Phase Separation in the Dairy

In this way, you avoid product losses and increase the quality!

Precision and reliability are the basics of an optimal and low-loss phase separation. Negele provides a variety of solutions for this purpose!

Sensors for phase separation.
left the turbidity measuring unit ITM-2;
right the conductivity measuring unit ILM-2.
Botth aseptic weld-in tube type EHG.

Phase separation - where and how?

You will find a phase separation in the various areas of the dairy. Particularly

- In the CIP-return line to the phase separation of the cleaning solutions
- When draining (flush-out) a production plant for switching over between product tank and feed tank and/or waste water and other media.
- For separating rinsing milk and water in the return line.

In these three main areas there are
basically 4 options for phase separation:

1. Manually by way of a sight glass (only possible under certain conditions)
2. Automatically by way of a time control
3. Automatically by way of volume acquisition
4. Automatically by means of conductivity and turbidity

The options in comparison:

Manual switch-over and time control

The two options first mentioned are sophisticated and involve considerable losses. Where the manual change-over and the time control are concerned, the investment costs are low. However, they are immensely expensive in the subsequent costs for a plant operation duration of 10 years, for example. This is evident from the following aspect: if only 10 l product are lost per phase change with, for example, 4 phase changes per week, this results in a loss amounting to a total of 10400l in 5 years. Multiply this with the margin of the product. For the purpose of clarity: 10 l product fit into an approx. 3m pipe with a nominal width of DN65. With a flow velocity of 1m/s, this means that 10 l disappear in just about 3 seconds!

The **manual switch-over** which cannot be adopted for use in the CIP area, requires increased manpower and can undergo considerable fluctuations depending on the co-worker and the daily form. **=> quality differences, product losses and personnel assignment.**

With the change-over by means of **time control**, a certain safety time interval must be given due consideration in order to prevent too much water from getting into the product tank. **=> in part, considerable product losses**

Phase separation by means of volume acquisition

With regard to the product loss, better results are achieved with the change-over by means of **volume acquisition** than with the time-controlled method. Depending on the plant, however, the volume acquisition is very sophisticated. Particularly where larger installations are concerned, where several tanks are connected up to one production plant, the emptying of a plant with water and the change-over as soon as the plant is empty is complicated to calculate because the piping routes and the tank volumes are different. Moreover, possible water inclusions which are still in the plant are not recognised.
=> in part, product losses; residual risk – water in the product; very sophisticated during start-up and planning

Phase separation by means of conductivity and turbidity

The **phase separation** with the use of **sensors** is a cost-optimal solution. The sensors, which are mounted at a short distance upstream of the switch-over valve, switch over exactly and precisely at the pre-set product concentration. Water inclusions are recognised immediately. Planning and start-up costs are low because the switch-over point is independent of volume and time. This also ensures maximum safety and reliability opposite unwanted water in the product.
=> minimal product losses; no quality differences; maximum safety and reliability; no personnel requirement

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Solutions made by NEGELE

In the previous section, it was clearly shown that a phase separation using clear and definite measurement-technical data is the most reliable solution which is also optimal with regard to costs. Negele offers measurement-technical solutions for all main sectors of the phase separation.
In the CIP return line, a conductivity measuring unit, e.g. ILM-2, is suitable for phase separation of the cleaning media.
The recognition of milk residuals in the pre-rinsing water as well as the switch-over during draining of a production plant can be realised by means of a turbidity measuring unit, e.g. ITM-2.

A description of the individual applications

CIP return line

During the phase separation of the cleaning media, the most important point is to classify the media flowing back from the plant and to lead them into the correct storage tank (lye, acid, water).
Based on their respective conductivity, these media can be differentiated. Depending on the conductivity of the medium in the return line, the medium in the piping can be identified.
Depending on the medium, the subsequently arranged valves are set in such a way that the lye is sent into the lye vessel, the acid into the acid vessel and the water into the stack tank.
A most important factor for a low-loss operation is good reproducibility (switch-over always at the same point) of the conductivity measuring unit as well as a rapidly functioning temperature compensation based on the various medium temperatures.
The degree of mixing of the various cleaning media and, therefore, the consumption of expensive cleaning concentrates depend on these two factors.

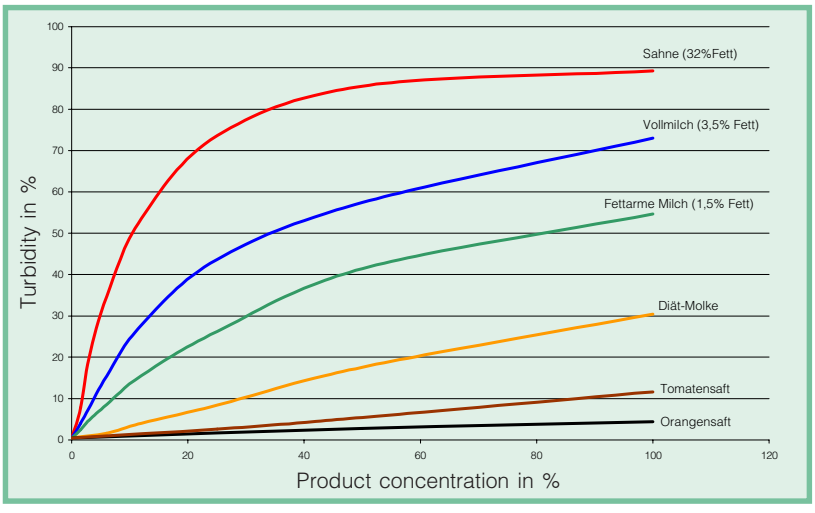
Our conductivity measuring unit ILM-2 offers both. The reproducibility of the unit lies at < 1 % from the final value. The temperature compensation is designed in such a way that a secure and reliable separation between lye 80 °C and water 20 °C is even possible after about one second of time.

Start-up and emptying of plants – secure and reliable without product losses

Before and after production or during pump circulation of tanks, the milk product must be differentiated from the water in the line or as used for press emptying. There is a mixture of milk and water at the phase transition. For this reason, the mixing ratio and the concentration, respectively, must be measured in order to carry out the switch-over always at the same point. This can be done with a turbidity measuring unit. Contrary to the time-controlled phase separation, where a safety time interval is envisaged, the product loss can cause considerable costs.
Where sensitive milk products such as yoghurt are concerned, which should have a long durability, it is also very important that absolutely no unwanted water can access the end product. Even the smallest amounts of coliform bacteria in the water would reduce the durability period. An access of water into the product cannot be ruled out neither with the time control nor the control by way of volume acquisition. For this reason, both options are second choice. This fact also speaks in favour of the use of the turbidity measuring unit.
In order to guarantee a consistent product quality, the reproducibility plays the main role here also - as in all phase separations.

Our Negele turbidity ITM-2 is suitable for these applications, for practically all milk products in particular. In the diagram you see the turbidity of various milk products as a factor of the concentration. By means of the switch outlet or analogue outlet, the switch-over is carried out between the two phases at a defined product concentration. The assembly work is low because the equipment unit is built into the process by way of a weld-in socket joint.

Turbidity diagram
With a phase change, the product concentration changes because of the water quota that either increases or decreases. This results in a change of the turbid condition. The diagram shows the turbidity, measured with the ITM-2, as a factor of the concentration of various milk products. During start-up and emptying of plants, exactly defined switch-over points between product and water can be set in this way. This avoids product losses and increases quality.



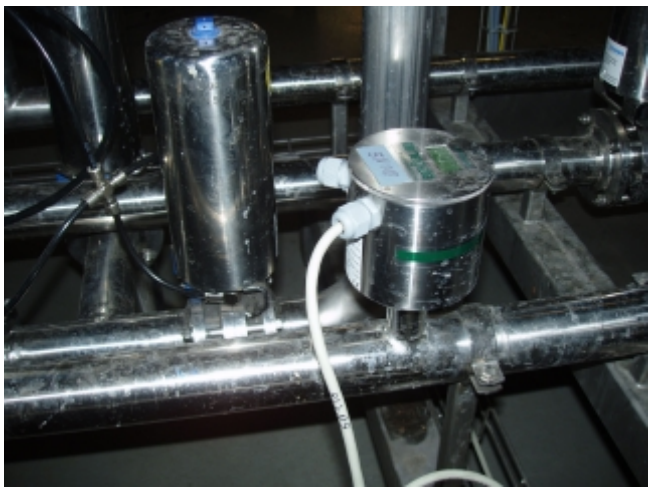
It´s worth it!

With regard to the minimisation of product losses, such a turbidity unit pays off very quickly. Calculate for yourself! You can use the following draft for calculating your own personal advantage of a phase separation milk - water by means of a turbidity measuring unit ITM-2 during the start-up and emptying of a plant.

	Your values	Example
Selling price (SP) of your product per litre	_____	2.00 Eur / l
Manufacturing costs (MC) of your product per litre	_____	0.20 Eur / l
Margin per litre = SP – MC:	_____	1.80 Eur / l
Product loss (in litres) per phase change	_____	20l
Monetary value loss per phase change = margin x produce loss	_____	36.00 Eur
Investment costs for ITM-2 including assembly: (equipment price approx. 1200 Euro plus assembly costs)	_____	approx. 1600.-- Euro
Amortisation achieved after X phase changes (= investment costs / monetary value loss per phase cycle)	_____	44
Number of phase changes per week in your plant	_____	4 / week
Amortisation time in weeks (= number of phase changes up to amortisation / number of phase changes per week)	_____	11 weeks
Savings with an assumed life service duration of 5 years (260 weeks) = (260 week – amortisation time) x phase change per week x monetary value loss per phase change	_____	35.856.- EUR

Application examples

Conductivity measuring units ILM-2 *in the CIP return line for the separation of cleaning media. One unit for each CIP cycle. Depending on the conductivity, the medium in the piping is recognised and directed back into the correct CIP vessel.*



Turbidity measuring unit ITM-2 *for phase separation milk - water. Used during emptying of a production plant. After completion of production, the plant is flushed empty with water. With the ITM-2, it is exactly determined when the plant is fully and thoroughly emptied.*

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Notes

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