WHITE PAPER:

Mold Releasing Process and Silicone

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With the increasing use of cast and injection molded wheels, questions of how these molded wheels are released from their molds and whether or not silicone is used in the process often arise. To answer this, it must first be understood that the release process for casting and injection molding are not the same and abide by different rules.

First, we will talk about the casting process. It is not a terribly complicated process, but it is an important one. To use urethane casting as an example, the process goes like this:

1. Heat the mold to the appropriate casting temperature for the material being used. This is usually between 200 degrees and 230 degrees.

2. Apply the release agent onto the mold. This is either done by spraying or brushing.

3. Pour the urethane into the casting mold

4. Cure the product. For more information on urethane curing, see the whitepaper: "Common Questions on Polyurethane and the Polyurethane Molding Process."

5. Remove the product from the mold.

6. Start again.

What the release agent does throughout this process is form a thin layer between the urethane and the mold itself. The release agent consists of two parts. About 5 to 15% is the actual release agent while the remainder is a carrier or solvent which evaporates at a low temperature. When the carrier evaporates it leaves the release agent behind and you are left with a smooth, even coating. As with most things, there is a technique to the application of the release agent because using the proper amount is critical. Too much release can cause problems such as runs or defective parts. Too little release and the product you just cast may be bonded to the mold itself. Neither outcome is acceptable, which is why using the proper amount of release and making sure the coating is evenly distributed is key.

The injection molding process is a little different. As with casting, a mold is used. However, in this instance the mold cavity is closed and the material is forcibly injected into the cavity. The following is a general outline of the injection molding process:

1. At the beginning of the run of parts, the mold is sprayed with mold release. This does not recur for every "shot." (A "shot" is what they call the load of melted plastic that is about to be injected into the mold cavity)

2. In order to control the process, the mold itself is actively cooled by running water through a series of built in channels. This helps control how the shot material flows and hardens as well as helps to provide dimensional control.

3. The two piece mold is forced together by the press built into the injection molding machine.

4. The melted material is shot into the mold.

5. The molds are designed such that when the press retracts, the parts stay in the movable half of the mold. The parts are then ejected from the mold by the machine using a set of ejector pins that are built into the mold structure.

6. The part then drops onto a conveyor, which takes it away from the machine to cool. This cooling is sometimes assisted by a water bath.

As mentioned in step one of the process, mold release is generally only used at the beginning of a run. The reason for this is that once the temperature of the mold stabilizes, the release agent is not required. However, if there is an interruption in the run and the temperature of the mold changes, then the release agent will be used again.

Now that we know how the mold release process works, we can talk about the mold release agent itself. The agent is a two part material. You have the material that forms the barrier and the solvent that carries the barrier material to help distribute it evenly. Some of these release agents make use of silicone. Silicone is a very slippery chemical and does a very good job of keeping things from sticking together. Anyone who has ever detailed a car and used a silicone based tire treatment can tell you that the stuff gets everywhere and is quite persistent (if the material gets

on your shoes or on the tread of your tires it significantly reduces the traction of either). In some applications, this can prove to be a disaster because the end user absolutely needs things to stick together. Industries such as composites, painting and finishing can be crippled if silicone were to contaminate their work areas as it would interfere with the bonding process. This could result in either a ruined finish or a composite part delaminating and thus coming apart.

If you find yourself in a situation where silicone contamination could be an issue, there are a couple things that can be done as preventative measures. First, please inform your RWM Sales Manager or Customer Service agent that silicone content is a concern. With this knowledge, there are steps we can take to help. Second, as outlined above, you can pick your process with the above information in mind. Injection molded wheels use far less release agent than cast wheels do and if such a wheel can be used in your application, it may be the easier way to go. Additionally if you must use a cast wheel where release agents are more frequently used, we can use a different type of mold release which does not contain silicone content or steps can be taken to clean the wheels.

Should you want to clean the wheels yourself as an extra precaution, there are two ways this can be done. The first is to use a cleaning solvent. There are many on the market. Though for medium to light cleaning, a solution of dish detergent and warm water, coupled with some scrubbing, is known to work well.

By now you should have a better understanding of the processes behind the de-molding of both cast and injection molded products. Hopefully this paper has also helped you understand why in some circumstances silicone may be detrimental to a customer's application and the steps that can be taken when faced with these situations. Finding the proper solution takes open communication, so please allow the knowledgeable sales and customer service staff at RWM to assist you.