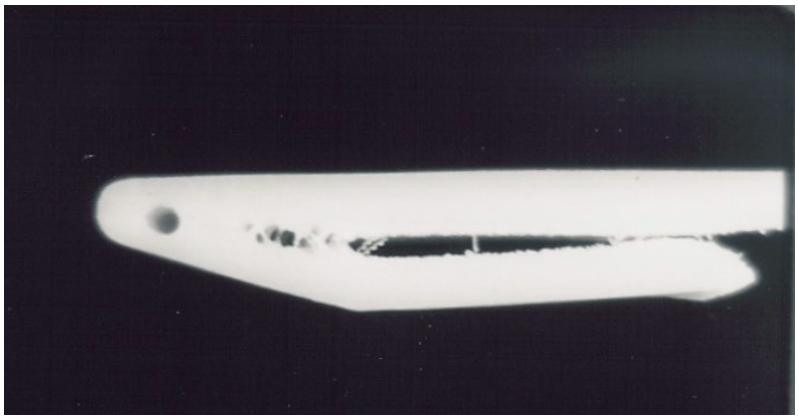

Figure 12 Small corner angle causing bridging, a thick section, and internal void.

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## Designer's Corner

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Some materials are better than others at flowing into restricted corners. Nylon has been successfully molded into angles as small as 20°. PE and PVC can have problems with angles of 30° or less. PC is better with angles of 45° or greater. All the commonly



moldable materials can accommodate a 90° or greater angle. The ideal shape for rotational molding would, however, be a sphere which has no corners at all.

Angles of less than 45° accumulate more plastic material than larger angles. The resulting thicker sections take longer to cool. The additional shrinkage in these thick corners contributes to molded-in stress and warpage. The two straight, parallel walls on the right hand side of Figure 12 have warped toward each other due to the increased shrinkage in the thick section on the left hand side of the part.

In situations where a small angle is required, these problems can be minimized by keeping the extension as short as possible and providing the largest allowable radius at the corner where the two walls meet. The important topic of corner radiuses will be covered in the next Designer's Corner article.

This article is a condensed extract from G. L. Beall's Hanser Publishers book entitled "Rotational Molding Design, Materials, Tooling, & Processing" available at hanser@ware-pak.com or phone (877) 751-5052.

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**Looking for a career change in the plastics industry? Go to**

**http://www.4spe.org/membercenter/careers/index.php**

**You will find advice on managing change, search for opportunities, even post your resume.**

Society of Plastics Engineers
Division of Rotational Molding
13 Church Hill Road
Newtown, CT. 06470

Phone: 847-549-9970
Fax: 847-549-9935

*Rotational Molding Division of the Society of Plastics Engineers.*

Your Award Winning Newsletter - 2005, 2006 & 2007

# Classified Advertising Opportunities


The **RMD Newsletter** is an award-winning publication available to thousands of SPE members on the RMD website.

This quarterly publication is well-read and received by international organizations and individuals involved in the rotational molding industry.

The RMD is now offering the opportunity for you to reach the global rotational molding markets by placing classified advertising in upcoming editions.

**RMD Classified Ads provide an excellent opportunity for you to:**

- ***Sell new and used rotational molding equipment and accessories***
- ***Promote goods and services to the rotational molding industry***
- ***Advertise for help wanted and positions wanted within the rotational molding industry***

**Positions Wanted ads may be sent to:**
**Melissa.inman@gulfviewplastics.com**
**(919)-888-0940**

**For paid advertising contact:**
**Russ Boyle**
**(727)-379-3072**
**Russ.boyle@gulfviewplastics.com**

## Rotational Molding Division Newsletter and Website Advertising

| | |
|---|---|
| Business card size advertisement | $400/year |
| 1/4 page size advertisement | $800/year |

Advertising in the Newsletter also includes a business card size advertisement on the Rotational Molding Divisions' website

Please contact Russ Boyle at 727-379-3072 or russ.boyle@gulfviewplastics.com

***View the current and previous editions of the RMD Newsletter online at www.rotational-molding.4spe.org***

**MEMBERSHIP APPLICATION**
(Online at www.4spe.org/join)

**Society of Plastics Engineers**
6 Berkshire Blvd., Suite 306
Bethel, CT 06801-1065 USA

**Membership Application**
PH: 203-775-0471 • Fax: 203-775-8490
www.4spe.org • membership@4spe.org

## Contact Information *Please print clearly*

First Name (Given Name) Middle Name

Last Name (Family Name)

Company Name/University Name (if applicable)

Mailing Address is: ☐ Home ☐ Business Gender: ☐ Male ☐ Female (for demographic use only)

Address Line 1

Address Line 2

Address Line 3

City State/Province

Country Zip/Postal Code Phone

Preferred Email (This will be your member login and is required for usage of online member services)

Alternate Email

Date of Birth (*Required* for Young Professional membership)

Graduation Date (*Required* for Student membership) Job Title

## Membership Types *Check one*

☐ **Student: $31** (Graduation date is required above)
☐ **Young Professional: $99** (Professionals under the age of 35. Date of birth is required above)
☐ **Professional: ~~$144.00~~ $129** (Includes $15 new member initiation fee)

Choose 2 *free* Technical Division and/or Geographic Section Member Groups. →

1. _____ 2. _____

Additional groups may be added for $10 each. Add Special Interest Groups at no charge.

1. _____ 2. _____
3. _____ 4. _____

Dues include a 1-year subscription to *Plastics Engineering* magazine-$38 value (non-deductible).
SPE membership is valid for 12 months from the date your membership is processed.

## Payment Information Payment must accompany application. No purchase orders accepted.

☐ Check Enclosed Amount _____

Charge: ☐ Visa ☐ Mastercard ☐ American Express Expiration Date: _____

Account Number: _____

Amount Authorized: _____ CSC#: _____ Last 3 digits from the back of MC/Visa. 4 digits from the front of AMEX.

Cardholder's Name (as it appears on card): _____

Signature of Cardholder: _____

### Payment by Wire Transfer Instructions

You **must** include account number +ABA number + bank fees.
Please include the Member ID# and Name so we may apply payment to the correct person.

**USD:** WELLS FARGO: 108 Federal Road, Danbury, CT 06811 USA

ACCT #2681786097 ABA #121000248 SWIFT CODE #WFBIUS6S

The SPE Online Member Directory is included with membership. Your information is automatically included unless you indicate otherwise.

_____ Exclude my email address from the Online Membership Directory
_____ Exclude all my information from the Online Membership Directory
_____ Exclude my address from 3rd party mailings

By signing below, I agree to be governed by the Bylaws of the Society and to promote the objectives of the Society. I certify that statements made in the application are correct and I authorize SPE and its affiliates to use my phone, fax, address and email to contact me.

Signature _____ Date _____

## Technical Division Member Groups - Connect with a global community of professionals in your area of technical interest.

☐ Additives & Color Europe - D45
☐ Applied Rheology - D47
☐ Automotive - D31
☐ Blow Molding - D30
☐ Color & Appearance - D21
☐ Composites - D39
☐ Decorating & Assembly - D34
☐ Electrical & Electronic - D24
☐ Engineering Properties Structure - D26
☐ European Medical Polymers - D46
☐ European Thermoforming - D43
☐ Extrusion - D22
☐ Flexible Packaging - D44
☐ Injection Molding - D23
☐ Medical Plastics - D36
☐ Mold Making & Mold Design - D35
☐ Plastics Environmental - D40
☐ Polymer Analysis - D33
☐ Polymer Modifiers & Additives - D38
☐ Product Design & Development - D41
☐ Rotational Molding - D42
☐ Thermoforming - D25
☐ Thermoplastic Materials & Foams - D29
☐ Thermoset - D28
☐ Vinyl Plastics - D27

## Geographic Section Member Groups - Network with local industry colleagues.

☐ Alabama/Georgia-Southern
☐ Asean*
☐ Australia-New Zealand
☐ Benelux
☐ Brazil
☐ California-Golden Gate
☐ California-Southern California
☐ Caribbean
☐ Carolinas
☐ Central Europe
☐ China
☐ Colorado-Rocky Mountain
☐ Connecticut
☐ Eastern New England
☐ France
☐ Hong Kong
☐ Illinois-Chicago
☐ India
☐ Indiana-Central Indiana
☐ Israel
☐ Italy
☐ Japan
☐ Kansas City
☐ Korea
☐ Louisiana-Gulf South Central
☐ Mexico-Centro
☐ Michigan-Detroit
☐ Michigan-Western Michigan
☐ Middle East
☐ Nebraska
☐ New Jersey-Palisades
☐ New York
☐ North Carolina-Piedmont Coastal
☐ Ohio-Akron
☐ Ohio-Cleveland
☐ Ohio-Miami Valley
☐ Ohio-Toledo
☐ Oklahoma
☐ Ontario
☐ Oregon-Columbia River
☐ Pennsylvania-Lehigh Valley
☐ Pennsylvania-Northwestern Pennsylvania
☐ Pennsylvania-Philadelphia
☐ Pennsylvania-Pittsburgh
☐ Pennsylvania-Susquehanna
☐ Portugal
☐ Quebec
☐ Spain
☐ Taiwan
☐ Tennessee-Smoky Mountain
☐ Tennessee Valley
☐ Texas-Central Texas
☐ Texas-Lower Rio Grande Valley
☐ Texas-North Texas
☐ Texas-South Texas
☐ Tri-State
☐ Turkey
☐ United Kingdom & Ireland
☐ Upper Midwest
☐ Utah-Great Salt Lake
☐ Virginia
☐ Washington-Pacific Northwest
☐ West Virginia-Southeastern Ohio
☐ Western New England
☐ Wisconsin-Milwaukee

*Asean: Indonesia, Malaysia, Phillipines, Singapore, Thailand, Cambodia, Laos & Vietnam

## Special Interest Groups - Explore emerging science, technologies and practices shaping the plastics industry. Choose as many as you would like, at no charge.

☐ Additive Manufacturing / 3D Printing - 033
☐ Advanced Energy Storage - 024
☐ Alloys & Blends - 010
☐ Bioplastics - 028
☐ Failure Analysis & Prevention - 002
☐ Joining of Plastics & Composites - 012
☐ Marketing & Management - 029
☐ Non-Halogen Flame Retardant Tech. - 030
☐ Plastic Pipe & Fittings - 021
☐ Plastics Educators - 018
☐ Plastic in Building and Construction - 027
☐ Quality/Continuous Improvement - 005
☐ Radiation Processing of Polymers - 019
☐ Reaction Injection Molding - 032
☐ Thermoplastic Elastomers - 006

Recommended by (optional) _____ ID# _____

PE15

# RMD Interim Financial Report

**SPE's Rotational Molding Division**
**Annual Financial Report 2015 -- 2016**
**July 1, 2015 to June 30, 2016**

| | Actual | Budget |
|---|---|---|
| **Cash Balance: Beginning Period** | $73,873.70 | |
| **Cash Receipts in Period** | | |
| SPE Rebate | $581.26 | $1,100.00 |
| Interest | $34.25 | $50.00 |
| Bank fee reimbursment | $20.00 | |
| Newsletter Ads/Sponsorships | $2,500.00 | $2,000.00 |
| TopCon 2016 | $282.00 | $20,000.00 |
| * Interest--should be on last yr | $3.61 | |
| **Total Income in Period** | $3,421.12 | $23,150.00 |
| **Cash Disbursements** | | |
| Postage | $6.10 | |
| Awards | $1,656.04 | $1,500.00 |
| Bank Fees | $6.00 | |
| IDES show | $1,871.00 | $3,000.00 |
| TopCon 2016 | $16,505.41 | $1,000.00 |
| Board Mtg | | $1,000.00 |
| Website | | $500.00 |
| ANTEC student activities | | $1,500.00 |
| Advertizing | | $3,500.00 |
| **Total Disbursements** | $20,044.55 | $12,000.00 |
| **Balance at end of Period** | $57,250.27 | |
| **Balance is made up as follows:** | | |
| Checking Account | $5,861.85 | |
| Savings Account | $51,388.42 | |
| **Total Balance** | $57,250.27 | |

* interst payment made 6/30/15 which should have been included in last years statement but was

Respectfully submitted
By Russ Boyle

SPE's **Digitized Presentations** are multimedia recordings of past e-Live™ Presentations.

Available for purchase on CD-ROM, they include presentations on more than 15 different plastics processes. Past e-Live™ Presentations are archived weekly. Go http://www.4spe.org/elearning/ for more information.

**Interested in sponsoring the RMD Newsletter? Please contact : Russ Boyle at Russ.boyle@gulfviewplastics.com or call at (727) 379-3072**

Welcome to SPE's Ask PiP (People in Plastics) discussion forums.
Ask PiP is a question/answer forum for the plastics industry.

This free service has been completely redesigned for easier access, utilization and functionality. We've added many new features to save you time and allow easier navigation. Ask PiP will now accommodate everyone. You can contact others in your field, post your questions or supply answers. All for FREE.
**http://www.askpip.org/**

# SPE-RMD LEADERSHIP ROSTER 2015-2016
## Officers/Directors/Chairman

**Barry Aubrey**
3694 TanBark Court
Amelia, OH 45102
(513)-892-9336
abiff99@aol.com
Past Division Chairman 2000-2001

**Glenn Beall**
Glenn Beall Plastics
32981 N. River Road
Libertyville, IL 60048
(847)-549-9970
glennbeallplas@msn.com
Historian
Past Division Chairman 1999-2000

**Russ Boyle**
Gulf View Plastics
18816 Oak Way Drive
Hudson, FL 34667
(727)-379-3072
Cell (270)-823-2256
Russ.boyle@gulfviewplastics.com
Treasurer

**Rob Donaldson**
Sasol Chemicals North America LLC
909 Osito Court
Keller, TX 76248
(281)-703-1672
Robert.donaldson@us.sasol.com
Past Division Chairman 2012-2015

**Melissa Inman**
Gulf View Plastics
109 Lands End Dr.
Williamsburg, VA 23185
(919)-888-0940
Melissa.inman@gulfviewplastics.com
Publications/Newsletter Chairman
Web Page Chairman
Director 2014-2017

**Tom Innis**
Avantech
1021 Madison St.
Brainerd, MN 56401
(440) 384-7654
Email: tinnis@avantech.com
Director 2015-2018

**Gary McQuay**
Engineering Manager
Plastics Innovation & Resources Center
DIF26
Pennsylvania College of Technology
One College Avenue
Williamsport, PA 17701
(570)-321-5533 Ext. 7681
Cell (570)-490-4667
Chairman 2015-

**Dr. Peter Mooney**
Plastics Custom Research Services
695 Burton Road
Advance, NC 27006
(336)-998-8004
PlasRes@aol.com
Secretary
Publication/Newsletter Co-Chairman

**Bruce Muller**
Plastics Consulting, Inc.
682 SW Falcon Street
Palm City, FL 34990
(772)-781-6699
plasticsC@aol.com
Honorary Member

**Michael Paloian**
Integrated Design Systems
74 West Main Street
Oyster Bay, NY 11771
(516)-482-2181 x 101
paloian@idsys.com
Webinar Chairman
Past Division Chairman 2007-2008

**Jon Ratzlaff**
Chevron Phillips Chemical Co. LP
146 Plastics Tech Center
Phillips 66
Research Center
Highways 60 & 123
Bartlesville, OK 74003-6670
(918)-977-4761
RATZLJD@cpchem.com
Inter/Intrasociety Chairman
Past Division Chairman
2001-2002
SPE International President

# Rotational Molding Division Past Chairs

| | | | |
|---|---|---|---|
| Glenn Beall | 1999-2000 | Paul Nugent | 2005-2006 |
| Barry Aubrey | 2000-2001 | Ken Wessler | 2006-2007 |
| Jon Ratzlaff | 2001-2002 | Michael Paloian | 2007-2008 |
| Marshall Lampson | 2002-2003 | Greg Stout | 2008-2009 |
| Ken Pawlak | 2003-2004 | C. “Hank” White | 2009-2012 |
| Larry Schneider | 2004-2005 | Rob Donaldson | 2012-2015 |

Continued on page 21

# SPE-RMD LEADERSHIP ROSTER 2015-2016
## Officers/Directors/Chairman

**Dr. Denis Rodrigue**
University Laval
1065 Avenue De La Medecine
Dept. Chemical Engineering RM 3546
Quebec City, QC G1V OA6
Canada
(418)-656-2903
Denis.rodrigue@gch.ulaval.ca
ANTEC Technical Program Chairman
Director 2014-2017

**Larry Schneider**
Schneider Plastics, Inc.
39155 N. Pine Grove Avenue
Wadsworth, IL 60083
(847)-623-7535
schplastic@aol.com
Awards Chairman
Past Division Chairman
2004-2005

**Thomas Steele**
Cytec Industries
1937 West Main Street
Stamford, CT 06904
(203) 321 2261
Thomas.steele@cytec.com
Director 2014-2017

**Ken Wessler**
Hedstrom
P.O. Box 99
Dunkirk, OH 45836
(419)-294-7269
kenwessler@prodigy.net
Grants and Scholarships Chairman
Past Division Chairman
2006-2007

**Charles (Hank) White**
Pennsylvania College of Technology
PMC DIF 26
One College Avenue
Williamsport, PA 17701
(570)-321-5533
cwhite@pct.edu
Past Division Chairman

**Larry Whittemore**
Stoner, Inc.
P.O. Box 65
1070 Robert Fulton Highway
Quarryville, PA. 17566
(717)-786-7355 Ext. 3118
Lwhittemore@StonerSolutions.com
Director 2015-2018

**SPE Liaison**

**Kathy Schacht**
Society of Plastics Engineers
6 Berkshire Blvd. Suite 306
Bethel, CT 06801-1065
(203) 740 5430
Cell (203)-775-8490
kschacht@4spe.org

**International Ambassadors**

**Roy Crawford**
18 Stonebridge Estate
RD 9
Hamilton 1706
New Zealand
67 64 7838 4673
r.crawford@waikato.ac.nz

**Mark Kearns**
Queens University
Ashby Building
Stranmillis Road
Belfast BT9 5AH
44 2890974700
m.kearns@qub.ac.uk

**Volunteers**

**John Bartolomucci**
Plastics and Polymer Engineering Tech.
DIF 27
Pennsylvania College of Technology
One College Avenue
Williamsport, PA 17701
(570)-320-2400 Ext. 7012
jbartolo@ptc.edu

**Joseph Lindsey**
PlayPower, Inc.
907 E. County Road
Monett, MO 65708
(417)-354-2563
Joe.lindsey@playpower.com

**The Rotational Molding Division would like to acknowledge and thank the following organizations that share their resources with the RMD by allowing and encouraging their employees to serve as members of the RMD Board of Directors.**

PCRS
PLASTIC CUSTOM RESEARCH SERVICES

PLASTICS CONSULTING, INC.
WWW.PLASTICSCONSULTING.COM

CRI
CUSTOM RESINS

GULF VIEW PLASTICS
GVP

Glenn Beall Plastics, Ltd.
Product Design
& Development

nexeo solutions

ExxonMobil Chemical

Pennsylvania College of Technology
PENNSTATE
Plastics Innovation & Resource Center
www.pct.edu/pirc

CYTEC
SOLVAY GROUP

Stoner ROTATIONAL MOLDING

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