

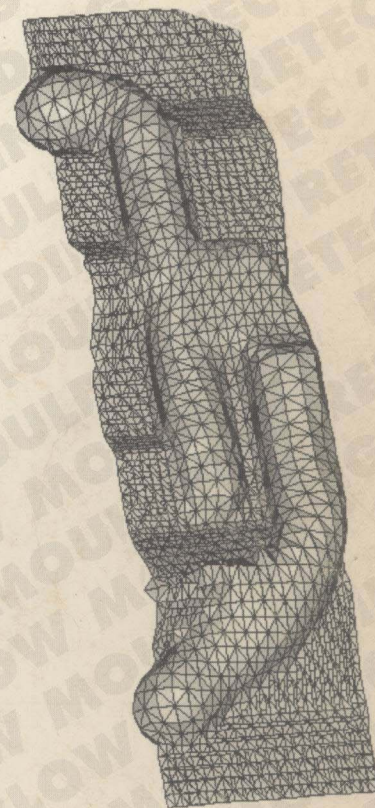


NRC-CMRC



BLOW MOULDING TECHNOLOGIES FOR THE 21ST CENTURY

BLOW MOULDING RETEC '97



**October 1-3, 1997
Industrial Materials Institute
National Research Council Canada
Boucherville, Canada**

Conference Proceedings

BLOW MOULDING TECHNOLOGIES FOR THE 21ST CENTURY

ORGANIZING COMMITTEE

CHAIR

DR. ANDRES GARCIA-REJON

Industrial Materials Institute
NRC Canada

CO-CHAIR

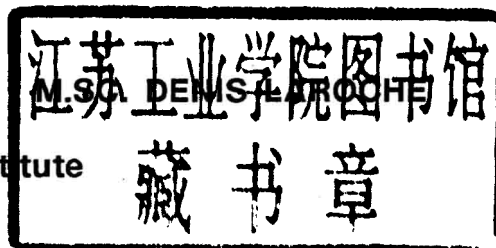
JOHN FRANCIS

Johnson Controls

TECHNICAL PROGRAM

DR. ROBERT DIRADDO

Industrial Materials Institute
NRC Canada



TREASURER

NAFEZ MELHEM

Industrial Materials Institute
NRC Canada

PUBLICITY

RICHARD FLYNN

Conference Sponsors and Exhibitors

The Blow Moulding RETEC '97 organising committee would like to thank the following companies for their contributions:

Conference sponsors

BMPS - Blow Moulding Parts and Systems Inc.

Pétromont Inc.

Synergistics Industries Limited

Conference exhibitors

Bekum America Corporation

BMPS - Blow Moulding Parts and Systems Inc.

Moldpro Inc.

Pétromont Inc.

TABLE OF CONTENTS

MARKET TRENDS

- 1) Innovative Automotive Applications of Blow Moulding**
C. Sadr, ABC Group..... 1
- 2) Polyethylene - Growing Old Gracefully**
D. G. Brady, Philips Petroleum Company..... 32
- 3) Blow Moulding for Automotive Interiors**
D. Moore, Lear Corporation..... 42
- 4) Optimization of the Blow Moulding Process**
M.E. Ryan, State University of New York at Buffalo..... 52

EQUIPMENT

- 1) Lights-Out Blow Moulding**
R. Jackson, Jackson Machinery Inc..... 100
- 2) Blow Mould Design Fundamentals**
A. Hobson, Hobson Mould Works Inc.....106
- 3) CRST System : Radial Wall Thickness Control for Accumulator Head Blow Moulding**
B. Agnew, Moldpro / C. Gotti, Meico ST

3D and Sequential/Co-ex Blow Moulding System
B. Agnew, Moldpro / C. Gotti, ST Soffiaggio Tecnica.....112
- 4) All Electric Accumulator Head**
M. Mellor, Davis Standard Blow Moulding Systems.....126
- 5) Foam Makes it Better**
D. Schulze, Krupp Kautex.....134
- 6) Process Management in Extrusion Blow Moulding**
D. Hunkar, Hunkar Laboratories Inc.....144
- 7) All Plastic Refrigerator Door**
D. G. Bank, Papago Plastics Inc., J. Karlin, J. Karlin Design.....150

APPLICATIONS / MATERIALS

1) History and State of the Art of Barrier Containers Emery Valyi.....	162
2) Extrusion Blow Moulding of LCP Multilayer Bottles Richard Lusignea, Superex Polymers Inc.....	181
3) Design and Continuous Improvement of PET Blow Moulding Processes with the Aid of Statistically Designed Experiments S. W. Zagarola, Terra Firma InternationalLtd.....	.186
4) Barrier and other Performance Requirements for Food and Beverage Applications (PEN, Super HeatSet, Coatings).....	204
5) New Trends in Polyester Technology for High Performance Packaging Applications M. Barger, Dow Plastics.....	205
6) Quick Change Modular Blow Moulds M. Ryan, Ryka Blow Moulds Ltd.	213
7) Effect of Moulded-in-Stresses on ESCR in Industrial Drum Applications D. R. Constant, B.R. Berg, Paxon Polymer Company.....	234
8) Blow Moulding Simulation in Practice A. Wuest, BASF Corporation.....	253
9) Engineering Plastics in Blow Moulding L. Ferguson, Parisons Inc.	268
10) Texturing Standards for Blow Moulding Applications C. Kelly, Tenibac- Graphion Inc.....	269

Innovative Automotive Applications of Blow Moulding

**C. Sadr
ABC Group**

INNOVATIVE AUTOMOTIVE APPLICATIONS OF BLOW MOULDING

**Dr. Changize Sadr
Vice President**

**ABCgroup
100 Ronson
Rexdale, Ontario, M9W 1B6
CANADA**

INNOVATIVE AUTOMOTIVE APPLICATIONS OF BLOW MOULDING

PRESENTATION

A: INTRODUCTION

Extrusion blow moulding has been one of the highest growth segments of plastics forming processing in terms of application and production volume. Recent developments in blow moulding technology have helped fuel this growth.

In general, blow moulding offers several advantages due to the nature of the process such as: design flexibility; double wall construction; natural reservoir condition for fluid management; natural duct condition for air management; high strength to weight ratio; relative low tooling cost; ability to incorporate late design changes into tooling; ability to prototype product with different weights from the same tool; short lead times; recyclable.

B: ABCgroup AND BLOW MOULDING

The ABCgroup started manufacturing blow moulded automotive products in the early 1960's. Since then, ABCgroup has pioneered in blow moulding technology and our innovation has led to the development of dozens of automotive products. We currently have well over a thousand parts in production. ABCgroup is unique in the industry for our in-house capabilities which include: product development and mould design; engineering and processing technology; secondary operations; finishing fixtures; machine building; and material development. Our ability to control these factors gives us the advantages of offering outstanding quality, short development timing, low cost and flexible manufacturing techniques customized to individual requirements.

These critical elements in the manufacture of automotive systems have resulted in over 70 patents and registrations worldwide, related to plastic conversion.

The following are specific examples of some areas which ABCgroup is currently doing production and development:

1) SEATING SYSTEMS

ABCgroup has been developing and manufacturing blow moulded seat frames and panels for 14 years. The material of choice has been developed by Salflex Polymers Ltd. Blow moulded panels give a considerable weight savings and components reduction over the traditional steel substrates. An advantage to all blow moulded assemblies and sub-systems which replace steel or thermoset composites is the ability to recycle the material, both at the time of processing and after the product life has expired.

The seat panels are normally made with one 'collar' a 60% panel and 40% panel moulded in one mould with 3 cavities, resulting in only 5%-10% flash which is reprocessed. Various brackets and latches are then fixed to the blow moulded substrates with automated finishing equipment.

Processing and material improvements have led to better tolerance control than was previously possible. Data points across the length of the part are now achieving tolerances of $\pm 0.25\text{mm}$ in current production programs.

Newer ideas which we are developing include moulding air distribution ducts into the substrates, further reducing components. Improvements in interior graining and integrally moulded colour additives have also led to designs in which portions of the substrates are exposed to the vehicle interior, reducing the need for foam and fabric finishes in specific areas. Blow moulded headrest substrates and package trays offer similar advantages.

2) KNEE BOLSTERS

To our knowledge, ABCgroup is the only Automotive Supplier manufacturing blow moulded driver and passenger side knee bolsters in production. The design and development has been done in conjunction with OEM customers.

Blow moulded knee bolsters offer several advantages over traditional assemblies including injection moulded or thermoset trim panels with steel structural members. Design of the double wall parts allow for features to be designed into both the cabin interior surface and mounting surface. This flexibility combined with stand off placement and design, rib locations, direction and angle allows for new innovations in

design and performance.

The blow moulded passenger side knee bolster can also be used as a glove box or storage compartment door with a bin attached to the door if required. Lap vents can be incorporated into the part design.

3) INSTRUMENT PANELS SYSTEMS

ABCgroup has taken a multitude of blow moulded instrument panels components, and developed complete systems. Currently, ABCgroup has production programs for instrument panels, air distribution systems and vents, knee bolsters, glove box doors and storage compartment panels, access panels, substrates, crash pads, trim panels and closeouts, and centre consoles, including foam-in-place and skin finishes.

Development of one-piece panel incorporating structural and air distributing requirements began nearly 10 years ago. Early problems of dimensional tolerances and vent opening cutting residue have been largely overcome with improvements in processing, material and post processing technologies.

Substrates can be finished with trim pieces, flexible skins, foam backed thermoformed sheet, foam in-place applications or in-mould decorating done during the blow moulding processing cycle.

The blow moulded instrument panel offers improved airflow, weight savings, reduced number of components and is much easier to recycle than current systems.

4) DUAL DUROMETER CO-EXTRUSION

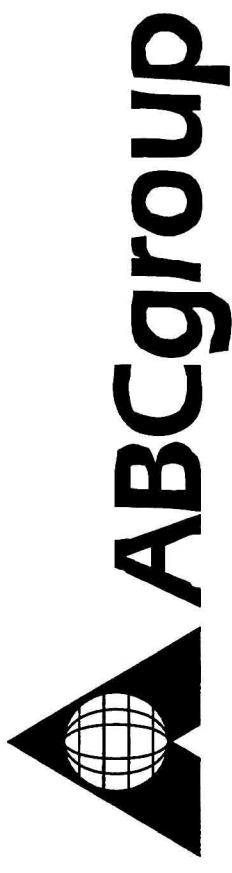
This patented process developed by ABCgroup uses 3 technologies interacting to produce complex part geometry with material transitions. Blow moulding machines and complex articulated moulds designed and built by the ABCgroup with flashless forming technology and material developments by Salflex Polymers Ltd. have led to the commercialization of air intake ducts. These ducts are built with 2 materials, processed at one time in the mould resulting in flexible sections with seal compression moulded openings to mating components, and rigid sections for vacuum and heat requirements. The recyclable dual durometer co-extruded duct with two clamps replaces an assembly of up to 7 components.

5) AIR INTAKE MANIFOLD

Today's automotive industry looks increasingly to external suppliers to provide more of their components and product systems, and to deliver them pre-assembled. Behind each of these products is a total customer solution - from design and development through to testing and verification. In addition to supplying air intake ducts, resonators and filter housings, ABCgroup is designing and manufacturing blow moulded intake manifolds as a part of the complete air intake system.

ABCgroup presented its first blow moulded prototype air intake manifold in 1992. Since then material and processing developments have led to more complex designs. In most cases a chamber and inlet ducts are blow moulded as one piece using glass-filled nylon. The main body is then over-moulded using low pressure injection moulding to achieve the mounting flanges and features.

Advantages using this process include weight savings compared to aluminum, competitive tooling costs compared to other processes, design flexibility and recyclability.



INNOVATIVE AUTOMOTIVE
APPLICATIONS
OF
BLOW MOULDING

ADVANTAGES OF BLOW MOULDING

☐ DESIGN FLEXIBILITY

A) ABILITY TO INCORPORATE LATE
DESIGN CHANGES INTO TOOLING

B) ABILITY TO PROTOTYPE PRODUCT
WITH DIFFERENT WEIGHTS FROM
THE SAME TOOL

☐ NATURAL RESERVOIR CONDITION
FOR FLUID MANAGEMENT

☐ NATURAL DUCT CONDITION
FOR AIR MANAGEMENT

☐ DOUBLE WALL CONSTRUCTION

☐ HIGH STRENGTH TO
WEIGHT RATIO

☐ LOWER TOOLING COST

☐ SHORT LEAD TIMES

☐ RECYCLABLE

IN-HOUSE CAPABILITIES

- ❑ PRODUCT DEVELOPMENT
- ❑ MOULD DESIGN
- ❑ ENGINEERING
- ❑ PROCESSING TECHNOLOGY
- ❑ SECONDARY OPERATIONS
- ❑ FINISHING EQUIPMENT
- ❑ MACHINE BUILDING
- ❑ MATERIAL DEVELOPMENT

IN-HOUSE CAPABILITIES

ADVANTAGES

- ❑ PRODUCT DEVELOPMENT
- ❑ QUALITY ASSURANCE
- ❑ MOULD DESIGN
- ❑ SHORT DEVELOPMENT TIMING
- ❑ ENGINEERING
- ❑ LOW COST MANUFACTURING
- ❑ PROCESSING TECHNOLOGY
- ❑ FLEXIBLE MANUFACTURING
- ❑ SECONDARY OPERATIONS
- ❑ TECHNIQUES CUSTOMIZED TO INDIVIDUAL REQUIREMENTS
- ❑ FINISHING EQUIPMENT
- ❑ MACHINE BUILDING
- ❑ MATERIAL DEVELOPMENT