Increasing capacity through more efficient fermentation

Royal Unibrew, Faxe, Denmark **Case story**

Increasing capacity was the driving factor behind the decision for Danish brewing company, Royal Unibrew, to invest in Alfa Laval's Iso-Mix rotary mixing technology. Following a series of trials, the brewery installed the Iso-Mix system in six of its 5,000 hectolitre fermentation vessels at its Faxe plant, making it one of the first companies to adopt the technology for beer fermentation.

Better, more consistent beer quality and up to 40% faster fermentation

Royal Unibrew produces and sells beers and soft drinks in a number of European countries plus overseas markets, where especially malt beverages are popular. Producing more than 20 different beer types, the Faxe plant has noted dramatic time savings in the fermentation process thanks to the Iso-Mix technology – up to 40% for the stronger beer types.

Jens Erik Klemmensen, Brewery Manager at Faxe, notes that this faster fermentation has been accompanied by improved quality, "thanks to the consistent fermentation each and every time." In conventional fermentation tanks, there is no forced mixing of the wort and yeast. But as tanks have grown in size and capacity this means that yeast contact with the fermentable sugars is reduced and fermentation is less efficient.

Jens Erik Klemmensen says: "Initially, we saw a time reduction of around 25% with our standard lager brands, but especially with our very-high gravity beer the process improvement was dramatic." Detailed analysis of the fermentation performance showed that with this brand the average process time was almost cut in half. But more importantly: where the traditional process often led to very long process times in excess of 20 days, the introduction of the Iso-Mix system led to a much more consistent process time. Thus, the variation in process time measured by the standard deviation was reduced from 9.1 to 1.6 days. The Brewery Manager adds that shorter, more consistent fermentation makes it much easier to follow the plans in the bottling section and to predict what to brew.

Sluggish fermentations were often seen in the old very-high gravity process, leading to higher residual extract levels than desired. Since the occurrence of sluggish fermentations has been alleviated with the Iso-Mix system, the extract utilization has both been improved and made more consistent.

Since Royal Unibrew installed the Iso-Mix rotary jet mixing technology in its fermentation vessels, the process has become considerably faster

According to Jens Erik Klemmensen all of these benefits have been reaped without negative impacts on quality. On the contrary, a more consistent product has been made, and the brewery has seen higher yeast viabilities of the yeast crop than was previously the case.

Improved yeast management

Since these Iso-Mix systems were installed in 2008, the Faxe plant has extended their application to eight yeast storage tanks, where the rotary jet mixers support improved yeast management. As most breweries serially repitch their yeast, proper storage is important. If the contents of the yeast storage tank are not kept in motion, settling will occur and subsequent pitching may take place with a slurry of varying composition.

The mixing system keeps the concentration and temperature of the yeast consistent throughout the tank, and aids a steady, controlled release of carbon dioxide from the yeast slurry.

For the Faxe brewery, the addition of mixing has also been positive. Jens Erik Klemmensen emphasizes that, “it is crucial that we get homogeneous yeast slurry to be sure to dose the correct amount of yeast.” Using the Iso-Mix system, that is exactly what the brewery gets, along with improved microbiological quality in the yeast storage tanks.

The company also appreciates the fact that one and the same system combines fermentation or yeast storage with efficient and cost-effective CIP tank cleaning.

At Royal Unibrew the Brewery Manager is keen to make further improvements to optimize the production process even further and Iso-Mix is part of that work. Many breweries are also looking to increase production with their existing tanks. So, “if we need to expand our capacity, the first step will be to install the Iso-Mix system in the remaining fermentation vessels,” Jens Erik Klemmensen concludes.

Iso-Mix in fermentation

The Alfa Laval rotary jet mixer’s patented design incorporates two or four rotating nozzles, which are positioned below the surface of the liquid in the tank. A gentle mixing action is achieved with the nozzles rotating around both the vertical and horizontal axes. This double rotation produces a mixing effect that reaches all the contents of the tank. An external pump in the recirculating loop makes sure that the contents at the bottom of the tank are recirculated to the jet heads and ensures effective mixing of the entire tank content.

Mixing in a fermenter influences three process phases: fermentation, diacetyl conversion and crash cooling. For fermentation, mixing leads to a shorter lag phase as the pitched in yeast is distributed more homogenously. End fermentation is reached faster as settling of yeast in the cone is prevented as optimal contact between the yeast and fermentable sugars is obtained. The improved mixing in the tank also has a positive effect on diacetyl break down and improves cooling due to convection introduced by the machine.

The shorter, more consistent fermentation makes it much easier for Brewery Manager Jens Erik Klemmensen (left) to follow the plans in the bottling section, and to predict what to brew.

In the yeast storage tanks the Iso-Mix system ensures a homogeneous yeast slurry and improved microbiological quality.

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