SILICONES and more

What is Casting Rubber?

Casting rubber refers to a castable material that exhibits the properties of rubber after curing. There are several artificial materials with this property, such as certain polyurethanes and epoxies. However, when we talk about casting rubber, silicone rubber is usually meant. Silicone as cast rubber is an excellent alternative to natural cast rubber or natural rubber. They retain their rubbery properties at both low and high temperatures. In addition, silicone lasts much longer than traditional rubber and is more resistant to chemicals. With us you will find an extensive range of silicones that are suitable as cast rubber. These silicones can be divided into two categories based on their chemical properties: condensation-hardening silicone (also known as tin-hardening silicone) and addition-hardening silicone (also known as platinum-hardening silicone).

What is the difference between addition and condensation silicone?

Simple explanation:

1. Condensation silicones: These silicones "sweat" out a bit of their own material over time (tin salts). This causes condensation silicone to shrink in the long run, usually by about 1% per year. Please note: condensation silicone is not food safe. In general, they are cheaper than addition silicone and easier to process.
2. Addition silicones: These silicones show virtually no shrinkage. However, in a liquid state, they can still react with certain materials or substances, which can cause poisoning of the silicone. Substances such as sulfur, nitrogen, amino compounds and metal salts can play a role in this. If you are unsure whether your material reacts well to the silicone, first carry out a small test. Addition silicone generally lasts longer and is slightly more expensive.

Detailed Explanation of Condensation and Addition Silicone

The chemical difference between condensation and addition silicone lies in the way polymerization takes place. Let's take a closer look:

1. **Condensation Silicone**:
    - Condensation silicone forms long chains during the curing process. Part of the material condenses (separates), resulting in a decrease in the total volume of the silicone. As a result, condensation silicone has more shrinkage than addition silicone.

- These silicones excrete tin salts during curing. Unfortunately, these salts are harmful to health, which is why molds made of condensation silicone are not suitable as a food mold.
- Condensation silicones continue to react continuously and form chains after mixing the A and B components. This means that over the years they shrink more and more and become more brittle. The advantage is that they also adhere to new condensation silicone when applied to an old silicone casting. With two-part molds of condensation silicone, it is essential to maintain proper separation between the two layers while pouring the second part to prevent unwanted adhesion.
- These silicones need moisture to harden. They get this moisture from themselves as well as from the environment or air. Therefore, the curing process is faster in high humidity. It is essential to seal condensation silicone tightly after use, otherwise the moisture will evaporate.

2. **Addition Silicone**:
   - Addition silicone shows virtually no shrinkage. They form long chains without excreting substances during curing.
   - However, in a liquid state, addition silicones can still react with certain materials or substances, which can cause poisoning of the silicone. Substances such as sulphur, nitrogen, amino compounds and metal salts play a role in this.
   - To enforce a 100% polymerization/curing or vulcanization and to prevent unreacted material, it is recommended to "post-cure" addition silicones after curing (place in an oven at 80-100°C for a considerable period of time).
   - Addition silicone requires heat for curing. In general, they harden faster at higher temperatures. However, at low temperatures (even noticeable at temperatures below 18°C), many addition silicones can harden poorly or not at all. Sometimes addition silicone is even used slightly cold to extend the processing time. Roughly speaking, the following often applies: With every 10°C higher temperature, the processing time and curing time halves. With every 10°C lower temperature, the processing time and curing time doubles.

Curing at elevated temperatures can affect the cross-linking to some extent and often results in a harder and stiffer silicone end product.

3. **Resistance to Chemicals and Pollution**:
    - After curing, condensation silicone is less resistant to chemicals and resins than addition silicone. However, during the curing process, condensation silicone can actually withstand contamination better.
    - Addition silicones can have problems with curing, when they become contaminated by substances such as tin salts (which are found in condensation silicones), various adhesives, phosphorus, arsenic, nitrogen, 1-component silicone and sulfur (even sulfur-containing latex gloves). If you are unsure whether the chosen silicone is compatible with other materials, always perform a small test on a non-critical part of the original. After curing, addition silicone can withstand many products. The biggest problems for silicones are usually petroleum derivatives (such as thinner to longer hydrocarbon chains) and strong bases or acids.
4. **Mixing ratios**:
    - With condensation silicone, the mixing ratios are less critical. A slightly excessive amount of catalyst will speed up the curing process and shorten the processing time. However, too much excess can have negative effects, such as reduced strength of the silicone. Too little catalyst results in very slow curing. Too much catalyst causes the silicone end product to age and brittle faster.
    - Addition silicones, on the other hand, must be mixed very precisely. Even small deviations can cause the silicone to stop curing. In the best case, this can be remedied by applying a "post-curing" process (placing the silicone in an oven at 80-100°C for a considerable period of time).