MADA: Industry design assignment - Annotated example

Rotational moulding

This is a manufacturing process that is designed to create hollow products of consistent wall thickness. The perks of this process allows manufacturers to create parts of any size, and in conjunction, finishes that are unique amongst polymer processing. In addition, given that rotational moulding is generally used for low volume large products, most processes cannot compete with its cost efficiency and low cost tooling. Materials usually used for this process are limited to thermoplastics such as: Polyethylene, Polypropylene, Nylon, Polycarbonate and Polyvinyl Chloride. However, other materials that are occasionally used with this process are: Aluminium, ABS, Acrylic, Polyester, Silicone, and foods like chocolate. Moreover, this process can be done mechanically with machine operation or manually by hand.

The process of Rotational moulding:

1. Powdered material is weighed and added into half the open mould or through a sprue or the close mould. Mould is then loaded onto the spider.
2. The whole mould is rotated through 360 degrees inside an oven at approximately 250 degrees Celsius for 30 minutes – By rotating on multiple axes, the melted resin adheres to the side of the walls with even distribution.
3. The mould is then moved to a cooling area where rotation continues alongside with the help of chilled water and ventilation. The whole mould needs to be cooled before retrieving the product.
4. The mould is opened, and the part is removed normally by hand with a knife or machine.

As a reasonably long document, this would benefit from a short table of contents or brief outline in the introductory paragraph. It helps to 'bring the reader in' to the text and they'll know what to expect. For an assessing lecturer, it gives them a quick understanding of how much work you've done.

Effective use of definition before listing the advantages of the process.

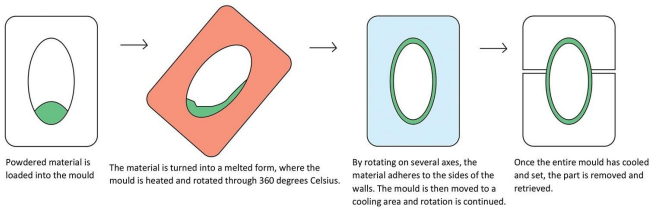
This paragraph is quite well written; however, the phrase 'The perks of this process allows' is grammatically incorrect and 'perks' is colloquial and informal. It is important to maintain a formal, objective style in a text such as this.

Effective use of transition words.

The process is well-communicated through a combination of image and text. The textual description is succinct, and the diagrams are clear and accurate.

Legend

Good practice | Needs improvement | Comment



The writing style throughout is concise and precise. The writer has used a mix of technical and general vocabulary. When writing at university - as when writing for an informed professional group - ensure an accurate use of technical vocabulary to convey complex details and concepts.

Process tolerances:

When it comes to designing moulds for rotational moulding, or for even any process, draft angles must be included. This allows the object to be retrieved out from the mould as parts may warp or shrink. Minimum draft angles of approximately 0.5 to 1 degree for outside walls are required.

'Any process' is a bit too broad. This should be 'any moulding process'.

This is correct. However the diagram above shows an undercut in the last image - care must be taken in technical illustrations to uphold accuracy.

Design guidelines and limitations:

Good design features for this process will include products that are ideally designed to be hollow.

The sizes that rotational moulding can produce is endless, however, the complete size limitation depends on how big of a machine is available.

Identify products that are treated/formed with this process:

The headings are clear but the verb 'Identify' is unnecessary here and it does not match the noun phrases used in the other headings.

Given that rotational moulding is commonly used for large volume products, this process is ideal for producing water tanks, furniture, toys, rowing boats, playground slides, bins etc. A good use of a rotational moulded product are kayaks. This is because these are fairly large products that can be made efficiently with even wall thickness where ribs can be added in for support after being moulded.

Environmental impact:

Energy wise, I wouldn't say that rotational moulding is energy efficient. This is because rotational moulding requires an extensive amount of heat to be applied in the mould while the material inside is rotated in its melted state. In addition, the cooling process for rotational moulding usually consists of placing the mould in chilled cold water, thus causing more energy consumption, and water wastage – Other processes such as injection moulding do not require the entire mould to cool, instead only requires the part that has been processed to be. However, through using rotational moulding several parts of an object can be produced rapidly in comparison to other processes.

This is a big call - rotomoulding may appear energy intensive, however, when we consider the machinery and energy use of injection moulding, not to mention the far greater embodied energy of the tonnes of steel required to make injection mould tooling, rotomoulding is quite low-energy. Yes, it could be better though.

The grammar could be improved here.

When it comes to rotational moulding, very minimal waste is created. Waste is created when there are things such as cutting out extra material covering where holes are meant to be. However this waste is recycled and reused in the process.

Advantages and disadvantages:

This information is all good and useful. Consider the use of a diagram again to give these points context. For example, the points about wall thickness or material flow in the mould could be shown with reference to an image illustrating the problem.

Advantages:

- Creating high volume products at a cost efficient rate.
- Consistent wall thickness & ribs can be designed into the part.
- If there are several pieces for one design, these parts can be moulded as one – Eliminates the high cost of fabrication.
- Feasible alternative to blow moulding. However only effective in small scale products.
- Moulds for these process require less tooling, which allows the mould to be put into production quicker.
- There are no sprues, off-cuts or pinch off needed – Less material wastage. Material can be easily recycled and reused in the process.
- Ribs can be added in. Minor undercuts can be added in without draft angles.
- Stress free parts & a larger design flexibility.

The list covers the technical terms but the grammar and punctuation could be improved. The ampersand symbol (&) should be avoided as it is too informal.

Disadvantages:

- As a low pressure process, designers and manufacturers find difficulty in allowing the material to reach hard areas of the mould. The chosen plastic must be able to flow easily through the mould cavity, and the design of the product must be taken into account.
- The entire mould itself needs to be cooled when it comes to rotational moulding, leading to the increase of costs in terms of financial and environmental. Other processes wait for the product to be cooled.
- Plastics used must have a high resistance to permanently change.
- The inside design of the product cannot be controlled as the material is pushed towards the outer walls.
- The process in some aspects relies on trial and error – When the mould was to be taken out of the oven or when it was cool enough to be removed from the mould.

The grammar is incorrect here. What is being described as a 'low pressure process'? The intended term should be used immediately following the comma.

This could be expressed more clearly. A better way of expressing this would be: 'the increase of financial and environmental costs'.

Use past tense to describe an event that has occurred. Otherwise, use present tense to describe a general characteristic.

Alternatives:

Alternatives to rotational moulding can be either blow moulding or injection moulding. Blow moulding produces a very similar result to rotational moulding. Its process creates hollow thin walls. However, the process of blow moulding is very limited in terms of specific polymers, the lack of control when it comes to wall thicknesses, and the inability to create interior ribs and walls. A downside to blow moulding as well is that the larger the product tends to be, the more expensive it is. The other alternative is injection moulding which is ideal with thermoplastics and thermosets. This process, unlike rotational moulding, pressurises and pushes the material. However, the cost of the mould for injection moulding would be more significant than ones required for rotational moulding.

Good analysis and discussion of the implications.

Accessibility:

There are several suppliers in Australia who provide the process of rotational moulding. For example, in Victoria, there are the following:

Rotadyne Pty Limited
31 Lakewood Blv, Carrum Downs VIC 3201

Rudplas Rotomoulding
42 Peninsula Blv, Seaford VIC 3198

Australian Rotomoulding Industries Pty Ltd
Pakenham VIC 3180

Rotaform Pty Ltd
54 Brunel Road, Seaford VIC 3198

Great. Show them on a little map?

Cost:

Costs of tools in terms of rotational moulding are much cheaper than those compared to injection moulding for example. These tools are approximately 1/5th less in cost.

Designers:

When specifying this process, the designer needs to know both the pros and cons of this process. The elements of the chosen material should be known, as rotational moulding has no pressure to push the polymer into the mould – The chosen polymer must be able to flow with clarity. How much of a draft angle is needed.

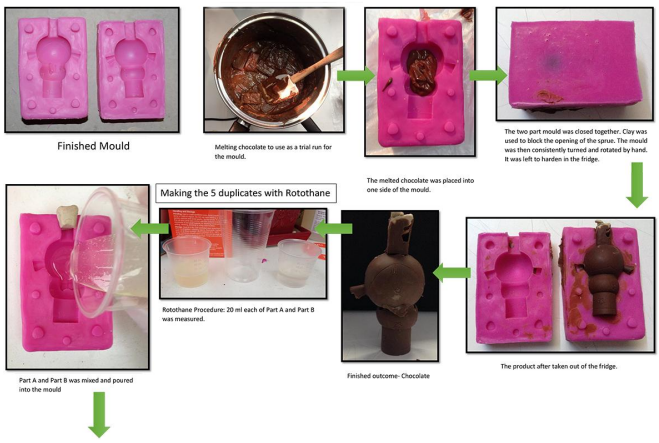
Good analysis and discussion of the impact and effect on the field. The last sentence, however, is unclear. Allowing time for proofreading can ensure an assignment does not contain errors like this.

Making a two part mould

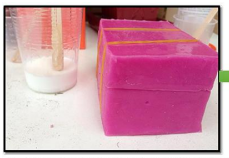
These photographs and captions offer a clear visual and textual representation of the process involved. The captions, written in past tense, are succinct. The formal, objective tone is maintained here, even when describing the activities carried out by the student.

The images are good, nice and neat, well lit and shot, and consistent too. What would improve them is consistent size - it would make the timeline clearer and easier to interpret. Also consider numbering for more clarity.

Trailing the mound with chocolate



The images show an excellent understanding of the process. It's great to see theory turned into practice.



The mould was secured tight with rubber bands and rotated on several axes by hand

5 finished duplicate parts.

Final Composition

The actual 'doing' of a process is one of the most valuable parts of this project. The photos and timeline are great, really clear. What would have made this even better is the identification of some of the strengths and weaknesses of the process (which are written above) in the model made by the student. For example, it would be great to know what the average weight of the moulded parts are, roughly how thick the walls are, any moulding issues, wear and tear on the tool after 5 parts were made, etc.