PROPAX

Yeast propagation technology

The aim of propagation is to grow sufficient pure culture yeast in an optimal physiological state so that at a given pitching rate, wort composition and temperature regime the yeast can consistently provide the required fermentation times and the desired beer profiles over a number of generations.

Oxygen is absolutely required and necessary for the synthesis of sterols and unsaturated fatty acids during yeast growth. It is clear that both oxygen transfer and uptake efficiency by the yeast are very important for good propagation.

A good oxygen transfer can be ensured by using a membrane sparger in a loop configuration. Results show the effectiveness of the membrane loop concept regarding yeast quality, lipid biosynthetic activities and fermentation performance. This technology was developed by **MEURA**. Industrial results with the **MEURA *PROPAX*** system show its high efficiency. As a result it can be stated that with the membrane sparger loop, the oxygen supply is no longer the limiting factor during yeast propagation.

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PROPAX

MAIN ASSETS

- Increased yeast concentration up to 200 million cells/ml (depending on the wort composition) at the end of propagation:
  - smaller reactor volumes (also due to the use of oxygen instead of air)
  - less consumption of C.I.P. products.
- Yeast crop in an optimal physiological state assures a regular and short fermentation cycle.
- Possibility of using pure oxygen, which increases the oxygen transfer and limits the foam formation. It also allows the use of propagation vessels with less head space.
- Short propagation cycles of about 24 hours thanks to sufficient oxygen supply in the yeast.
- Elimination of transfer steps, thus less risk of microbiological infection.
- Easy implementation and adaptation in existing propagation systems.

TECHNICAL DESCRIPTION

- A one-vessel propagation plant with the possibility of sterilising the wort only at the first propagation step. At this step, 4 hl wort is taken, sterilised, cooled and pitched with a new yeast culture from a Carlsberg flask. After propagation of this 4 hl, additional cold wort is added for the main propagation.
- A second system, allowing sterilising wort at each step, is the two-vessel propagation plant consisting of a yeast storage vessel (4 hl) and a yeast propagation vessel. The 4 hl freshly propagated wort with yeast from the Carlsberg flask is stored in a vessel. The required volume of wort is taken into propagation vessel, sterilised and cooled in the vessel and then pitched with the 4 hl yeast from the storage vessel.

Figures 1 and 2 show the two systems.

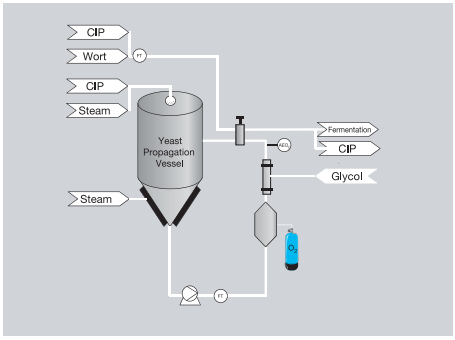

Figure 1: **MEURA** one-vessel propagation

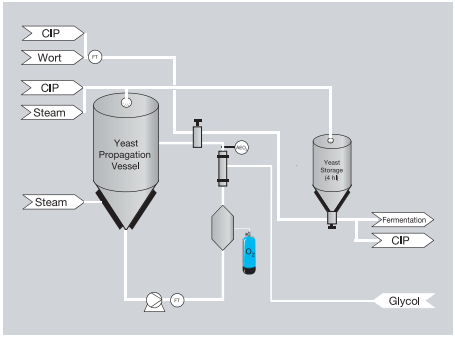

Figure 2: **MEURA** two-vessel propagation

The uniqueness of the system is the oxygen transfer by a membrane sparger. A flow of oxygen is forced through the sintered aluminium oxide membrane with a pore size of 0.05 µm in the upward flow of the bulk yeast suspension in the internal channels (figure 3).

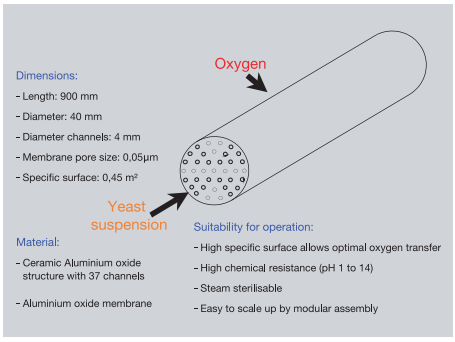

Figure 3: The characteristics of the membrane sparger system.

The membrane sparger assures a direct dissolving of oxygen into the liquid phase and allows the injection of pure oxygen. Another advantage of the system is the use of pure oxygen. The solubility of oxygen in the wort (at 11.5°P) is 8.0 mg O_2/l by aeration or 38.5 mg O_2/l by oxygenation.

This low solubility by aeration combined with the stripping effect of 78% of nitrogen makes the transfer of oxygen to the liquid phase much more difficult. Another problem with using air is the amount of foaming due to the nitrogen gas, which requires a vessel with a headspace of at least 50%.

The propagation media is homogenised through external circulation. This allows easy and accurate temperature control as well as oxygen concentration control. The oxygen level is measured continuously and the input is controlled through a proportional valve. The speed of the circulation pump is controlled through a flow sensor allowing the use of the pump for pitching.

As a result of a higher efficiency of the oxygen transfer, yeast concentrations up to 200 million cells/ml (depending on the strain and the temperature) are observed after propagation with 100% malt worts. In comparison, the yeast concentration obtained with traditional systems is about 80 to 100 million cells/ml.

SOME REFERENCES

- Achouffe Brewery, Belgium
- Bavik Brewery, Belgium
- Brasserie Gayant, France
- Coopers Brewery, Australia
- Haacht Brewery, Belgium
- MEIIG Brewery, Jordan
- Nocal Brewery, Angola
- Nocalbo, Angola
- Palm Brewery, Belgium
- Van Steenbergen Brewery, Belgium
- Zaragozana Brewery, Spain

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