RMD News

The Rotational Molding Division of SPE Newsletter

2nd Quarter 2015 Volume 15 Issue 2

In the News:

Plastics Professionals Converge on Penn College Campus

Meet Our Members:

Denis Rodrigue

Department of Chemical Engineering, Université Laval

Plasticraft and Milwaukee Institute of Art and Design (MIAD) Collaborate to Educate

VISIT US ON OUR WEBSITE WWW.SPE-ROTOMOLDING.ORG

ROTATIONAL MOLDING

Also In this issue:

Chairman's Message

Rob Donaldson

Chair's Message

Hello fellow RMD Members.
I hope this version of our division newsletter finds you busy and your business prosperous. This will be my last Chair message before I pass off the reins to our new RMD Chair, Gary McQuay. I would like to congratulate Gary and the Board for the great work they have completed during my Chairmanship for the last 3 years. I appreciate all of your enthusiasm, effort and patience in all our dealings. It was a strong team effort and I believe we accomplished what I formally (and informally) set out to achieve personally.

I still remember the day that I was truly humbled when I received a call, so many years back, and was asked, "Have you ever thought about volunteering on the SPE RMD Board?" I was lucky enough to be elected later that year and like any worthwhile uses of volunteer time have appreciated the opportunities the RMD has afforded me, including being their Chair. I am indebted to those who have mentored me (Glenn Beall, Larry Schneider, Hank White, Peter Mooney, Bruce Muller, Russ Boyle and so many others) as they have made this a terrific experience.

In the spirit of giving back, I will still be involved with the RMD by co-chairing the TOPCON 2016 with Larry Whittemore and we both look forward to that challenge. TOPCON is the next big ticket item for the RMD to organize and execute. There is much more news on this and you will be getting updates very soon.

I want to thank all the present (and former) RMD Board members for volunteering your time and energy. You are crucial to the survival of our small Division and you have my admiration and thanks. To those that have not volunteered for our Division this is a challenge to you; come work with a great team of likeminded professionals that love and promote Rotational Molding.

Yours in Rotomolding,

Rob Donaldson
RMD Chair

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

INDEX

Meet Our Members

Denis Rodrigue

Department of Chemical Engineering, Université Laval

Denis Rodrigue obtained a B.Sc. (1991) and a Ph.D. (1996) in chemical engineering from *Université de Sherbrooke* (Sherbrooke, Canada) with a specialization in non-Newtonian fluid mechanics. In 1996, he moved to *Université Laval* (Quebec City, Canada) where he became full professor in 2005. Over the years, he was visiting professor at different universities like University of Guadalajara (Mexico) and Karlsruhe Institute for Technology (Germany). His current interests and research areas include:

Foams, Suspensions, Emulsions, Polymers in solution, Interfacial phenomena, Rheology, Newtonian and non-Newtonian fluid mechanics, Multiphase flows, Recycling, Separation processes and Polymer processing in general.

Professor Rodrigue had several positions in the Department of chemical engineering at Université Laval: Head of undergraduate studies (2002 - 2009), Assistant head of the Department (2002 - 2009) and Head of international studies (2002 - 2013). He was also the vice-president (2002-2003) and president (2003-2005) of the *Quebec Polymer Society* (QPS). As an active member of the *Society of Plastics Engineers* since 2002, he is now a member of the rotational molding division board (ANTEC technical programme chair) since 2014. Finally, he is currently serving on the Advisory Editorial Board of the *Journal of Cellular Plastics* as well as *Cellular Plastics*.

Denis Rodrigue, ing., Ph.D.
Professor
Department of Chemical Engineering
Université Laval
Adrien-Pouliot building, room 3546
1065 Avenue de la médecine
Quebec City, Qc
G1V 0A6
Canada

Tel.(418) 656-2903
Fax.(418) 656-5993
Email. Denis.Rodrigue@gch.ulaval.ca

In the News

Plastics Professionals Converge on Penn College Campus

The renowned Plastics Innovation & Resource Center at Pennsylvania College of Technology extended its expertise to plastics professionals throughout the country by hosting the seventh annual Hands-On Rotational Molding & Advanced Materials Workshop earlier this month.

With support from the Association of Rotational Molders and the Society of Plastics Engineers Rotational Molding Division, the PIRC's workshop brought 31 individuals to campus, representing various sectors of the plastics industry and 11 states.

> "It was tremendous to host diverse plastics professionals from throughout the country for this year's workshop," said Gary E. McQuay, PIRC engineering manager. "Attracting such talent on an annual basis speaks to the high quality of both the workshop and our plastics facilities at Penn College."

Participants received training on higher-level technology in rotational molding. The two-day course offered classroom presentations and hands- on sessions connecting material preparation to molding parameters and final-part quality.

"The rotational molding and advanced materials workshop gave me an increased awareness of many nuances of rotomolding and will help me work with rotomold suppliers to design and procure quality parts," said Trevor Bludis, of Novatec Inc. in Baltimore.

Marc Willma, of Elkhart Plastics Inc. in Middlebury, Indiana, said the workshop "showed very good descriptions of voids, bubbles and blowholes."

Added Brian Steenbeke, of Brunk Corp. in Goshen, Indiana: "Excellent class. Very relevant."

Rotational molding experts presenting at the workshop included Paul Nugent, Jerry Ramsey and Terry Gillian. Nugent wrote the book, "Rotational Molding: A Practical Guide," and travels across six continents offering his expertise. Ramsey is owner of Akro- Plastics, a custom rotational molder in Kent, Ohio.

Gillian is the founder and owner of Paladin Sales in Uniontown, Ohio, a firm representing manufacturers serving the rotational molding industry .

Continued on page 5

Continued from page 4

The hands-on portions of the workshop featured the expertise of Penn College personnel. McQuay and John R. Bartolomucci, assistant professor of plastics & polymer technology, led lab experiences with support from Ryan L. Newman, PIRC technician, and research assistants Madison T. Powell, Jared W. Mahaffey and Ian Killian.

Additional PIRC support came from C. Hank White, director; Christopher J. Gagliano, program and technical service manager; Christy S. Allen, client development consultant; JoAnn M. Otto, PIRC assistant; and Beth Zielewicz, customer service assistant..

Penn College is one of just five colleges in the nation offering degree programs accredited by the Engineering Technology Accreditation Commission of ABET. For information on the plastics degrees and other majors offered by the **School of Industrial, Computing & Engineering Technologies**, call 570-327-4520.

The PIRC is one of the top plastics technology centers in the nation for research, development and education related to injection molding, extrusion, blow molding, rotational molding and thermoforming. Its Rotational Molding Center of Excellence is a technical resource offering independent, hands-on applied research and development to the rotomolding community.

To learn more about the **PIRC** and the Rotational Molding Center of Excellence, call 570-321-5533.

For more about **Penn College**, email the **Admissions Office** or call toll-free 800-367-9222.

In The News

HOW EFFICIENT IS DRY-BLENDING AND ROTOMOLDING TO PRODUCE WOOD-PLASTICS COMPOSITES COMPARED TO COMPRESSION MOLDING

Denis Rodrigue[1], Brian Vezeau[1], Bernard Riedl[2]
1-Université Laval, Department of Chemical Engineering, Quebec City, Quebec, Canada, G1V 0A6 2-Université Laval, Department of Wood and Forest Science, Quebec City, Quebec, Canada, G1V 0A6

Abstract

In this work, wood-plastics composites (WPC) were produced at different wood contents (0-40% wt.) in linear medium density polyethylene (LMDPE). In particular, the initial dry-blending of the materials was performed and a comparison is made on the effect of theprocessing method used: 1) compression molding, 2) melt blending followed by compression molding, and 3) rotational molding. The composite properties are then compared in terms of mechanical properties (tension and flexion) as well as polymer degradation while processing.

Introduction

In the last few years, several papers have been published on the production and characterization of wood- plastics composites (WPC) via different molding processes like extrusion, injection and compression. More recently, rotational molding was also proposed to produce WPC and this method has been studied in our group using wood [1-5], and natural fibres [6].

In general, it is necessary to decrease the processing cost by limiting the number of processing steps. Since both materials (polymer matrix and reinforcing fibres) can be obtained in a powder form, a simple dry-blending technique has been used as a preliminary step to get good dispersion without having to melt and mechanically process the compounds. It is believed that by doing so, this also limits thermo-oxidation degradation of both materials. But several questions are still unanswered about the efficiency of the dry-blending technique and processing these materials via rotational molding.

The objectives of the present investigation are to answer three important question: 1) how efficient is rotomolding to produce WPC since no pressure is applied on the materials in the melt state, 2) how efficient is dry- blending when compared to melt blending in terms of overall properties of the composites, and 3) how much difference in terms of polymer degradation is induced by the processing used. To answer these questions, WPC with different wood content were produced via three methods based on an initial dry-blending of both components (fibre and matrix): 1) compression molding,
melt blending followed by compression molding, and
rotational molding. As a first step, no coupling agent or fibre surface treatment is used in this work.

Continued on Page 7

In The News

Continued from page 6

Materials

The polymer used was Hival 103508 from Ashland (Canada). This linear medium density polyethylene (LMDPE) has a density of 936 kg/m_3, a melt flow index of 3.5 g/10 min (190$_o$C @ 2.16 kg, ASTM D1238) and a melting temperature of 128$_o$C.

The reinforcement used was wood sawdust as residues from a softwood processing mill (Découpage Axis Inc., Princeville, Canada). The material was sieved to keep only particles between 125 and 600 microns and Figure 1 presents a general view of these particles.

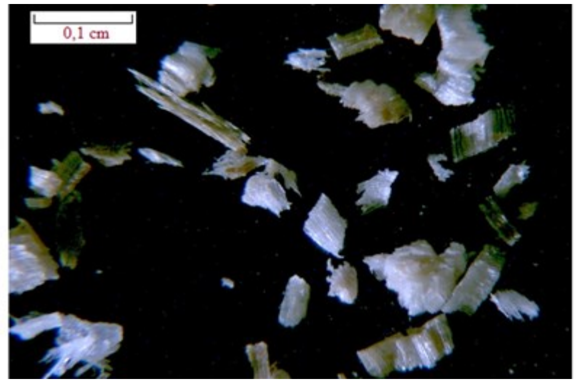


Figure 1. Optical micrograph of the wood particles used.

Methods

Before processing, the wood particles were dried overnight at 95oC in an oven. Then, dry-blending was manually performed with the LMDPE powder in a plastic bag for 1 min. For each compound (wood content between 0 and 40% wt.), three processing methods were used as described next.

Compression molding

The dry-blended compounds were placed in a mold having dimensions of 80 x 80 x 3.24 mm3 inside a Carver laboratory press model Mini Series C. Molding was performed at 160oC for 2 min without pressure, followed by 10 min with a force of 1.5 ton. Then, heating was stopped and water cooling was applied for 5 min.

Melt-blending followed by compression molding

In this case, the dry-blends were melt mixed in a Haake Rheomix internal batch mixer operating at 60 rpm and 150oC for 5 min. The compounds obtained were then compression molded as described above.

Rotational molding

The dry-blends were placed in a shuttle type rotational molding machine at WES Industries Inc. (Princeville, Canada). The geometry of the sample is presented in Figure 2 which was an automotive part (cup- holder). The oven temperature was fixed at 260oC and the rotation speed ratio was fixed at 4:1.1. The heating (natural gas oven) and cooling (forced air convection in summer time) periods were fixed at 18.5 min each.

Figure 2. Typical parts produced by rotomolding with 0% wood (left) and 20% wood (right).

Continued on page 8

Industry News

Continued from Page 7

After processing, the samples were cut into different geometries depending on the characterization to perform as described next.

Tensile Properties

Tensile tests were done using a universal mechanical tester model 5565 (Instron, USA) with a 500 N load cell. Type IV samples according to ASTM D638 were used to perform the tests at room temperature and a rate of 1 mm/min. For each material, five specimens were tested to get an average and standard deviation for tensile modulus and strength.

Flexural Properties

Three-point bending tests were done on a model 5565 (Instron, USA) universal mechanical tester equipped with a 50 N load cell. Rectangular bars with dimensions of
mm in width were used. The tests were performed at room temperature and 2 mm/min with a span of 60 mm. Five samples were tested for each material to get an average and standard deviation for flexural modulus.

Morphology

Optical images were taken on an Olympus SZ-PT stereomicroscope to determine the geometry and sizes of the wood sawdust. Also, micrographs of the molded samples cross-sections were taken at different magnifications by a JEOL JSM-840a scanning electron microscope (SEM). Each sample was first broken in liquid nitrogen and then covered with a thin layer of Au/Pd.

Gel Permeation Chromatography (GPC)

To determine the absolute molecular weight distribution of the polymer matrix, a high temperature GPC system was used: Viscotek HT-GPC 350 (triple detection). The measurements were performed in 1,2,4 trichlorobenzene (TCB) at 140^{o}C. Three repetitions were used for each sample.

Density

Density was measured by the ratio of mass over volume. Mass was measured by an analytic balance (Mettler, USA) to 10^{-4} g and volume was determined by water displacement.

More details about materials, processing and characterization can be found elsewhere [7].

Results and Discussion

Figures 3-5 present the results of the mechanical characterizations. From these figures, it is clear that the processing method has a direct effect on the behavior of the WPC produced.

First, Figure 3 presents the results of tensile modulus. For compression molding alone, the modulus increases continuously from 409 MPa for neat LMDPE to 661 MPa (62% increase) at 30% wood. On the other hand, no clear difference can be observed for the samples prepared by a previous melt blending at low wood content; i.e. up to about 30% wood. Nevertheless, at higher wood content (40%), the difference is significant where a modulus of 899 MPa was obtained in this case (120% increase compared to the neat matrix).

On the other hand, the samples produced by rotational molding have a decreasing tensile modulus with increasing wood content. As described in previous studies [1-4], this behavior is related to the lack of contact between the hydrophilic wood particles and the hydrophobic matrix. This incompatibility between each phase leads to the presence of interfacial voids inside the parts which also produces unwanted porosity. This can be seen in Table 1 where density results are reported. As wood content increases for compression molded samples (similar data where obtained within experimental uncertainty for samples with and without melt blending), density substantially increas-

Continued on page 9

Industry News

Continued from Page 8

es due the highest density of wood particles (usually between 1.3 and 1.5 g/cm3) compared to the polymer matrix (0.93-0.94 g/cm3). On the other hand, rotomolded samples have decreasing density with increasing wood content.

Table 1. Typical density (kg/m3) for compression molded and rotomolded samples.

Wood (%)	Compression	Rotomolding
0	930	940
10	950	920
15	950	880
20	960	750
30	1000	-
40	980	-

The porosity created inside the sample is believed to be the results of two main factors. First, there is no pressure applied on the melts inside the rotational mold and this limits the contact and the compaction between each phase. Second, the wood particles have very low bulk density and particle geometry different than the polyethylene powder. So there might be some segregation and difficult particle positioning inside the mold in rotomolding due to physical differences between each phase [8]. Selected images of the compression molded samples are presented in Figure 6, while typical micrographs of rotomolded samples were presented elsewhere [1-2].

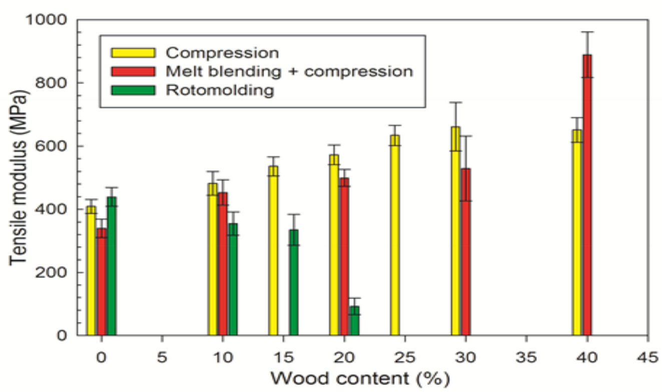


Figure 3. Tensile modulus results for all the conditions tested.

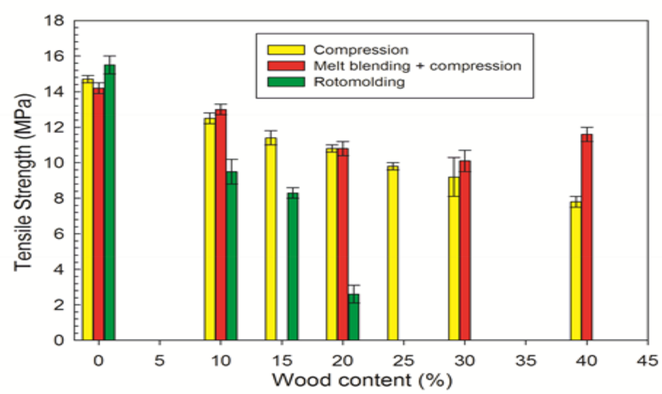


Figure 4. Tensile strength results for all the conditions tested.

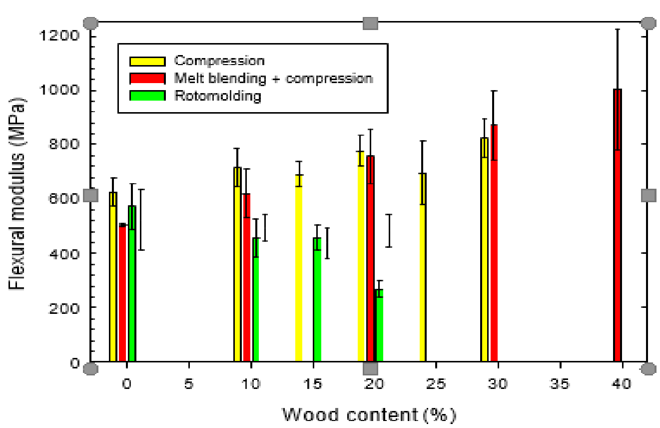


Figure 5. Flexural modulus results for all the conditions tested.

Continued on page 10

Industry News

Continued from Page 9

Figure 4 presents the tensile strength results for all the processing methods. In all case, the values are decreasing with increasing wood content. This behaviour is related to the fact that no coupling agent or wood surface treatment was used in this study. Due to bad compatibility between wood particles (polar) and polyethylene (non-polar), poor adhesion occurs limiting stress transfer [9]. Like for tensile modulus results (Figure 3), there is no significant difference between the samples compression molded at low wood content (up to 30%). But again, the melt blending step gives much better results at higher wood contents (40%) probably because of better wood dispersion and particle coverage limiting particle- particle interactions (contacts) which are causing defects inside the composites. Once again, rotomolded samples have lower tensile strength probably because of higher porosity (more defects) in the composites structure; i.e. the voids are not able to sustain any stresses as it is the case for foamed samples [3].

For flexural modulus, the trends are similar as reported for tensile modulus in Figure 3. Compression molded samples were able to improve the flexural modulus from 626 MPa for neat LMDPE up to 1003 MPa (60% increase) at 40% wood. Once again, rotomolded samples have decreasing flexural modulus with increasing wood content for the same reasons as presented above

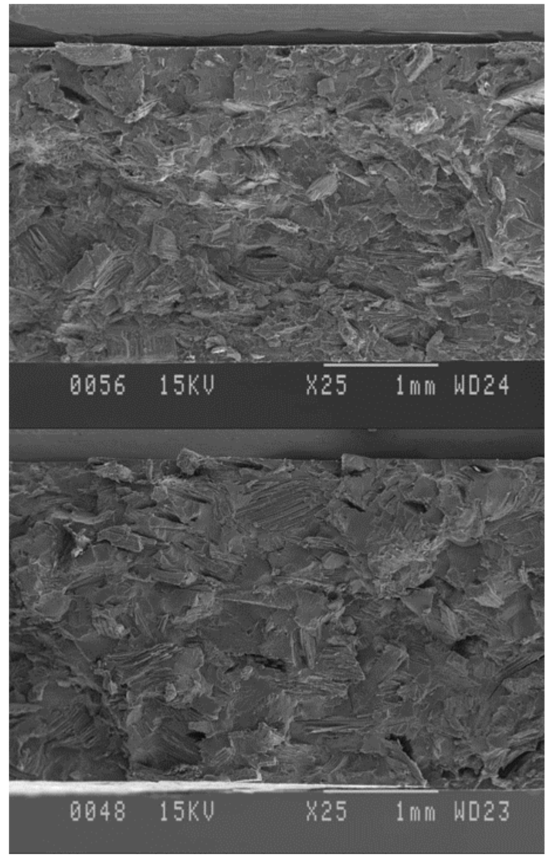


Figure 6. Selected SEM images for compression molded samples at 30% wood with (top) or without (bottom) a previous melt blending step.

Finally, Table 2 presents the molecular weight distribution results in terms of weight average molecular weight (Mw), number average molecular weight (Mn) and branching frequency (BF) which represents the number of side chains per 1000 carbon atoms of the backbone.

Table 2. GPC results of selected compounds.

Sample	Wood (%)	Mw (kDa)	Mn (kDa)	BF (#/1000C)
LMDPE	-	132	25.9	2.54
Compression	0	119	29.3	2.31
	10	103	26.6	2.21
	15	110	26.7	2.87
	20	110	27.2	3.55
Melt blending + compression	0	101	25.1	2.28
	10	104	24.7	2.85
	20	90.9	26.5	2.52
Rotomolding	0	111	26.1	2.29
	10	110	27.2	2.40
	15	105	28.6	2.34
	20	107	29.1	2.41

In general all the processing methods decreased the initial molecular weight of the virgin LMDPE powder (132 kDa). Compression molding alone seems to be the process having less effect on polymer degradation with the least reduction of Mw. On the other hand, melt blending followed by compression molding is the one degrading the most the polymer matrix since two heating steps are used, as well as degradation related to the mechanical energy of the rotor. In between, rotomolding has an intermediate behavior. There is less mechanical energy than melt blending, but the material spends more time at high temperature. By comparing the total processing time at high temperature, compression molding is around 12 min, melt blending followed by compression molding is around 17 min, and rotomolding is around 37 min. These results indicate the relative effect of thermal, oxidative and mechanical degradation of the polymer. Another results obtained from Table 2 is that Mw decreases, while Mn increases with increasing wood content. This indicates that mostly larger molecules are broken down into smaller ones since BF values are not significantly modified. Similar results have been reported by Wolcott [10].

Continued on page 11

Industry News

Continued from Page 10

Conclusions

In this work, the simple dry-blending method was used to produce wood-plastics composites (WPC) based on linear medium density polyethylene (LMDPE) and softwood sawdust. In particular, three different processing methods were applied to determine their effect on composite properties: 1) compression molding, 2) melt blending followed by compression molding, and 3) rotomolding. From the samples produced, mechanical (tension and flexion) and physical (density, gel permeation chromatography) characterizations were performed. The results obtained enabled to draw several conclusions as follows:

A) Rotational molding produces composites with high porosity degree due to the lack of pressure and poor compatibility between wood particles and polyethylene.
B) Even if no coupling agent or wood surface treatment was used, tensile and flexural modulus increased with wood content up to about 40% when compression molding was used with or without a preliminary melt blending step.
C) The use of a preliminary melt blending step is only necessary at higher wood content (40% wt. and above).
D) All processing methods produced polymer degradation; i.e. lower average weight molecular weight. The order of degradation level can be related to the amount of thermal and mechanical energy imposed on the materials while processing. Nevertheless, oxidative degradation must also be accounted for. This is why compression molding alone degraded the least the polymer, followed by rotational molding and melt blending combined with compression molding.

Finally, more work should be done to improve the mechanical performances of WPC by performing a preliminary step to modify the surface properties of the wood particles before the dry-blending step. Preliminary results were already conclusive [5,11]. More work should also be done on different polymer matrices and natural reinforcements to get a wider range of possibilities for these simple processing methods.

Acknowledgements

Financial support from the National Science and Engineering Research Council of Canada (NSERC) was obtained for this work. Polyethylene samples and rotational molding machine time from WES Industries Inc., as well as wood samples from Découpage Axis Inc. were greatly appreciated.

References

1. N. Ward-Perron, and D. Rodrigue, *Proceedings of the 70th SPE Annual Technical Conference & Exhibition*, Orlando (FL), 1-5 May, paper 00467 (2012).
2. A. Raymond, and D. Rodrigue, *Proceedings of the 71th SPE Annual Technical Conference & Exhibition*, Cincinnati (OH), 21-24 May. paper 1589808 (2013).
3. A. Raymond, and D. Rodrigue, *Cell. Polym.*, **32**(4), 199 (2013).
4. N. Ward-Perron, and D. Rodrigue, *Procedings of the 11th International conference on foam materials & technology*, Seattle (WA), 11-12 September, paper 22 (2013).
5. A. Raymond, and D. Rodrigue, *Proceedings of the 72th SPE Annual Technical Conference & Exhibition*, Las Vegas (NV), 28-30 April. paper 1870685 (2014).
6. R.H. López-Bañuelos, F.J. Moscoso, P. Ortega-Gudiño, E. Mendizabal, D. Rodrigue, and R. González-Núñez, *Polym. Eng. Sci.*, **52**(12), 2489 (2012).
7. Brian Vezeau, "Caractérisation mécanique de composites LMDPE/bois en vue d'une application en rotomoulage", M.Sc. Thesis, Université Laval, Canada (2010).
8. A. Aït Aissa, C. Duchesne, and D. Rodrigue, *Polym. Eng. Sci.*, **52**(5), 953 (2012).
9. A. Mechraoui, B. Riedl, and D. Rodrigue, *Compos. Interf.*, **14**(7-9), 837 (2007).
10. M.P. Wolcott, Wood-Fiber/Polymer composites: Fundamental concepts, processes, and material options, Forest Products Society, 134 p. (1993).
11. A. Verdaguer, and D. Rodrigue, *Proceedings of the 72th SPE Annual Technical Conference & Exhibition*, Las Vegas (NV), 28-30 April, paper 1869913 (2014).


The
Most Experienced
Rotational Molds Manufacturer-
Worldwide.
ROTATIONAL MOLDS
BUILDING TOOLS THAT WORK
A COMPREHENSIVE SET OF SERVICES
A TRADITION OF INNOVATION
Engineered Molds
Modular Molds
VMX Modular Spiders
NORSTAR
ALUMINUM MOLDS, INC.
W66 N622 Madison Ave., Cedarburg, WI 53012-0991 USA 262-375-5600 Fax 262-375-5660
E-Mail: norstar@norstarmolds.com Web: www.norstarmolds.com


ROTOMACHINERY GROUP™
ROTATIONAL MOULDING TECHNOLOGY
STP
ROTOMACHINERY
POLIVINIL®
ROTOMACHINERY
MANUFACTURERS OF ROTATIONAL MOLDING EQUIPMENT
STP ROTOMACHINERY INC.
120 rue des PME, Sherbrooke
J1C 0R2 (QC) CANADA
Ph. +1 819 846 2787
Fax +1 819 846 3096
Toll Free +1 888 308 4787
www.stprotomachinery.com
sales@stprotomachinery.com
- In-line shuttle machines
- Independent-arm machines
- Rock & Roll machines
- Turret machines
- Swing-arm machines
- Lab machines
- Dispensing equipment

Designer’s Corner

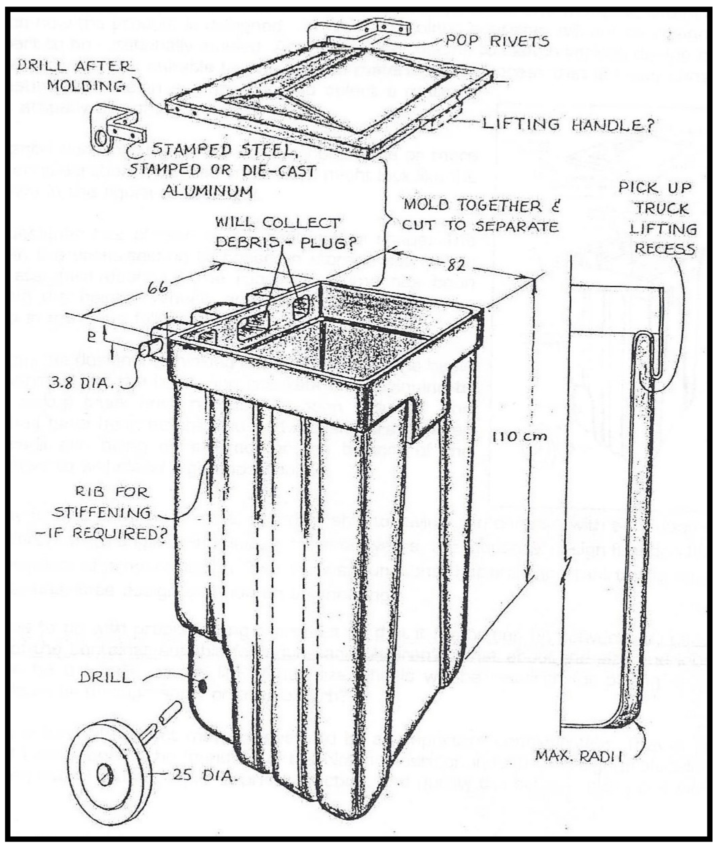
Product Design Considerations– Part Two

By: Glenn Beall

Once the design engineer has decided on a specific process and material, those decisions will influence how the product is designed. An injection molded container will not be designed the same way as a part to be rotationally molded. As the designer begins to sketch various design concepts, the structures that evolve will be suitable for the chosen material and process that is being considered. That is one of the reasons the design engineer should select a material and process before actually designing the part.

After some experimental doodling, the designer will choose one or more concepts for further consideration. The resulting sketch might look like the refuse container shown in this figure.

In this sketch, the designer has chosen a tall, rectangular shape. The container is narrow in cross-section to conserve storage space and to accommodate a standard doorway. The required volume has been achieved by increasing the height. Wheels and two larger handles have been provided, to help in moving a full container.



Even at this early stage, the designer’s thinking is well advanced. The basic elements of strong handles and the lid-hinging brackets are beginning to evolve. A molded-in pickup truck hook recess has been included. The molding parting line has been established and molding draft angles are evident. Larger radii are being considered for the bottom of the container, which will have to withstand high impact loads.

Before proceeding any further with the project, it is desirable to review the concept with an industrial designer. Industrial design is different from engineering design. In recent years, the industrial design function has expanded to encompass many aspects of product design. Two of those functions that are important to the success of this refuse container are appearance design and human engineering.

Human engineering has to do with proportioning a product so that it fits or can be conveniently used by human beings. Is the height of the container suitable for adults and children? What about the size and location of the handles? Should there be a handle on the lid? What size wheels will be required for pulling or pushing the container across the lawn, or through snow or over a curb?

The appearance of an industrial product may not seem to be an important consideration. That is an incorrect assumption. Raymond Loewy, one of the founders of the North American industrial design procession, correctly observed that

“Between two products, equal in price, function, and quality,
the better-looking one will outsell the other”

Continued on Page 17

Do you plan to change your email address? Make sure your email address is updated at http://www.4spe.org/forms/changeaddress.php and continue to get your copy of your newsletter!

For information on Conferences and more events, see the SPE website. You can find a thorough list of events worldwide for the plastics industry at: [.http://www.4spe.org/training/eventcalendar.php](http://www.4spe.org/training/eventcalendar.php)

Designer's Corner

Continued from Page 14

Industrial designers receive special training in appearance design, human engineering, and many other subjects. The early input of a qualified industrial designer can greatly increase the customer acceptance of a product. It is beyond the scope of this article to do justice to the industrial design function. Industrial designers are, however, another valuable resource that design engineers are not using to its full advantage.

At this phase of the project, it is important to compare the product that is evolving with the design checklist in order to make certain that it is still within the original product specifications. Compromise decisions made along the way may well have eliminated some important functional features. Studies by the Institute of Competitive Design have indicated that the decisions made up to this point will determine 75% of the product's cost. The design sketches should be reviewed one last time to determine whether or not there are any changes that could be made to reduce the product's cost. In the next phase of the project, other people will become involved. Once they approve the design concept, it becomes locked in. Future changes will be more difficult to make, as they will require the approval of the other interested people.

The concept sketches, or refined versions of them, will then be reviewed with the company's marketing department and/or the ultimate customer.

If the concept is acceptable as sketched, or with only slight modification, the design engineer can proceed to develop the product.

At this phase of the project, there is a list of requirements in the form of the checklist and a sketch showing the approximate size and shape of the product. The plastic material and molding method have been chosen. If the design engineer has little or no experience with rotational molding, it is highly desirable at this point to review the project with a custom molder. A molder may not have had prior experience with, and is probably not an expert in, refuse containers, but he will be an expert in rotational molding. Custom molders are a valuable plastic product development resource and are all too often overlooked by design engineers. Any successful rotational molder will know enough about design, plastic materials, tooling, and molding to be able to comment on the manufacturability of a product. A molder can provide valuable input on finalizing the material selection and deciding what kind of mold to use, and in fine-tuning the design for efficient molding.

The sketch, with its approximate overall size and estimated wall thickness, can also be used to secure tentative tooling and molded part cost estimates. These preliminary estimates will indicate whether the product is within an acceptable price range.

Up to this point in the project, all the work that has been done can be described as product design. The next step will be to reduce the concept sketch to a detailed piece-part drawing, or computer-aided design (CAD) database. The next DESIGNERS' CORNER article will address the issues to be considered in the piece part design part of the new product design and development process.

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.

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

The submission deadline for the next edition is Aug 1st.

Industry News

Plasticraft and Milwaukee Institute of Art and Design (MIAD) Collaborate to Educate

By: Louise Bushman

For almost 15 years, Matthew Bushman, president of Plasticraft Corporation in Darien, Wisconsin, has welcomed students from Milwaukee Institute of Art and Design (MIAD) as well as their professor, Pascal Malassigné, to observe the rotational and blow molding processes. This unique partnership is part of a semester-long class that teaches about materials and manufacturing processes. Bushman desires to educate the design profession on the proper manufacturing of parts. He believes that the earlier the designers are educated, the more they can expand their use of processes in their designs.

A typical visit to Plasticraft begins with Bushman and Jim Van Dreser, engineering manager, explaining the overall processes as well as the do's and don'ts of rotational and blow molding. By showing many products in Plasticraft's showroom, Bushman and Van Dreser explain the issues encountered during production. They also explain the give and take discussions that must take place between Plasticraft and designers in order to find the optimal design that can be successfully molded.

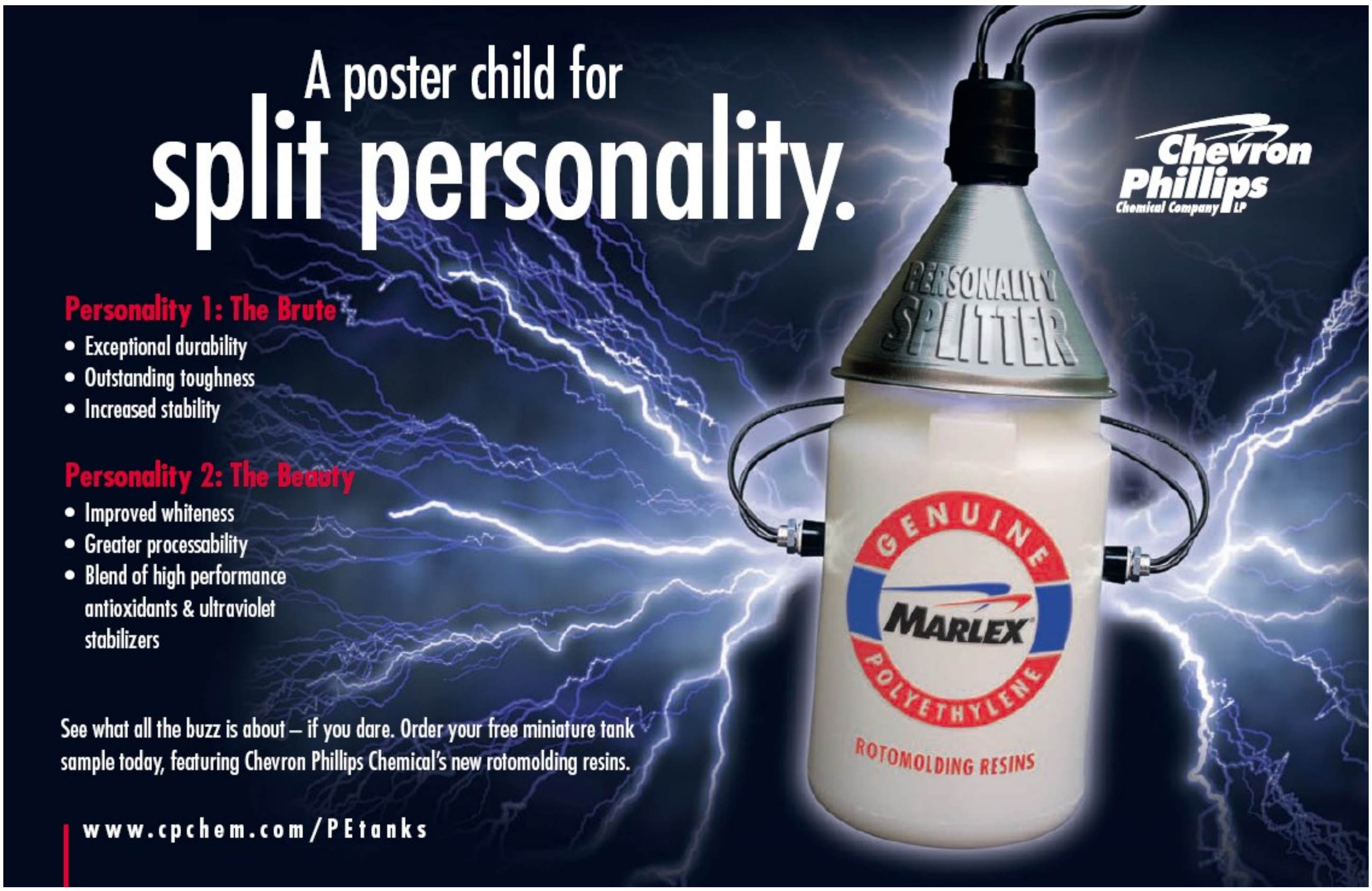
After receiving an overview, the students are taken into the plant to observe all steps of the processes. Although the students watch videos in class that depict processes and look at parts and samples, having the opportunity to see each production process in person is essential for the students to truly begin understanding the manufacturing of hollow plastic parts. The students are able to observe the fascinating molding processes from the beginning to the end. This includes smoothing out parting lines, robot trimming, foam filling, assembly, flame polishing, and packaging. Through viewing these processes, the students are able to compare theory to practical application and learn how things are actually done.

"A visit to Plasticraft is an ideal way for the students to learn. It is a far cry from the way I learned in the early 70s, which was entirely on a classroom blackboard," says Malassigné. Since the majority of design students are visual learners, this is vital as it enables them to more easily comprehend the processes.

The students appreciate the insight from the tour, as it is a class requirement to enter the ARM rotational molding design competition. In addition, students have entered rotational molding design competitions sponsored by SPE and WinSell Granites. Many MIAD students have been very successful in the competitions, winning awards for their designs. Bushman and Malassigné are very proud of the students' accomplishments and plan to continue this unique collaboration for many years to come

VISIT US ON OUR WEBSITE
WWW.SPE-ROTOMOLDING.ORG

SPE ROTATIONAL MOLDING



What can SPE Membership do for you?

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
rmd@rotomolding.net

RMD News

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.***

View the current and previous editions of the RMD Newsletter online at www.rotomolding.net

Nominal rates:

Business card ads only $100.00/issue, $350/year.

Classified ads for only $100.00 per column inch.

Positions Wanted, up to 75 words, free of charge to all SPE members!

Positions Wanted ads may be sent to:
Melissa.inman@gulfviewplasitcs.com
919-888-0940

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

Society of Plastics Engineers

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

P.O. Box 403, Brookfield, CT 06804-0403 USA
Tel: +1 203-740-5403 Fax: +1 203-775-8490
www.4spe.org

European Member Bureau
Eric Sasselaan 51, BE-2020 Antwerpen, BELGIUM
Tel: 32 (0)3 541 7755 Fax: 32 (0)3 541 8425 www.speeurope.org

Application Information

Name:
First last mi

Company Name and Business Address (or College)
Company / College
Job Title:
Address:
Address:
City **State:**
Zip: **Country:**

Phone/Fax Format: USA & Canada (xxx) xxx-xxxx All Others +xx(xx) x xxx xxxx

Work Phone: **Fax:**

Email: *used for society business only*

Home Address: *(please provide)*
Address:
Address:
City: **State:**
Zip: **Country**

Home Phone:

(√) **Preferred Mailing Address** O Home O Business

Gender: O Male O Female

Birth Date: (mm/dd/yyyy)

Demographics

Job Function: *(choose only one)*
O Consulting
O Design
O Education
O General management
O Library
O Manufacturing
O Maketing/Sales
O Other
O Purchasing
O Quality Control
O R & D
O Self Employed
O Retired
O Student Tech Support
O Tech Support

Materials: *(choose all that apply)*
O Composites
O Film
O General Interests
O Nylon
O PET
O Foam/Thermoplastics
O Polyolefins
O Polystyrene
O TPEs
O Thermoset
O Vinyls
O No Interests

Process: *(choose all that apply)*
O Blow Molding
O Compression
O Compounding
O Engineering Properties
O Extrusion
O Fabrication
O Foam
O General Interest
O Injection Molding
O Mold Making
O Product Design
O Rotational Molding
O Thermoforming
O No Interest

The SPE Online Membership Directory is included with your membership. Your information will automatically be inlucded.
O Exclude my email from Online Membership Directory
O Exclude all my information from the Online Membership Directory
O Exclude my address from all 3rd party mailings

Payment Information

New Member 1 year	New Member 2 Years *	Student Member
O US ($140.00)	O US ($253.00)	O US ($30.00)
O Euro** (€124.00)	O Euro** (€224.00)	O Euro** (€23.00)

My Primary Division is (Division names are below**): RMD (D42)**

Additional Divisions are available for a fee. Check below to select additional Divisions.
O Additives & Color Europe (D45)
O Automotive (D31)
O Blow Molding (D30)
O Color & Appearance (D21)
O Composites (D39)
O Decorating & Assembly (D34)
O Electrical & Electronic (D24)
O Engineering Properties & Structure (D26)
O Extrusion (D22)
O Flexible Packaging (D44)
O Injection Molding (D23)
O Marketing and Management (D37)
O Medical Plastics (D36)
O Mold Making & Mold Design (D35)
O Plastics Environmental (D40)
O Polymer Analysis (D33)
O Polymer Modifiers & Additives (D38)
O Product Design & Development (D41)
O **Rotational Molding (D42)**
O Thermoforming (D25)
O Thermoforming, European (D43)
O Thermoplastic Materials & Foams (D29)
O Thermoset (D28)
O Vinyl Plastics (D28)

Students must supply graduation date:____________

Membership Amount ____________

Primary Division FREE

Additional Division(s)
Costs for each Additional Division

	1 year	2 years
US	$10.00	$20.00
Euros	€8.00	€15.00

TOTAL ____________

O CHECK **O VISA** **O AMEX** **O MASTERCARD**

Card number

Expiration date (mm/dd/yyyy)

PAYMENTS MUST ACCOMPANY APPLICATION
Sorry, No Purchase Orders Accepted

Checks must be drawn on US or Canadian banks in US or Canadian Funds.
Dues include a 1-year subscription to *Plastics Engineering* magazine–$38.00 value (non-deductible).
SPE membership is valid for twelve months from the month your application is processed.
*extra savings. **European membership dues include a program fee to support SPE's activities in Europe.

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

Signature Date

Recommended by member (optional) ID #

WWW-RMD

RMD Interim Financial Report

SPE's Rotational Molding Division
Annual Financial Report 2013-2014
July 1, 2013 to June 30, 2014

	Actual (proposed)	Budget
Cash Balance: Beginning of Period	$61,391.45	
Cash Receipts in Period:		
SPE Rebate	$1,018.76	$1,160.00
Interest	$40.33	$32.00
Newsletter Ads/Sponsorships	$0.00	$2,000.00
Scholarships/Grants Fund	$20.00	$0.00
TopCon (TopCon 2013)	$2,885.82	$6,000.00
Total Income in Period	$3,964.91	$9,192.00
Total Cash to be accounted for	$65,356.36	
Cash Disbursements in Period:		
Board Meetings (teleconference)	$0.00	$500.00
TopCon (TopCon 2014)	$5,500.00	$500.00
e-Newsletter Printing/Mailing	$0.00	$0.00
Awards (Student Papers)	$0.00	$0.00
Scholarships/Grants	$0.00	$2,000.00
ANTEC Expenses	$0.00	$200.00
BOD & ANTEC Speakers Awards	$814.17	$1,500.00
President and Past Presidents Awards	$114.97	$500.00
Membership Outreach	$0.00	$250.00
Website Hosting	$269.86	$200.00
Election, Ballot, Postage	$0.00	$0.00
RMD Design Competition	$9,889.47	$2,000.0
Website Domain name (2013-2022)	$440.80	$0.00
Webinar	$0.00	$0.00
MISC (Plastics News Advertisement)	$3,600.00	$0.00
Checking Accounts Check-Leaves	$33.15	$0.00
Checking Statement expenses	$6.00	$0.00
Total Disbursements in Period	$20,668.42	$7,650.00
Cash Balance End of Period	$ 44,687.94	

The Cash Balance is made up as follows:

Scholarships/Grants (savings acc.)	$2, 042.69
Checking Account	$261.71
Savings Account	$42,383.54
Total Cash Balance	**$44,687.94**

Respectfully submitted
By
Rex Kanu
Treasurer RMD

SPE-RMD LEADERSHIP ROSTER 2014-2015
Officers/Directors/Chairman

Barry Aubrey
3694 TanBark Court
Amelia, OH 45102
513-892-9336
abiff99@aol.com
Past Chairman
2002-2001

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
M Holland Company
400 Skokie Blvd.
Suite 600
Northbrook, IL 60062
682-214-1828
Cell 682-351-8315
rdonaldson@mholland.com
Division Chairman 2012-2015

Melissa Inman
Gulf View Plastics
174 Alwoodley
Williamsburg, VA 23188
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

Ronald Markovich
The Dow Chemical
2301 N. Brazosport Blvd.
Freeport, TX 77541-3257
979-238-7541
rpm@dow.com
2014-2017 Councilor

Gary E. 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 Elect 2015-

Dr. Peter J. 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
33 Great Neck Road
Great Neck, NY 11021
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

SPE-RMD LEADERSHIP ROSTER 2014-2015
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

Fred Schockey
WinSell Specialty Plastics
1729 #J Merriman Road
Akron, OH 44313
330-836-7421
Cell 330-289-3449
fred@winSellinc.com
Membership Chairman
Director 2015-2018

Thomas P. 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 D 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

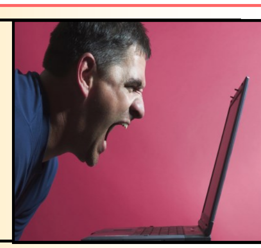
Mark Kearns
Queens University
Ashby Building
Stranmillis Road
Belfast BT9 5AH
44 2890974700
m.kearns@qub.ac.uk

Volunteers

John R 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

Joesph L. Lindsey
PlayPower, Inc.
907 E. County Road
Monett, MO 65708
417-354-2563
Joe.lindsey@playpower.com

Got a comment?
www.spe-rotomolding.org
919-888-0940



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®

M. HOLLAND™
THE GOLD STANDARD IN PLASTICS

Glenn Beall Plastics, Ltd.
Product Design
& Development

nexeo® solutions

ExxonMobil Chemical

Pennsylvania College of Technology
PENNSTATE

Plastics Innovation & Resource Center
www.pct.edu/pirc

SELJAN COMPANY INC.

Chevron Phillips Chemical Company LP