

Mold release agents in the bakery

RELEASE AGENTS ARE INVISIBLE HELPERS WITH A VISIBLE EFFECT. IN THE BAKING INDUSTRY THEY ARE HELPFUL AGAINST STICKINESS AND ADHESION



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+ Modern production in a bakery must proceed smoothly and with no malfunctions to enable the production of optimum quality baked goods. One of many big challenges is that baked products, especially those with a high sugar and protein content, have a large tendency to be sticky, and even slight adhesion leads to quality reductions, which must be avoided. This is where release agents make a huge difference. They suppress adhesion without “oiling” the baked goods too much. To achieve optimum results, the release agent must form a closed, stable, homogeneous release film that is maintained throughout the entire baking phase. In other words the release agent acts to prevent contact between the baked products, batter or dough and the baking tray or pans.

A distinction can be made between three types of release agents:

- I. Simple liquid release agents based on vegetable oils and lecithin.
- II. High-performance release agents, non-viscous to viscous agents based on vegetable oils, lecithin and waxes.
- III. Release emulsions, mostly very viscous, water is also added to the “actual release agent” by using an emulsifier.

The correct release agent for every application

The choice of the release agent to be used depends essentially on two factors: the product that is to be released and the material of the trays or pans.

A basic distinction can be made between four groups of baked products:

Breads/bread rolls are baked goods that are easy to release. Simple liquid release agents or emulsions are sufficient here.

So-called “**morning goods**” such as sweet bread rolls, croissants etc. already impose greater demands on the release agent. The use of a low-viscosity, high-performance release agent is recommended for these baked products.

Baked goods containing large amounts of protein and sugar made from batters with baking powder, e.g. sand cakes or muffins, require a high-viscosity, high-performance release agent with wax for faultless release. This also fulfills another important criterion that is very important in the manufacture of these baked products: it adheres to steep-sided mold walls – including especially on continuously operating production lines in which the pan walls are still hot (60 °C) when they are sprayed. If the release agent’s adhesion is not optimum and it runs down into the lower corners of the pans, a certain defect occurs: The consequence is a so-called frying effect, i.e. the baked goods acquire a very coarse surface.

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For **long-life baked products**, e.g. biscuits, waffles or lebkuchen (gingerbread) with a shelf life of 12 months for example, the release agent should display low gumming (resinification) and high oxidation stability in addition to the release effect. For this reason, special liquid release agents are particularly recommended for these baked products.

The material of the trays and pans in use also affects the choice of release agent:

Aluminum trays have poorer thermal conductivity compared to black plate (tin-free sheet iron). This makes release more difficult, although this can be modified via the baking ►

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++ figure 1
The irregular dispersion of the solid wax particles is clearly apparent. Depending on the amount applied, they float in the release film in a disordered way

temperature. Low-viscosity or high-viscosity release agents with wax should be used in this case.

For **perforated metal trays in a rack oven** it is important that the “holes” do not become blocked, e.g. due to the release agent becoming gummy (resinified). Therefore a low-viscosity release agent containing wax is preferable when using these trays.

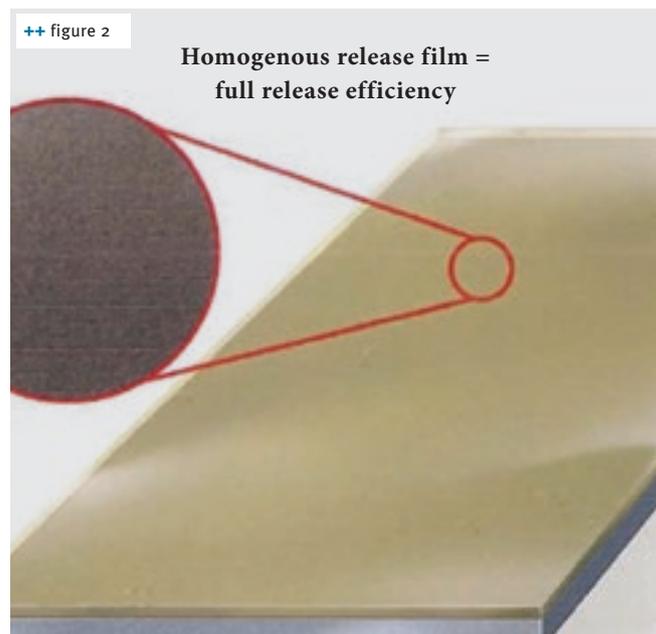
Teflonized trays or pans have an extremely smooth surface. The sparing use of a high-performance release agent is recommended for optimum release and to prolong the lifetime of the trays or pans. Essential to note: an emulsion must not be used in this case!

With **siliconized trays or molds**, release agents should be avoided entirely so as not to damage the coating.

The ingredients determine the properties

As can be seen in table 1, there are numerous ingredients used to manufacture release agents. In each case the release agent's functionality is based on a balanced mix of various raw materials and the associated manufacturing process. Different ingredients and a specific manufacturing process are chosen, depending on the properties the manufacturer considers to be important. In this respect manufacturers can often fall back on knowledge derived from many years of experience.

Vegetable oils are the basis – or the body – of a release agent. Refined oils or fats and/or their fractions are used in the manufacturing process. Their choice affects the polymerization/resinification and oxidation stability. MCT oil (medium chain triglyceride oil) – a fraction from palm or coconut – may be mentioned as an example fraction here.



++ figure 2
The fine release film fully wets the tray. The wax is in an ultrafine dispersion in the homogeneous film

This expensive oil fraction has a big effect on polymerization and oxidation stability.

Waxes, wax esters and lecithins provide the actual release function: lecithin enables the formation of a thin, uniform release film. Without lecithin, separate droplets form.

The purpose of the waxes and/or wax esters is to form a closed release film that remains stable throughout the entire baking time. Beeswax and carnauba wax are examples of high melting point waxes. In addition to the release function, this property also controls the viscosity. The larger the amount of these waxes that is used, the more viscous is the release agent and thus the better its adhesion to the mold walls.

Wax ester, a liquid wax, allows the manufacture of low-viscosity, high-performance release agents.

Emulsifiers are necessary to manufacture release emulsions. These water-in-oil emulsions are white, highly viscous release agents. The preferred proportion of water is 60 %.

Antioxidants increase the oxidation stability of the oils and fats.

The influence of the manufacturing process

In addition to the ingredients, the following example shows how much the manufacturing process also affects the quality of a release agent: high-performance release agents with carnauba wax pass through various cooling and homogenizing steps to achieve an ultrafine dispersion of the wax. This ultrafine dispersion affects the release efficiency and viscosity.

This is shown by scanning electron microscope photos (see figures 1 and 2). +++



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