Midas Technical Support

Understanding Reaction Injection Moulding

What exactly is RIM?

RIM, or reaction injection moulding, is a cold casting process that begins life as two separate liquids. Different materials, including polyurethanes, polyesters, and epoxies can be processed using reaction injection moulding, however, the most commonly used material is polyurethane. When components A, polyol, and B, isocyanate are mixed together, a chemical exothermic reaction occurs, creating a thermosetting polyurethane resin, often referred to as PUR.

Once fully cured, parts **cannot** be re-processed in the same way. However, they can be repaired, refurbished, repainted to suit new branding, and modified. When parts reach the end of life and can no longer be used, they can be ground down into inert bulk filler for the construction and composite industries. Great news for the environment and circular economy.

How Are Reaction Injection Mouldings Made?

In order to process the material constituents, low-pressure meter mix equipment is used to separately pump the two liquids into the mixing head. Thompson (2011) provides a simple overview of the process in the image below. As soon as the two materials meet in the mixing head, the chemical reaction begins and the operator has a short period of time to fill the mould tool. This is typically referred to as the “material pot life”, and ranges between 30 seconds and 3 minutes.

Tooling can be manufactured from a range of materials, depending on part size, geometry, and predicted annual volumes. For prototyping and low volume projects, tooling will typically be manufactured from polyurethane tooling board which offers good stability and allows for rapid machining. For projects requiring 10+ years’ production, which also have complex features, composite materials and metal inserts are favoured.

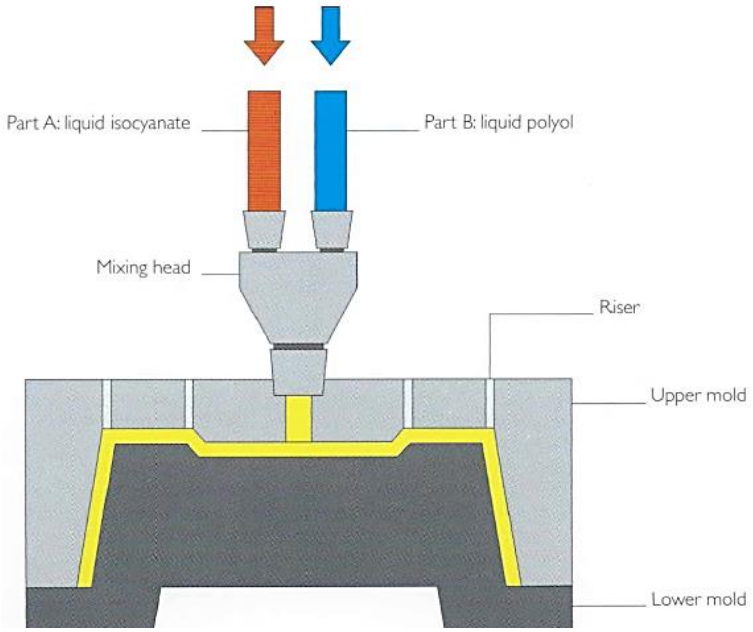

Illustration of RIM the Process (Thompson, 2011, pg. 15).

What are the benefits of RIM moulding?

RIM moulding provides designers with an opportunity to create stylish and ergonomic covers, faster and with lower risks and constraints than alternate processes. The process is particularly useful for larger parts (>1m) and can offer incredible cost savings. Whilst each project will differ, savings can be as high as 90% when compared to conventional injection mould tools. This, in conjunction with flexibility in supply, value-added assembly, and small-batch deliveries, RIM moulding can really favour new and innovative projects where funds are limited.

Polyurethane RIM moulding can accommodate varying wall sections with no risk of sink, and the encapsulation of threaded inserts, studs, and magnet keepers help reduce risk and improve manufacturing efficiencies. Parts as heavy as 30kg and 3m in length can be manufactured as single items which can often reduce the need for multiple components. This helps streamline purchasing and reduce tooling budgets. It can also simplify BoM and assembly content by reducing fixing components and complicated joints often associated with multi-panel enclosures. Excellent tolerance control and fitment are possible due to the low pressure required to process the polyurethane material, so batch to batch consistency is high and distortion minimal.

Order flexibility makes sure market demands can be met, without holding excessive stocks. Parts can also be customised in different colours and textures, batch to batch, or to suit special requests. RIM mouldings are generally painted in hard-wearing two-pack paints including polyurethane, acrylic, and epoxy which offer excellent chemical resistance, durability, UV stability, and confirm with all the latest RoHS guidelines.

Where can RIM moulding be used?

RIM mouldings can be used across a variety of industries and sectors. From medical to marine, transportation, and everything in-between. These robust mouldings play a crucial role in industries where reliability and durability can be life-saving.

Polyurethane housings are used within the medical and scientific industries to provide parts for innovative cancer treatment, robotic surgery and laboratory testing equipment. These safety-conscious industries demand compliance against all regulatory standards as well as UL94 V0 flammability ratings and the option for EMC shielding. Electric vehicle charging units, personal dive units, and solar canopies on the other hand require robustness and UV stability so they can stand up to the rigors of external use. **RIM moulding** can create precision parts that offer structure and confidence when it counts.

How to Design for Reaction Injection Moulding

It is important to work closely with your chosen moulding company to make sure the design is robust for manufacture. Good communication allows for part optimisation, which can often lead to cost savings and improved quality and consistency.

Although reaction injection moulding is a forgiving process, it is sensible to follow standard casting guidelines wherever possible. These include maintaining a consistent wall section and checking parts have sufficient draft and strength radii to help flow and avoid stress fractures. Undercut features are typically created using loose cores that are manually operated, so understanding size and space requirements will make sure your tooling lasts.

Summary

- **Cost-effective process for parts >0.5 m^2**
- **Low-cost tooling with options to suit different size and volume requirements**
- **Flexible ordering and small runs to match to your build rates**
- **Customisation with colours, multiple finishes, and screen printing**
- **All parts conform with UL94 V0 ratings and industry standards**
- **Free of charge DfM support and unlimited CAD feedback.**

If you are interested in understanding how rigid polyurethane can assist you with your product development, click here for more information or contact Rachel Sparkhall at **07791 161542** **r.sparkhall@midas-pattern.co.uk**