FRYING

Maximizing Cooking-Oil Life

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HEAT AND CONTROL

Looking for a way to stretch shelf-life and cut costs?
Read more about the strategies that are improving product stability.

CLEANLINESS COUNTS: Here, hamburger patties are cooked with curtains of filtered oil.

POLYMERIZATION PRODUCT: When frying oil deteriorates at temperatures above 200°C, particle clusters can form causing oil foaming.

CLEAN SWEEP: Filtering systems remove particulate material before it can compromise the end-product or the oil.

Frying oil is an expensive component of food processing, so using less or taking steps to delay spoilage can result in reduced expenses. Since deterioration is a multi-faceted problem, processors need to tackle the issue on several fronts—by understanding their market and environmental needs, by determining the oil that is best suited to their process, and maintaining a correct standard of oil.

Correct oil choice

What oil should a processor use? That depends in part by market considerations. The end flavor could dictate what type of oil is to be used. Consumer preference might force the processor to minimize the level of saturated fats in the final product. (Increasing the level of unsaturated oils would result in greater oil instability—an important consideration when selecting frying machinery.)

Environmental requirements are also crucial. Some oils solidify under ambient conditions, so effective oil-handling techniques associated with correct oil storage and transfer equipment need to be taken into account.

Processors have to ensure that their oil is suited to their particular cooking technique. For example, confectionery manufacturers can only use certain oils to fry nuts, so as not to contaminate their chocolate. If oil turnover within the fryer is large—as is the case in nut frying—a more stable oil may be required.

Additionally, check that oil standards are met. It is essential that processors establish what they perceive to be a minimum level of oil and ensure that the supplied oil complies within this standard. The quality of refined oil can be compromised at any level—from raw feedstock, through the refining stage leading up to and including the distribution of the refined product.

Processors should remember the Latin phrase 'Caveat Emptor', which means 'Let the buyer be aware'—cheap oil does not always mean good oil.

Furthermore, some oils may need to have a chelating agent (to prevent particle build-up) added to fresh oil before it is poured into the fryer; in addition to antioxidants or anti-foam additives.

Proper storage and handling

During delivery, bulk oil should only be received via vehicles designed for oil handling. In addition, the vehicle should be clean both on the outside and the inside to prevent contamination. During transfer, care should also be taken so that the oil is not accidentally aerated. (This is especially important towards the last part, when the tanker is almost empty.)

Oil-storage tanks should be able to be sealed so as to slow down the flow of air into the headspace. Ideally they should be injected with some form of an inert gas like nitrogen. In addition, tanks and pipe work should be constructed of materials that will not compromise the oil—copper parts are not acceptable.

In terms of maintenance, tanks and associated pipe work may need to be 'traced' or heated to convert residual oil back into a liquid state. Cleaning should be done routinely to keep the storage tank hygienic.

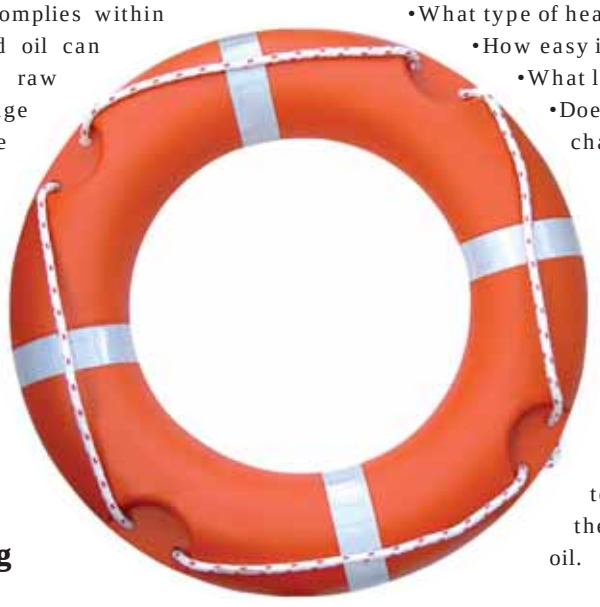
Smart equipment selection

There are a variety of different fryer styles and configurations available to processors, ranging from large, continuous systems to small, restaurant-style batch units. The type of system is dependent upon processor requirements and resources.

When selecting a fryer system, consider the following factors:

- How will the machine affect oil selection?
- How much oil will be absorbed by the product during cooking?
- How many kilograms/hour of final product is required?
- What is the size of the raw/cooked product?
- How much heat energy is required?
- What type of heater do you need?
- How easy is it to clean the fryer?
- What level of oil filtration is required?
- Does the end product have any special characteristics?

Well-designed fryer systems address processor needs and help to maintain oil integrity within the fryer.



LIFE PRESERVER: Some oils may need 'chelating' agents to prevent particle build-up, antioxidants to prevent spoilage, or anti-foam additives.

a) modified atmosphere

They ensure that the frying oil is minimally exposed to air. This is done by various methods (e.g. steam blanketing, internal baffles, controlled air flows, etc.). Each technique is designed to prevent oxidation, the process where air interacts with the hot oil.

b) correct oil levels

They prevent oil levels from changing too much. Too much or too little can harm frying oil.

How does oil spoil?

There are three main types of frying-oil breakdown:

1. Oxidation

This occurs when air comes in contact with frying oil. The oxidation reaction is catalyzed by high temperatures, metal alloys, large-surface exposure of oil to air, high oil-turnover times and UV light. Antioxidants can delay the onset of excessive oxidation and help maintain product shelf-life.

2. Hydrolysis

This reaction is caused by water interacting with oil, causing the end-product to have a tainted or acidic flavor. Acids, high temperatures, high oil-turnover rate, increasing the number of heating and cooling cycles of the oil, fines present in the oil, high pressures, products of oxidation, some emulsifiers, caustic soda, and metal alloys can all exacerbate hydrolysis.

3. Polymerization

When frying oil deteriorates, the resulting products form both volatile (or reactive) and non-volatile compounds. Non-volatile compounds remain within the frying oil, and can produce polymerization at frying oil temperatures above 200°C or in isolated hot spots within the frying system. These molecules bond together to form large, different-sized clusters that accumulate on the oil's surface. Since they don't dissolve, they cause foaming; trapping air under the oil, and increase the possibility of hydrolysis.

c) fryer sizing

They should be sized to suit the heat load, production capacity and output requirements. If systems are sized too big then the 'oil turnover' time can be too excessive, causing oil to breakdown too quickly before it can be replaced by fresh oil. If the heater is sized too small, the output may have to be reduced, again causing oil quality to suffer.

d) correct material

They are manufactured from functional materials that do not compromise oil quality.

e) effective filtering

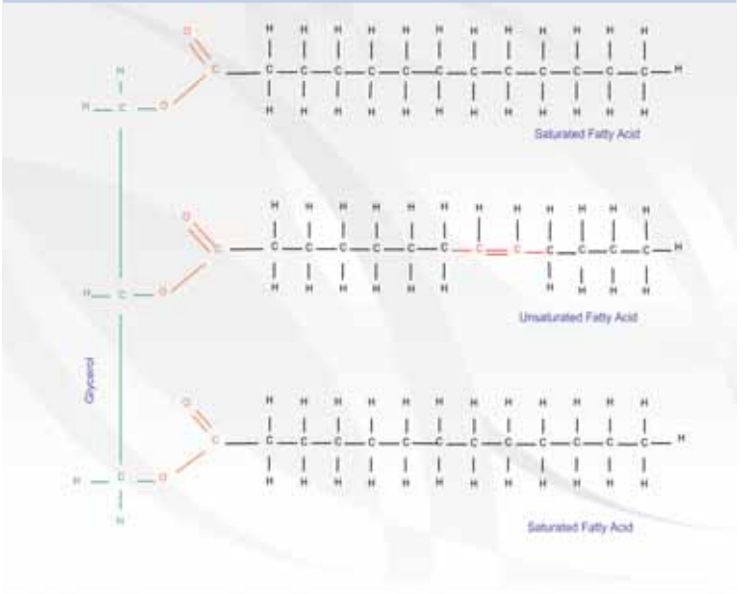
They remove particulate material before it can compromise the end-product or the oil.

f) effective oil heating

They are designed not only to fulfil heat-load requirements, but also to minimize any oil damage from excessive heater/oil-film temperatures.

CHOOSE CORRECTLY: Pick a fryer based on your-energy, heater, cleaning and oil-filtration requirements.

MORE STABILITY: Saturated fats are more stable during cooking than unsaturated fats. Unfortunately from a consumer point of view, they also increase the risk of heart disease.



g) oil volumes

They minimize oil volumes within the fryer system, reducing the time needed to replace old oil with fresh material. Therefore, they help to control oil condition.

h) ease of cleaning

They should be reasonably easy to clean. In some models, they have built-in CIP (Clean In Place) systems for effective, automated cleaning.

i) drainage

They can fully drain all liquids. The removal of water from a fryer system is crucial, not only for maintaining oil integrity but also for user safety.

Frying Effectively

Here are some tips that may to help maintain oil quality:

Start as late as possible. Fill and start heating the fryer system only when production is about to begin. Pumping and heating oil without passing any product through will not only damage the oil, but may also result in additional costs.

Keep the fryer closed. Operators should not lift hoods or openings during production, so as to keep controlling gases inside (e.g. steam, nitrogen, etc.) while preventing air from entering.

Where applicable, secondary filtration systems should be switched to operate on automatic. If not, oil quality, and subsequently product quality, could suffer.

After shutdown, the processor should cool the oil as quickly as possible to below 80°C, and then pump it to an overnight storage tank. If fitted, use a modified atmosphere in the storage tank's headspace.

The frying system should be cleaned regularly, not only for HACCP compliance, but also to minimize oil deterioration.

In case of a fryer breakdown, the heating system should be turned off and the oil cooled as quickly as possible—ideally below 80°C. In circumstances of prolonged stoppages, it may be warranted, if possible, to pump the oil to the overnight oil storage facility until production can be restarted. ■

More Information

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