RMD News
The Rotational Molding Division of SPE Newsletter

4th Quarter 2018 Volume 18 Issue

Plastics Custom Research Services (PCRS) Releases its 8th Report

In the News:

DR. ROY CRAWFORD

THE PROFESSOR

In the News:

Jerico Plastic Industries, Inc. Announces New Compounding

Jerico Plastic Industries, Inc.

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www.rotational-molding.4spe.org

In this issue:

In The News: Dr. Roy Crawford– The Professor

DR. ROY CRAWFORD THE PROFESSOR

There are many important jobs in the Modern World. The impressive contributions made by Engineers and Scientist, the Medical Profession, the Heads of State, and the Titans of Industry and Commerce, pale by comparison to the words that mothers do in shaping the minds and bodies of the next generation. In our sophisticated high tech world, it is still true that the hand that rocks the cradle rules the world. If mothers have the most important job, and they do, who has the second most critical job. That honor belongs to the Teachers and Professors who finish the work started by mothers.

Dr. Roy Crawford

Roy Crawford was a Professor who devoted his entire career to teaching. First at Queen University in Belfast, Ireland, and then at the Universities of Auckland and Waikato in New Zealand. His chosen field was the relatively new and not yet fully developed Plastics Industry. He developed a keen interest in plastic materials and processing techniques.

While still a student he recognized that the relatively small Rotational Molding Industry did not attract the attention of the University and Industrial Communities research and development efforts. Roy devoted much of his personal research and that of his students to developing an understanding of the science behind the detail of the rotational molding process. He established and was the Director of the Rotational Molding Research Center at Queen University.

Roy was always a University Professor. However, he also devoted a lot of time to presenting educational rotational molding seminars, and technical papers. He was a much sought after and highly respected guest speaker in the worldwide Rotational Molding Industry.

Taken as a group, Professor Crawford's technical papers and his books have advanced the technical understanding of the rotational molding process. As a result, the rotational molding process has taken its rightful place among the other older plastic molding and processing industries.

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In The News:

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Roy Crawford was also one of the three founders of the Society of Plastics Engineer's Rotational Molding Division. For many years he was the Division's International representative. He and his students presented many scholarly, technical papers to help establish that organization.

Roy's contributions have been acknowledged by the Industry and the Association of Rotational Molders (ARM). He was inducted into ARM's Rotational Molding Hall of Fame. This is the Industry's highest award bestowed upon a member.

An additional exceptional recognition was bestowed when ARM renamed their Rotomolding Education and Development Foundation the "ROY CRAWFORD ROTOMOLDING EDUCTION AND DEVELOPMENT FOUNDATION".

This action assures that Roy's name will continue to be spoken and his memory will live on. The Foundation has just announced that they will award at least three $2,000 scholarships this year.

Professor Crawford leaves behind an even more important legacy in his many students who have spread out around the world. Those young professionals are now using what they learned to help further develop the International Rotational Molding Industry.

Thank you for a job well done.

Respectively submitted by a friend and admirer,
Glenn L. Beall

In The News: Roto Patent Review

ROTO PATENT REVIEW

CROSS-LINKED POLYETHYLENE COMPOSITION HAVING IMPROVED PROCESSABLITY

U.S. Patent # 9,388,296 B2 Issued: July 12, 2016

Rotational molded cross-linked polyethylenes (XLPE) are known for their greater strength and better resistance to heat, weather, aggressive chemicals, and environmental stress cracking. This material's reduced coefficient at thermal expansion has added benefits for the large parts produced by this process.

This patent teaches a detailed formulation of a XLPE composition that improves molding by retarding the initiation of the cross-linking process.

The standard PE cross-linking agents are organic peroxides that begin to decompose and start the cross-linking at around 150°C. This can result in cross-linking before all of the powdered material has been deposited on the cavity or worked its way into restricted areas. Cross-linking this early in the molding cycle also reduces the time available to eliminate bubbles in the wall of a part.

Use of the claimed XLPE composition was found to reduce molding cycle time while quality and uniformity of the molded components was improved.

LEISURE ARTICLES AND CARS PREPARED BY MULTI-LAYER ROTATIONAL MOLDING

U.S. Patent #9,919,491 B2 Issued: March 20, 2018

Multi-layered rotational molded plastic parts are not new. The industry has learned to use multi-layer and multi-material molding to improve the strength and other performance characteristics of plastic components.

This patent teaches techniques for maximizing these advantages by improving the bond between multiple layers while allowing the molding of parts with layers of dissimilar plastic materials, including a layer of expanded foam between two non-foamed skin layers. The use of ionomer and grafted polyolefin are discussed. Ethylene vinyl alcohol (EVOH) polymers are recommended for use as a tie layer between multi-wall PE and nylon parts. A thin layer of nylon on the outside of a thicker PE part provides both higher fuel impermeability and paintability. The allowable differences in density, melt index, and molecular weight distribution are presented.

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In The News: Roto Patent Review

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Independent claim 1 and dependent claims 2 through 19 refine the overall processing conditions of temperature and time at which subsequent layers are to be added to the mold.

Independent claim 20 sets out the basic material composition for the various layers.

This patent mentions the use of drop boxes and the stop rotation manual method of adding subsequent changes of material. However, these techniques are not claimed.

The detailed descriptions of the techniques mentioned here are included in the patents which can be downloaded at www.pat2pdf.org.

In The News: The Challenges Ahead– Peter Mooney

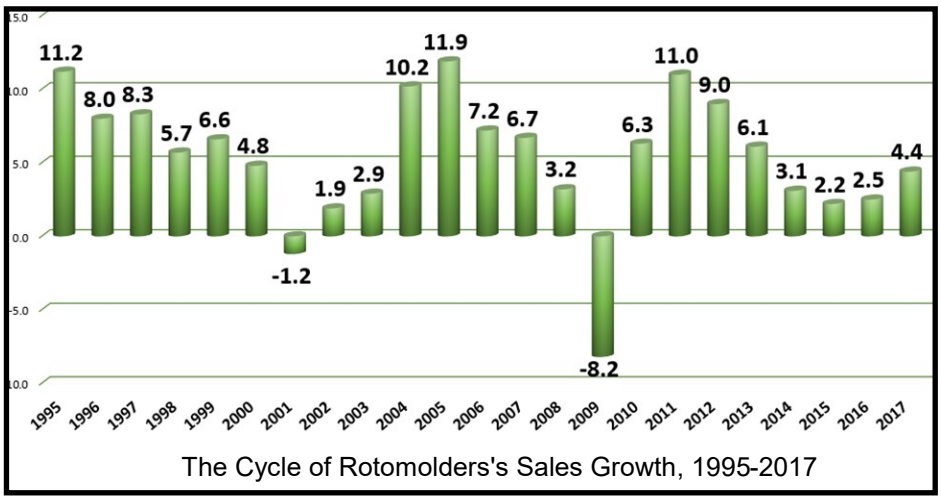
Rotational Molding:

The Challenges Ahead

By Peter Mooney

In May 1995 Plastics Custom Research Services (PCRS) published a report covering the North American rotational molding business. Later that year, in August, Plastics News published the results of its inaugural survey of rotational molders based in the United States, Canada and Mexico. PCRS has revisited this business roughly every 3 years, and Plastics News has produced its rotational molding rankings issue every year since 1995. These then are the two most comprehensive sources of data and insights relating to the regional rotomolding business over the past 23 years.

Here at the end of 2018 PCRS has released its 8th and final report, providing a review of the past and prescriptions for the future of this unique process. The long-term growth of aggregate sales revenue in this business has been impressive. Rotomolders have managed to penetrate every segment of the plastic structural plastic part marketplace – agriculture, automotive, building and construction, material handling, medical, toys and tanks – with its ability to produce structurally strong and aesthetically pleasing hollow and semi-hollow parts.



The Cycle of Rotomolders's Sales Growth, 1995-2017

In this new report PCRS throws a candid and compelling spotlight on issues regional rotomolders need to confront going forward. The first issue is the recent slowdown in aggregate sales. From 1995 through 2013 the average annual growth rate was 5.2%; that rate ratcheted down to 3.1% from 2014 through 2018. This was reflective to some extent of the weak, "new normal" U.S. economic growth rate of the post-recession years.

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In The News:

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The second issue addressed is productivity. Sales/employee grew fairly consistently from 1995 through 2008, but then in the wake of the Great Recession the trend in this measure of productivity flattened and actually declined to 2017. Sales/machine occasionally dipped, but the trend of this metric over the past 23 years has generally been "uphill" (3.7% on average).

The recent weakening of sales/employee is noteworthy since rotational molding is a much more labor-intensive process compared to injection molding, industrial blow molding and industrial thermoforming. In fact the labor/capital ratio (i.e., the average number of employees per machine) in regional rotomolding has been rising - this at the same time robotics and other forms of labor-saving automation are spurring the productive efficiency of alternative plastic structural part processing methods.

The third issue is one rotomolders around the world have struggled with for a long time, and that is their reliance on various grades of polyethylene; in the North American market this resin accounts for over 90% of part output. The original resin of choice, vinyl plastisol, holds a minor share of the market today, and some of the more enterprising companies have mastered the art of processing nylon, polycarbonate, and a few other engineering resins. However, the rotomolders have yet to add ABS to their material menu, and they have been ambivalent in their commitment to polypropylene – a resin that vastly improved the market reach of injection molders and industrial thermoformers.

Ultimately the issue the regional rotomolding community has to face is the need for "new blood". On the one hand, the number of new entrants into the regional rotomolder ranks has tapered off since the turn of the century. On the other hand, rotomolders have perennially found it challenging to attract new plant operatives and retain existing plant operatives. It all goes back to the need to make the process more productive and the work environment more appealing. Solving this issue would help restore the former pace of growth and development of the regional rotomolding business.

For more information on this new PCRS report, "The North American Rotational Molding Business: Review and Outlook", contact PCRS at plasres@AOL.com

In the News: Jerico Plastic Industries Expansion

Jerico Plastic Industries, Inc. Announces New Compounding Line

Wadsworth, OH - Jerico Plastic Industries, Inc., announces the installation of a complete 75- mm twin-screw compounding line to replace an existing 6", single-screw extrusion compounding line at its Minerva, OH, plant. This new twin-screw compounding line is part of a larger expansion of plant capacity and capabilities that allows Jerico to continue to increase the support it offers to its rotational molding customers.

The replacement line will increase Jerico's productive capacity by 6 million pounds annually and allow the company to produce an even wider range of compounding materials. In addition, it will broaden the overall scope of compounding capabilities in support of anticipated requirements over the next several years. The new line provides the ability to add heat-sensitive and shear-sensitive additives downstream in the extrusion process.

With manufacturing facilities in Minerva, OH, and Greensboro, GA, Jerico Plastic Industries is committed to excellence in rotational molding and custom compounding. As a custom manufacturer of color compounds, specialty resins and recycled products, the company currently offers rotational moldable polypropylene, cross-linkable polyethylene, flame- retardant polyethylene, and special effects polyethylene compounds.

For more information, contact Steve Copeland, president, at (330) 334-5244 or Brandi Frey at info@jericoplastic.com.

In The News: Recent Publications

Recent Publications Related to Rotomolding

Period: April-December 2018

Rotomolded Antistatic and Flame-retardant Graphite Nanocomposites
By: Mhike, Washington; Focke, Walter; Asante, Joseph
JOURNAL OF THERMOPLASTIC COMPOSITE MATERIALS
Volume: 31
Issue: 4
Pages: 535-552
DOI: 10.1177/0892705717712634
Published: 2018

Rotomolding of Foamed and Unfoamed GTR-LLDPE blends: Mechanical, Morphological and Physical Properties
By: Dou, Yao; Rodrigue, Denis
CELLULAR POLYMERS
Volume: 37
Issue: 2
Pages: 55-68
DOI: 10.1177/026248931803700201
Published: 2018

Material Selection for Rotational Moulding Process Using Grey Relational Analysis Approach
By: Chaudhary, Bhavesh; Ramkumar, Pl.; Abhishek, Kumar
MATERIALS TODAY-PROCEEDINGS
Volume: 5
Issue: 9
Pages: 19224-19229
Part: 3
DOI: 10.1016/j.matpr.2018.06.278
Conference: 8th International Conference on Materials Processing and Characterization (ICMPC)
Location: Hyderabad, INDIA
Date: MAR 16-18, 2018

Morphology and Mechanical Properties of Maple Reinforced LLDPE Produced by Rotational Moulding: Effect of Fibre Content and Surface Treatment
By: Hanana, Fatima Ezzahra; Chimeni, Desire Yomeni; Rodrigue, Denis
POLYMERS & POLYMER COMPOSITES
Volume: 26
Issue: 4
Pages: 299-307
DOI: 10.1177/096739111802600404
Published: 2018

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In the News: Recent Publications

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Rotational Molding of Self-hybrid Composites Based on Linear Low-Density Polyethylene and Maple Fibers
By: Hanana, Fatima Ezzahra; Rodrigue, Denis
POLYMER COMPOSITES
Volume: 39
Issue: 11
Pages: 4094-4103
DOI: 10.1002/pc.24473
Published: 2018

Polylactic Acid-agave Fiber Bio Composites Produced by Rotational Molding: A Comparative Study with Compression Molding
By: Cisneros-Lopez, Erick Omar; Perez-Fonseca, Aida Alejandra; Gonzalez-Garcia, Yolanda; Ramirez-Arreola, Daniel Eden; Gonzalez-Nunez, Ruben; Rodrigue, Denis; Robledo-Ortiz, Jorge Ramon
ADVANCES IN POLYMER TECHNOLOGY
Volume: 37
Issue: 7
Pages: 2528-2540
DOI: 10.1002/adv.21928
Published: 2018

Effect of Wood Flour Addition and Modification of its Surface on the Properties of Rotationally Molded Polypropylene Composites
By: Barczewski, Mateusz; Szostak, Marek; Nowak, Daniel; Piasecki, Adam
POLIMERY
Volume: 63
Issue: 11-12
Pages: 772-784
DOI: 10.14314/polimery.2018.11.5
Published: 2018

Polypropylene/Polyethylene Two-layered by One-step Rotational Molding
By: Jansri, Ektinai; O-Charoen, Narongchai
JOURNAL OF POLYMER ENGINEERING
Volume: 38
Issue: 7
Pages: 685-694
DOI: 10.1515/polyeng-2017-0367
Published: 2018

Numerical Simulation of Reactive Polymer Flow During Rotational Molding Using Smoothed Particle Hydrodynamics Method and Experimental Verification
By: Huu Thuan Nguyen; Cosson, Benoit ; Lacrampe, Marie-France; Tu Anh Do
INTERNATIONAL JOURNAL OF MATERIAL FORMING
Volume: 11
Issue: 4
Pages: 583-592
DOI: 10.1007/s12289-017-1367-2
Published: 2018

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In The News: Recent Publications

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Recycling of Polymeric Fraction of Cable Waste by Rotational Moulding
By: Diaz, Sara; Ortega, Zaida; McCourt, Mark; Kearns, Mark P.; Benitez, Antonio N.
WASTE MANAGEMENT
Volume: 76
Pages: 199-206
DOI: 10.1016/j.wasman.2018.03.020
Published: 2018

Rotational Moulding and Mechanical Characterisation of Halloysite Reinforced Polyethylenes
By: Hofler, Gunther; Lin, Richard J. T.; Jayaraman, Krishnan
JOURNAL OF POLYMER RESEARCH
Volume: 25
Issue: 6
Article Number: 132
DOI: 10.1007/s10965-018-1525-3
Published: 2018

Thermal Analysis of Foamed Polyethylene Rotational Molding Followed by Internal Air Temperature Profiles
By: Gonzalez-Nunez, Ruben; Moscoso-Sanchez, Francisco J.; Aguilar, Jacobo; Lopez-GonzalezNunez, Rosa G.; Robledo-Ortiz, Jorge R.; Rodrigue, Denis
POLYMER ENGINEERING AND SCIENCE
Volume: 58
Pages: E235-E241
Supplément: 1
Special Issue: SI
DOI: 10.1002/pen.24725
Published: 2018

Finite Element Optimisation for Rotational Moulding with a Core to Manufacture Intrinsic Hybrid FRP Metal Pipes
By: Nieschlag, Jonas; Ruhland, Paul; Daubner, Simon; Koch, Simon-Frederik; Fleischer, Juergen
PRODUCTION ENGINEERING-RESEARCH AND DEVELOPMENT
Volume: 12
Issue: 2
Pages: 239-247
DOI: 10.1007/s11740-017-0788-6
Published: 2018

Modelling of an Innovative Liquid Rotational Moulding Process
By: Agbessi, Yao; Bereaux, Yves; Charmeau, Jean-Yves; Le Goff, Ronan; Biglione, Jordan
INTERNATIONAL JOURNAL OF MATERIAL FORMING
Volume: 11
Issue: 2
Pages: 257-267
DOI: 10.1007/s12289-017-1349-4
Published: 2018

Continued on page 12

In The News: Recent Publications

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The Development of Thermoplastic Fibre Based Reinforcements for the Rotational Moulding Process
By: Aleman, D. N. Castellanos; McCourt, M.; Kearns, M. P.; Martin, P. J.; Butterfield, J.
PROCEEDINGS OF 21ST INTERNATIONAL ESAFORM CONFERENCE ON MATERIAL FORMING (ESAFORM 2018)
Book Series: AIP Conference Proceedings
Volume: 1960
Article Number: UNSP 120002
DOI: 10.1063/1.5034970
Published: 2018
Conference

Conference: 21st International ESAFORM Conference on Material Forming (ESAFORM)
Location: Univ Palermo, Palermo, ITALY
Date: APR 23-25, 2018
Sponsor (s): European Sci Assoc Mat Forming

The Effect of Internal Mould Water Spray Cooling on Rotationally Moulded Polyethylene Parts
By: McCourt, Mark P.; Kearns, Mark P.; Martin, Peter J.
PROCEEDINGS OF 21ST INTERNATIONAL ESAFORM CONFERENCE ON MATERIAL FORMING (ESAFORM 2018)
Book Series: AIP Conference Proceedings
Volume: 1960
Article Number: UNSP 120016
DOI: 10.1063/1.5034984
Published: 2018
Conference

Conference: 21st International ESAFORM Conference on Material Forming (ESAFORM)
Location: Univ Palermo, Palermo, ITALY
Date: APR 23-25, 2018
Sponsor (s): European Sci Assoc Mat Forming

Optimisation of Multi-Layer Rotationally Moulded Foamed Structures
By: Prichard, A. J.; McCourt, M. P.; Kearns, M. P.; Martin, P. J.; Cunningham, E.
PROCEEDINGS OF 21ST INTERNATIONAL ESAFORM CONFERENCE ON MATERIAL FORMING (ESAFORM 2018)
Book Series: AIP Conference Proceedings
Volume: 1960
Article Number: UNSP 120011
DOI: 10.1063/1.5034979
Published: 2018
Conference

Conference: 21st International ESAFORM Conference on Material Forming (ESAFORM)
Location: Univ Palermo, Palermo, ITALY
Date: APR 23-25, 2018
Sponsor (s): European Sci Assoc Mat Forming

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In The News: Recent Publications

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Fracture Toughness of Rotationally Molded Polyethylene and Polypropylene
By: Saifullah, Abu; Thomas, Ben; Cripps, Robert; Tabeshfar, Kamran; Wang, Lei; Muryn, Christopher
POLYMER ENGINEERING AND SCIENCE
Volume: 58
Issue: 1
Pages: 63-73
DOI: 10.1002/pen.24531
Published: 2018

For more information contact Prof. Denis Rodrigue at: denis.rodrigue@gch.ulaval.ca

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Designer's Corner

DESIGNER'S CORNER

Part #13

REINFORCING FEATURES – PART 3

By: Glenn Beall

Editor's Note:

This is the 13th 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.

This is the last of a series of three articles that describe techniques for providing added strength on thin-walled rotationally molded products.

Some rotationally molded parts are double-walled. In some instances the inner wall has approximately the same shape as the outer wall. The open space between the inner and outer walls can be filled with self-rising foam for added stiffness or improved insulating capabilities.

Another less costly stiffening approach that eliminates the cost of adding a foam is the use of kiss-offs. It is a common practice to provide additional strength by attaching two closely spaced parallel walls to each other. This technique can convert two relatively weak walls into one integral box-beam structure that is inherently strong. The thickness of the wall in the kiss-off area (Figure 1) is almost always established by trial and error, but 1.75 times the nominal wall thickness should be specified on the part drawing as a starting thickness. This spacing provides enough room for the powdered plastic to move freely through the cavity. The kissing off or welding together of the two walls takes place only as the last of the powdered plastic coats the cavity.

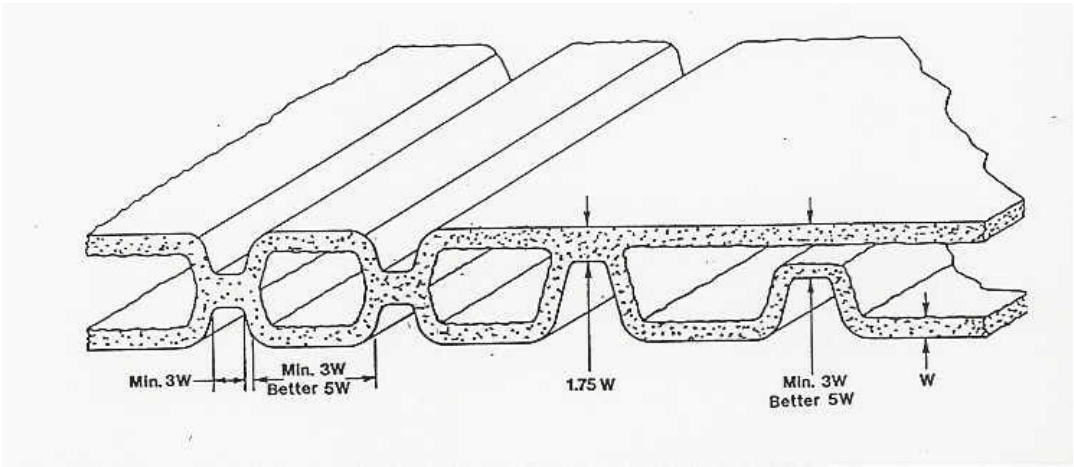

Figure 1.

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Designer's Corner

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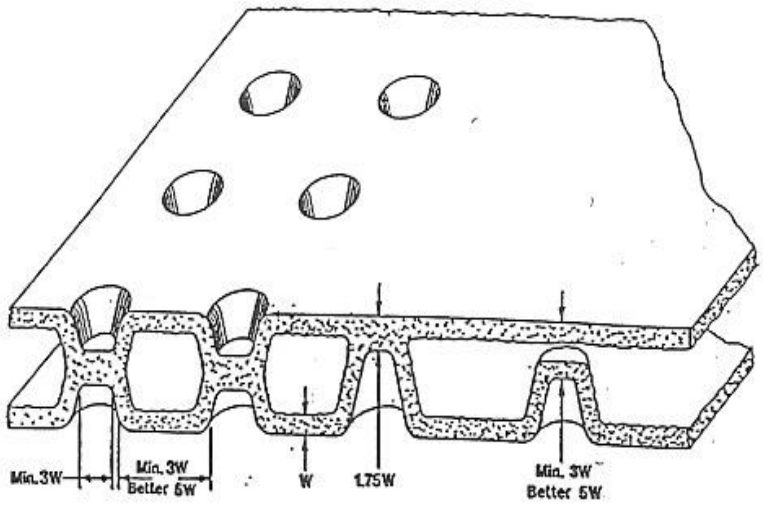
Kiss-off reinforcing ribbing refers to long, continuous kiss-off areas. Tack-off reinforcing refers to interrupted kiss-off areas. These tack-offs can be any shape, but round is the most common (Figure 2).

In those instances where kiss-off ribbing or tack-offs are undesirable on an appearance surface, the kiss-off can be designed into only one wall of the part on the non-appearance side.



Tack-off and kiss-off reinforcing is sometimes used in large rectangular portable liquid tanks to strengthen the side walls and discourage the liquid in the tank from sloshing from side to side. In these situations there can be a substantial distance between the two walls that are to be attached to each other. In these cases kiss-off ribbing should be designed into both walls. This minimizes the depth of the recess and makes it easier to heat the mold in the actual kiss-off area at the center of the tank.

Designer's Corner

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Kiss-off ribbing has been used in the bottom of double-walled tanks for products such as insulated ice-making machines. In these applications the kiss-off strengthens the inner wall. Failures can develop at the edge of the kiss-off on tanks that hold liquids or products such as grain that act like liquids. These failures have been traced to the added strength at the kiss-off. The inner bottom wall of the tank between the kiss-offs bends under the load. Stresses build up at the junction between the weaker inner bottom wall and the stronger kiss-off. In some cases a more durable tank has been produced with what is referred to as an "almost kiss-off". This brings the inner and outer walls of the tank close together, but they are not attached to each other. As the inner wall is loaded it bends and comes to rest on the almost kiss-off. This supports the inner wall while leaving it free to move relative to the kiss-off. Kiss-off and almost kiss-off details are shown in Figures 1 and 2.

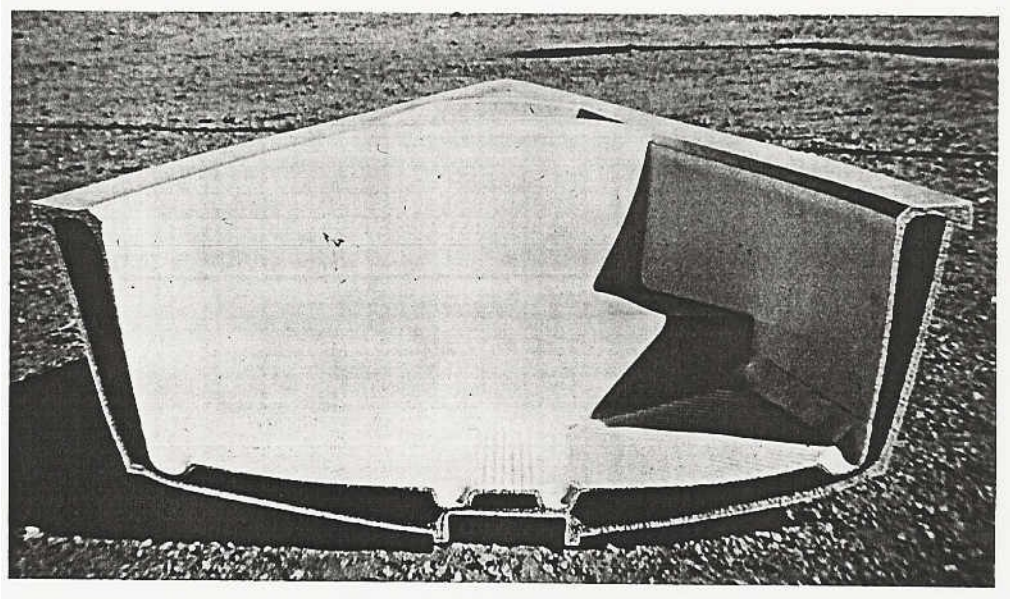

Figure 3.

The inner and outer hulls of the boat in Figure 3 have kiss-off ribbing along the keel. Almost kiss-off ribs have been provided along the outside edges of the deck. If the deck flexes under load, it will gain strength from the outer hull, which is supported by the water. At the same time, the inner and outer hulls are free to move relative to each other in response to inside or outside forces.

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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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

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

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

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