NEW PUMP APPLICATION HELPS CREATE HIGH-EFFICIENCY BREWING PROCESS

Although it is a process which is prone to problems, the need to pump malt is central to the brewing industry. However, a project in Denmark has shown that many of the traditional difficulties can be avoided by choosing the correct type of pump for this application.

In its basic form, the brewing process involves bringing together water, a starch source such as malted barley and a flavouring such as hops. The malted barley is usually crushed and mixed with water to create a thick, sugary and solids-heavy mash which is then taken on to the next stage of the brewing process. It was this last stage that had been causing major difficulties for one of the leading providers of malt to the Danish brewing industry.

The company involved had been using a semi-open vortex impeller unit to pump the malt mash. These are regularly used to transport liquids through piping, with the liquid entering the pump impeller along, or near to its rotating axis and then being driven radially outward into a diffuser before it leaves the pump at a higher speed than it entered. However in this instance, problems had arisen due to the high solids content of the malt mash.

Whenever the pump was turned off – even for a little as one hour – moisture would begin to escape from the malt, leaving behind an increasingly less liquid mash. In order to begin operation a centrifugal pump must be primped with the fluid to be pumped, and as the malt in

this case became increasingly dry it posed more and more resistance to being moved. This in turn made the pump increasingly difficult to restart. In many cases the only option was to open and clean the pump, and sometimes the adjacent piping too, before the pump could be restarted – a process which was leading to additional downtime and extra costs.

In addition, the customer was ideally looking to uses less water in the creation of the malt mash, as this would lead to a better end product. However reducing the water content was not an option with the existing arrangement, as it was likely to lead to a number of other problems which are common to centrifugal pumps, such as reducing the flow of pumped liquid which in turn can cause overheating of the pump. Increasing the proportion of solids content by reducing the volume of water in the malt mash was also likely to increase the levels of wear and tear to the impellor and could even have helped induce corrosion inside the pump. Clearly a new pumping solution was needed.

The new solution had to be able to satisfy many different criteria. Although an especially difficult liquid to deal with, the malt mash needed to be pumped at flow rates of 18 – 19 cubic litres per hour, which meant that a powerful pump was required. Consistent performance was also needed so that no cumulative build-up or congealing could occur inside the system. However the malt mash also had to be pumped smoothly so that its consistency remained undamaged.

Reliability was another essential requirement, as was the need for extremely high levels of hygiene and leak-free performance. Just to add to the demand on the chosen solution, extended intervals between scheduled maintenance were also vital in order to minimise incidences of expensive downtime.

There were a number of potential solutions to this problem, including a simple gravity-operated pump coupled with an inlet valve – an option which was rejected due to the likelihood of blockages caused by the solids content – or a peristaltic pump which operated on the positive displacement principle. However, the large percentage of solids present in the malt mash could again lead to blockages here, caused by the rotor repeatedly opening and closing the flexible tubing used in this type of pump. Any blockage problems which resulted could have caused a recurrence of the drying out and thickening process, meaning that a peristaltic pump was not ideally suited to this application.

A progressive cavity pump offered another possible option for this situation. The combination of a rotor and a stator generates a positive displacement action by creating a series of small, fixed-shape cavities within the pump. As the rotor turns, these cavities fill with the pumped liquid before moving along the line of the pump and taking the liquid with them. The relatively gentle action of a progressive cavity pump would certainly have been suited to the malt application as it applies low levels of shearing to the pumped fluid and minimises the likelihood of damage.

However, the new pump was required to sit in the relatively restricted floor area occupied by its predecessor. The size of progressive cavity pump needed to provide the required power and flow rates would have occupied too large an area and this ruled out this type of pump as a solution.

This eventually led to a decision to trial a Verder High Efficiency Universal Screw (HUS) channel pump for this application. Featuring a corkscrew-profile impeller fitted inside a cone-

shaped casing, this type of pump is ideal for media which contains long fibres, sludges and slurries. It is often found in use on applications which involve viscous or high-solid content fluids.

Although pumping liquids of this nature by other methods can often lead to considerable energy consumption and high maintenance costs, this was not the case with the HUS channel pump. The open-channel design of the impellor and its corkscrew motion create a positive displacement action, literally pushing the malt mash away and combined with the centrifugal forces involved this generates a very powerful yet gentle force.

Compared to the original centrifugal pumps, the HUS replacement allows the liquid to move axially and without turbulence which helps prevent excess foaming or damage to the malt grains. It is also able to maintain its flow rates even if the viscosity of the malt mash increases.

The solid content of the mash also proved to be no problem for the HUS pump. On average this type of unit can reliably handle up to 13% solids, as the cone shape helps ensure blockage-free operation. This is the reason why this type of pump is so often specified to handle demanding duties involving the typically thick sludges and slurries found in food, beverage, water and waste applications. There are also many different models available which can offer a wide variety of different features such as resistance to abrasion, corrosion and cavitation.

For the malt mash application the HUS channel pump has performed flawlessly. During periods of downtime the pump has dramatically reduced the amount of moisture being lost

from the malt mash. The mash has remained far more fluid and so has presented no resistance when the pump has had to be restarted. The powerful yet gentle performance of the pump and its ability to retain moisture in the mash even when not operating, has also allowed the customer to reduce the volume of water used in to create the mash without adversely affecting the pump's performance. The power created by the pump means that it is also using less energy than its predecessor, yet the malt is being handled gently and without the risk of damage.

Even when operating at higher flow rates the relatively low energy consumption of the HUS channel pump has combined with low maintenance requirements to help reduce operating costs. The success of this original exercise has since lead to HUS channel pumps being used to replace other centrifugal pumps that were being used on four further malt handling applications.

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