



Faster and more consistent beer fermentation process with Iso-Mix rotary jet mixing

Carlsberg, Fredericia, Denmark

Case story



According to Production Manager Peter Rasmussen, the Iso-Mix system was very easy to fit into the existing fermentation vessels.

The need to continually improve all aspects of its brewing process without compromising its famous quality lead Carlsberg's Fredericia brewery in Denmark to look at the potential of Alfa Laval's Iso-Mix rotary mixing technology for beer fermentation.

The Fredericia plant produces both beer and soft drinks with an annual production of around 6.5 m hl of beverages annual of which there are more than 40 different beer types, accounting for 3.5 m hl of production.

Having an earlier interest in the use of Iso-Mix technology for water de-aeration, the company then decided to work with Alfa Laval to explore its potential further to improve the fermentation stage of its beer production. After extensive trials, Peter Rasmussen, Production Manager at the Fredericia brewery approved the investment in the new technology. Consequently, the Danish brewery became one of the first breweries in the world to install the Iso-Mix system including an external heat exchanger on four surplus 5,000 hl cold storage tanks converting them to fermentation vessels.

Faster fermentation and cooling plus energy savings

For Carlsberg, the introduction of the Iso-Mix rotary jet mixing technology has, depending on the type of beer being brewed, cut down the fermentation time to diacetyl acceptance by 1-2 days. In addition, the cooling process is now reduced from 24 to 36 hours to only 12 hours. Peter Rasmussen says that the Iso-Mix technology combined with the heat exchangers has led to "energy and time savings" and the fermentation is now "a more consistent process."

Quality secured

"We have the capability to secure quality better than that of old fashioned beer making," Peter Rasmussen adds. "Because the Iso-Mix system employs an external plate heat exchanger, we now have more precise control of the fermenting process, and the temperature can be more accurately controlled." He also confirms that there is greater homogeneity in the suspension of yeast in the wort and that no additional stress on the yeast has been noted.



The Iso-Mix system installed in Carlsberg's fermentation tanks include a plate type heat exchanger, which enables much faster cooling.

As an added benefit, Carlsberg has also demonstrated that the Iso-Mix system can be used to add stabilizing ingredients in the unitanks, thereby providing more contact time than if dosed before the filter. This has enabled Carlsberg to cut down on stabilizer usage. In addition, the Iso-Mix rotary jet mixer is employed in hygienic and effective tank cleaning operations in between fermentations.

Flexibility and ease of installation

Furthermore, the system has given Carlsberg some extra flexibility by allowing the tanks to be used for production of small batches, something that was not possible previously. The unitanks have a number of cooling jackets on the surface and consequently there has been a limit to the minimum batch size if cooling must be performed. This problem has been resolved with the Iso-Mix system.

One of the other features of the Iso-Mix system is its ease of installation with minimum production downtime. And Peter Rasmussen confirms that, "it is an uncomplicated system and very reliable." Carlsberg are successfully applying the Iso-Mix system with heat exchanger to all types of beer and even cider production in Fredericia. Indeed, since the Iso-Mix system's introduction in 2007 at the Danish brewery and, more recently by its sister plant at Northampton in the UK, it has been such a success that the Carlsberg group has plans to roll out the Iso-Mix technology throughout the world.

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Iso-Mix in fermentation

The rotary jets of the Iso-Mix system mix the contents of the fermentation vessel, keeping the concentration of yeast uniform throughout the tank. As the yeast is constantly kept evenly mixed with the wort in the fermentation tanks, the contact between yeast and fermentable sugars is improved. This means that the conversion of sugars to alcohol is faster.

Introducing mixing in a fermenter influences three process phases: primary fermentation, diacetyl conversion and crash cooling. During primary fermentation, mixing leads to a shorter lag phase as the pitched yeast is distributed more homogeneously. End fermentation is reached faster as settling of yeast in the cone is prevented. The improved mixing in the tank has a positive effect on diacetyl break down. During crash cooling the forced convection provided by the rotary jet mixer leads to faster cooling, and if an efficient plate-type heat exchanger is inserted in the loop as is the case at Carlsberg cooling time can be further reduced.



At its Fredericia brewery Carlsberg uses Iso-Mix system for faster fermentation of both beer and cider.