PREOX

Yeast pre-oxygenation technology

Yeast needs to be in an excellent physiological state to obtain active and regular fermentation. Oxygen is required for the yeast and therefore it is common practice to aerate the cold wort. Drawbacks of conventional wort aeration technology are oxidation of wort constituents with undesirable colour and flavour changes, low solubility in high density worts, poor oxygen transfer due to foam formation and the risks of over- or under-aeration resulting respectively in excessive growth or poor attenuation.

During yeast storage, these problems may be overcome by oxygenating the sterol-depleted yeast crop. For this to be achieved, sufficient oxygen is needed to meet the metabolic demands of the yeast used for re-pitching.

An excellent oxygen conversion efficiency is possible by using a membrane sparger in a loop configuration. Our 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 ***PREOX*** system show its excellent efficiency.

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PREOX

MAIN ASSETS

- No more wort aeration, resulting in:
  - considerably less wort oxidation
  - less excessive foaming during filling of the fermenters
  - elimination of problems with oxygen solubility for high density worts
  - elimination of stalling of the fermentation due to insufficient aeration of the wort
  - no risk of over-aeration with an excessive yeast growth as a result.
- Possibility of precisely dosing the oxygen needed for rebuilding the yeast membrane
- 10 to 15% gain in fermentation time.
- Homogenous yeast suspension for pitching.
- Constant yeast quality means constant and better control of the fermentation with regular fermentation cycle times, allowing for better production planning.

TECHNICAL DESCRIPTION

The pre-oxygenation vessel is equipped with an external loop with a membrane sparger. The process starts with the uptake in the pre-oxygenation vessel of yeast from a storage tank or straight from a fermentation vessel. In the first step the excess CO_2 is released slowly and the temperature is controlled until the set point.

Once the temperature set point is reached the yeast can be oxygenated. During oxygenation the oxygen concentration is maintained at a constant level, providing sufficient oxygen to the yeast to rebuild its cell membrane. The oxygen is injected into the medium through aluminium oxide membranes (pore size of 0.05 µm). The time for the pre-oxygenation process is about four to five hours. The pre-oxygenated yeast is then pitched to the non-aerated wort.

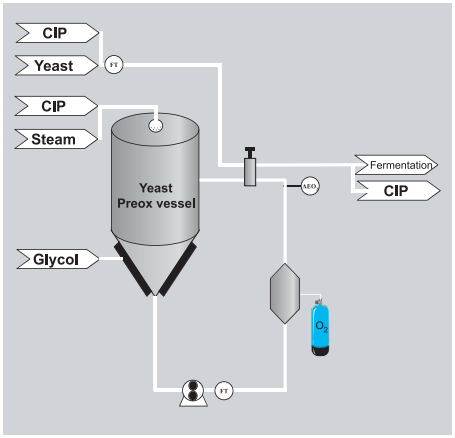

Figure 1: *The membrane loop concept: layout and operating conditions.*

The uniqueness of the system is the oxygen transfer by a membrane sparger. Oxygen transfer is considerably improved due to the resulting large gas/liquid interface. 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 2).

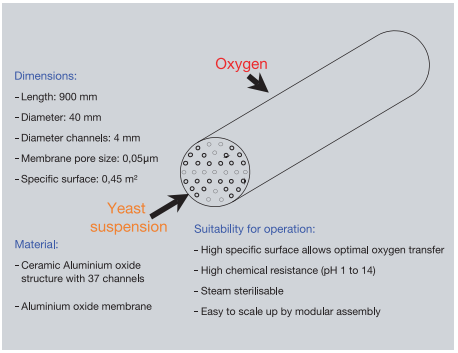

Figure 2: *The characteristics of the membrane sparger system.*

During the yeast pre-oxygenation an oxygen mass flow control is applied to the membranes.

The external circulation loop also allows for easy temperature control, guarantees the homogeneity of the yeast suspension and allows optimal yeast dosing during pitching.

SOME REFERENCES:

- Coopers Brewery, Australia
- Palm Brewery, Belgium
- Pilot plant, Confidential project, The Netherlands
- Shymkentpivo, Kazakhstan

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