Clarification of whey

The purpose with whey clarification is to remove remaining cheese fines from the whey. This improves the efficiency in the whey separation that normally is the next step in the process.

Process

Whey, free from air, should be fed to the centrifuge, a clarifier, at relatively constant temperature and capacity. A change in operating conditions will influence the clarification efficiency.

The cheese fines collect at the periphery of the bowl in the sediment space and are discharged through the cyclone. The clarified whey is discharged in the top of the centrifuge.

Recovered cheese fines can be used in process cheese production or for cattle fodder.

Factors influencing safety

It is important that you set the sediment discharge volume and the sediment discharge interval to match not only the fines content in the whey but also the production schedule and the operating conditions.

Always follow the given recommendations. Check on discharge size and cleaning result now and then.

Improper cleaning impair performance and ultimately lead to imbalance problems.

When salt whey is processed it is of vital importance to keep the machine clean. Sediment discharge size should minimum equal the sediment space. The discharge interval must be short. CIP must start with thorough flushing with water and never end with any acid remaining in the clarifier. Separator bowl must be inspected regularly. See separator manual for procedures.

Adjustments in separation process

It may be necessary to adjust the clarification process, for example when capacity or type of whey changes.

Pressure

To work properly semi-open centrifuges shall have a back pressure that is 50-100 kPa lower than the overflow pressure. The hermetic centrifuges can have a back pressure up to 600 kPa. If the back pressure is set too low, cavitation may occur.

Capacity

Whey is normally clarified at maximum possible throughput for the centrifuge with regard to fines content. An adjustment of back pressure is necessary when the capacity is reduced (semi-open centrifuges).
Temperature
Whey is normally and preferably processed at vat temperature. Higher temperature will not improve efficiency, but rather lead to an increased fouling and eventually an impaired efficiency.

Sediment discharge size and intervals
Too small a sediment discharge volume or too long a sediment discharge interval will affect the efficiency negatively. Sediment discharge volume should be equivalent to the sediment space in the bowl. Discharge interval depends on whey type, fines content, temperature and capacity. An increase in any of the three last parameters may lead to shorter interval time.

Clarification efficiency
With efficiency for a clarifier we normally mean the ability to reduce the level of sediment at a consistent and high level in a production with no unintentional stops. The raw material and the operating conditions are essential for an optimal result. A good result after clarification is 20-30 mg fines per kg of whey.

To maintain a high availability it is important to make necessary adjustments with care, to run a proper cleaning every day and to make the recommended daily checks. Maintenance may be carried out by certified personnel only.

Product quality
The product quality in a whey clarification process is often measured in terms of maintained fat quality and air in the discharged product.

If the incoming whey contains too much air there will primarily be a problem with process control and foaming in product tanks. Secondarily, air is the major cause for destruction of fat globule membranes. The globule will be smaller and more difficult to separate in the following fat separation.

Sampling and analysing methods
Fines content
Below is an example of a method for determination of fines content in whey used by the NIZO institute in Netherlands and by Tetra Pak.

A sample is taken into a bottle. The bottle is shaken strongly and 333 grams of whey is put in a centrifugal cup as soon as possible after the sampling.

The cup with the sample is spun at 1200 g during 30 minutes. The liquid is decanted from the sediment. The cup wall is flushed clean by hot water without turning the cup upside down. By this procedure the remaining fat is rinsed away and the sediment layer is not destroyed. Rinse the sediment and transfer it by hot water to a 25 ml centrifugal tube and spin it for 10 minutes at 400 g.

The filtering device must be dried and weighed before use. The sample is transferred from the centrifugal tube by means of hot water. The filter cake is flushed twice with 10 ml hot water.
Application

Clarification of whey

After drying for 2 hours at 105°C the sample is kept until the weight becomes constant (approx. 30 minutes).

The weight in mg is then multiplied by 3 to get the fines content in mg per kg of whey.

Air content
Fill a bottle with narrow neck through a plastic hose until the bottle is full. Hold the hose under the liquid level. Leave the bottle at 55-60 °C for 1 hour. The amount of water needed to fill the bottle again in relation to the original sample volume gives the air content in percentage.

Cleaning
Cleaning must always start with a cold water rinse and large sediment discharges in order to flush out as many fines as possible before the detergent phase.

Cleaning must never end with an acid phase when salt whey is processed.
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