

## New release agent free from wax and siloxane

So-called wax-siloxane emulsions have been used as pressure die casting release agents for around 30 years. Such release agents principally consist of the water as a carrier to the dies, and waxlike organic components as the actual release agent.

In order to be able to produce a stable water dispersion or emulsion it is necessary to use an emulsifier and, if too little is used, the emulsion becomes unstable and the wax creams on the surface. If a lot of emulsifier is used this results in a stable finely dispersed emulsion but has the disadvantage of the loss of the water-repellent effect, which is very important for pressure die casting, inasmuch as evaporation of the water from the release agent must leave a water repellent surface. If this is not so the parting layer formed on the die is re-emulsified through further spraying, i.e. re-dissolved and then washed into the remote parts of the die by the spray stream. At these points, where too much release agent is undesirable, collections of material and gasification occur; too little release agent is present at the washed-out positions, e.g. gate and cores where it is mostly needed. Current processes can produce stable wax emulsions with a low emulsifier content of < 5 %. Today, wax emulsions are used throughout the world, they have good release properties and provide good casting surfaces.

**Disadvantages of wax emulsions.** Wax alone is not sufficient as a separating substance. It burns relatively quickly at temperatures exceeding 300°C and has no emergency lubrication properties. This then requires the use of siloxane or silicon, which has a higher thermal stability rating and therefore better release action.

Waxes collect at the die holders and die frame, which must be regularly cleaned. The core slides become coated with wax so that the gases can no longer escape, resulting in increased porosity. The nozzles can also become blocked with wax. The piping furs up, bacteria grow and infect the complete system, above all in the hot summer months.

The siloxanes separate the organic residue, i.e. this evaporates in the die leaving finely dispersed quartz powder (SiO<sub>2</sub>) that with time changes the contour of the die. Siloxanes have a tendency towards the rejection of lacquer, which can lead to coating problems if too much is sprayed.

On account of these disadvantages the industry has been engaged for many years in the very intensive researching of new processes, the following 3 of which have a prospect of being successful:

- Powder spraying instead of the use of water
- Condensation of release agent vapours and
- A wax-free water dispersion with water-repellent effect.

**Wax-free water dispersion with water-repellent effect.** A hydrophobic dispersion is a „milky“ product that can optionally be further diluted with water. But at the moment when the water is removed the remaining oil is completely insoluble in water, i.e. it can no longer be re-emulsified. Such natural dispersions are well-known, such as milk and latex. Because of this, Tribo-Chemie GmbH wanted to develop a process with which it is possible to also technically produce hydrophobic dispersions. Mixing of water and oil to form a stable dispersion requires a large

amount of energy and a stabilizer.

The company has been concerned with the solution of this problem for many years and, following initial partial success in 1996, has refined and perfected the process to arrive at production of the first completely stable hydrophobic water dispersion. Completely water-repellent organic oils that are resistant to high temperatures can now be stably dispersed in water without the use of emulsifiers. This is exceptionally important for pressure die casting.

During spraying of the die the water evaporates in a fraction of a second and a separating film is formed which, because it is hydrophobic (water-repellent), can no longer re-emulsify and remains at the position where it is sprayed.

This brings numerous advantages for pressure die casting foundries. Die separation is good and even better than with wax-siloxane emulsions, there is no longer any formation of wax on the die holders and the nozzles do not block. In other words, die maintenance is practically superfluous. After the changeover, wax residues remaining from previous release agents should be flushed out of the piping. There are no longer any problems regarding lacquering or coating. However, the technical plants with which such products can currently be produced must be specially built for this application because there are not yet any standard plants available.