welcome

Presentation Objectives

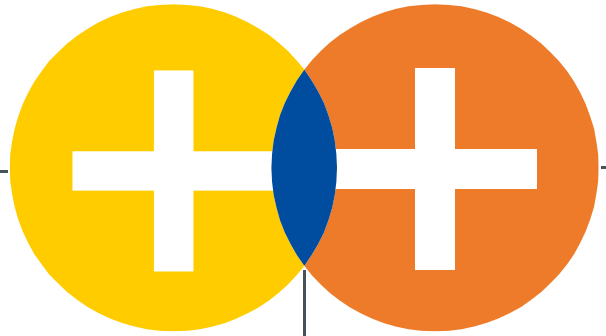
+ Thieme Corporation
+ RIM Overview
+ Medical Products Designed in RIM
+ What is the RIM Process
+ RIM Advantages Over Other Technologies
+ Value Propositions for RIM
+ Limitations of Design
+ FRP, Thermoforming Conversion Process with RIM
+ Kitting and Customer Assembly Line Ready Racking
+ Tooling Cost Considerations
+ Thieme Design Assistance Capabilities

Two Strategic Business Units...

One Single Philosophy: With innovative products, we are technology leaders in our markets.
Consolidated annual sales amount to € 55 million

Polyurethane
200 Employees

Plastics
Processing



Administration

25 Employees

Printing Systems

140 Employees

Mechanical
Engineering

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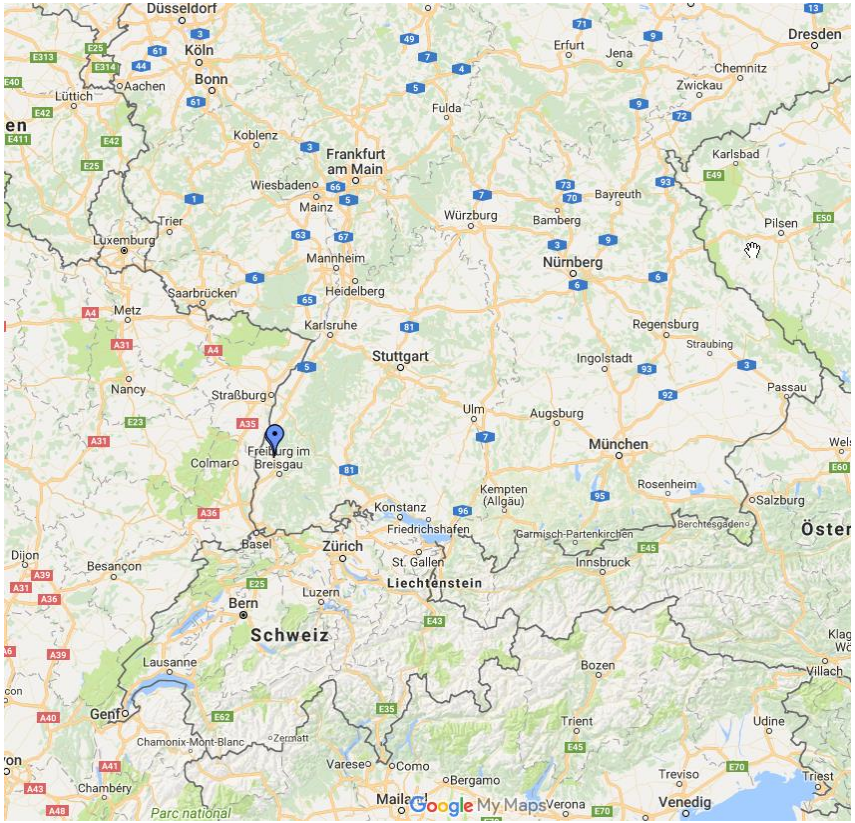
Corporate Structure

RIM Molding
Development and production of RIM molded, functional and safety parts made of polyurethane

Printing Systems
Development and production of screen printing systems and digital printing systems

THIEME - Polyurethane - Teningen, Germany



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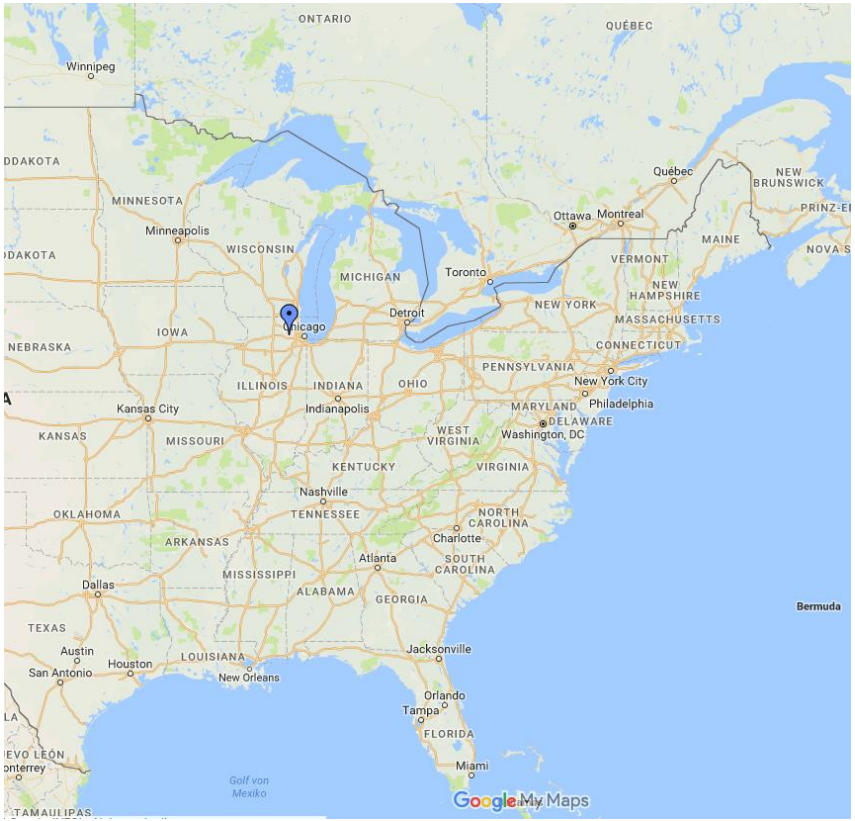
THIEME Corporation - Chicago, USA



Business Unit RIM Molding

We have been developing and producing Reaction Injection Molded (RIM) parts for more than 50 years. Polyurethane is an ideal material for combining aesthetics, ergonomics and function into a cost-effective product design.

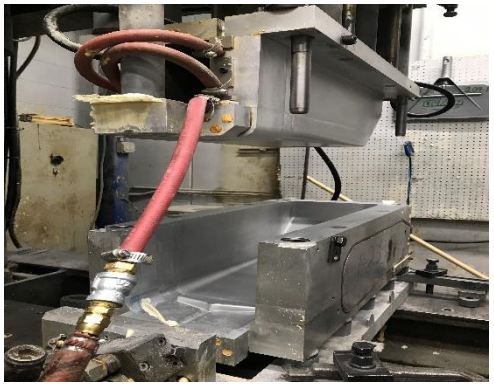
- St. Charles, IL: 2 Shifts, 5 days per week Germany: 24-hour production, 6 days per week
- St. Charles 32,000 sq. ft manufacturing, 30,000 sq. ft warehouse and assembly. Germany: 49.400 m² total area, 15.400 m² of which are production and storage area
- Parts ½ lb. to 85 lbs./shot w/ 8’ x 8’ x 3’ projected area
- Network with partner companies (injection molding, thermoforming, cast urethane, paint finishing)

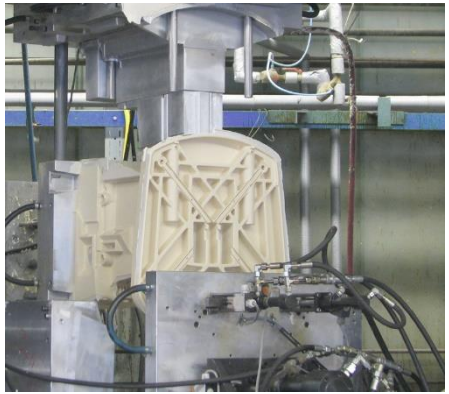
RIM Molding

RIM Molding

RIM Carrier Selection

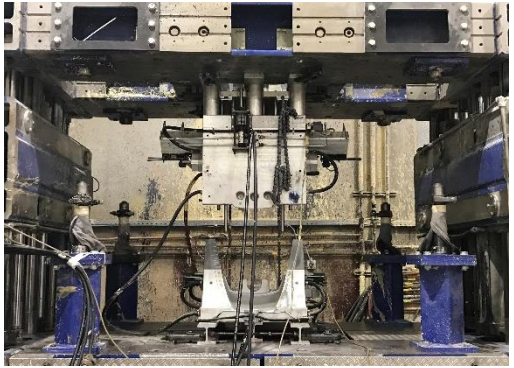
- Three (3) Small to Medium Carriers
  - 25 Ton
  - Tilt 105 degrees
  - Max Shot 20 lbs.
  - 56” x 28” Platen
  - Runs Prism CM-200 & Baydur 726 Structural





RIM Carrier Selection

- One Large Carrier
  - 250 Ton
  - Tilt 90 degrees
  - Max Shot 85 lbs.
  - 8’ x 8’ x 2.3’ Part Area
  - Runs Prism CM-200 & Baydur 726 Structural



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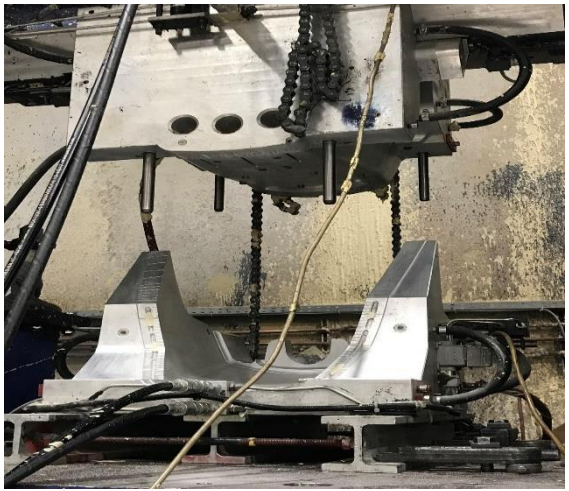
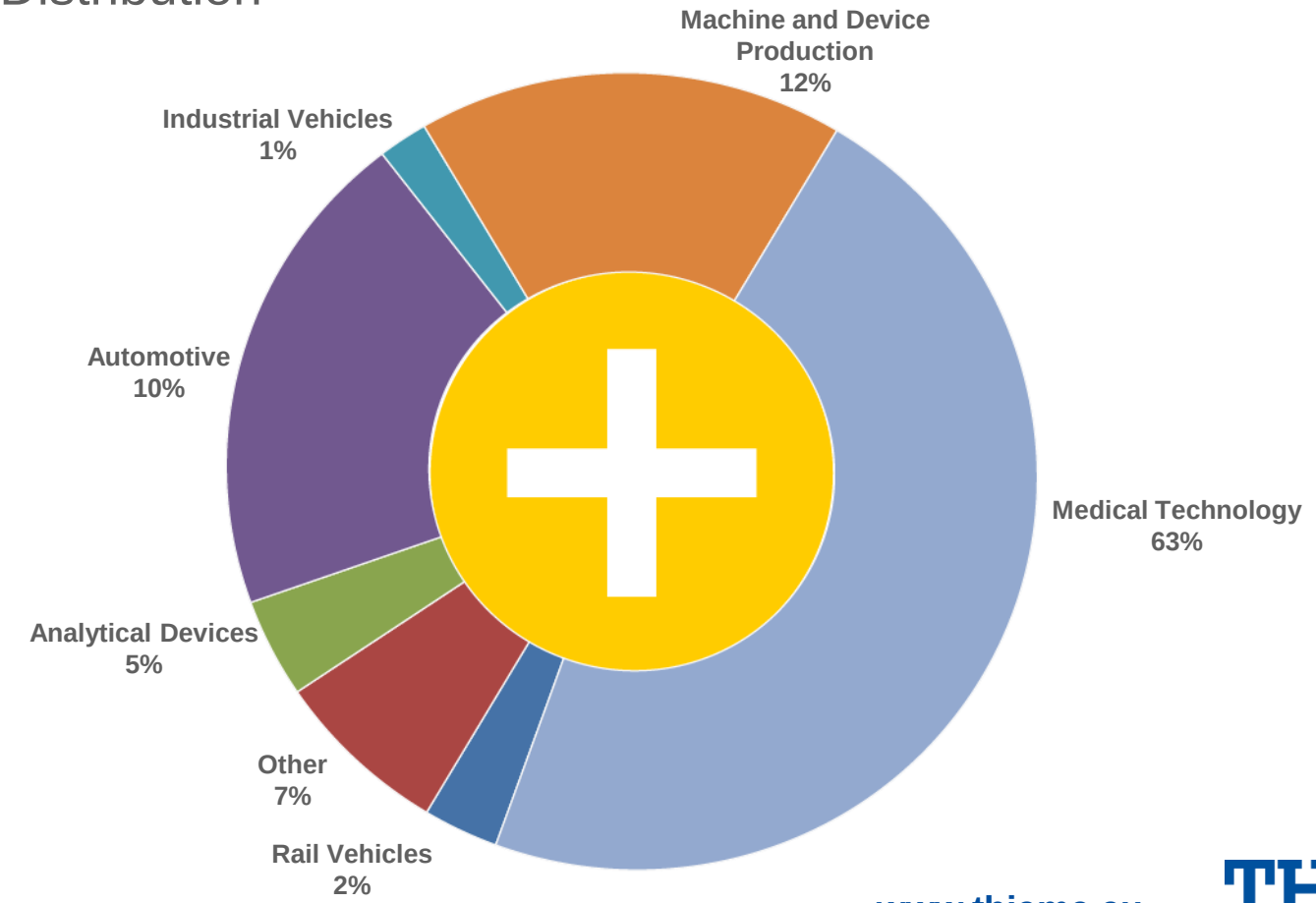
RIM Carrier Selection

- One Medium Duty Carrier
  - 125 Ton
  - Tilt None
  - Max Shot 20 lbs.
  - 108” x 48”” Platen
  - Runs Bayflex Elastomeric



Industry Distribution



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Design, Project Management, Product Development, Supplier Management

Design: Early Engagement

+ New concepts and experience for design and function of RIM parts

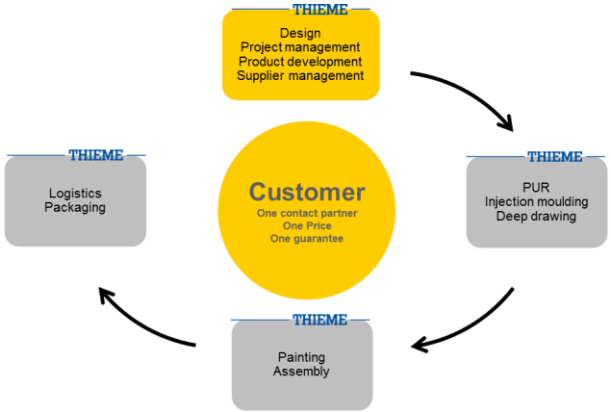
Project Management

+ Specific project teams
+ Cost-oriented and timely realization of complex housings and functional parts (part consolidation opportunities)

Product Development

+ Project-related material and process developments
+ Detailed solutions on the knowledge base of more than 4,000 realized projects

Supplier Management



Surface Decoration and Assembly

Paint and Applications

+ Light Textured Coatings
+ Topcoats
+ High Gloss Finishing
+ EMI Shielding (Spraylat Copper)
+ Multi Color Masking Operations
+ Screen printing, Decorating, Logo’s

Assembly Operations

+ Completion of housings
+ Functional components molded in
+ High level assembly including lasers, LED lights, speakers, glass components, wire tracks, tie downs, control panels, metal components, hinges, plates, etc.
+ Molded or post mold insert work
+ Functional checks

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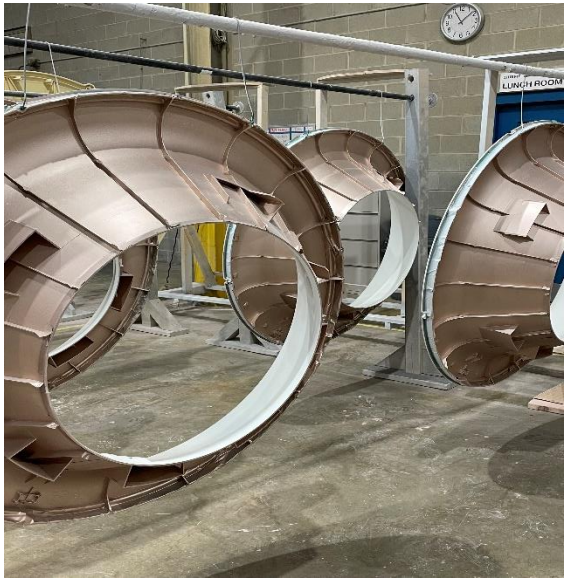
Paint Finishing: St. Charles, IL

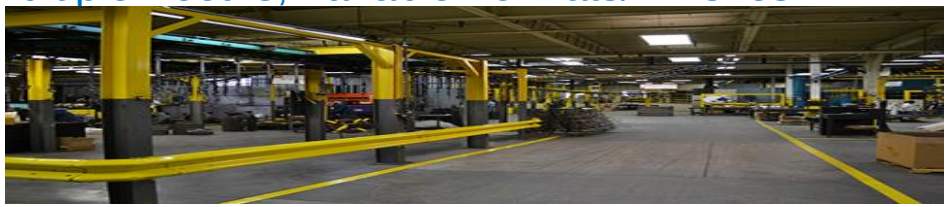
In-House Paint Operations: Manual Wet Coating, Single Booth, Large Format



Paint Finishing: External Partners

SIC, Wisconsin
Plastisol, Chicagoland Area
Britt, Chicagoland Area
Tri-Fin, Chicagoland Area

Manual/Robotic Wet Coating, Multiple Booths, Variable Formats/Finishes



Logistics and Packaging

+ Nonreturnable packaging
+ Returnable packaging
+ System returnable packaging
+ Internal/External returnable packaging

Reaction Injection Molding: PUR Foams

EXPERIENCE in custom-RIM parts

- Housings
- Enclosures
- Functional parts
- Energy Absorbers & Cores
- Car interior components
- Work piece carriers

+ Rigid Foam Products

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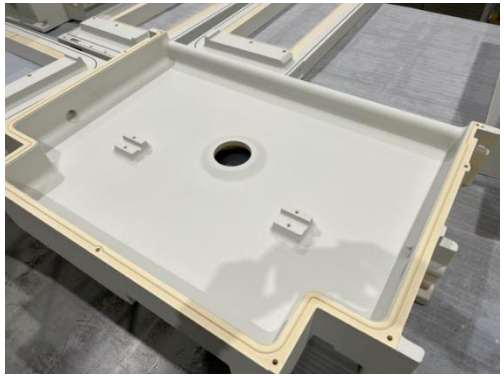
What Is A RIM Part? Does your application fit here?

- Molded Parts • from 1 to 100 pounds/part

-Annual Volumes from 100 to 5,000/year
- Part Has Complex Geometry
- Large Format Molding (up to 8‘ x 8‘ x 2.5‘)
- Deep Draws In Part Required
-Variable Wall Sections in Part?
- Structural Strength with a lightweight material?
--Sheet Metal, FRP or Thermoform Conversion
- Paint Finish/Texturing
- Insert Molding, Assembly Aides & Molded In Features
- Partially assembled components, Light Assembly
Complete Assembled Systems

Advantages of RIM



+ Large Part Molding
+ Varying Wall Thickness Capability
+ Composite Constructions Possible
+ Encapsulation (glass/electronics/metals)
+ Use of Lower Cost Reliable Tooling
+ Dimensional Stability & Reproducibility
+ Great Physical Properties
+ Great Chemical Resistance
+ Reduced Assembly Cost Due to Repeatable Molded in Functional Features

RIM - Reaction Injection Molding

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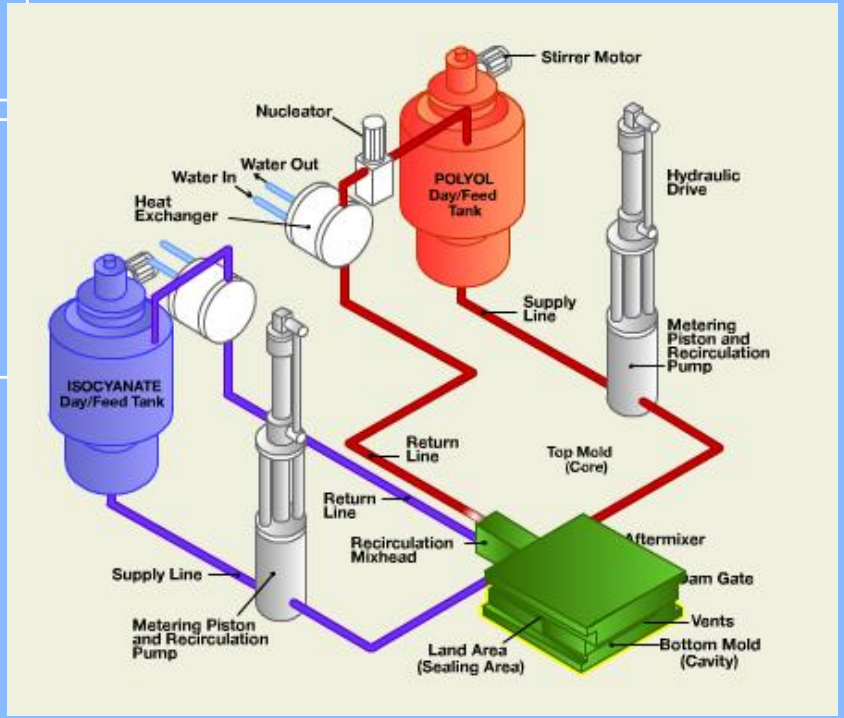
2 Components are mixed and injected into the mold in a liquid stage.

They react inside the mold and cure.

Low molding temperatures 90 –120 degrees Fahrenheit

Low in mold pressures 5-50 psi –longer material flows

In-line additives & fillers



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RIM – Basic Tool Concept

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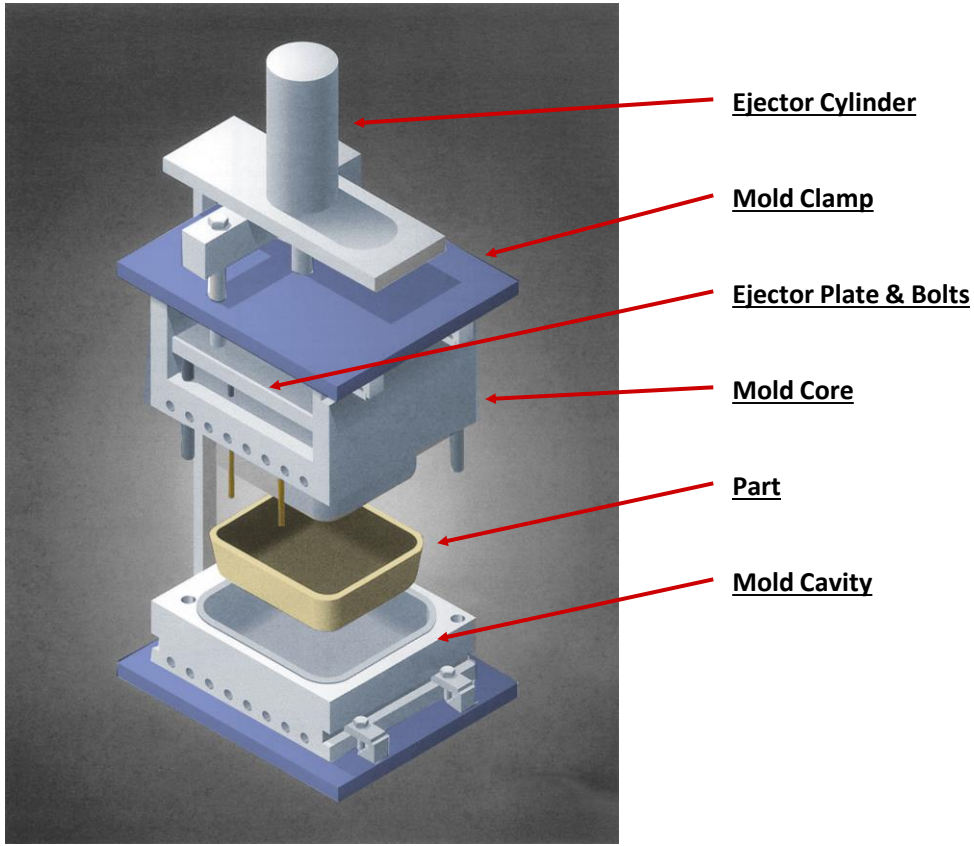
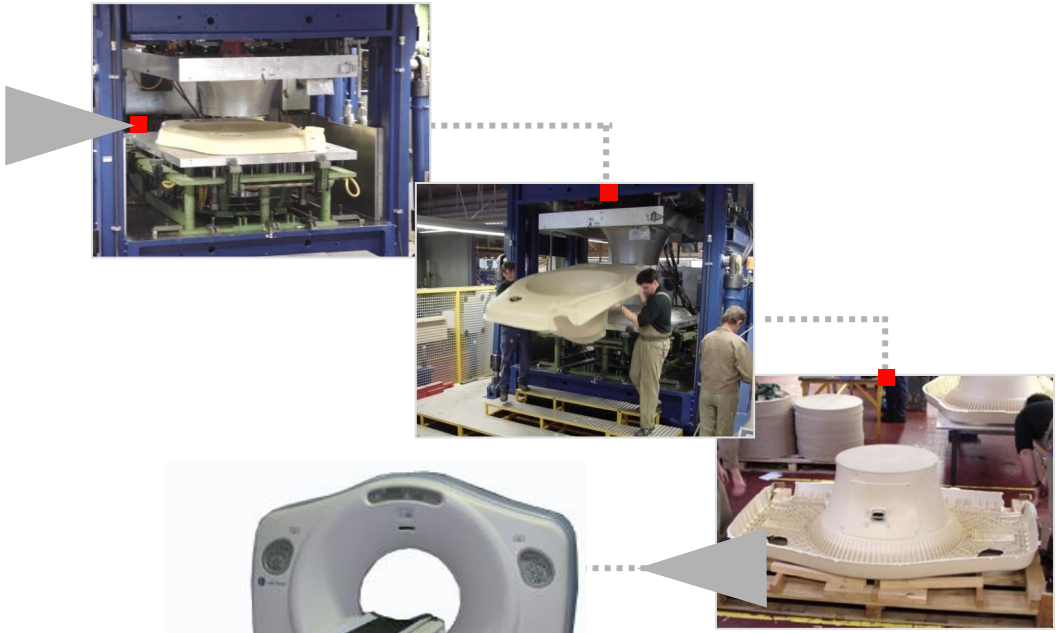


Large Format Molding -GEHC Helios

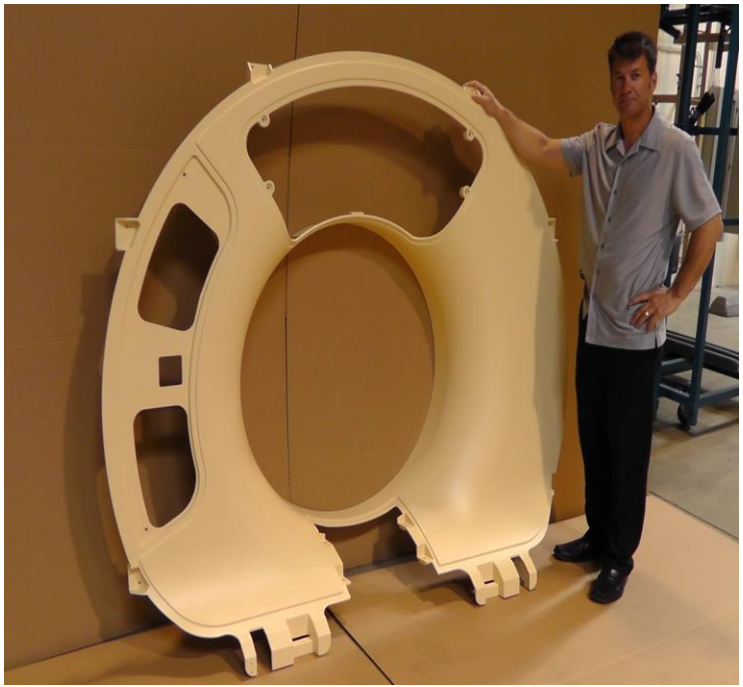


finished product.

RIM - Examples

Large Format Molding with Integrated Structure

Front Cover (L) Volvo Motor Coach Bumper (R)



RIM - Examples

Large Format Molding Complete Assembly with Integrated Internal Structures (unpainted)
Imaging Systems -PMS

Medical Technology

+ Analysis Device Housing
+ PET (Positron-emission-tomography)
+ MRT (Magnetic resonance tomography)
+ Mammography
+ Dental Equipment
+ Anesthesia Equipment
+ Dialysis Machines
+ CT (Computer tomography)
+ OP Lighting

Examples

Medical Applications

CT with LED‘s Philips Medical, Imaging Enclosure Bio-Rad & Dialysis Unit, Fresenius

Examples

... from leisure to industrial.

Tanning Bed, UWE

Petrochemical Analyser, ISL

Transit Fare Box

Consumer Electronic, Lifestyle

+ Televisions
+ Shower panels
+ Office chairs
+ Tanning beds
+ Audio speakers

Beverage Industry

+ Beer dispenser
+ Coffee dispenser
+ Fruit juice dispenser

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Commercial Vehicles, Agricultural and Construction Machinery

+ Dashboard for busses
+ Exterior panels for forklifts
+ Control panels for forklifts
+ Salt spreader (e.g. for winter service)

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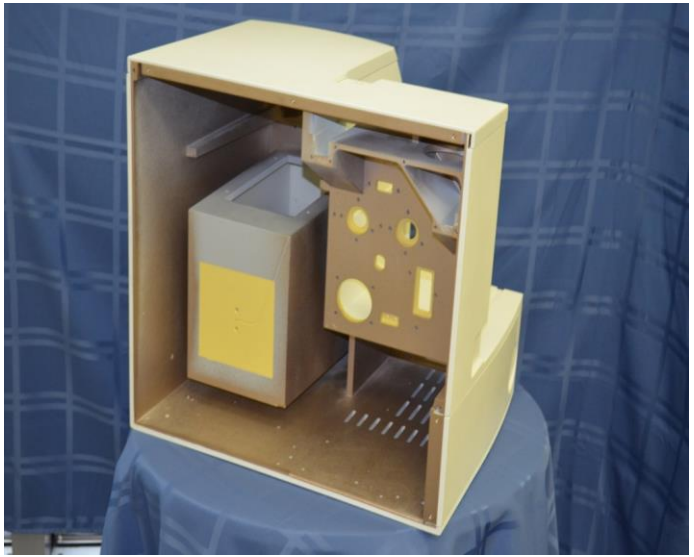
Logistics

+ Storage/transport boxes for wiper motors
+ Work piece holders for cylinder heads

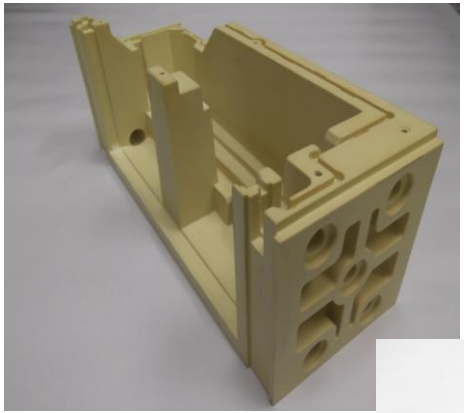
RIM - Examples

Complex Geometry & DFA Technique Integration



RIM - Examples

Complex Geometry, Multi Wall Section & Machined Cast Aluminum Replacement Technology

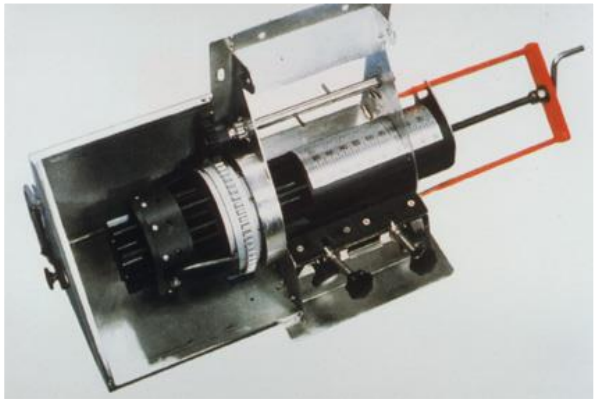


Part Integration and Consolidation

Before:
Many individual parts were manually assembled.

After:
RIM Design reduced unit to only 3 parts.
Improvements in:

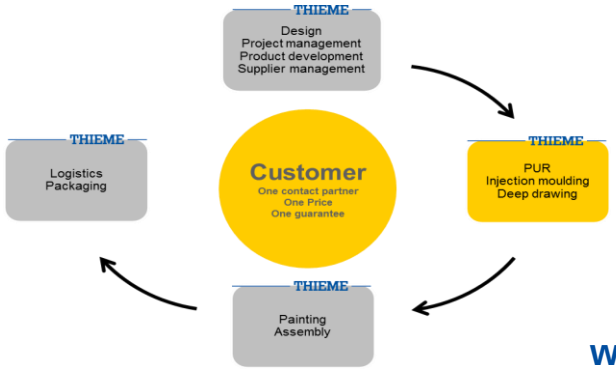
- Number of Vendors
- Logistics/Warehousing Cost
- Assembly Cost
- Error Proofing
- Overall Part Cost



PUR Material Systems

Custom RIM Molding

+ PUR Baydur 726 (Covestro) Sandwich or Structural Foam
+ PUR Prism CM-200 (Covestro) Compact thin walled foam
+ PUR Bayflex 110 Elastomeric Foam
+ Presidium 2000 RIM



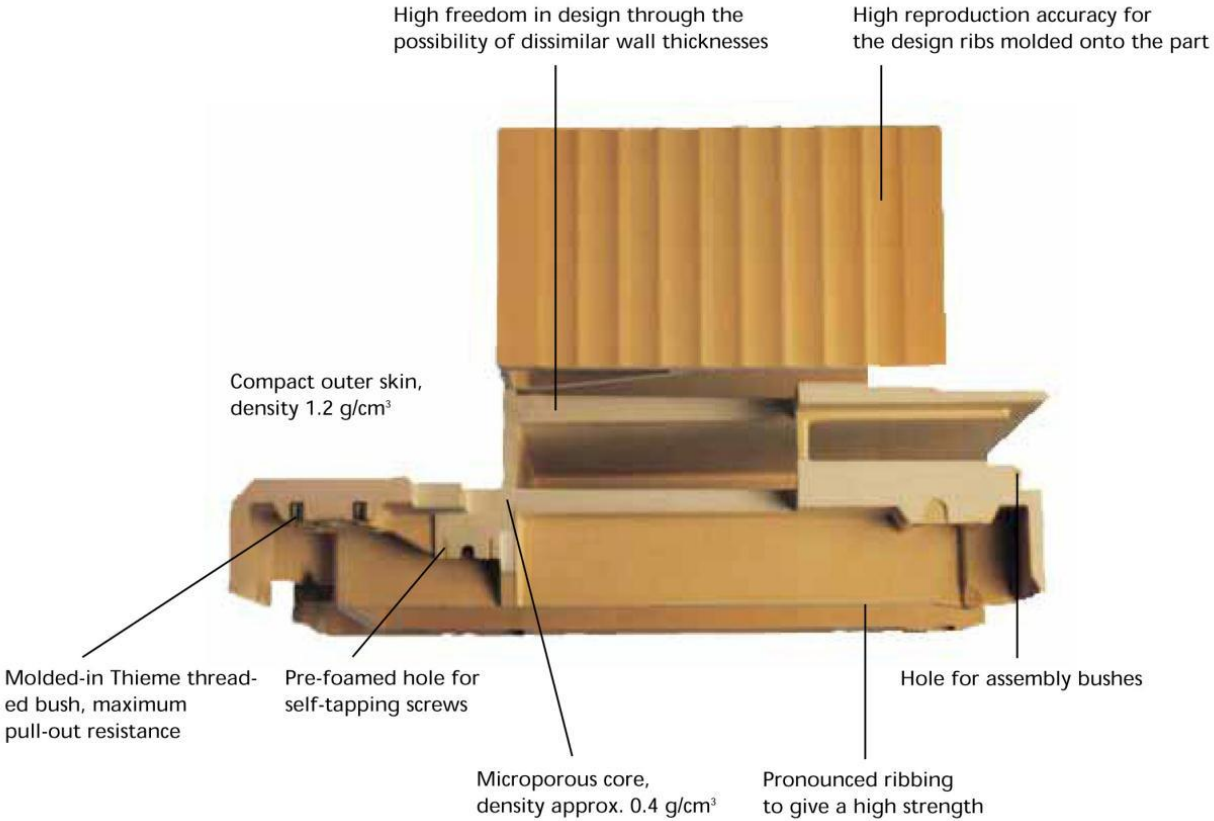
PUR Baydur 726 Structural foam

+ Sandwich-style construction with high inherent rigidity
+ Extraordinary design flexibility
+ Good thermal and acoustic insulation properties
+ Variable wall sections ¼” to 2” w/o sink

Areas of application

+ Medical technology
+ Carts/Handling units
+ Bank and automatic teller machines
+ Consumer electronics / Lifestyle
+ Access systems
+ Beverage industry
+ Workpiece carriers

Cross Section Baydur 726 Structural

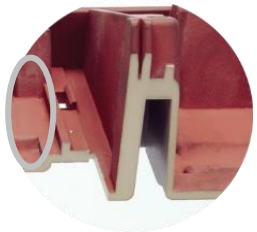


PUR Prism CM-200 Foam

+ Compact structure & high impact strength
+ Alternative to injection molding
+ Components up to 6 m² projected area
+ Consistent wall sections
+ Large part capability 85 lbs per shot
+ Complex Geometries

Areas of application

+ Machine and scientific application enclosures
+ Medical technology enclosures
+ Transport and storage containers
+ Mass Transit Fare Kiosks
+ Heavy equipment and construction machines
+ Logistics
+ Consumer electronics



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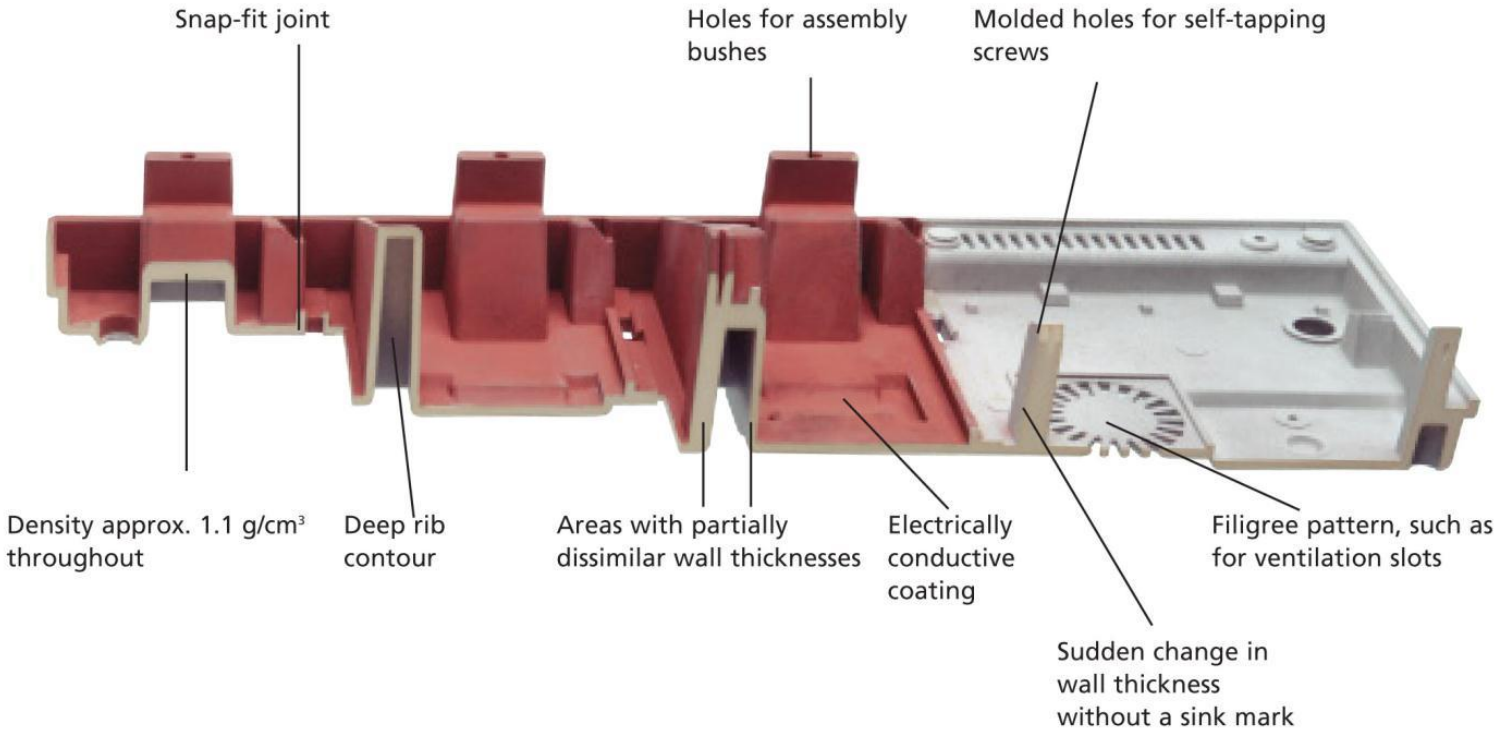
Cross Section Prism CM-200



PUR Bayflex Foam (Elastomeric)

- High impact strength; also at high/low temperatures
- Extraordinarily durable
- Aesthetics possible by means of structured tool surfaces
- Long travel paths, quick filling

Areas of application

- Industrial and recreational vehicles
- Construction industry
- Agricultural technology
- Logistics
- Access systems
- Transport belts

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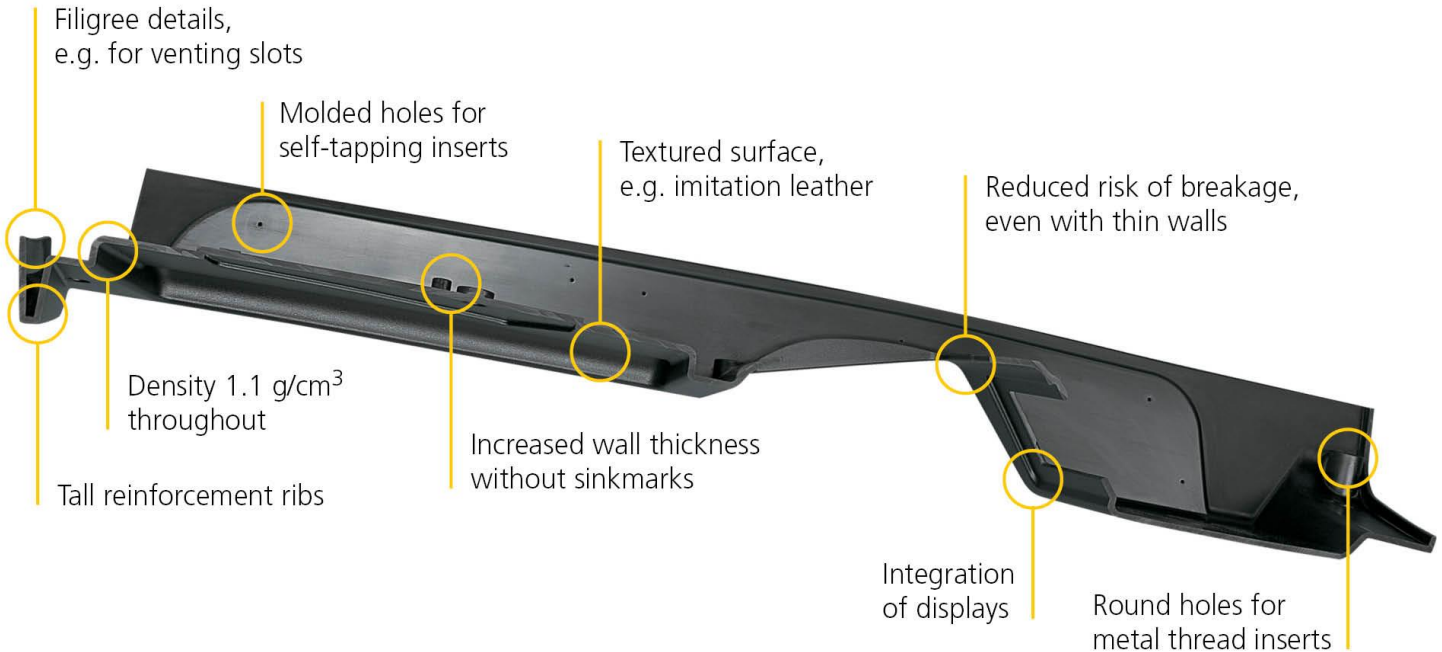
Cross Section Bayflex



Value Propositions For RIM Vs. Other Molding Technologies

- \+ Repeatability, Reliability & Dimensional Stability
- \+ Design Freedom/Material Options
- \+ Part Weight Reduction
- \+ Assembly Cost Reduction
- \+ Value Added & Insert Molding
- \+ Part Quality
- \+ Piece Price Reduction

RIM Vs. Injection Molding

- + Lowered Tooling Costs by about 1/3
- + Less Costly Parts in Low Volumes
- + Greater Design Flexibility
- + Economic Flexibility
- + Shorter Tool Lead Times
- + No molded in part stresses due to material flow ability and liquid RIM process
- + Large Part Manufacturability & Economics
- + Variable Wall Thickness Capability

RIM Vs. Fiberglass Lay Up

+ Faster Part Processing
+ Better Over all Fit & Finish
+ Consistent Part to Part Mating w/ less interference
+ Tighter Part Tolerances w/ Less Variability
+ More Accurate & Uniform Parts
+ Repeatable
+ More Material Selection
+ Lighter Weight
+ Lower Piece Part/Production Costs
+ Ribbing Ability
+ Overall Design Flexibility

RIM Vs. Thermo Forming

- \+ Multi Wall Thicknesses Possible
- \+ Better Fit & Finish in Complete Assembly
- \+ Overall Design Flexibility through Insert Molding, deep draw features & part complexity
- \+ Less Tolerance Variability (wall thicknesses)
  - \+ *More Accurate & Uniform Parts*
  - \+ *Repeatable*
- \+ More Material Selections
- \+ Less Secondary Operations Needed (like gluing of functional features in TF and FLU)
- \+ Lower Post Molded Part Costs (assembly/production)
- \+ Ribbing Ability
- \+ Ability to make larger &/or rounded & aesthetic part designs

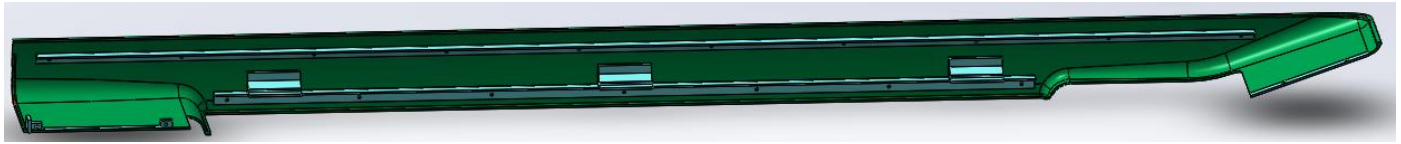
RIM Vs. Structural Foam (Thermo Plastics)

+ Higher Stiffness Ratio Vs. Structural Part
+ Better Surface Finish
+ Less Energy Needed, Less Tonnage Machine which = lower production cost
+ Less Expensive Tooling (Not steel)
+ More Material Options with RIM

Limitations Of RIM Design

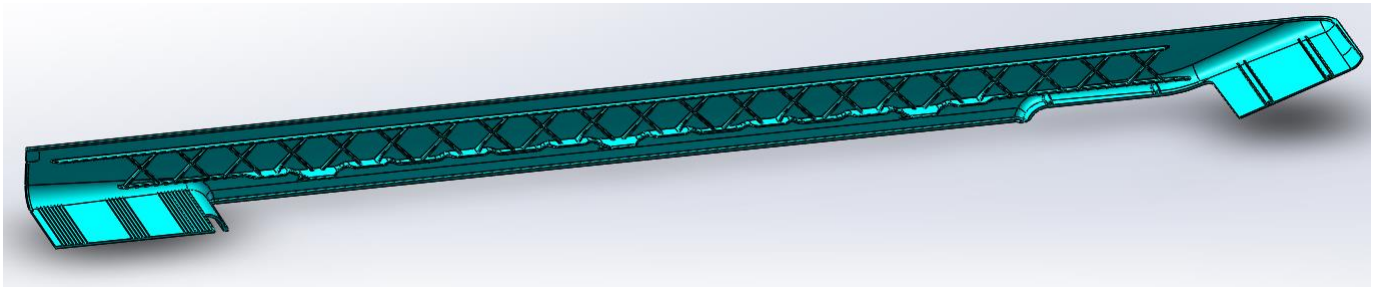
- Undercuts (increased tool cost)
- Large Wall Stock (increased de-mold times)
- Sufficient draft is required to ensure parts de-mold without distortion.
- Sharp corners to be avoided (other than split line in tool), which can cause turbulence in tool cavity and increase potential for pin holes / voids.
- In mold texture is not encouraged due to mold release build up in tools.
- Parts requiring split cavity is not encouraged, because this creates air trapping condition (difficult to vent).

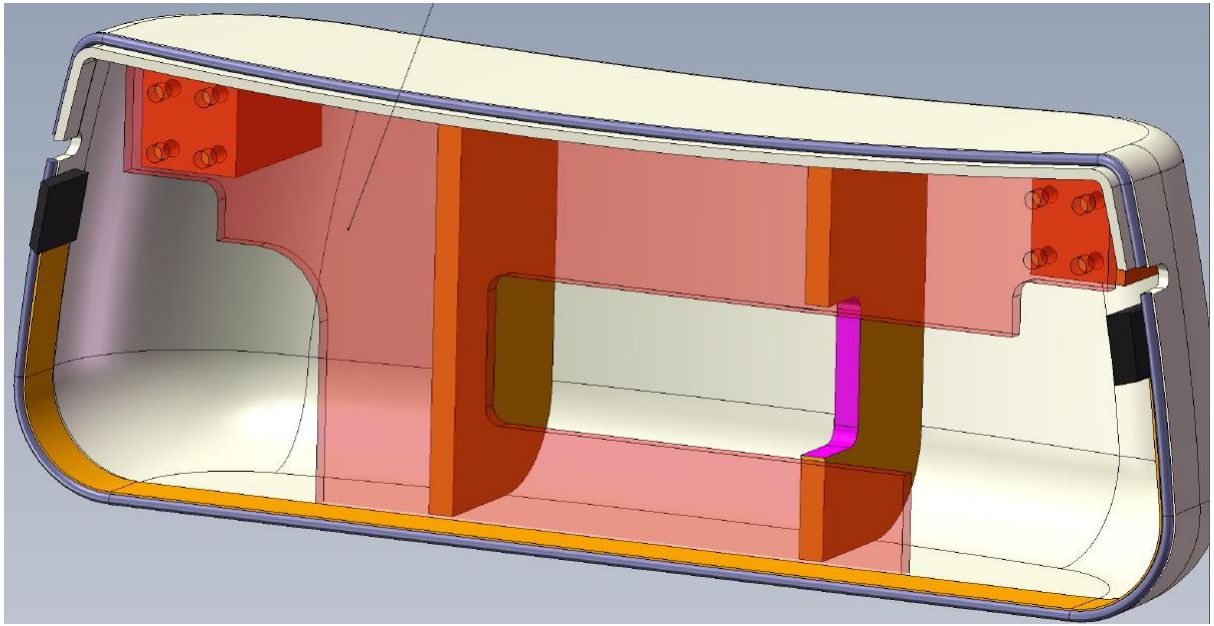
Conversion of FRP/Thermoformed Parts to RIM



Original design was comprised of a vacuum formed part. (2) bonded in stiffening beams. (3) bonded in gripper details, Other bonded in features for fastening to bed.

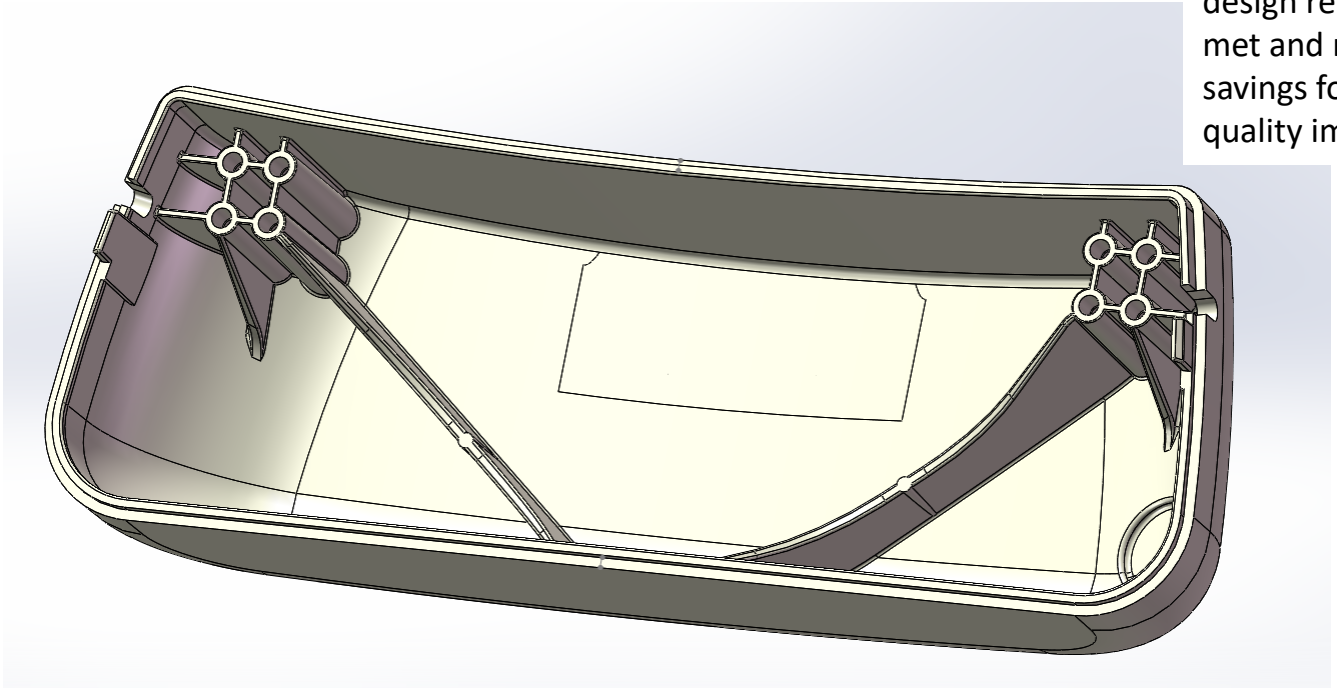
Redesigned part for RIM molding encompassed all assembly components in a single molded part. All the design requirements were met resulting in cost savings and quality improvement.





Original design was comprised of a vacuum formed part, (2) bonded in stiffening beams, (2) bonded in fastening blocks, (1) bonded in spacer/stop plate, (2) Guide tabs, and (1) O-ring retaining strip.

Redesigned part for RIM molding encompassed all assembly components in a single molded part. All the design requirements were met and resulted in cost savings for a more robust quality improvement.



RIM Value Add Services

Kitting and Racking for Customer Assembly Line

RIM Value Add Services

Kitting and Racking for Customer Assembly Line

Tooling Cost Considerations

- Final part design validation must include interference detection and include approval from all internal engineering departments
- RIM and Low pressure process allows reduced tooling costs 1/3 of other technologies (traditional injection and structural)
- Tooling sees very little stress / wear and tear due to low cavity pressure
- Ease of incorporating minor design changes
- Undercuts (increased tool cost)
- Sliders Average Cost $2-4(k) pending size
- Floating cores / Lifters Cost on Average $1-3K pending size

Quality and Environment

Quality:

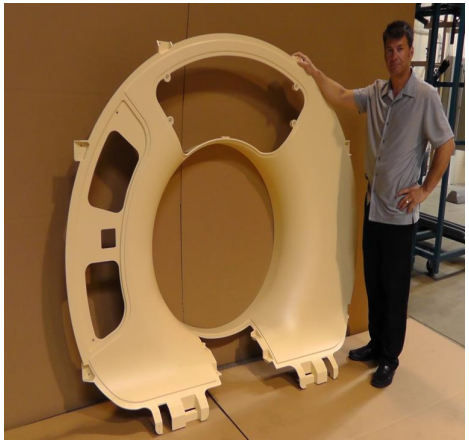
+ 50 years of experience in the development and production of custom RIM parts as well as technical high-quality printing systems
+ Thieme USA: ISO 9001 Certified
+ Germany: Certified to DIN EN ISO 9001, ISO/TS 16949 and UL QMRX 2

Environment:

+ Environmental friendly production
+ Plastic products conform to ROHS and are recyclable according to WEEE
+ Coating plant is environmentally friendly being water based
+ Certified to DIN EN ISO 14001, Germany

Reference List

Thank You for Your Interest in Thieme & RIM



+ **Michael A. Young**
+ Sales Manager, N.A
+ Thieme Corporation
+ 3605 Swenson Ave.
+ St. Charles, IL 60174 USA
+ 248-705-7663 Cell
+ 248-628-2930 Office
+ My@thieme-us.com
+ www.rim-molding.com

+ **Nino Mastrolonardo**
+ General Manager, N.A
+ Thieme Corporation
+ 3605 Swenson Ave.
+ St. Charles, IL 60174 USA
+ 630-513-1666
+ Nm@thieme-us.com
+ www.rim-molding.com