



SOCIETY OF PLASTICS ENGINEERS BLOW MOLDING DIVISION

Winter 2003 Issue

ADVANCEMENTS IN SOLIDIFICATION OF AUTOMOTIVE BLOW MOULDED PARTS

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ABSTRACT: The accurate prediction of part deformation due to solidification in automotive formed parts is important to help achieve an efficient production. Tolerance issues are critical in automotive applications and therefore part deformation due to solidification needs to be controlled and optimized accordingly. Formed parts can have a wide range of deformations according to the conditions of solidification. Both a small displacement and a large displacement formulation are developed for prediction of part deformation due to solidification. Experimental results obtained on a complex automotive part are compared with numerical predictions to determine whether the small displacement theory or the more complex approach is more appropriate. Finally, the importance of taking into account accurate boundary conditions as well as non-uniform heat transfer coefficients during part cooling is highlighted and results are presented.

INTRODUCTION:

Part designers in today's global environment are under increasing pressure to reduce part development time to a minimum, yet ensuring the maximum part quality and minimum manufacturing costs. Recently, numerical simulation has improved the understanding of polymer forming and allowed designers to evaluate the effect of tooling geometry and operating conditions on the quality of the final part.

Shrinkage and warpage are deformation phenomena that occur during the solidification stage of forming operations. Depending on the processing conditions (part thickness distribution, polymer temperature, mould temperature, cooling time), inhomogeneous cooling can lead to thermal and residual stresses that, if significant can make the part a reject. The relaxation of these stresses will cause the part to deform to an equilibrium state. If on the other hand, the stresses are not allowed to relax, via excessive mould cooling or a fixation device, mechanical failure can occur. Therefore it is important for the designer to achieve an optimal balance between the level of deformation and the amount of residual stresses. Modelling of the deformation and residual stresses allows the designer to obtain this balance off-line, with minimal experimental trials.

The material model used to depict the large deformations that occur during the blow moulding process is the K-BKZ model, which is an integral type viscoelastic model. Both a linear small displacement formulation and a non-linear large displacement formulation were developed to represent the part deformation during out of mould cooling. The solid state material characteristics are given by a Maxwell-Weichert viscoelastic model (1). Temperature-dependent thermal and physical properties such as specific heat and density are considered. To numerically demonstrate how the boundary conditions are applied and influence the results, two tests have been investigated: with gravity and without gravity. The condition of no gravity permits evaluating a part for which warpage is not influenced by its position during cooling. Heat transfer coefficients between the mould and the part (HTC) are also important parameters to include in the numerical simulation of blow moulding. However, information on actual numbers is quite limited. Heat transfer coefficients between the mould and the polymer were determined using a simplified set-up (2). The transient effect of heat transfer coefficient was integrated as a boundary condition in the finite element software and used to predict the blow moulding of a complex automotive part.

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Chairperson's Message



Welcome to The WINTER 2003 Newsletter

As I write this, our Board just completed our winter meeting, this year in Houston. We had dinner with the South Texas Section and Donna Davis, our SPE President, was the featured speaker. Her topic was "SPE, Leadership for Excellence". Three other people, Gary Carr of Bekum America, Robert Slawska of Proven Technology and Graham Machinery, and Rainer Farrag of Fasti, gave excellent presentations about the "Future of Blowmolding". Gary spoke about the latest trends in bottles, Bob spoke about machinery trends, and Rainer talked about some new advances in processing. A turnout of 60 people enjoyed the evening.

Our next event will be Tuesday afternoon at ANTEC, this year in Chicago on May 18. Joe Altimari of Graham Machinery has lined up six papers on topics including heat transfer, stretch blow molding, co-extrusion, parison formation, cooling simulation, and analysis of permeability.

This fall, Sept 22-23, our Annual Blowmolding Conference will be held at the Industrial Materials Institute in Montreal Canada. Robert DiRaddo of the National Research Council Canada is organizing a very good program. Program highlights include; process control and automation, manufacturing tendencies, simulation design, micro blow molding, material advancements, and workshops on 3XY, multilayer, injection stretch, and micro blow molding. Montreal is also a good reason to stay a little longer and enjoy one of the best cities in North America.

Welcome aboard to three new members; Rainer Farrag of Fasti, Karim Amellal of Vitec LLC, and Janai Stepp of American Safety and Equipment, who have joined our Board of Directors.

If you are interested in meeting new people, learning more about blow molding, donating some of your knowledge to our industry, or just general networking, consider joining our group as a Director or active member. You can contact any member listed on the back of this newsletter for more information.

Sincerely,
Bruce Thompson
Chairman, Blowmolding Division, SPE

Blow Molding Calendar of Events

2004

April 25-29: ANTEC - Annual SPE Meeting and Conference, Navy Pier and Sheraton Hotel, Chicago, IL. Joe Altimari, Chairperson. Technical sessions, blow molding Division BOD meeting, No business meeting, Best paper, Scholarship and Student Design Awards presented.

September 22-23, 2004 : ABC 2004 - Annual Blow Molding Conference Theme: Innovations In Blow Molding Materials, designs and processes, NRC, Boucherville, Canada. Robert Dirrado - Chairperson, Steven Li (amcor) and Lou Savoni (Textron) - Co-chairs, Sylvie Lamontagne - Local Coordinator, Ngoc Huyhn - Marketing/Publicity. Technical Session, Formal Business meeting & BOD mtg. Lifetime Achievement Awards presented. Further info is continued inside this newsletter.

2005

January TBD: ANTEC 2005 - Matrix Meeting, TBD - ANTEC 2004 TPC Chair and ANTEC 2006 TPC Chair to attend.

January - Feb: SPE BM BOD Winter Meeting, TBD

May: ANTEC - Annual SPE Meeting and Conference, Boston, MA. Technical sessions, blow molding Division BOD meeting, No business meeting, Best paper, Scholarship and Student Design Awards presented.

2006

January TBD: ANTEC 2006 - Matrix Meeting, TBD - ANTEC 2004 TPC Chair and ANTEC 2006 TPC Chair to attend.

January - Feb: SPE BM BOD Winter Meeting, TBD

May: ANTEC - Annual SPE Meeting and Conference, Charlotte, NC. Lew Ferguson, Chairperson. Technical sessions, blow molding Division BOD meeting, No business meeting, Best paper, Scholarship and Student Design Awards presented.



ANTEC 2004

I am the Technical Paper Chairperson
for ANTEC 2004, to be held in Chicago.
The SPE Blow Molding Division will have several papers
presented. You can visit the SPE's website at :
www.4spe.com for more information and details regarding
The ANTEC & the papers.

If you need any further information, please contact :

Joe Altimari

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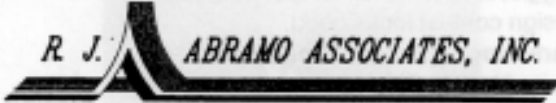
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Any of the Board of Directors listed on the back of the Newsletter

Attend ANTEC 2004 In Chicago visit SPE website www.4spe.com for further info and details regarding paper submission & deadline dates

Become A Member Of The SPE Blow Molding Division Contact: Lew Ferguson at 609-368-7229 or email him at parisons@aol.com

BOARD OF DIRECTOR'S MEETING

Minutes of the Board of Directors of the Blow Molding Division of SPE, Meeting held at Embassy Suites, Troy, MI. October 13, 2003

- ☐ **Executive Meeting: 8:00 - 9:00 AM; Present Jon Meckley, Ron Puvak, Bruce Thompson, Bob DeLong, Mark Heitker**

- ☐ **Call to order 10:39 am, Bruce Thompson**

- Bruce Thompson reviewed SPE anti-trust policy
- BOD Members present: R.Slawka, B.Thompson, R.Puvak, M.Keith, J.Meckley, M.Barger, J.Altimari, G.Carr, B.Jackson, R.DiRaddo, D.Holliman, L.Ferguson, B.Delong, J.Rathmann, W.Burrington
- BOD Members Excused: Robert Gilbert, Gordon Williams
- BOD Members Absent: Rainer Farrag
- Nomination of Jack McGarry to BOD to fill a vacancy (2005). MB-Bob Jackson, SB-Dave Holiman, VT- Unanimous
- Need to fill Secretary position, looking for a volunteer, see Bruce Thompson.

- ☐ **Secretary's Report by (TEMP) Ron Puvak**

- Reviewed minutes of last face to face BOD meeting and the July Teleconference
- MB-Bob Jackson, SB-Tim Noggle, VT-Unanimous

- ☐ **Treasurer's Report by Mark Heitker**

- Division finances good; no issues or requests that are needed at this time.
- MB-Bob Jackson, SB-Bob DeLong, VT-Unanimous

- ☐ **Finance Report by Bob DeLong**

- Audit will be performed today.
- Newsletter funding running at a deficit.
- Need better definition on the Graham funding. This will be addressed by Bob DeLong, Joe Altimari and Tim Noggle.
- Will need budget requests by December.

ACTION ITEMS:

1. Need GMG donation formalized.
2. Bob to send out budget requests.

- ☐ **Nominating Committee Report by (Bruce Thompson)**

- Need nominations for next election. Vote taken at Winter BOD meeting.
- We have one slot on the board open for 2005. Will have second one once a secretary is found.

- ☐ **Awards Report by Dave Holliman**

- Lifetime Achievement Award winner is Michael Gigliotti
- Lew Ferguson has been nominated for Fellow. Need next years fellow and LAA nominees.
- List has been generated for past LAA and Outstanding BOD members.

- ☐ **Membership Report by Lew Ferguson**

- Total as of 09/03 - primary& secondary 908

ACTION ITEMS:

1. Lew Ferguson to investigate discounted membership at ABC through the SPE. This was offered by Jenny at last ABC
2. Budget should be increased to cover additional mailing and recruitment costs.
3. There were two write-ins from last election. Robert Fisch & Randy Wiser. Lew to contact them.
4. Lew to contact National on additional recruitment tools that we can use.

- ☐ **Councilor's Report by Bob DeLong**

- Councilor's meeting upcoming.
- Boards decision is to vote no on the proposal to freeze the dues rebates. (see motion # 2)
- Motion #1: ANTEC complimentary admissions needs to be eliminated. Exceptions are for Speakers and Division chosen Moderators. MB-John Rathman, SB-Bob Jackson, VT-Unanimous
- Motion #2: If the proposal to freeze the rebates is defeated then, for one year, the division will make donation to SPE National in the amount of the dues rebate. MB-Bruce Thompson, SB-Mark Heitker, VT-Unanimous.
- Motion #3: Recommend that the SPE seriously look at member development in the Asian areas and report back to the Membership on the programs and results. MB-Bruce Thompson, SB-Bob Jackson, VT- Unanimous.

- ☐ **Newsletter Report by Bob Slawka & Tim Noggle**

- The next issue has been delayed to Fall, Will be out before the end of January. Content can still be added. Send the material to Emma.
- Suggested content; Best ABC 2003 paper, Graham Program needs advertised.

ACTION ITEMS:

1. BOD members need to promote sponsorship which will help newsletter

- ☐ **TPC - Jon Meckley**

- See attached TPC report. Updated at meeting

- ☐ **Education - Mark Barger**

- Need reviewers for the scholarship applications. Tim Noggle, Mark Heitker, Robert Dirrado
- Design contest looks good.

- ☐ **Marketing - (temp) - Ron Puvak**

- Committee drafted a plan and defined some of the products. Action items listed on the plan. Plan passed out at meeting.
- WEB SITE Sub-Committee: Reviewed web site updates, passed out the issues/work plan list.

ACTION ITEMS:

1. Have next steps in the plan completed by Winter BOD meeting.

OLD BUSINESS:

- None

NEW BUSINESS:

- Volunteers for design contest ñ Dave Holiman, Bob Slawka, Robert Dirrado
- Need everyone to be on two committees actively

continued on page 9

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Michael Gigliotti, Lifetime Achievement Award Winner 2003 (left) with Bob Jackson (center) and Bruce Thompson (right)



Michael Gigliotti (right) receiving the Lifetime Achievement Award 2003 from Bruce Thompson (left)



Mr. & Mrs. Gigliotti at the podium

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Bekum's Consignment Supports Ferris' Plastics Program

The Plastics program of the Plastics and Rubber Engineering Technology Department at Ferris State University, Big Rapids, Michigan, recently received consignment of a new Bekum Model H-111S extrusion blow molding machine.

Bekum America, Inc. has long been a supporter of Ferris' Plastics program, regularly consigning updated machines to the University for student use.

The H-111S provides the Plastics Engineering Technology program with a State-Of-The-Art continuous extrusion blow-molding machine, which incorporates the latest in microprocessor controls.

Students will utilize the machine in the lab portion of their classes in learning to run, optimize, and troubleshoot the blow-molding process. As graduates, these students will use their knowledge in engineering-focused careers to optimize product and process design.

"The consignment is very important to the program as the process of blow-molding is one of the major processes used within the plastics industry," said Associate Professor **Larry Schult**.

"We have developed kind of a special bond with Ferris over the last 10 years with our ongoing consignment of a continuous extrusion blow-molding machine for their Technology Center," said Bekum President **Martin Stark**. "We are very pleased to be able to support this fine university and, in particular, contribute to continued education in blow-molding."

Robert Speirs, Plastics and Rubber programs chair, notes that the current consignment helps students hone their skills on the kinds of equipment they will work with in the field.

"Bekum's support is instrumental in our students' education," said Speirs. "The consignment affords our students the opportunity to learn extrusion blow-molding on State-Of-The-Art equipment."

In addition to its consignments of machinery, Bekum is working with Ferris' Plastics program teaching staff to enhance the curriculum for blow-molding education.

Bekum employees in key company positions are alumni of both the Plastics Engineering and Electrical Engineering Technology programs at Ferris State.

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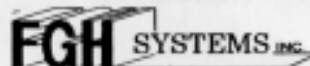


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EXECUTIVE DIRECTOR OF SPE HEADQUARTERS, MIKE CAPPELLETTI RETIRES

As 2003 came to an end, the SPE bid farewell to Mike Cappelletti, its Executive Director. Mr. Cappelletti retired with 19 years of service, the last 10 in the position of Executive Director. Mike came to the SPE with a financial background and, after serving in that role, grew to manage the entire operation.

Among his accomplishments was overseeing international growth. The European member service bureau was established and a European-centric version of "Plastics Engineering" was initiated. Growth and member services were facilitated by new electronic equipment and a web presence. He also strengthened SPE's relationships with other industry organizations such as the British Plastics Federation, the Canadian Plastics Industry Association, the American Plastics Council (now part of the American Chemical Council), and the Society of the Plastics Industry in the USA. Several new technical divisions have been established with more in development. We wish Mike and his wife Julie all the best in their retirement.

With Mr. Cappelletti's departure, the SPE will be managed by Deputy Director Susan Oderwald. Ms. Oderwald joined the organization three years ago with a background in professional and trade associations. She has been central to SPE's day-to-day operations since joining us and will continue the strategic directions established by the SPE governance.

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- If you can remember 7 computer passwords but not your anniversary
- If you have memorized the program schedule for the Discovery channel and have seen most of the shows already
- If you have ever owned a calculator with no equal key and know what RPN stands for
- If your father sat 2 inches in front of your family's first color TV with a magnifying lens to see how they made the colors, and you grew up thinking that was normal
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Jack McGarry a former member of the SPE Blow Molding Division returns to active participation on the Board of Directors. Jack was a past Division Chairman, and currently an SPE Honored Service Member who returns after 4 years absence from direct Blowmolding Division participation activities. He brings his 25 years blow molding machinery sales & marketing background and expertise with complete blow molding machinery systems.

He currently runs his own MBK / BLOWMOLDING MACHINERY Company, representing two (2) European blow molding machinery manufactures from Germany [Maschinenbau KOETKE] and from Italy [MECCANOPLASTICA]

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*Manufacturing Efficiency
in Blow Molding*

**September 22-23, 2004 - Boucherville,
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email address: Robert.Diraddo@cnrc-nrc.gc.ca

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Annual Blow Molding Conference 2004
Manufacturing Efficiency In Blow Molding
September 22-23, 2004

Industrial Materials Institute
Boucherville, Quebec, Canada

The **Society of Plastics Engineers Annual Blow Molding Conference** is the premiere forum for the blow molding industry. This year it will be held on September 22-23 at the Industrial Materials Institute in Boucherville, minutes from downtown Montreal. The focus will be on manufacturing efficiency.

The goal of the conference is to provide a forum for blow molders, resin manufacturers, mold-makers and machinery manufacturers to interact on a variety of subjects. The targeted audience includes technical, design, production line, laboratory and marketing personnel.

PROGRAM

Speakers from the following organizations are confirmed:

- **Processors:** Kautex-Textron, VITEC LLC, Visteon, Lear Corp.,
- **Materials:** Bayer, Nova Chemicals, Vordian, Exxon, Dupont-Dow
- **Research:** IMI, U Mass, U Toledo, UBC, Ecole des mines-France.

TOPICS

Presentations will cover the following subjects:

- Process control and automation
- Manufacturing tendencies
- Design by simulation
- Heating effects
- Micro-blow molding
- Materials advancements for EBM and ISBM
- Workshops on 3XY, multilayer, one-stage ISBM, micro-blow molding

MONTREAL

Montreal, Canada's second largest city, is unique in its combination of both European and North American culture. It is within hours travel time from most locations in the Northeast. The city has many architectural, historical, nature and cultural attractions.

CONTACT & INFORMATION

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REGISTRATION

After Aug. 15, 2004: \$400.00 US
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TABLETOP EXHIBITION

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BOARD OF DIRECTOR'S MEETING

Continued from Page 4

NEW BUSINESS:

- Define Administration Assistant's job duties and scope. Bruce and Ron to complete.
- Do we want to still have BOD Meetings at ANTEC? For now, yes.
- Motion: Does the BOD formally declare that the scholarship grant funds be dedicated ONLY to this type of disbursement? MB-Bruce Thompson, SB-Bob Jackson, VT-Unanimous.
- Motion: The board authorizes the Chairman to obtain a review on how the scholarship funds can best be protected for the desired purpose. Should expenses need to be incurred, then the expected costs will be quoted prior to the activity and not to exceed \$2,000. MB-Mark Heitker, SB Mark Barger, VT-Unanimous
- Bekum would like to be recognized in the newsletter for donating a Blow Molder to Ferris State - Will be added to the next addition.
- Do we want to add job listings on the web site? Will be added to part of the Web site plan/work areas.
- We need volunteers to collect the scholarship funds. These are also needed for existing newsletter ads. Suggestion that the BOD members divide up the list and call them. It would be a small number. Bob DeLong will send out the list.

ADJOURNMENT: Motion to adjourn - Mark Heitker; Approved-4:30 PM

A Business Meeting was held at ABC 2003 on October 14, 2003 at 4:00 pm.

There were 83 people in attendance (15 BOD members).

Topics covered:

1. Secretary Report - published in Newsletter
2. Treasurer Report - audited on Oct 13, welcome to question accuracy
3. Membership Report - averaging about 1000 members per year, correlating to SPE numbers
4. Web address - accessible to all members
5. Division won Outstanding Division Award two years in a row.
6. Next Meetings: Houston Feb 11&12, Chicago May 16-20, Montreal Sept 23-24.
7. Scholarships - >\$150,000 awarded so far.
8. Benefits of Joining SPE Blowmolding: Networking, Becoming Active in Industry, Expand your knowledge.

ADVANCEMENTS IN SOLDIFICATION OF AUTO-MOTIVE BLOW MOULDED PARTS *continued from COVER*

EXPERIMENTAL

The automotive part studied (a filler panel) is manufactured by Lear Corporation in Concord, Ontario (Figure 1). A complete description of the experiments is given in Ref. (3). We consider the parison extrusion, inflation and solidification of the part, both via simulations and experiments.

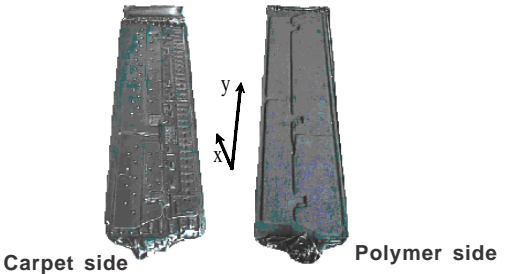


Fig. 1. Automotive filler-panel blow moulded part.

The material considered for the study is a filled PP blow moulding grade. Among the complexities associated with processing of this part is that upon solidification in air, the part exhibits a deflection in the centre zone. Due to its specific geometry (long and thin), this part is subjected to warp, taking a typical bended shape, referred to in industry as "the banana effect". This is mainly due to the thermal insulation caused by the carpet on one face that leads to an inhomogeneous cooling and consequently to residual stresses and warpage. The warpage amplitude of the part, corresponding to the deflection in the centre zone, has been measured for different operating conditions summarized in Table 1.

Table1. Automotive part operating conditions

Experiment Number	Cooling Time (s)	Mould temp. carpet side (°C)	Mould temp. core side (°C)
1	86	14.5	56.4
2	46	14.5	56.4
3	120	14.5	56.4
4	86	14.5	48.5
5	86	14.0	38.0
6	46	14.0	38.0

RESULTS AND DISCUSSION

Figures 2 and 3 show the maximum amplitude of experimental and numerical warpage for the operating parameters presented in Table 1. The effect of gravity is investigated via different cooling orientations of the part: horizontally, on both carpet and core side (gravity along the x and -x axis, respectively).

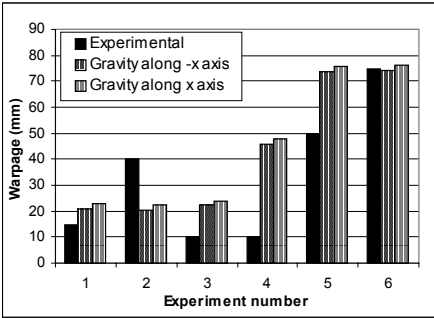


Fig. 2. Warpage amplitude after cooling with gravity along the (x) and (-x) axis of the part.

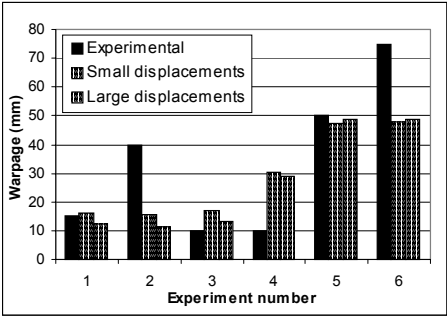


Fig. 3. Warpage amplitude after cooling without gravity.

In current production, the part must be supported (put on the ground for example), but the effects of gravity will depend on the orientation of the part during cooling (i.e. which side of the part contacts the ground). Therefore, the solidification mechanisms will be highly sensitive to part placement and difficult to reproduce.

From the comparison of the experimental and simulation results, we can see that gravity plays a critical role on the part deformation in particular with regard to the quality of the prediction. For the experiments, parts were placed flat on the ground to cool.

Some of the parts behave as if there was no gravity boundary condition whereas other parts behave as if there is a gravity boundary condition. However, if the gravity condition is properly known, the quality of the prediction relative to experimental results is excellent. Therefore, in order to ensure a consistent part deformation it is extremely important to have exactly the same solidification system for the part.

With no gravity, the amplitude of warpage is due only to stresses that are generated in the part, and the deformation is consequently much lower. Parts 2 and 6 appear to be better predicted via a gravity imposition whereas Parts 1, 3, 4 and 5 are better predicted via no gravity imposition. It is also interesting to note that Parts 2 and 6 are the parts with the lowest cooling times, indicating that the parts are removed from the mould hotter than with the other parts. This leads to the conclusion that gravity should be applied with hotter ejected parts and removed with cooler ejected parts. Predictions performed using the large displacements theory show a slight improvement over the traditional small displacements calculations. However, figures 2 and 3 show that the effect of gravity is more important than the effect of using a large versus a small displacement formulation. We can see that the overall trend is well represented but again the prediction of warpage is strongly influenced by gravity. Finally, Part 5 is predicted using non-uniform heat transfer coefficients during the cooling cycle. Simulation result shows an important warpage of the part, which is compared to the experiments in Figure 4.



Fig. 3. Experimental and numerical result of the warpage of an industrial part.

CONCLUSION

In this work, the solidification of polymer formed parts is investigated. The focus is set on warpage prediction. A comparison between experimental measurements and numerical simulations on an automotive part is performed. The results obtained show the complexity of the phenomena that occur during the cooling of formed parts. Besides, warpage is simulated using respectively small and large displacements approaches. The results obtained demonstrated the importance of boundary conditions choice when simulating the part cooling. When the part comes out of the mould, the way gravity operates leads to various warped shapes. It is thus critical to take into account precisely the way the part is hold during its cooling.

REFERENCES

1. Debergue P., Masse H., Thibault F., DiRaddo R. SAE 2003 Congress, Detroit.
2. Masse H., Debergue P., DiRaddo R. ANTEC 2004 Congress, Chicago.
3. Thibault F., Debergue P., Laroche D., DiRaddo R. ANTEC 2002 Congress, San Francisco.



**Robert Jackson,
President & CEO
Jackson Machinery, Inc.
receives**

SPE Honored Service Award

Bob received his B.A in Economics from Olivet College in 1967, and has continued his graduate work at Wayne State University as well as

attending Polymer Processing classes at General Motors Institute. He joined both the SPI and the Society of Plastic Engineers in 1969 and currently serves on the Board of Directors of the Blow Molding Division of the SPE.

In the seventies, he served the mid Michigan Chapter of the SPE in all of the chairs, including: President (1978/79) and National Councilman. During his tenure the chapter grew from about 80 to nearly 100 members. In about 1980, Bob was chairman of a successful regional technical conference that focused mostly on injection molding.

In 1986 he became a Director of the Blow Molding Division, serving as Secretary, Treasurer and Chairman. During his tenure as Chair-Elect and Chair, the Division received the coveted SPE Pride Award. He was the author of the Material Handling chapter of the Blow Molding Handbook, published in 1990. After the handbook was published Bob's company sold additional copies generating income for our scholarship fund, amounting to \$3000 annually for several years. Bob was Technical Program Chair of the Blow Molding 8th Annual High Performance Conference held in Chicago that generated \$26,000 for the board's scholarship fund.

Bob has served as publicity chairman during which he initiated the construction of the blow molding division's website and underwrote the costs during its initial phases. One of Bob's associates Alex Weber still maintains the site and assists Ron Puvak (Chair-Elect) in further enhancement and growth of the site. As the technical conferences generate new information they will be indexed and serve as an educational tool for the future of the blow molding industry. Thus allowing our division to achieve its primary goal of being the best source for information about blow molding in the world. Bob also maintains the divisional database and contacts for various mailing lists necessary for the success of our regional conferences.

Bob has been a guest speaker at many seminars and educational functions throughout the country. He is an asset as an educator and contributor to the ongoing success of the SPE Blow Molding Division. He was Chairman of the Annual High Performance Blow Molding Conference in Troy, Michigan, October 2003.

Not only has Bob been a major contributor to the SPE, but his company Jackson Machinery, has been financially supportive as well. This includes such things as secretarial and administrative support, as well as accounting and tax services.

Jackson Machinery Inc. was founded in 1986 for the manufacture of blow molding machinery. Today JMI is the foremost manufacturer of integrated work cell technology, utilizing a unique combination of a core blow molding machine and a secondary processing module affording the user fully automatically produced industrial products.

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