The Journal

Summer 2014
Volume 5
Issue 3

Product Design and Development Division

Newsletter

Editor's Desk

Summer 2014
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My Two Cents Worth

Brandon Lee

Through my numerous travels to the Super Market, I have had the privilege to observe the evolution of shopping cart material from all steel to all plastic. The question that continually comes to mind is this, is the steel shopping cart design the best design for plastics?

Now there are numerous advantages of using plastics over steel. Production labor costs are reduced with both fabrication and assembly. In addition, the part count can be lowered. One plastic part can remove a number of assembled steel parts. Also, material waste can be reduced, e.g., cut lengths of steel tubing and wire creates waste in the form of scrap. Finally, the product lifecycle may be longer with the appropriate plastic selection, increased durability and weather resistance.

For the user, both retailer and consumer, there are advantages too. For example, plastic shopping carts resist being and less likely to inflicting damage.

With all these advantages of plastics, I personally do not think the present design really optimizes the strengths of plastic, either functionally or aesthetically. As designers it's our job- no, our duty- to create the most appropriate, economical, and unique design, whether we're assigned to design for a specific material or function.

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Introductions

Beginning this issue, we are adding a new feature, a mentor's column. This is an opportunity for our beginning and even our experienced designers to get advice on product design and development, and life in general from our esteemed Michael Paloian. I will let Michael tell you a little about himself and his experience.

Also, we are featuring The Gallery of Goofs, a collection of plastic design errors. Every once in awhile we make a mistake.

Finally, either in the spring or summer issue of the Journal there will be a survey. This will be your chance to voice your opinion about the Journal and our division.

Have a great autumn, and I'll be speaking with you again in the winter issue.

Brandon Lee
Editor-in-Chief
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PD3

President's Desk

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President's Message for Fall, 2014 PD3 Newsletter

Al McGovern

Greetings to all from the Product Design and Development Division (PD3) President's Desk!

As I type this from my home in a southwestern suburb of Chicago, it is hot and steamy outside. Summer has finally arrived, even though it's the middle of September! I guess better late than never, as we've had a very cool summer this year in the upper-Midwest USA. As this is the Fall edition of the PD3 Journal newsletter, I hope the weather in your area is more like Fall as you read this next edition of our fine newsletter.

For many, the summer months were a time to slow down a little, take some time off from work and look for ways to enjoy time with those who matter most in our lives. Most of us on the PD3 Board of Directors (BOD) have used this summer to recharge our batteries. We have hit the ground running with plans for:

Membership

Reach out to new PD3 members

Retain current members

Bring back PD3 members who have not renewed their SPE membership

Newsletter

Even more issues of The Journal

New Content

Advertisers

Website

Create a PD3 website

TopCons

Scheduling Upcoming Dates and Locations

ANTEC

Adding More Plastic Part Design Papers and Case Studies

Additive Manufacturing

CAD User Groups

Our focus is on making PD3 the go-to destination for plastic part designers, or those who wish they were! If that sounds like you, and if you are one of those people who wants to make a difference, then why not join us on the PD3 BOD. We are expanding by adding several new members to bolster our ranks in this time of growth. The experience is better than the pay—much better actually! Why not make this the year you broaden your plastic design world and add your voice to ours as we, together, solidify PD3 as the premier plastic part design source.

Wishing you peace and happiness in all you do,

Al McGovern
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Board of Directors Meeting, June 19, 2014

David Tucker

Meeting Attendees:

- Albert McGovern
- David Tucker (notetaker)
- Jordan Rotheiser
- Brandon Lee
- Ed Probst
- Michael Paloian
- Eric Larson, PE
- Jeremy Braaten
- Larry Schneider
- Glenn Beall
- Lance Neward
- Mike Lacey
- Mark MacBlean-Blevins

Budget Review: Larry

1. Rebate from SPE for membership
2. Current budget is below

Current Budget:

	Date	Income Dividend	Deposit	Withdrawal	Balance	Withdrawal Description
5	08/19/13	3.84			59,781.00	
6	09/31/13	3.13			59,784.13	
7	10/04/13			(2,500.00)	57,284.13	Syracuse University (Plastics Library)
8	10/13/13	0.49			57,284.62	
9	11/18/13			(2,000.00)	55,284.62	2014 Spring Conference (Seed Money ED Probst)
10	11/26/13			(1,196.65)	54,087.97	Councilor Travel-Mark MacLean-Blevins
11	11/29/13	0.46			54,088.43	
12	12/31/13		1,287.50		55,375.93	SPE Rebate
13	12/31/13	0.46			55,376.39	
14	03/12/14		929.06		56,305.45	SPE Rebate
15	03/18/14	0.90			56,306.35	
16	03/27/14			(165.00)	56,141.35	Antec Awards Luncheon - Al McGovern
17	03/31/14	0.47			56,141.82	
18	04/17/14			(114.49)	56,027.33	plaque for Ed Probst TOPCON Chairman
19	04/24/14			(130.19)	55,897.14	Award for Michael Paloian-Al McGovern
20	04/29/14		7,156.00		63,053.14	Topcon 2014 profit
21	05/06/14			(1,756.01)	61,297.13	Councilor Travel-Mark MacLean-Blevins
22	04/30/14	0.46			61,297.59	
23	05/12/14			(1,000.00)	60,297.59	Society of Plastics Engineers (Students Activities)
24	05/29/12		929.06		61,226.65	SPE Rebate
25	06/03/14	0.51			61,227.16	
26					61,227.16	

Membership Report: Jeremy

1. Flat PD3 Growth
    a. 72 New Members, equal members lost
2. Actions:
        a. Develop methods to get new Members
        b. Retain old members
3. Created Flier for SPE Membership Growth
    a. To be sent out to the PD3 group
            I. Contains Value Proposition
4. Membership Report Below

Membership Report:

Date	Primary	Secondary	Total
March (2012)	554	372	926
May (2012)	637	434	1071
February (2013)	689	427	1116
April (2013)	702	462	1164
May (2013)	692	452	1144
October (2013)			1045
November (2013)			1071
December (2013)			1068
January (2014)			1058
February (2014)			1065
March (2014)			1071
April (2014)			1048

Membership Gender Breakdown:

	Women	Men	Total
March (2012)	64	862	926
May (2012)	83	988	1071
February (2013)	85	1031	1116
May (2013)	86	1058	1144
October (2013)	85	960	1045
November (2013)	89	982	1071
December (2013)	88	980	1068
January (2014)	90	968	1058
February (2014)	95	970	1065
March (2014)	96	975	1071
April (2014)	93	955	1048

1. Follow up Questions:
   a. What can be done to improve retention of members? What is the best method for obtaining this information?
   b. How does PD3 compare to industry as a whole?
   c. SPE membership is about 30,000 and 14,000

d. Reach out to delinquent members of PD3, history has shown that a phone call can improve retention.

Website: Albert

1. PD3 Website is live and active
2. Web Location:

http://www.4spe.org/Communities/divisionsdetail.aspx?ItemNumber=5059

3. Other SPE groups have separate websites (a site within a site)
4. Should website be renewed
5. Creation of a microsite
6. Membership of the site creation committee

Newsletter: Brandon

1. Current Issue is out
2. Next issue is September 15
3. Cost model for advertising is established
4. Goal is to be a technical Journal
5. Sponsorship to be used for Newsletter funding

Counselors Report: Mark

- Sent out via Email

TopCon Committee: Ed

1) Brainstorm list of locations to consider including attributes for a successful event

San Diego- LA	Medical Roto, Blow, Inj., Tform
San Francisco	SPE Records- membership density (by division & section)
SLC	Strong Section - active mailing lists
Texas-DFW, Austin	Easy airport access
Boston	IDSA connections
Atlanta	Nice but not too nice
Carolinas	Industry support, on-site,

2) Determine subject matter of TOPCONs

Material Selection (how to)	Resin/DistributorsTech staff
Process(es)	
Industry focused (i.e. Medical, Communications)	
Plastic use for non-plastic designers	
Process to match industry	
Audience focused: Product, mold designers, SPE data	
# days and # of speakers	
Deep dive vs. Overview	
Canned program	

3) Determine schedule and number of TOPCONs

Timing - avoid conflicting events	
Dependant on subject and style	
Weather	
Every 6-9 months w/no conflicts w/other events	
List of events to avoid	ANTEC/NPE, Polyolefins TOPCON, Division TOPCONS, K-Show
Holidays to avoid	month of December
Using canned program	
Possible consecutive programming with close geographic sites (North Texas/South Texas or LA/SanFrancisco)	

Antec Committee: Mike Lacey

- Meetings will be scheduled for future on technical paper selection
- Strategy will be to select topics that will draw people to the discussion
- Creation of a how to design with plastics guide for website
- SPI and SPE are coordinating more efforts for successful NPE and ANTEC collaboration
- ANTEC can be a marketing opportunity for SPE PD3 Growth

Old Business:

Board of Director - Contact information to be updated

Action Items:

1. TopCon List to be provided to Jeremy from Lance.
2. Follow Up Discussion between Al and Jeremy to discussion strategy for retainment of Membership
3. Send to Al for email for membership of the website committee
4. Members thoughts on the creation of the newsletter, Standardized Layout vs. user generated layouts, Use of Deb Dailey creates graphics for SPE in main office, brochure creation etc
5. Discussion of Flyers and promotional media for NPE 2015
6. Future meeting 2 months from now, week of August 11 or 18th.

Next Meeting:

August 21, 2014 at 9:00 Central Time

David Tucker

PD3 Secretary

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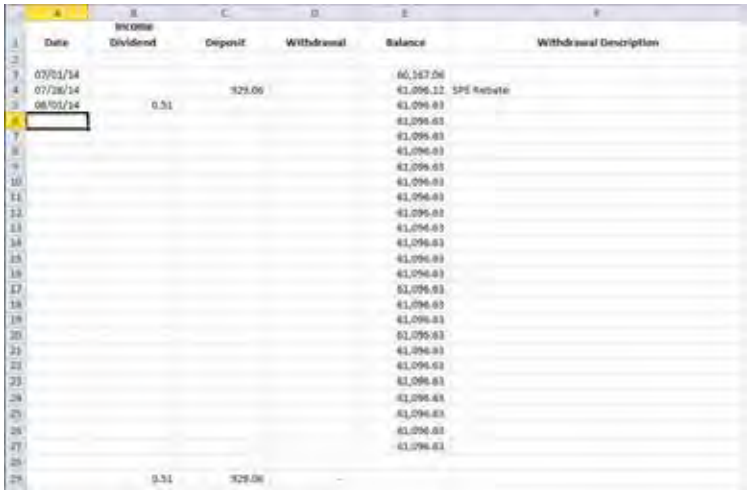
Board of Directors Meeting, August 21, 2014

David Tucker

Meeting Attendees:

- Albert McGovern
- David Tucker (notetaker)
- Mike Paloian
- Brandon Lee
- Jeremy Braaten
- Lance Neward
- Ed Probst
- Jordan Rotheiser
- Mike Lacey
- Mark MacLean-Blevins
- Larry Schneider

Agenda:

1. Roll Call of Members Present: Al
2. Treasurer's Report: Larry Schneider
   a. 
   b. SPE Rebate established to provide payment to divisions based on their size.

3. Councilor's Report: Mark MacLean-Blevins
    a. Last meeting was at Antec
    b. Next meeting will be September 13th and 14th in New Orleans, LA
    c. Next election meeting to be at Antec
4. Membership Report: Jeremy Braaten
    a. Update on reaching out to new members, following up with nonrenewed members, etc.
    b. Proposed Flier to reach out to new members is below:
    c. 

    d. Target Market for the flier and campaign
        i. SPE members who are not part of PD3
    e. Promotional avenue that can be used to reach target market
        i. Linkedin Advertisement
        ii. SPE Headquarters
            1. Distributed at alternate headquarters

iii. Ed to provide names of past TopCon Attendees
iv. Distributed flier at NPE and Antec 2015

f. Upcoming Actions:
    i. Jeremy to Setup follow up meeting with selected team to establish a path forward
    ii. Email distribution and start discussion
    iii. Close loop with Kathy Schacht (liaison from SPE) at SPE to discuss reach of national organization.
    iv. Need to focus on how to retain members, Currently members are leaving faster than they are joining.
        1. Al and Jeremy to discuss retention with Kathy

5. Newsletter Report: Brandon
    a. Next Journal Issue, Fall
    b. Advertisers?
        i. Develop list of companies that would be interested in sponsoring possible to email from SPE national organization
    c. Discussion points:
        i. Technical Content: ways to obtain and what the newsletter should achieve
        ii. Benchmarking Thermoform Newsletter for content and format
        iii. Discuss methods for distribution and tracking
        iv. Connection of Newsletter with member retention
    d. Actions:
        i. Al to sort through the board list and discuss enlarging board to gain additional support for Newsletter
6. Committee Discussion
    a. Website Committee: Al, Brandon, Mark MB, Mike Lacey
        i. Discussion on Preferred Microsite Direction- ALL
        ii. Generate Feedback on Website Strategy

1. Work with the headquarters microsite and use the URL to point people to the location
2. Possibility to expand in the future if the Topcons grow

iii. Action:

1. Al to schedule follow up meeting and setup discussion with SPE and discuss strategy for website URL.

b. TopCon Committee: Ed, Mike Lacey, Lance, Michael P, Eric, Glenn (consult)

i. Update on plans for next TopCon
ii. Goal is the schedule three upcoming topcons
iii. Discussed dates Feb 2015, October 2015, and Feb 2016
iv. Follow up meeting to be scheduled and reported in the next SPE board meeting.

c. ANTEC Committee: Mike Lacey, David, Al, Eric (consult)

i. Paper submittals

1. September 26th final submission date
2. Antec in March 22/23rd
3. Request assistance to reviewing papers

ii. Moderators Strategy for Antec 2015

1. SPE allows 2 people per session

iii. Target would be to have 4 people committed
iv. Thoughts on Additive Mfg, CAD User Groups, etc.

7. New Business

a. HSM Award Nomination: Mark MB

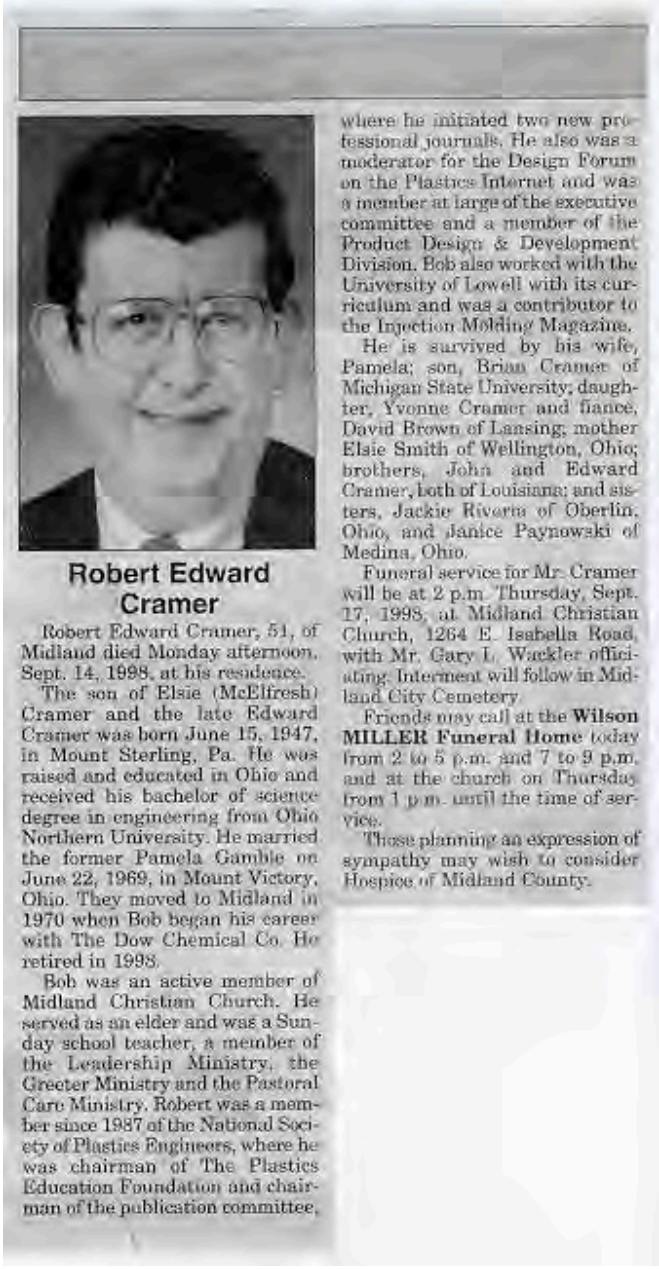
i. Awards Chair Position

1. Al to work with Kathy to establish job description

2. Strategy- best to have two members new and senior members due to the amount of paperwork required
3. Anne and Barbara (board members)

b. Call for Divisions Committee Office Nominations: Al

8. Scholarship discussion
    a. information to be added to the Newsletter for promotion
    b. Establish method for reconnecting with the Cramer scholarship
    c.



Robert Edward Cramer

Robert Edward Cramer, 51, of Midland died Monday afternoon, Sept. 14, 1998, at his residence.

The son of Elsie (McElfresh) Cramer and the late Edward Cramer was born June 15, 1947, in Mount Sterling, Pa. He was raised and educated in Ohio and received his bachelor of science degree in engineering from Ohio Northern University. He married the former Pamela Gamble on June 22, 1969, in Mount Victory, Ohio. They moved to Midland in 1970 when Bob began his career with The Dow Chemical Co. He retired in 1998.

Bob was an active member of Midland Christian Church. He served as an elder and was a Sunday school teacher, a member of the Leadership Ministry, the Greeter Ministry and the Pastoral Care Ministry. Robert was a member since 1987 of the National Society of Plastics Engineers, where he was chairman of The Plastics Education Foundation and chairman of the publication committee, where he initiated two new professional journals. He also was a moderator for the Design Forum on the Plastics Internet and was a member at large of the executive committee and a member of the Product Design & Development Division. Bob also worked with the University of Lowell with its curriculum and was a contributor to the Injection Molding Magazine.

He is survived by his wife, Pamela; son, Brian Cramer of Michigan State University; daughter, Yvonne Cramer and fiance, David Brown of Lansing; mother Elsie Smith of Wellington, Ohio; brothers, John and Edward Cramer, both of Louisiana; and sisters, Jackie Rivera of Oberlin, Ohio, and Janice Paynowski of Medina, Ohio.

Funeral service for Mr. Cramer will be at 2 p.m. Thursday, Sept. 17, 1998, at Midland Christian Church, 1264 E. Isabella Road, with Mr. Gary L. Wackler officiating. Interment will follow in Midland City Cemetery.

Friends may call at the **Wilson MILLER Funeral Home** today from 2 to 5 p.m. and 7 to 9 p.m. and at the church on Thursday from 1 p.m. until the time of service.

Those planning an expression of sympathy may wish to consider Hospice of Midland County.

d. Bob Cramer Scholarship

i. You may recall that since Bob Cramer's passing in Sept 1998, SPE/PD3 has instituted a scholarship, and raised a fund of over $25,000. The fund is being administered by the SPE Foundation, and the interest from the fund is used to award a scholarship annually in the amount of $1000.00. The first award was given to Mr. Jason R. Haserodt, a freshman from Case Western University. Jason's interest in Plastics stems from a family business- Automatic Stamp Products- and its sister company- Haserodt Machine & Tool (a metal stamping and tool & die company. Last summer, Jason helped converting the sketches to CAD drawings for cataloging the components. Jason graduated in the top 10% of the high school senior class and carries over 4.0 gpa.

9. Old Business
    a. Sub Committee Meetings beyond BOD meetings
10. Adjourn

Next Meeting:

Meeting to be established via email.

David Tucker

PD3 Secretary

PD3

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Fall 2014 Council Meeting Report, September 13 and 14, 2014

Mark MacLean-Blevins

The fall Council meeting this year was held earlier than normal to accommodate the earlier than normal ANTEC, co-located with NPE in March of next year. Several important issues were discussed during the meetings. However, the nominations and voting for SPE executive committee positions has been moved to the Council I meeting at ANTEC. The elected officers will be inducted and take their respective positions during the Council II meeting at ANTEC. Other notable issues discussed were:

- The Sections Committee, the Divisions Committee, and the Council Committee of the Whole (CCOW) were merged into one group meeting with each committee having time to review their business. This format seemed to work well and provided the ability to discuss issues at length, which otherwise could not be discussed during Council meetings due to time constraints and the formal nature of the Council meetings.
- From this merged meeting – there is a group to represent 3D Printing/Additive Manufacturing information. With a leadership matrix nearly in place, the group can begin petitioning to become a Special Interest Group (SIG).
- Also from this merged meeting, the Next Generation Advisory Board (NGAB) discussed their plans and asked for Section and Division support - both volunteers and financial support.
- Gail Bristol has retired and a new Managing Director has been hired and will begin with the Society after October 1st – SPE will make a formal announcements in the coming weeks.

- The new website is being received well – nearly 1000 hits per day. The search page is second only to the home page in number of hits. Website advertising is generating revenue and seems to be gaining traction.
- The Events App is now 8 months old and has been used by 14 events by the Society and sub-groups.
- The "Chain" SPE's new social networking site is nearing completion – beta testing is underway – the soft launch (1000 or so users) will occur around October 1st, with the full implementation scheduled for January 1st 2015.
- SPE is encouraging Sections and Divisions to use the SPE site and to create micro-sites within the SPE site. This increases the SPE site usage, providing better overall ratings within the search engines and it helps to justify and provide better value to advertisers.
- Financial results – FY 2014 is tracking close to the projected budget. FY 2015 budget looks to be near to a break-even budget – based on additional income from expanded advertising avenue from the website.
- Councilors participated on a small group discussion workshop centered around member values, membership classifications, costing, and governance restructuring. Results were mixed but in general the small groups supported the introduction of an e-subscription for non-members wanting to get a taste of SPE through the use of the "Chain" with limitations on access to SPE knowledge base and member information. The small groups generally agreed that a small increase in membership price is justified, once the overall fee structure is clean-up and streamlined. Finally, the small groups saw no need to restructure the governance, but agreed that steps needed to be implemented to allow a more nimble management of the Society.

- A special presentation was delivered by Mr. Bill Carteaux, CEO of SPI, regarding the changes in governance made at SPI over the last 9 years to allow them to weather the financial storm and to grow.
- A report was made to the Council by Ashley Price, from the NGAB, regarding their activities and successes. The Plastics Race, as initially held at ANTEC 2014 in Las Vegas, will be held again in Orlando, but this time it will be inside the show at NPE. Participants may visit participating booths to receive answers their questions. NGAB expects 200+ race participants and has a goal of engaging 100 booth vendors at NPE. The NGAB has asked each Section and Division to help by finding at least one booth vendor to signup to be a participating booth at NPE – cost to the booth to participate will be around $1000 to help cover the expenses for the race, including individual QR codes for each participating booth along with signage and prizes.
- Student Activities at ANTEC – the ANTEC in Las Vegas had good student participation with 122 students receiving travel assistance awards – compared to 87 the year before. PD3 donated $1000.00 last ANTEC and the Student Activities Committee is requesting all Sections and Divisions consider donating again for the upcoming ANTEC 2015 in Orlando.

Respectfully Submitted
22SEP2014

Mark MacLean-Blevins
PD3 Councilor

PD3

Membership Desk

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September 2014, Status

Jeremy Braaten

Dear members,

Greetings from the PD3 Board of Directors. I hope that everyone has had a great and prosperous summer. I would like to, again, remind everyone again of the great benefits of being a member of PD3, and emphasize the advantages of getting other individuals involved, as this will increase everyone's ability to create a greater network of professionals in the plastic field.

The membership of PD3 is steady as we have a large amount of our members renewing their memberships. We are also getting many new members joining our division every month. This is great news for our division!

One of the things that has helped me over the years to grow in the plastic industry is knowledge management. Trying to constantly find information about how to design critical features- whether it is a living hinge, the correct rib to wall thickness to reduce sink marks, read through, or even the correct resin to use for certain applications- has been difficult, requiring me to search many different internet sites hoping that they had the information that could help me. What the Plastic Design and Development Division of SPE does for its members is provide a place for them to get answers for these questions.

SPE members have many avenues to get the information they need for their plastic design questions; including workshops, webinars, and conferences.

Being a member also allows us to attend or participate in these events at a discounted price. Another benefit of the SPE is that it provides consulting, creatively called “Consultants Corner”, for its members to get a more in-depth connection to the plastic industry.

We as members also need to help build our future plastic professionals. These individuals are students coming right out of colleges and universities or young professionals that have been in the plastic industry for a short period of time. We need to encourage them to join SPE as they will be able to enjoy the benefits of creating a foundation for their networks, career building resources, and grow their knowledge base in the plastic industry.

The goal for PD3 is to provide the resources to help our members grow and develop strong networking ties in the plastic industry as well as to provide tools to develop our members to become better, smarter, and more productive employees for your businesses.

Sincerely,

Jeremy Braaten
Membership Committee Chair

PD3

Mentor's Corner

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Product Specifications – The First Step in Design

Michael Paloian

Hello fellow plastics designers. I would like to introduce myself to you since I will be a contributing editor to this publication from now on. My name is Michael Paloian, past chairman of the SPE-PD3 and Rotational Molding Division as well as a longtime member of the SPE. I've been recently asked to contribute to this newsletter on a regular basis because of my extensive experience as a product designer as well as my education as a plastics engineer and industrial designer. Although I write for other publications, I want these articles to be especially interesting to you and therefore welcome your comments. The format I've chosen to share my opinions and comments is first person. This will hopefully maintain a personal line of communication between you and me. I look forward to hearing from you and will respond to your comments by modifying my editorials based on your feedback.

My first article will address the importance of defining product specifications before any project is started. I believe this first step is the most important phase in any product design program. It establishes the common foundation upon which all subsequent decisions will be made throughout the remainder of a project. A well-written set of product specifications will not only outline the definition of the product but also provide a framework for setting priorities and performance criteria.

Every product must comply with a number of functional requirements or it isn't a product, it is simply a useless object, trash, or in some cases artwork. I'd like to state that art is not being compared to trash, although

some art is trash in my opinion. Therefore the first phase of any design project requires you as a designer to focus your attention on the product application. This study should enable you to gain a comprehensive understanding of the product's purpose and all the parameters associated with its intended use, as well as its potential unintended use. The latter is as important as the former since unintended use can result in premature failures or serious safety risks. These criteria should then be documented as specifications which define the product based on numerous parameters. The remainder of this editorial will describe the importance of such a document and how it establishes all the subsequent decisions made throughout the design development process.

There are no rules or standards for creating product specifications. Some products require extensively detailed documents which could include hundreds or thousands of pages of specifications while others may be as brief as a page or two. It doesn't matter how "simple" a product is, some form of documentation is always required to establish how that part or product is to perform based on one or more sets of conditions. Although this may appear to be sensible and obvious within the context of this editorial, product specifications are often overlooked or omitted from the design process. Omissions typically lead to confusion during development, resulting in costly rework or catastrophic product failures. I often like to compare specifications to a contract between the development team and the company for which the product is being designed as well as the end user. Specifications will not only influence the product design, but also user manuals, compliance with regulatory bodies and legal ramifications. Specifications should be written with careful consideration of sound engineering principles, user requirements, cost considerations, manufacturing parameters and marketing requirements. Incorrect assumptions or omissions will lead to costly recalls or unnecessary complications throughout the design process.

Since every product requires its unique set of specifications, I cannot provide a recipe for creating a universal specification. However, I have provided an abbreviated list of general specifications, which could pertain to many products. This list is provided below:

- Marketing
    - User requirements
    - Appearance
    - Forecasted sales
- Engineering
    - Structural
    - Mechanical
    - Functional
    - Life cycle/reliability
    - Performance
    - Testing and verification
- Financial
    - Return on investment/amortization
    - Capital availability
    - Risk
    - Vendor selection
- Manufacturing
    - Location for production
    - Supply chain
    - Design for manufacture
    - Number of parts
    - Tooling design
- Regulatory compliance
    - Recycling
    - Compliance with specific regulatory body; UL, CSA, FDA, RoHS, etc.
- Project Management

- Lead times
- Project risks
- Project schedule
- Available resources

A small subset of this list can be discussed in limited detail to serve as an example describing how tightly these parameters are interrelated. Material selection, for example, is dictated by designers and is critical to overall product performance, cost, reliability, appearance, manufacturability, compliance with regulatory bodies and in some cases, lead times. Your critical role as the person making these significant decisions requires you to have a thorough understanding of static and dynamic structural requirements for a product during short term as well as long term performance. You should understand the significance of tensile strength, tensile modulus, fatigue resistance, creep and impact strength during the material selection process based on structural analyses. This insight will provide you with a sound basis for selecting optimal plastic resins for a particular application. Your list may be further truncated based on thermal conditions, chemical resistance, UV resistance, clarity requirements, etc. Other factors including availability, cost, and lead times for delivery may further reduce the selection. Chosen materials may also be reviewed by the molding department or molder based on ease of processing, tool design and proposed secondary operations.

Structural analyses, testing and all the associated performance evaluations which effect material selection are based on the specifications. If product specifications omit potential exposure to harsh chemicals, or thermal conditions, the analysis and resin selection will be based on erroneous premises which could lead to premature failure. Omissions in specifications typically arise from ignorance of the effects certain environmental conditions have on plastics. It is therefore crucial to test molded parts under anticipated environmental conditions as stated in the specifications to

uncover potential failure. Rapid time to market often forces designers to omit long term testing or simply ignore it all together which introduce high risks in a project. In such cases it is often advisable to include a plastics materials specialist to review the specifications and assess the potential risks. Material selection will influence wall thickness, design features such as ribs, bosses, snaps, etc, and appearance for the designer. It will also affect a molder's choice of tooling material, gate location and shrinkage rate and many other factors influencing tool cost.

Material selection is only one of the many parameters that are dictated by product specifications. I hope you can extrapolate all the other important decisions influenced by such an important document. Next time you begin a design be sure you have a comprehensive understanding of where that part is being used, how it is being used and why. Your insight could prevent major setbacks or financial losses. I hope this brief article outlining the importance of defining product specifications has been informative and interesting. I look forward to your comments and replies. You can post your opinions on my blog at http://www.idsys.com/color-and-graphic-design/

Thank you

Michael Paloian
PD3 Mentor

PD3

Gallery of Goofs

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The Showerhead

Russ Malek

Immediately after World War II, when there was a shortage of brass, a manufacturer of showerheads needed to convert his parts to another material, and plastics were suggested. As was common then, the part that had been brass was duplicated as an injection molded part. Areas that had included a mass of brass in the casting were duplicated accordingly in the molded part.

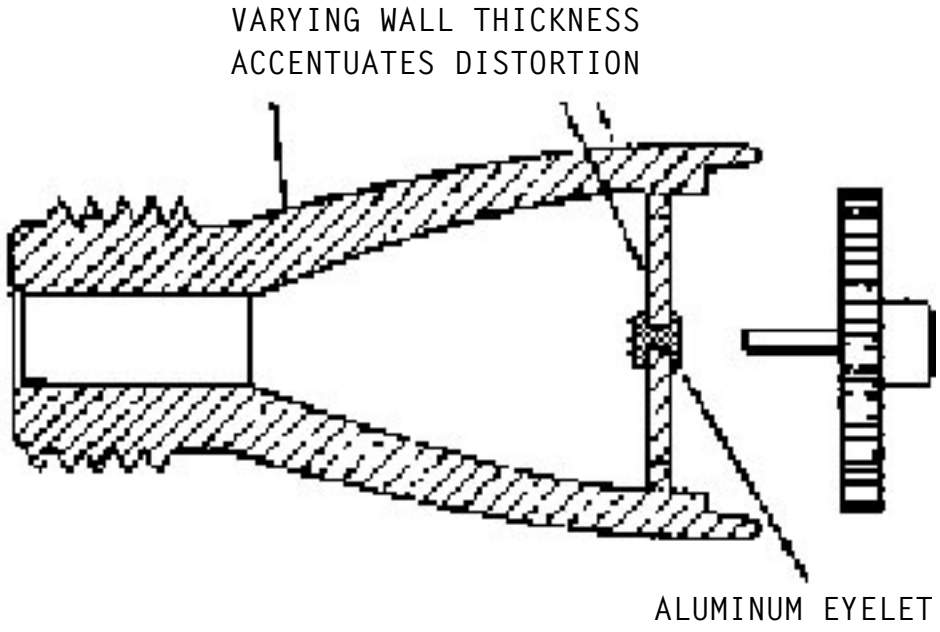
The adjustable spray of the head was achieved by using an aluminum eyelet, because any aluminum that had been rejected by the Army or Navy was declared surplus and could be used in a civilian product.

At the time, the most readily available thermoplastic material was acetate. Since plastics were priced at a premium, the manufacturer thought it would be a good idea to mold the showerhead in black because the company was able to buy scrap material and color it black. Not only was the material not homogeneous, but in regrinding the material and in blending the various colors together, the different flow characteristics and different hardnesses of acetate were exaggerated even more.

The end result was a product that looked reasonably attractive on the surface since it followed the exact same design as the conventional brass showerhead. The new shiny black showerhead enjoyed an immediate acceptance. However, shortly after it was placed on the market, the manufacturer was shocked by the number of returns. The showerheads were warped, distorted and shrunken.

Acetate by itself is basically a hydroscopic material and will absorb up to 5-percent moisture. Add hot water, possibly at 160F to 170F (almost at the yield point of the material) plus the continuous pressure applied by the hydraulic force of the hot water on the acetate and deformation in short order was not surprising. In addition, the aluminum rivet conducted heat to a localized area, also creating deformation. In this case, therefore, the failure of the product was caused by the selection of the improper material.

Would it have been possible immediately after the war to design a showerhead in a thermoplastic material that would not distort under heat and load? Yes, there were butyrate materials filled with asbestos or other materials that would have increased the heat resistance of the material; and, if the part had been designed with a relatively thinner section so that there was less mass of material, it possibly could have functioned reasonably well under the circumstances.



Plastics were not then, and are not now, a cure-all. There are areas in which they will not function as well as another material. However, it is up to the design engineer in particular to recognize the problem. With rare exceptions, the designer should be able to find either an existing material or work with the polymer suppliers or custom compounders to develop a special polymer or custom compound to meet the requirements of the end use.

PD3

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Playing with Fire

Eric R. Larson, PE

The story behind making a child resistant lighter

Kids can make any product designer look like an idiot.

Designing a product so that is it always used properly is hard. Even when done right, adults typically still need some form of instructions -- pictures, icons, letters, color-coding -- that tell a user to “DO THIS LIKE THIS…”

Designing a product so that it can’t cause harm - even if it is mis-used – is even harder. But even the best design can cause problems when a kid grabs it. Then licks it, immerses it in the sink, turns it upside down, throws it, hammers it, and sticks it in any suitable slot, crevice, or electrical outlet. When kids are in the mix, the matrix of possible mis-uses is overwhelming.

A few years ago I was invited to participate in a design project for the BIC Corporation. BIC is a global manufacturer of high-quality, affordable consumer products. This project involved a possible design change to one of their products, the BIC disposable lighter.

This small, inexpensive device provides users a simple means to make fire on demand, at - *the flick of a Bic*. It does this safely, reliably, and cost effectively – exactly as it was designed - for millions and millions of people around the world. It is a design and engineering masterpiece included in permanent collection of the New York Museum of Modern Art.

But flammable equals risk. Not only can a Bic make fire on demand, it is also a pressure vessel filled with a highly flammable liquid. Same formula as a

bomb. Most adults understand fire will burn them and this tool should be used responsibly, but kids can be less than clear about where risk lies.

Bic had encountered an issue with 4-6 year old boys, for whom the lighter was a toy. Not because it made fire, but because it made pretty sparks. Run the lighter's wheel at the right angle on the carpet, or on the edge of the sofa, or on the side of the bed and you had a fantastic race car that made just the right vroom sound (wheel friction against the flint) and sparks shot out.

Vroom, vroom, VROOM!

But get the angle of the wheel wrong, then add household fabrics (carpet, sofa, bed), a few sparks, and a little bit of butane gas and you had disaster involving a young child. BIC had been named as a defendant in a number of wrongful death lawsuits and they were seeking a way to make their product safer.

To do so, BIC commissioned a number of different teams to explore options on changing the design of their lighter to make it "child resistant." It seems like a pretty straightforward design task, but implementing a design change in a product like this is not cheap.

BIC has produced over 20 billion lighters in the last 35 years. Worldwide, they produce over 5 million lighters every day.

The main body of the BIC lighter is molded from acetal resin, and it weighs approximately 20 grams. If we assume the molding cycle for this body is 10 seconds, and we assume the factories are all running 24 hours a day, it would require at least 10 molds – with 64 cavities in each mold – to manufacture this many lighters.

	one mold	ten molds
cavities / mold	64	640
parts per cycle	64	640
cycle time (seconds)	10	100
parts per minute	384	3840
parts per hour	23,040	230,400
parts per 24 hour day	552,960	5,529,600

Making a design change to the body of the lighter would require changing every cavity of every mold. It would also require making changes to all the parts that interface with the body (the release lever, the valve, maybe even the spark wheel), to all of the tools that make these parts, and to all of the equipment used in the manufacture and assembly of these parts.

I had a lengthy discussion with the Bic design team about performance requirements, scenarios for use and mis-use, tooling and manufacturing requirements. I came home, and spent weeks exploring options.

I came up with a design solution that I thought was perfect. My design featured a mechanism that was simple, elegant, and nailed all the specifications. It involved the addition of one single part and the modification of two others. I had a fully-functioning prototype made, then assembled a presentation demonstrating the effectiveness of the design change, the costs to implement it, and the schedule involved. The managers at BIC thanked me for my work.

Sometime later I learned that my exact design had not been implemented. I also learned that a similar design had been implemented, but it cost a few

pennies more than the existing design, and it was not selling well. Even though the product was now safer, people weren't willing to pay a higher price for it. It was a sobering lesson in human behavior, and in the cost constraints of the consumer market.

Decades later, the BIC lighter remains in production. The design has gradually evolved. The valve to allow for an adjustable flame has been replaced. A protector strip has been added above the spark wheel. A number of international safety standards (including ISO 9994) have been enacted to ensure safe use, and prevent *reasonably foreseeable* mis-use. It is a still a design and engineering masterpiece. And even though my exact design was not used, I am proud to say that I contributed.

Years ago, when I became a registered professional engineer, I took an oath that I would uphold the safety, health, and welfare of the public in all of my professional activities. I keep a framed copy of my registration certificate in my office to remind myself of that oath. And right beside it, I keep a copy of my original design sketch for this mechanism, to remind me of the real-world challenges we often face in design and engineering.

Be careful when playing with fire.

This article is a condensed extract from http://plasticsguy.com/playing-with-fire/

Eric R. Larson, PE
PD3 Contributor

PD3

Article

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Choosing Plastics, Price per Part, not Price per Pound

David Hunt, PE

I'm going to discuss two situations from my career where an obsession with the **price per pound** of the resin was evident, rather than the much-more-relevant **price per part**. I'll conclude with some points to ponder when choosing plastics for cost minimization, whether in a new application or when considering substituting one resin for another in an existing product.

The first situation was my job straight out of graduate school. I'd landed at the engineering center for M.A. Hanna Resin Distribution, now PolyOne. I'd come to this particular project quite late, but still managed to contribute a little, and to see the end-game play out.

The situation was that a nationally known maker of home laundry drying racks, or exercise equipment: who wanted a plastic base platform underneath the treadmill of their latest design. Their purchasing manager had heard of a material we had available: recycled polypropylene battery trays. It was cheaper than dirt – if I recall, something like 20 cents a pound. It also had the engineering properties of dirt. Low stiffness, low strength, low modulus of elasticity, and being recycled with varying feedstock, it processed inconsistently with predictable quality and consistency issues. But it was cheap.

So despite our concerns about this material's suitability for the application, we had developed a design that met their specifications. It was heavy, with many deep ribs and thick sections necessary to meet the structural, deflection, and impact requirements. Because of these design features, we estimated its cost per part as fairly high despite the low cost of the base material.

As an experiment, we picked a prime engineering resin; I recall it being a PC/PET blend with 10% glass fiber reinforcement. At close to 10x the per-pound material cost of the original material, it seemed like a non-starter. But we plugged the different loading scenarios into the CAD program's design optimizer (at this employer I used Pro-Engineer), with parameters such as the number, depth, and thickness of ribs, the thickness of the base platform's flat area, and so on. Setting the objective function to minimize the part volume while still meeting all the different loading scenarios, we let slip the dogs of optimization to try different design iterations.

Lo and behold, because we were using a prime resin with much higher strength, rigidity, and impact resistance, the reduction in the thicknesses, depths, and number of ribs resulted in a part that was so much lighter than the original design that the reduction in weight more than compensated for the higher per-pound price. Additionally, there were three other cost benefits; one we could approximate, and the other two were an arm-waving savings we couldn't quantify, but which were definitely something that needed to be considered.

First, because the mass of material was so much lower, and the wall thicknesses so dramatically thinner, the estimated cycle time per part was vastly reduced because the part could be cooled more quickly; this meant – going from memory – something like a 30% increase in the number of parts per hour. Even if the material cost had been a wash from one to the other, this added in a second advantage for the better material.

Second, the because of the weight reduction, shipping costs would be lower because of the reduced weight and lower volumetric part envelope, which resulted in a greater packing density per shipping container. We couldn't quantify this in any meaningful way, but it was certainly something to point out. And third, the lower number of ribs, thinner sections, and overall shallower design meant less machining of tool steel, for an unknown

but definite advantage in tooling cost and timing coming from the more expensive material.

But the project was killed. In our presentation to our customer we had two columns for the two materials. And we made the mistake of having, right under the two material names, the price per pound. Our customer's purchasing manager never got past those two numbers to the nitty-gritty where the part with a more expensive resin was actually less costly, with other benefits to boot.

The second example comes from when I was at Ford Motor Company in Sandusky, Ohio; specifically, injection molded nylon housings for air cleaners. There were two suppliers ("A" and "B") who continually vied for the business – we bought millions of pounds of plastic a year just for this application family. Big bucks were at stake.

Our purchasing person was obsessed with price-per-pound. Company A had a cent-or-two advantage, and this was the supplier they wanted to use. But Company B had three advantages, and I (and others!) wanted to use them preferentially.

First, the densities were different. Company B's material was lighter; even though it was marginally more expensive per pound, since the mold's cavity had the same volume of plastic used the relevant parameter was not *cost-per-pound* but *cost-per-cubic-inch*. Company B's material, on that basis, was actually roughly a cent per part cheaper.

Company B's material also processed marginally faster. Because it was slightly less dense, and had a fractionally-higher thermal conductivity, it would cool faster after injection, leading to a couple of extra parts per hour.

And they had one final advantage: Company B was much more responsive. Faced with a service request call because of a production issue, Company A's response was, typically, to schedule a visit within a week or so.

Company B? You'd call with a problem and they'd be there the next day – live and in person – to help you figure things out.

Presenting these arguments convinced Purchasing to go with Company B.

From these two examples I'd like to extract some lessons which I hope are useful:

1. In the design phase of a project, use your CAD program's optimization feature to minimize the volume of material used under the different loading scenarios. It's very likely that the cheapest material, which probably has lesser properties than a more expensive one, may require more material than the expensive one; the reduction in material used per part might well overcome the more expensive material's price per pound sticker shock.
2. Cycle time is important too. A higher-cost material, having better structural properties, can reduce cycle times by having thinner walls, which cool faster; this adds more parts per hour into the cost equation.
3. Depending on the part's functionality, a higher-end resin may require less structural features like ribs and gussets, as well as those features being smaller – resulting in a less expensive tool delivered faster because of reduced machining requirements.
4. When considering swapping out one material for another in an existing mold, consider these two "lumped parameters" as rough first-pass screening tools; these two will interact, and your internal labor cost will be necessary in factoring out which one is more important (remember – these are presented as screening tools only, not definitive factors – you need to do a proper analysis based on your own situation!):

    - Multiply *price per pound* times *density* to get price per volume. Using this parameter, the lower cost part will come from the material with the lower value.
    - Multiply *density* times *heat capacity* and divide by the *thermal*

conductivity. Using this parameter, the lower cost part will come from the material with the lower value.

5. When presenting alternative materials, especially to non-engineers, put the estimated price per part right at the top of the two columns comparing the alternatives – above any other data. Get into the details of price per pound, wall thickness, cycle times, etc., later to support your cost per part estimate. Remember that, at the end of the day, what matters is cost per part. So put that first!
6. Recycled materials are not necessarily bad materials *per se*, and can often offer substantial cost advantages – but unless the supplier takes extreme care in the recycling and pelletizing operation they may have the requisite physical properties while processing less consistently from lot to lot. This inconsistency may end up being more trouble than the lower material cost is worth. (This was seen in a third case at Ford, not discussed above, where we considered recycled polycarbonate from CDs instead of virgin material; the inconsistent processing and increased scrap eliminated any material cost advantage.)
7. Service and response time matter. When you have a problem you need help now, not in a week or so. Lost production can cost you a lot, in scrap costs and in OT required to make up lost production, as well as in your reputation with your customer (and possible penalties they may charge you for not meeting their schedule). That responsiveness is worth an added margin to the raw material cost – especially in these days of lean manufacturing and minimal safety stock which could otherwise insulate your customer from your production hiccups.

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Designers' Corner, Rotational Molding, Part 11

Glenn L. Beall

REINFORCING FEATURES – PART 1

Editor's Note: This is the 11th in an ongoing series of articles on design guidelines for rotationally molded parts. These articles are written by Glenn Beall, a Past Chairman and one of the Founders of SPE's Rotational Molding Division. He has been designing rotational molded parts since 1963.

The plastics molding industry is now under extreme pressure to reduce costs. The cost of a rotationally molded product is, to a great extent, dictated by the plastic material being molded and the wall thickness of the part. The recommended wall thickness for different rotational molding materials was reviewed in the fourth installment of this series of articles.

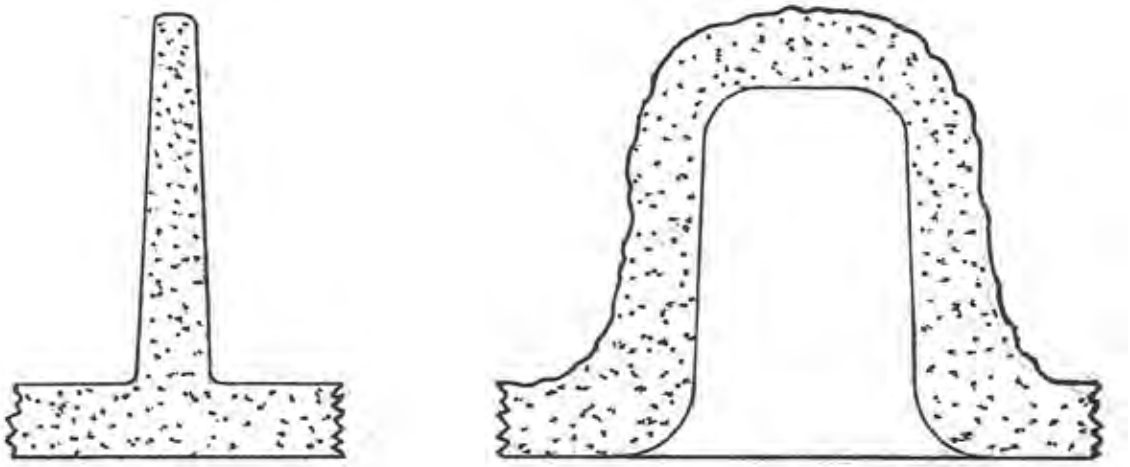
The ideal wall thickness is always the thinnest wall that will satisfy both the functional and manufacturing requirements of the product. Rotational molding excels in the production of large parts with relatively thin walls. During the rotational molding process, the plastic simply adheres to and coats the cavity as the molding machine rotates the hot cavity through the puddle of material in the bottom of the cavity. In many instances, the process is capable of molding parts with walls too thin to satisfy the functional requirements of the product. In these cases, the wall thickness must be increased, as function always takes priority over cost and processing considerations.

Increasing the wall thickness will produce a stronger part. There are,

however, other ways of increasing strength, while keeping the wall thickness to a minimum. This article and the next two will review some of those techniques.

For a given wall thickness, radiused corners are stronger than square corners. Crowning or doming a flat surface increases its stiffness. The most frequent technique for increasing the strength of a thin-walled part is the use of reinforcing ribs.

Rotational molding is not a good process for producing the common solid reinforcing ribs of the type used on parts produced by closed-molding techniques, such as injection or compression molding. This process is at its best while producing hollow ribs (Figure 1).



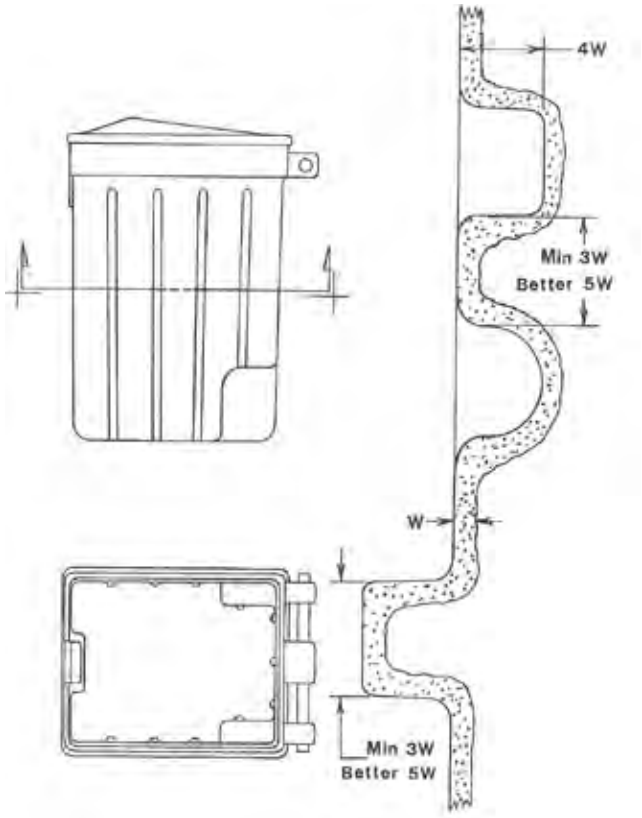
A. Solid Rib Bad

B. Hollow Rib Good

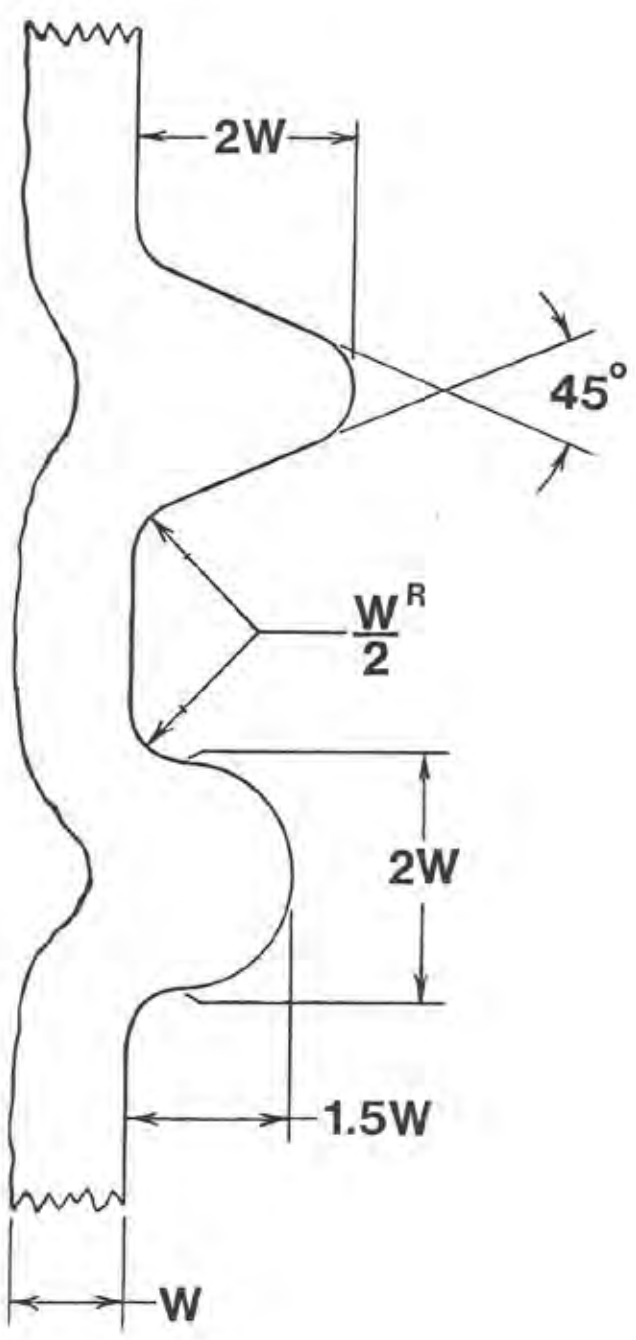
The refuse container shown in Figure 2, is rectangular in cross-section. The four flat walls in the sides of the container are subject to an outward thrusting force when the container is filled to capacity. Adding vertical reinforcing ribs on these four walls would increase their ability to resist that force. Doming these surfaces inward or outward would also increase their stiffness. The bottom of the container, and if necessary the lid, could also be stiffened with reinforcing ribs.

The shape of reinforcing ribs can be rounded or trapezoidal in cross-section. The ribs must project above or below the nominal wall of the part a distance of at least four times the nominal wall thickness, in order to provide a significant stiffening effect.

Hollow reinforcing ribs become closely spaced parallel walls, and they must follow the same rules. Outwardly projecting hollow ribs must have a minimum width of three, and preferably five, times the nominal wall thickness. The recommended proportions for stiffening ribs are shown in Figure 2.



If the width of a rib, or the space between ribs, is less than three times the nominal wall thickness, the powdered plastic has difficulty flowing into these restricted areas. This problem becomes magnified as the depth of these recessed areas increases. Ribs that project more than four times the nominal wall thickness should be designed with proportionately wider spaces for the powdered plastic to flow into. (Figure 3)



Solid reinforcing ribs are not recommended for rotationally molded products. In those cases when solid ribs cannot be avoided, they must be kept as small as possible. The proportion of solid ribs that have been successfully produced are shown in Figure 3. Ribs of this type can only be produced as outwardly extending projections.

These solid ribs are thicker and take longer to cool than the nominal wall of the part. Solid ribs will shrink more than the rest of the part. The increase in shrinkage in these thicker and stronger solid ribs may deform the walls to which they are attached. The increase in shrinkage in solid ribs normally results in a sink mark on the inside surface of a part. These sink marks may or may not be acceptable.

This article is a condensed extract from G. L. Beall's Hanser Publishers book entitled, Rotational Molding Design, Materials, Tooling, & Processing, ISBN 1-56990-260-7, available from the SPE

Glenn Beall
PD3 Director

PD 3

Announcements

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PD3 Calendar

October 19-22, 2014

Flexible Packaging Conference

Location: Marriott Grande Dunes, Myrtle Beach, South Carolina, USA

October 20-22, 2014

VINYLTEC

Location: The Alexander Hotel, Indianapolis, Indiana, USA

November 6, 2014

Medical Plastics MiniTec

Location: Desmond Hotel and Conference Center

November 19, 2014

Expoplast 2014

Location: Palais des congrès de Montréal, Montreal, Canada

November 21, 2014

SPE ASEAN Section Seminar

Location: LT A4.10 (block A), SIM University (UniSIM)

February 22-25, 2015

2015 SPE International Polyolefins Conference

Location: Hilton Houston North Hotel in Houston, Texas

February 23-25, 2014

SPE ACE Conference 2015

Location: Melia Sky Hotel, Barcelona, Spain

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