ROTATIONAL MOLDING NEWS

VOLUME 02/2
Stuart J. Lipsteuer, Editor
Robert D. Swain, Asst. Editor

Message from the Chair

The fiscal year of SPE is closing to an end with a positive showing at ANTEC and several accomplishments. First of all, we had a full days session at ANTEC with a good selections of papers from an international showing. If you were not able to attend, I encourage you to get a CD of the proceedings. It is a great reference tool for not only the rotational molding papers but also all papers presented at ANTEC. See the SPE website (www.4spe.org) for details. We packed the room at ANTEC for the papers and it was good to see the increase in numbers over last year. Also, please see our website www.rotomolding.net for the paper call for next years ANTEC. The good news is SPE has got the entire system in electronic format so abstracts are due much later this year. Go check it out.

Also, we presented a Best Student Paper award to Ms. Louise Pick for writing the best paper entitled *"An Investigation of the Impact Behaviour of Rotomoulded Polyethylenes Over a Wide Temperature Range"* from the University of Belfast. The award included a plaque and $200, which was donated by Glenn and Patsy Beall Student Scholarship fund. Ms. Pick not only wrote the excellent paper, but she gave an excellent presentation. Also, judging took place for the Best Paper award and the winner will be announced at our RETEC in Cleveland, OH June 9-11.

Also, I would like to announce the Rotational Molding Division won the SPE Pride Report for meeting all the conditions set for a Division. We were able to do this in only our second year and I wish to thank our Officers, Board of Directors and our volunteers that made this possible. However, it does not stop there. Your Rotational Molding Division also won the Outstanding Division Award! This award recognizes those Divisions that go beyond the normal expectations and is a sign of excellence in the SPE society. This is quite an honor for the RMD and the fact that we accomplished this in just our second year is quite a feat. I want to thank the entire staff for their hard work to get us where we are today. I would like to make a special thank you to Einar Voldner and Julie Stout for their exceptional assistance. As to our members, thank you for your support and interaction that gives us the direction in which you would like the Division to go. I, again, want to thank all those involved and SPE for presenting us the Award.

Next, I would like to announce that Marshall Lampson will be your new Chairman for the next fiscal year of SPE. Marshall is the V.P. of Technology at Poly Processing and is stationed at Stockton, California. I have known

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SCHOLARSHIP AWARDS

The Society of Plastics Engineers is an individual member international society dedicated to providing and promoting knowledge and education for plastics and polymers worldwide. The SPE Foundation annually awards scholarships to students who have demonstrated or expressed an interest in the plastics industry. They must be majoring in or taking courses that would be beneficial to a career in the plastics industry.

Please refer to page 15 in this newsletter for a list of the 2001-2002 scholarship winners.

Applications for scholarships for the 2002-2003 school year are currently available from the Foundation.

For further information on the SPE Foundation, contact Gail R. Bristol, Managing Director at (203)740-5447 or email: foundation@4spe.org

RETEC RECAP

At the June 9-11 meeting in Cleveland, there were 135 attendees, and 121 exhibitors.

Don't forget to visit our website at:
www.rotomolding.net

See the updated SPE website at:
www.4spe.org

The Rotational Molding Process - Granular Powder Behavior

Nearly all rotational molded parts begin as powder. The powder is usually produced by grinding polymer pellets. The usual powder particle size is -35 mesh *(or 420 mm)* to +200 mesh *(or 74 mm)*. The powder bulk density is normally in the range of 35% to 50% of the polymer pellet density. There must be room in the mold cavity for the powder with some "tumbling headspace." A myriad of processing problems can occur if powder cannot flow freely across the mold surface. A drop box is required if the mold initially cannot contain all the powder. Flat products such as door panels, and parts with small cross-section regions, such as hobby horses, are examples of problematic parts.

The polymer pellet may contain additives such as colorants, ultraviolet stabilizers, antioxidants, and antistatic agents. Some of these additives, such as colorants and antistats, may simply be dry-blended with the powder just prior to dosing the powder into the mold cavity.

The polymer retains its granular form for about one-third of the rotational molding heating cycle. Since the rotational speed is very low, the powder tends to reside in the lower portion of the mold. Powder behavior has been described as a near-quiescent "pool" under which the mold surface passes. In general, particle shape is considered one of the major keys to good powder flow. Particles with near-spherical and *"squared-egg"* shapes are examples of freely-flowing powders. Acicular or fiber-like particles, particles with highly irregular surfaces or grinding tails, and sticky particles will not flow well.

Powder flow in the mold has been categorized as either steady-state circulation, avalanche flow, or slip flow.

In steady-state circulation, the powder bed is continually in motion. The powder in contact with the moving mold surface is dragged upwards until it reaches a specific angle, known as the dynamic angle of repose. At this point, it cascades across the bulk of the powder bed. This motion is continuous. The powder in contact with the mold surface is heated, and the cascading action mixes the hot powder with the cooler powder in the bed. This thermal mixing ensures the most uniform powder bed temperature. Smooth, cohesive-free, spherical or squared-egg powder characteristics are required for steady-state circulation.

Avalanche flow is similar in some respects to steady-state circulation, in that the heated powder in contact with the mold surface cascades across the bulk of the powder bed. However, the action is intermittent. In other words, the entire powder bed is dragged upwards by the moving mold surface until the dynamic angle of repose is achieved. Then a portion of the bed collapses across the rest of the powder bed. Then the entire powder bed is again dragged upwards by the moving mold surface. The effect is akin to snow or sand avalanche behavior - thus the name, avalanche flow. In general, avalanche flow does not achieve the same level of thermal mixing as steady-state circulation flow. In general, particles with slightly irregular surfaces, and acicular, and disk-like particle shapes exhibit avalanche flow.

A third type of powder flow, slip flow, is really not flow at all. Instead, the bed remains without flow or static. The moving mold surface simply under the static powder bed. If there is very low friction between the mold surface and the powder bed, the bed simply stays in one place. If there is some friction, the entire bed may be cyclically dragged upwards, then slide back to a lower position. Heat transfer between the mold and the powder bed is very poor in slip flow. Agglomerating or sticky powders and powders with low coefficients of friction with mold materials exhibit slip flow. Certain mold release agents can exacerbate the slip flow problem.

It has been observed many times that powder flow behavior changes as the mold and polymer heat. Finer particles may become fluidized when powder is alternately trapped and dumped from "pockets" within the mold. Then, the coalescence process may act to segregate powder sizes, with the finer powders adhering to the mold surface first. Then, cohesionless particles may become sticky as their surfaces reach the tack temperature. Sticky powders agglomerate. As polymer adheres to the mold surface, the interface between the moving mold surface and the powder bed may change from very low friction to very high friction over a very short time, sometimes dramatically. Then, particles with very irregular surfaces and long tails will smooth and the tails may separate or shrink as the powder heats.

In general, powder flow has not received the attention that other aspects of the rotational molding process have. Nevertheless, powder particle characteristics do govern many of the final part properties.

This article is extracted from R.J. Crawford and J.L. Throne, Rotational Molding Technology, Plastics Design Library/William Andrews Publishing, Norwich NY, 2002, available through SPE.

continued from page 1

Marshall for many years know and am completely confident in his leadership and his proactive approach. I would like to welcome Marshall to the Chairmanship of RMD and I will continue to support the Division as the past-chairman. I would like to thank Barry Aubrey, our outgoing past chairman, for his hard work and leadership that helped this Division get to where we are today.

Lastly, but very importantly, I want to issue a special thank you to Paul Nugent and Bruce Muller and their team that help put the recently completed RETEC on the map and made it a very good one at that.

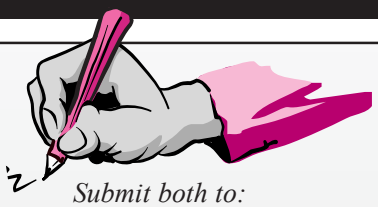
For a list of papers please see our website at www.rotomolding.net. It will very worth your while for members and non-members alike.

Thank you again to all those who contributed this year.

Jon Ratzlaff, Chairman, RMD

Call For Papers

GPEC 2003
Global Plastics Environmental Conference



Please, submit a 200 word abstract by July 1st, 2002.

The technical paper is due by September 1st, 2002.

Submit both to:
Michelle Mikulec
22270 Long Boulevard
Dearborn, MI 48124-1147
Phone: 313-407-0092
michelleMikulec@peoplePC.com

Proposed Subjects for Technical Papers:

1. Odor Evaluation for Automotive Interiors
2. Bottles
3. Marketing & Sales
4. Electronics
5. Automotive
6. Tire Recycling
7. Use of Recycled Materials
8. Biodegradable Materials
9. Legal Issues
10. Office Equipment
11. Innovative Recycling Processes
12. Instrumentation Testing of Plastic Materials
13. New Sources of Energy and Effect of Energy on the Environment
14. Energy Conservation
15. Resource Recovery

ANTEC 2003

Nashville, TN., May 4-8, 2003

The ROTATIONAL MOLDING DIVISION is pleased to solicit your abstract *(100 words or less)* with the Intent to Present Form. Simply log-on to this website address and follow the directions to register and submit your abstract: http://www.miracd.com/antec2003 Deadline for the abstract is October 15, 2002. Papers are due on December 6, 2002.

The Technical Program Committee is specifically looking for technical papers that will appeal to Polymer Engineers and Researchers in all aspects of rotational molding.

For more information and a copy of the Intent to Present form, please contact:

E. Takacs (905) 525-9140 x 24100
etakacs@mcmaster.ca

Call For Papers (continued)

RETEC: ROTOMOULD 2002

The Association of Rotational Moulders Australasia Inc. would like to offer you the opportunity to present at their 24th annual conference from October 19-22, 2002 in Melbourne, Australia.

Rotational Moulding From Concept to End User

This concept incorporates the following:

- Is rotational molding an art, a science or a successful combination of both?
- New technology , materials, and processes that will have an impact on new product categories and markets
- New developments in design and processing
- Successful management of the plant as a business
- Marketing rotationally moulded products to an uneducated buyer
- Company Profiles or "What's New" presentations are only available under the Association's Sponsorship Opportunity

The theme encompasses a broad scope of topics for possible technical papers *(which should be of a length enabling a conference presentation of approximately 40 minutes)*. If you have a technical paper relevant to the theme with a view to rotational moulding....
Please submit your interest to the Association of Rotational Moulders Australasia Inc. by March 31ST, along with a short summary of your paper *(200 words maximum, including title of paper and presenters name and organization)*. We will notify you by April 30th, or your paper's inclusion/exclusion in the conference program.
Submissions of interest should be faxed or emailed *(in Microsoft Word)* to:
Lesia Donlan, Association of Rotational Moulders Australasia Inc. Fax: +61 7 3009 0600
email: Idonlan@rotationalmoulding.com

Best Paper - RETEC

The "Best Paper" award was presented by Dr. Paul Nugent to Mr. Harry Howard at RETEC 2002.

A copy of this technical paper can be obtained by contacting the author or rotomold@chromacolors.com

Best paper RETEC 2002

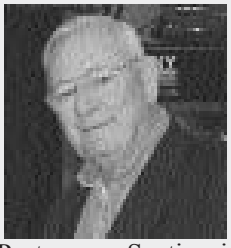
INVESTIGATION OF NON-TRADITIONAL ANTI-STATIC ADDITIVES FOR IMPROVED IN-PROCESS COLOR CONSISTENCY

Harry Howard

Abstract

An investigation was undertaken to define non-traditional antistatic additives that would eliminate the color consistency problems that can occur when using dry blended colorants in the rotomolding process. Traditional antistatic agents, such as glycerol monostearates have been used, but require relatively high humidity to be effective. As a result of this investigations, a system was defined which is effective regardless of atmospheric conditions. During the course of this work there were a number of issues studied in addition to those associated with static. Among the unexpected results were the affect of resin particle size distribution and pigment type on color distribution in a rotomolded part.

COUNCILOR'S REPORT



The winter Councilor's Meeting was held in Palm Beach Gardens on February 2. The main action was the election of the officers for the 2002-2003 operating period: Claudius Feger of IBM will become President at the 2002 ANTEC; Donna Davis of Exxon as President Elect; Kishor Mehta of Bayer as Senior Vice President and Randy Lewis of P.R. Lewis Consulting as International Vice President.

The European Thermoforming Division (D/43) was chartered. A petition was approved for Portuguese Section-in-Formation and an additional petition was approved for the Additives & Color Europe as a Special Interest Group.

Twelve committees met at the Council Meeting. The Finance Committee continues to monitor the well being of our association and is scaling back operating budgets to reflect reduced levels of income.

At the meeting of the Councilor-as-a-whole, I raised the concern of the exorbitant cost of attending ANTEC as conveyed to me by Nick Schott. Other than acknowledging the statement there was no action taken on this issue. If this is of concern to the Division membership, there should be an organized attempt made to be more vocal in presenting our concerns to several of the Operating Committees and then re-introduce it on the floor at the C.O.W. Meeting.

The job of the Councilor, as I see it, is to represent you-the members of our RMD. Please convey your ideas, thoughts, suggestions or complaints to me. I will make an effort to respond to each of you.

Sincerely,
Robert D. Swain

Recap of the 2. Pan-European Rotomoulding Conference

5. - 7. May 2002 Paris-EuroDisneyland

The exhibition ran parallel with the conference, and included 38 exhibitors. It was very well accepted and attended by the delegates because such an opportunity was non-existent in Europe before and was helped by the fact that lot of participants didn't have the chance to attend Rotoplas.

- Simultaneous translation into 5 languages
- 7 translators and 1 technician
- 6 technicians looking after the presentation show, 2 running the show in detail, 4 for general functionality
- 38 different presentations plus general moderation

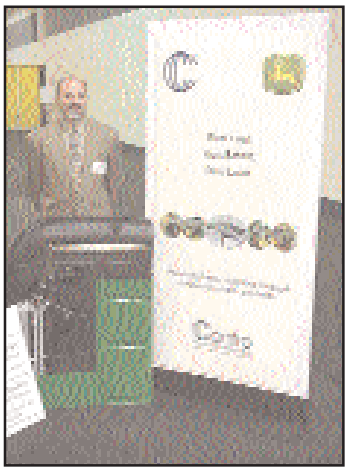
The Reception, Gala Dinner and the Pop Story Show were successful and appreciated.

With 383 delegates coming from 35 different countries *(5 continents)* this conference was a great success. Compared with the first event of this type, this attendance represents an increase of about 60%. More than 85% of the participants came from European countries which shows the importance of such an event for the European rotomoulding industry.

The delegates reported that the program was put together in an optimal form concerning industry news in areas such as: equipment, raw materials, moulds, additives etc. All areas of importance for the future development of this industry were covered including the quality improvement areas, and cost reducing possibilities, opportunities for product development, as well as market developments and design . These areas are extremely important for the future development of the rotational moulding industry. In the rotational moulding related tabletop exhibition which included 40 exhibitors, the delegates had the opportunity to become informed about the latest developments in rotational molding in addition to starting individual discussions with industry specialists, on an international basis. For Europe, this was a unique opportunity for the rotational moulding industry which was very well accepted.

Erich Boersch

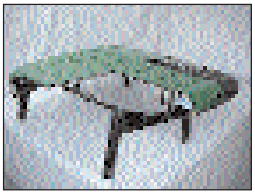
Press Release Information
JOHN DEERE ROOF

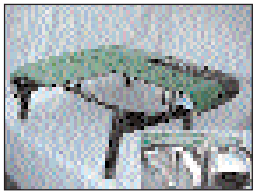


The winner of the 2002 Industrial Plastics Product Design Award, given in honor of Glenn L. Beall, is a rotationally molded roof for the new integrated cab of a John Deere agricultural tractor *(5000 Twenty Series)*. The manufacturer is Centro, Inc. of North Liberty, Iowa; the toolmaker is Wheeler-Boyce of Stow, Ohio; the resin supplier is ExxonMobil Chemical. Agricultural vehicles typically have HVAC components mounted into an A/C housing, which is then mounted to the roof. This design uses the rotationally molded roof as the A/C housing in which the HVAC components are installed. The new roof design is a fully recyclable part containing eight cored features and 63 molded-in inserts, which are possible only because of the development and use of an advanced process by the molder. Made of a composite LLDPE skin with LLDPE foamed inner walls, the multifunctional design includes molded-in ductwork that eliminates seals and mounting hardware; the molded-in foam layer provides the function of thermal and sound insulation, thereby improving the operator's working environment.

The Centro/Deere roof also took top honors at the Association of Rotational Molders (ARM) annual meeting where it won the Innovative State of Art Award and the Product of the Year Award.

As in the past, the National Plastics Center & Museum will display the photos and write-ups of all the 2002 Society of Plastics Engineers winners throughout the next year in its Leominster, Massachusetts's facility.





Rotational Molding Technical Program at ANTEC 2002

The ANTEC 2002 meeting in San Francisco was a great success. The two half-day sessions on Monday were very well attended and highlighted recent advances in rotational molding.

The morning session dealt with processing issues. Dr. James Throne started the session with an enlightening talk on powder flow in rotational molding, fundamental powder properties, parameters affecting the powder flow and methods of measuring these properties. The session continued with talks on powder sintering: how preprocessing conditions affect the densification process and a study of the sintering behavior of thermotropic liquid crystalline polymers in rotational molding. The morning session ended with two award winning presentations: *"An Investigation of the Impact Behavior of the Rotomoulded Polyethylenes Over a Wide Temperature Range"* by Louise Pick and Eileen Harkin-Jones (best student paper) and *"The Importance of Monitoring Mold Pressure During Rotational Molding"* by Roy Crawford, Maria Clara Cramez, Maria Jovita Oliveira, and Alvin Spence (best paper).

In the afternoon session, talks focused on the formulation and use of new materials: the measurement of peroxide content of crosslinkable polyethylene, rotational molding of dicyclopentadiene reactive liquid polymer, polyolefin plastomers, thermoplastic olefins, and polyethylene foams. The session ended with two presentations on the development of nanocomposite materials for rotational molding from The University of Queensland in Brisbane, Australia.

SPE Membership 2002-2003

New membership is $115.00
($105.00 plus $10.00 initiation fee)

Renewals	$105.00
Student	$26.00

UPCOMING ANTECS

May 4-8, 2003
ANTEC 2003, 61st Annual Technical Conference & Exhibition, Nashville, TN

April 25-29, 2004
ANTEC 2004, 62nd Annual Technical Conference & Exhibition, Chicago, IL

Designer's Corner

Glenn Beall

WARPAGE CONSIDERATIONS

Rotationally molded parts are produced in hollow molds without cores. The inside surfaces of the parts are free-formed in this open molding process. During the cooling portion of the molding process, the plastic material contracts or shrinks. Shrinkage of these hollow parts allows them to pull away from the cavity before the material has cooled enough to be strong enough to retain its shape. This condition encourages large, flat surfaces to warp, as shown in **Figure 5.**

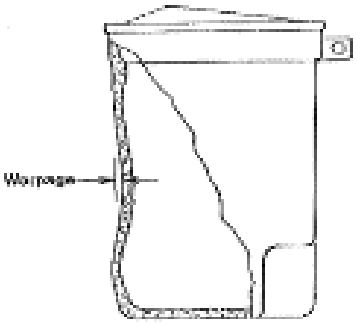


Figure 5

This type of warpage comes as a surprise to engineers who are accustomed to designing parts for closed-molding processes such as injection molding, structural foam, and reaction injection molding. Engineers who are not familiar with rotational molding can be guided by following the industry recommended flat panel warpage standards listed in Table 2.

TABLE 2

Flat-Panel Warpage Standards for Commonly Molded Materials in ±cm/cm and in./in.

Plastic Material	Ideal	Commercial	Precision
PE	0.050	0.020	0.010
PP	0.050	0.020	0.010
PVC	0.050	0.020	0.010
Nylon	0.010	0.005	0.003
PC	0.010	0.005	0.003

The "ideal" warpage standard can normally be achieved with no additional cost. The "commercial" standard requires special care and may or may not result in a longer molding cycle and added cost. The "precision" standard will almost always be the most costly of the three ranges. The best design is, therefore, the one that can accommodate to the "ideal" warpage standard.

Shrinkage-related warpage can be significantly reduced, or eliminated, by pressurizing a hollow part during the cooling part of the molding cycle. This internal pressure forces the part to cool while being held in contact with the cavity. Forcing the part into contact with the cool cavity has the added benefit of reducing the time required to cool the part. Cooling with internal pressure also reduces part-to-part dimensional variations. The use of pressurized air or inert gas has many benefits, but not all molding machines are equipped for this type of molding.

A simpler approach to discouraging the warpage of large, flat surfaces is to avoid designs of that type. If flat surfaces cannot be eliminated, they can be strengthened to resist warpage with the use of stiffening ribs, steps, crowns, and domes, as illustrated in **Figure 6.** In this case, a large, round, flat-topped tank has been redesigned to resist warpage. A dome as small as 0.015 cm/cm (0.015 in./in.) is enough to discourage warpage, but the larger the doming or crowning, the less warpage there will be.

Continued on page 10

Designer's Corner (cont.)

Continued from page 9

Glossy surfaces that reflect light exaggerate the appearance of a warped surface. Deeply textured surfaces do not reflect light and this makes warpage less noticeable. Incorporating a graphic or engraving on a flat surface has the same effect.

This article is a condensed extract from G. L. Beall's Hanser Publishers book entitled "Rotational Molding Design, Materials, Tooling, & Processing" available from SPE.

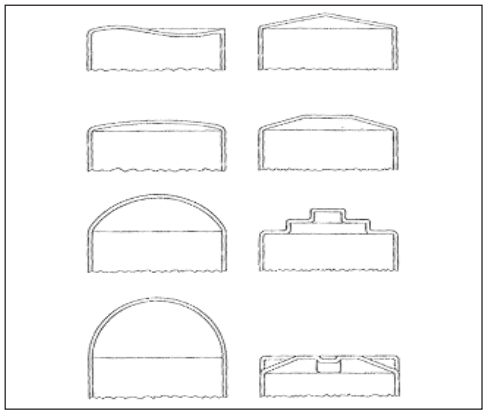


Figure 6

Best Papers - ANTEC

We would like to recognize Louis Pick (Paper # 35 in the ANTEC program) entitled, ***"An Investigation of the Impact Behavior of Rotomoulded Polyethylenes Over a Wide Temperature Range."*** for her excellent work and winner in the Best Student Paper category, and also recognize Ray Crawford, Maria Clara Cramez, Maria Jovita Oliveira, and Alvin Spence, (Paper # 32 in the ANTEC program) entitled, ***" The Importance of Monitoring Mold Pressure During Rotational Moulding***." for the best paper awardees.

Below are the abstracts for both. Due to space limitations in this newsletter, we encourage you to contact the author or Chroma Rotational Molding Division at rotomold@chromacolors.com for an email of either one or both of these excellent papers in complete form.

Best paper ANTEC 2002

THE IMPORTANCE OF MONITORING MOLD PRESSURE DURING ROTATIONAL MOLDING

Roy Crawford, Maria Clara Cramez, Maria Jovita Oliveira, Alvin Spence

Abstract

During the rotational molding of plastic parts, the pressure inside the mold can become positive or negative depending on a variety of factors such as the size of the vent, the quality of the mold, the heating rate, etc. In commercial molding, the pressure is likely to vary in an arbitrary manner, depending on particular combinations of key variables. This leads to conflicting reports about the causes and cures of problems such as warpage, residual stress and shrinkage. This paper reviews the effects of pressure variations on the quality of rotomoulded parts and using experimental data, demonstrates the importance of monitoring the pressure inside the mold throughout the cycle. Methods of doing this are illustrated and the benefits in terms of reduced cycle times and improved part quality and consistency are demonstrated.

Best student paper ANTEC 2002

AN INVESTIGATION OF THE IMPACT BEHAVIOR OF ROTO-MOULDED POLYETHYLENES OVER A WIDE TEMPERATURE RANGE.

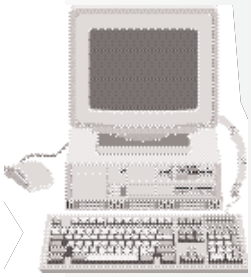
Louise Pick., E Harkin-Jones

Pictured (l-r) Glenn Beall, Louise Pick, and Claudius Ferger 2002-2003 SPE President

Abstract

This paper examines the relationship between the impact strength of rotationally moulded polyethylene parts and the dynamic mechanical properties. A range of conventional linear low density polyethylene powders (LLDPE) and metallocene polyethylene powders (MPE) were rotationally moulded and tested. Falling weight impact tests were carried out over a temperature range from -60ºC to 20ºC. Dynamic mechanical thermal analysis (DMTA) was carried out from -100 to 90ºC, at different frequencies. Transitions evident in DMTA results are used to explain sub-zero maxima in the impact strength of the polymers tested.

E-com Corner



SPE announces improved Website

The Society of Plastics Engineers is proud to present the enhanced website- www.4spe.org

The site, although the address remains the same, has undergone dramatic changes making surfing SPE easier and more effective in a search for the most comprehensive information in the plastic industry. There is a special area for Sections and Divisions, and member recognition is highlighted in a distinctive section. With advanced search capabilities, you can find that particular publication *(for the best price)* quicker and easier in the SPE Bookstore.

The home page emphasizes SPE products and services, allowing members as well as potential members to keep informed about the latest in the plastics industry. Visit www.4spe.org **http://www.4spe.org** and see for yourself.

Enter another dimension

Welcome to the Plastics Engineering DataZone. Since the June Issue, SPE has made it earlier to learn more about the advertisers' companies, services, and products found in the monthly Society magazine. Any editorial or ad that ends with the ***PE*** DataZone logo means that there is additional information available for the asking.

There are two ways to ask for and collect valuable information. You can either fill out the ***PE*** DataZone reader service numbers in the boxes on self addressed cards in back of each magazine, or you can visit www.plasticsengineering.org and click on the ***PE*** Datazone logo and take it from there.

The site is completely searchable and you can request that information be forwarded via email, mail, phone, fax or link directly to a vendor's web site.

The Society of Plastics Engineers was founded in 1942. Its mission is to provide and promote the knowledge and education of plastics and polymers worldwide. It is the leading technical society in the plastics industry, and currently represents more than 29,000 plastics professionals in 74 countries.

Did you know. . .

The site *(www.plasticscircle.com)* serves several purposes? For everyone looking for experts- it saves time- you can search alphabetically or by the specific need of your project. You can find industry experts quickly and easily. You'll have technical and non-technical advice at the click of a button.

For consultants, consider that this new service provides you with a direct line to those seeking industry experts; lists your name under specific areas of expertise; and there are special posting packages tailored to your requirements.

The Web Site of SPE Rotational Molding Division

By RMD Web Page Chair: Dr. Linda Xu

SPE Rotational Molding Division's web site is an information site for the rotomolding industry. Since launching our new web site on July 1, 2000, we have made many changes and upgrades. We have recently successfully enhanced this new web site for SPE's Rotational Molding Division with many new features and added functionality in order to serve our members and the rotomolding industry better. RMD's web site currently contains 25 pages which include: News, Events, Products, Membership, Services, Press Release, Newsletters, Technology, Links, Contacts, Information Requests, Books, etc. Please visit SPE's Rotational Molding Division's website at **www.rotomolding.net!** Check out our spin on rotational molding!

PATENT CORNER

ANISOTROPIC MEASUREMENT OF SHORT GLASS FIBER-EPOXY COMPOSITES OBTAINED BY ROTATIONAL MOLDING APPARATUS

Authors: Kumagai, Yaomi; Urabe, Kei; Kemmochi, Kiyoshi

Source: Kobunshi Ronbunshu (2001), 58(1), 50-55 (in Japanese)

Organization: National Institute of Materials and Chemical Research, Higashi, Tsukuba, Ibaraki, 305-8565, Japan

Abstract: It has been almost impossible to make experimental composite materials with randomly oriented fillers of a heavy density in matrix resins of low viscosity, because the fillers precipitate out at the bottom of the mold due to gravitation before the liquid resins have time to cure with chemical reactions. In this paper, a new bi-axial rotational molding apparatus to cure the resins containing heavy fillers has been developed and the distribution of short glass fibers and their nickel-coated fibers has been investigated (using this instrument). An aminimide compound, adopted as a latent hardener for epoxy resins, was thermolyzed to generate a tertiary amine for catalysts and an isocyanate at 130° and above. The results obtained from SEM cross-section photographs and from fiber orientation measurements with a rotative polarization system of millimeter waves showed a random orientation of fibers. The moduli of the composites measured by flexural tests were very close to the values calculated from Nielsen's theoretical equation for random orientation in orthogonal directions.

FINE-TUNING THE DESIGN PROCESS FOR COMPLEX ROTOMOLDED STRUCTURAL PARTS

Authors: Berg, David W.

Source: Plast. Eng. (Brookfield, Conn.) (2000), 56(12), 48-52

Organization: Tennant Company, Minneapolis, MS, USA

Abstract: Rotational molding allows more freedom of design than other plastics manufacturing processes. Designing the complex parts permitted by this method requires careful project management.

ROTATIONAL MOULDING OF METALLOCENE POLYETHYLENES

Authors: Xin, Wang; Harkin-Jones, E. H.; Crawford, R. J.; Fatnes, A.-M.

Source: Plast., Rubber Compos. (2000), 29(7), 340-348

Organization: School of Mechanical and Manufacturing Engineering, The Queen's University of Belfast, Belfast, BT9 5AH, UK

Abstract: The authors compare the rotomoldability and mechanical properties of conventional polyethylenes with metallocene polymers (all LLDPE) having a similar melt flow rate or the same density. The rotomoldability was evaluated in terms of bubble removal, cycle times, and heat stability during the molding process. The mechanical properties, such as tensile strength and peak impact energy, were measured on parts produced using a variety of molding conditions. It was found that the metallocene polymers display greater toughness if subjected to the same molding conditions as the conventional polymers. Conversely, the same toughness can be obtained in both materials if shorter cycle times are used for the metallocenes. This behavior was linked to the relaxation behavior of the molecules in the solid state. Other material parameters, such as the nature of the comonomer, the long chain branching density, and the crystalline morphology were studied by NMR, DSC, and polarizing light microscopy. The differences between the molecular structures of the 2 types of polyethylene can be used to explain why the metallocene materials possess many rheological and other characteristics that are desirable in rotational molding.

PREDICTION OF MECHANICAL PROPERTIES OF POLYETHYLENE MOULDINGS BASED ON LAMINATE THEORY AND THERMOMECHANICAL INDICES

Authors: Godinho, J. S.; Cunha, A.; Crawford, R. J.

Source: Plast., Rubber Compos. (2000), 29(7), 329-339

Organization: The Queen's University of Belfast, Belfast, BT9 5AH, UK

Abstract: The properties of molded plastic products are dependent on the processing technology used in their manufacturing and in particular on the structural morphology resulting from the thermomechanical environment imposed on the melt. The authors present a unified approach to describe the behavior of the products based on knowledge of the thermomech. conditions imposed during processing. A linear medium-density polyethylene was processed using rotational molding, compression molding, and injection molding in order to achieve different thermomechanical conditions *(i.e. shear rates and cooling rates)*. The processing conditions used were typical of those in common use in the respective industries. The molding parts were mechanically tested to determine the tensile, flexural, and impact properties. These measurements were performed both on samples corresponding to the entire thickness of the molding and on slices taken from across the section of the moldings. On the basis of these measurements, two models were developed. One is based on laminate theory, in which, from a knowledge of the mechanical properties of the individual layers through the wall thickness, it is possible to predict the tensile and flexural properties of the full thickness molding. The other is an empirical model that predicts the tensile modulus of a plastic part as a function of two thermomechanical indexes. It is shown that the type of dependence of the mechanical performance on the thermomechanical conditions imposed during processing is similar for the three molding techniques used. A good agreement is achieved between the experimental data and those predicted by the thermomechanical model. It is also shown that via the combined use of the thermomechanical indexes concept and the laminate analogue, good predictions of the mechanical behavior of plastic moldings with complex microstructures can be achieved. It is proposed that this approach could provide a very valuable addition to existing melt flow simulation packages. This would enable not only processing conditions to be optimized but the properties of the end product could be predicted.

PAST CHAIRMAN'S REPORT

This message is my last. I will soon fade into the background but I will always be involved and I will always be available to help or simply be a sounding board for anyone that wishes to pass old times around. Even though I relish the past because of the groups accomplishments, I am focused on the future for our profession, our Division, our organization, our plastic process, and all my friends and acquaintances. I take great pride in knowing all of you and participating in this professional organization. For me, this has been a great experience.

Well, where do we go from here? Visions and reflections are difficult human capabilities to master. Their use, dominance, and practicality all interact as our jobs change, pressures change, ages change, and family pressures change. We all have to have various visions in our life and our work acquaintances have to have visible visions or we are naturally reluctant to help or follow.

This division was started by Glenn Beall who had a vision of what it should be and what it should stand for. Jon Ratzlaff, our third chairman, was an excellent choice by the Board of Directors because he had both vision and the ability to manage detail. The details of managing a new, not fully formed Division with many new supporters working hard to supply their part of the puzzle and handcuffed by organization requirements, are monumental. Over the past year, Jon has finalized the Division procedures, won the Pride award, won the Outstanding Division Award, improved our Home Page, conducted a member survey, and a hundred other things. Jon was an excellent leader with vision and a good *"doer"* that managed all the little stuff, much of which he did himself. The membership owes Jon a great deal for his year-long efforts as our chairman. Thanks Jon!

Marshal Lampson is our new Division Chairman. He will steer a course for our Division that follows his vision and priorities. Marshal is a very impressive leader. Please give him your total support during the coming year.

One aspect of our Division's focus is the value of membership. A most perplexing challenge that all organizations struggle with in today's changing times. In periods of cost cutting, stretching budgets, and spare time being a premium; the value for membership and participation is sometimes hard to see. This is in the forefront of all the committees efforts and it is a constant topic with the Past President's committee. This value was also the reason for conducting the membership survey this year. The Division will be struggling to identify what it is and more important what it is not in today's professional arena. This identification or definition of worth has to change constantly with professional and business needs. The constant change in technology, not only in our field but in communication methods and types, has presented additional hard decisions for our Division.

The challenges are right in front of us. They are easy to see but difficult to overcome. Our success will be the result of all of us pulling together to work toward our functional goals. Please be an active part of our organization. I bid you farewell.

Sincerely,

Barry Aubrey

Barry Aubrey

HOT LINE

Anyone having questions, complaints, or suggestions regarding the R.M.D. or who just wants to chat, contact Glenn or Barry at:

Barry Aubrey: Tel. 513-530-4216
Fax: 513-530-4268
email:barry.aubrey@equistarchem.com

Glenn Beall: Tel. 847-549-9970
Fax: 847-549-9935.

PROCESSING TIPS By: Jon Ratzlaff, Chevron Phillips Chemicals

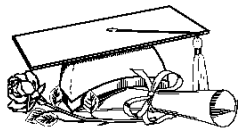
The following is the second of a continuing series of tips that will appear in subsequent editions of this newsletter

PROBLEM	PROBABLE CAUSES	SUGGESTED SOLUTIONS
Warped Parts	1) Uneven cooling caused by resin pulling away from the mold wall	a) Excessive or too effective mold release. b) Rotate during cooling cycle. c) Make sure mold is venting to prevent vacuum inside part. d) Add air pressure through drilled spindle during cooling. e) Reduce cooling rate during initial part of cooling cycle. f) Reduce oven temperature. g) Avoid large flat panels.
	2) Uneven cooling caused by shielding panels.	Remove shielding panels and replace with screen.
	3) Uneven cooling caused by clogged water nozzles	Check and clean nozzles on a periodic schedule.
Low Impact	1) Insufficient fusion of resin.	Increase heating time and/or temperature.
	2) Too slow cooling	a) Avoid excessive air cooling. b) Cool as rapidly as possible using techniques mentioned to prevent warpage.
	3) Improper coloring	a) Select pigment and pigment loading that do not materially affect impact strength. Use color compounds.

The SPE Foundation Awards $53,000 in Scholarships

The SPE Foundation, an affiliate of the Society of Plastics Engineers, is pleased to announce the recipients of $53,000 in scholarships for the 2001-2002 school year:

Joel R. Bell	$2,000	Winona State University
Lindsey D. Cameron	$4,000	Harvard University
Derek K. Choi	$4,000	University of Texas at Austin
Jennifer R. Conley	$4,000	University of Cincinnati
Jonathan A DeSousa	$1,000	University of Massachusetts - Lowell
Damon B. DeVore	$4,000	Penn State - Erie
Gregory C,. Gemeinhardt	$2,500	University of Southern Mississippi
Joel S. Goward	$5,000	Ferris State University
Matthew J. Heidecker	$5,000	Penn State University
Lianne D. Ing	$2,500	University of Toronto
Timothy L Johnson	$1,000	University of Cincinnati
Joseph P. Klesko	$4,000	University of Detroit - Mercy
Ronica A. Licciardello	$4,000	University of Pennsylvania
Andrea L. Lincoln	$5,000	University of Wisconsin - Platteville



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Web Page Chair	Linda Xu Little Tikes Company	Phone: 330-650-3883 Email: linda.xu@littletikes.com	Fax: 330-650-3951

2002-03 Calendar of Events

October 6-9, 2002
27th Annual Fall Meeting and Rotoplas '02
Sheraton Centre Toronto & The National
Trade Center, Toronto, Ontario, Canada

October 15-18, 2002
Expoplas 2002 Australia's International
Plastics Trade Exhibition
Phone: 61 500 567 808
Fax: 61 (0) 7 3009 0600

May 4-8, 2003
ANTEC 2003
Nashville, TN
Additional info: etakacs@mcmaster.ca

June 23-27, 2003
NPE 2003 The World's Plastics Showcase
McCormick Place, Chicago, IL USA
Website: http://www.npe.org

UPCOMING RMD BOARD MEETINGS
September 13th, 2002
Conference call 11:00 - 1:00 Eastern
December 6th, 2002
Conference call 11:00 - 1:00 Eastern
March 7th, 2003
Conference call

UPCOMING ARM BOARD MEETINGS
October 8-9, 2002 27th Fall Meeting
March 30-April 2, 2003 Spring Meeting
November 2-5, 2003 Fall Meeting
April, 2004 Spring Meeting
Refer to: www.rotomolding.org for locations

Society Of Plastics Engineers
Division of Rotational Molding
436 Morris • Mundelien, IL 60060