GEA
Liquid Processing Division

Tuchenhagen

Immocon

Rapid and continuous maturation of beer by means of immobilized yeast

Immocon Maturation

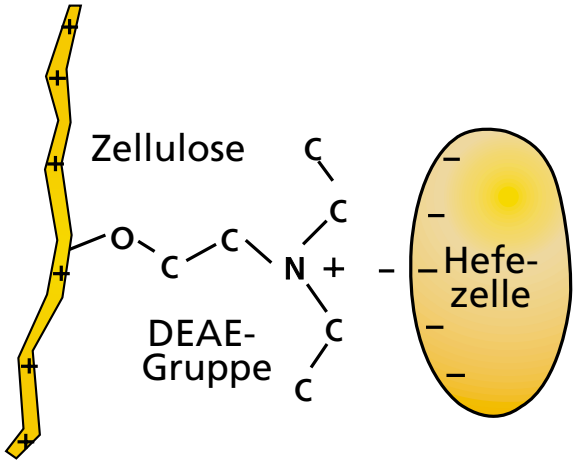
Introduction

The secondary fermentation or maturation is by far the most time consuming phase in the beer brewing process. The continuous Immocon process makes it possible to reduce this time from some weeks to 2 hours while maintaining the quality and taste unchanged. The process using immobilized yeast bioreactors was developed in Finland by VTT Biotechnology and Food Research, Sinebrychoff Brewery and Cultor Ltd., and designed and marketed for full scale production by Tuchenhagen.

Immobilization

The heart of the Immocon process is the proprietary carrier material, Spezyme® GDC, manufactured exclusively for Cultor Ltd. and sold exclusively by Tuchenhagen for fermented drinks production. Unlike other carrier materials, Spezyme® GDC does not encapsulate the yeast cells or trap them inside porous material; yeast cells are immobilized on the surface of a reticular carrier matrix, ensuring good contact between yeast and beer. The open structure of Spezyme® GDC enables rapid and easy immobilization and cleaning of the carrier.

The immobilization mechanism of Spezyme® GDC is based on electrostatic interaction between the negatively charged yeast surface and the positively charged carrier surface. This positive charge on the carrier is generated by DEAE-groups on the derivatized cellulose component of the carrier material.



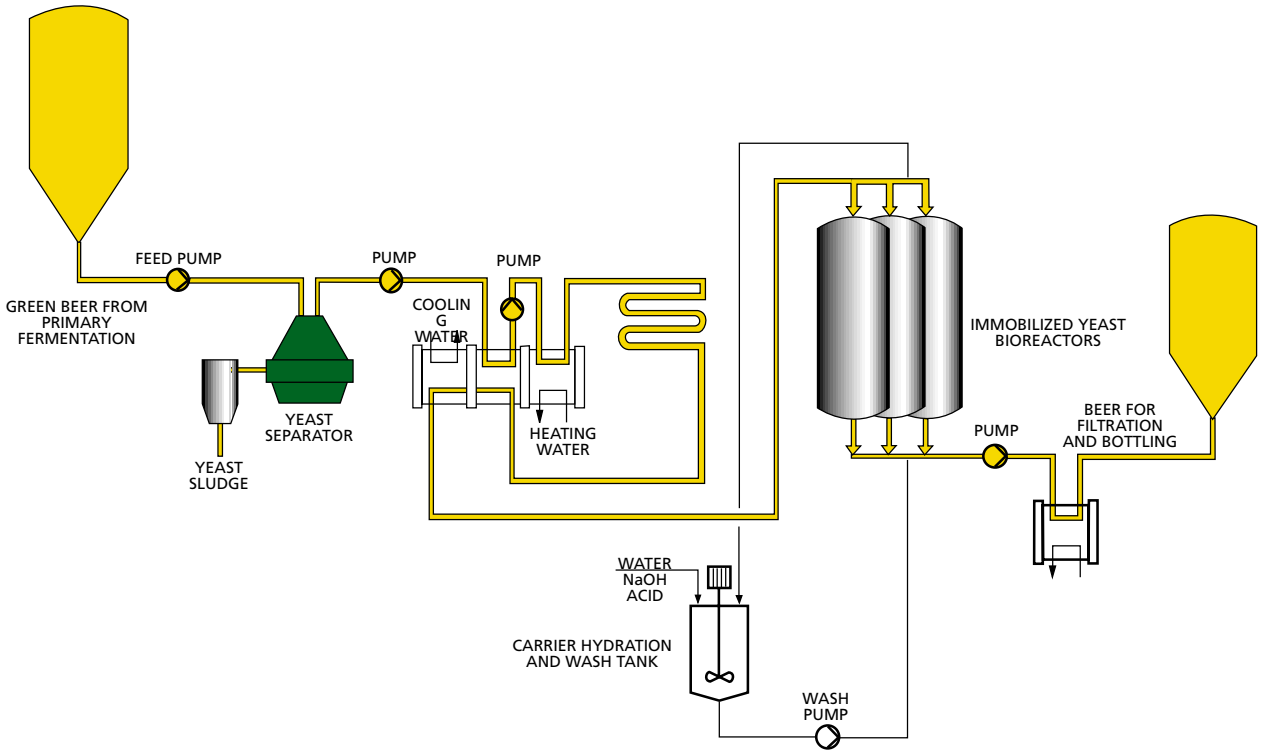
Specific properties of Spezyme® GDC

- long service life (up to 10 years)
- immobilization on the carrier surface
- easy and rapid immobilization
- no diffusion limitation
- incompressible (good column properties)
- reusable after regeneration
- transferable with normal pumps
- widely used in the food industry
- secured production
- strong patent protection
- technical service

(Spezyme® GDC is a registered trade mark of Genencor International Ltd., a joint venture of Cultor Ltd.)

Process description

When using the automatically controlled Immocon process, the primary fermentation of beer and the previous process steps are carried out as normally without changes. The first step of the Immocon process is the separation of yeast from the green beer as completely as possible with a high performance separator. The purpose of the subsequent heat treatment is to convert all diacetyl precursors into free diacetyl which is then removed in the bioreactor. The continuous flow into the bioreactor is adjusted so that the contact time is approx. 2 hours, during which the free diacetyl is converted into flavour-inactive compounds such as acetoin and butanediol. Many other reactions affecting beer maturation also take place, including the completion of fermentation so that the final attenuation is reached. After normal cooling and stabilization the beer, identical to traditionally produced beer, can be bottled separately or can be mixed with a traditional stream under the same labels and specifications.



The first full scale production unit with 1,000,000 hl/a capacity was started at the Sinebrychoff Brewery in Kerava, Finland in 1992, where the process is used alongside the traditional maturation. The practical experience from this plant has highlighted the following advantages of the Immocon maturation process:

- easy and rapid start-up
- short lag time before steady state operation
- stand-by during process breaks possible
- immobilization in the bioreactor
- use of the brewery's normal yeast strain(s)
- high gravity feasible
- operational flexibility comparable to filtration
- long process cycles
- stable quality
- rapid response to demand fluctuations (e.g. seasonal variation)

The Immocon maturation process offers substantial savings in investment and running costs:

Investment

- lower initial investment
- reduced beer in stock

Running costs

- reduced beer losses
- no tank bottoms
- improved filtration
- savings in cooling

Immocon Maturation and AFB

Tuchenhagen, together with the worldwide GEA Group Companies offer the following services:

- feasibility studies
- quotations
- detailed system design
- delivery, installation, commissioning
- training in partnership with Sinebrychoff Brewery
- after-sales service, maintenance
- on-site testing with the 50 l/h test unit

The immobilization technology used in the Immocon maturation process has also been applied for the production of alcohol-free beer. In this process, developed together with the Bavaria Brewery in Lieshout, the Netherlands, the alcohol formation is suppressed while other metabolic functions in the yeast producing important flavour compounds are active. The alcohol formation is controlled accurately in a continuously operated bioreactor filled with immobilized yeast. The Immocon alcohol-free process has been commercialized in a number of breweries throughout Europe.

The Immocon process installed in the Sinebrychoff Brewery, Kerava, Finland.

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