Rotary jet head burst cleaning technology delivers Significant savings in cleaning costs.

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Tank cleaning strategies generally involve the use of high mechanical energy associated with rotary jet head technology or long exposure time to the cleaning liquid associated with static spray ball technology. Now there is a new tank-cleaning strategy involving advanced burst cleaning, which combines the best of both technologies and delivers significant savings in time, cleaning fluid and overall cleaning costs.

Hygienic processes in the food manufacturing, pharmaceutical manufacturing, chemical processing and fermentation industries call for the tank interior to be free of unwanted debris and contaminants that may have a negative impact on the quality of the finished product. Difficult-to-clean areas often require special attention. One such area is the yeast ring, which is the area around the interior circumference of a tank that indicates the level to which the tank is filled (Figure 1).

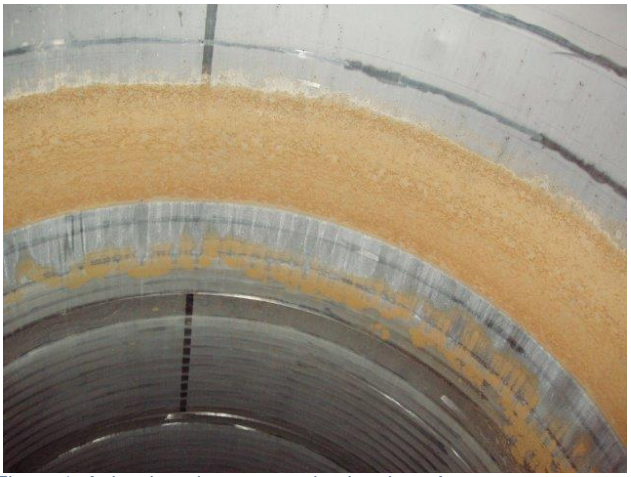

Figure 1. A hard-to-clean yeast ring in a beer fermenter.

Cleaning areas with stubborn soils like the yeast ring usually requires the use of high mechanical energy, such as that provided by rotary jet head technology, or exposure to cleaning fluids for a long period of time, such as that provided by static spray ball technology. However, using a continuous flow of cleaning fluid over a long period time often results in high consumption of cleaning fluid and therefore higher costs than when using high mechanical energy.

Traditional burst cleaning technology is another cleaning strategy, which allows the cleaning fluid to remain on the tank surfaces for a longer period of time yet uses less fluid than static spray technology alone. However, the use of traditional burst cleaning with static spray devices provides reduced mechanical energy compared to rotary jet head technology.

Now there is a new patent-pending tank cleaning technology for burst cleaning with rotary jet head cleaning devices that combines the best of the use of high mechanical energy and long exposure time of the interior tank surfaces to cleaning fluids. This innovative burst cleaning technology offers a smart alternative to cleaning stubborn soils in hygienic process tanks.

Burst cleaning

Burst cleaning is a technique for cleaning stubborn soils using less water and cleaning fluid than traditional tank cleaning methods. As the first step in the Cleaning-in-Place (CIP) process, a thin layer of cleaning fluids is periodically applied in a uniform manner onto the tank surface over a short period of time.

This replaces the normal water pre-rinse step that takes place during a standard cleaning cycle. By applying the cleaning fluid to a dry soil, the cleaning fluid more effectively penetrates the soil because the soil acts as a dry sponge, quickly absorbing the cleaning liquid, in contrast to the soil acting as a wet sponge as is the case when performing the water pre-rinse prior to the application of cleaning fluid.

Each cleaning fluid burst step is followed by a wait time, which enables the cleaning fluids to act upon the soiled area. After three burst steps are completed, the next step is water rinse, followed by acidic disinfection, which is then followed by a water rinse.

Traditional burst cleaning

For years, traditional burst cleaning has been carried out using static spray ball technology. Because the static spray ball devices are able to cover the entire tank circumference with cleaning fluids, the static spray ball devices provide fast wetting of the tank surface. While this fast-acting coverage has its advantages, static spray ball technology has these disadvantages:

- Limited reach and coverage of larger diameter tanks
- Risk of non-wetted zones on the tank wall and tank top, since the distribution of liquid relies on a falling film effect that is easily diverted due to irregularities, such as lumps of soil, on the tank wall;
- Very limited mechanical impact provided by static spray devices

Traditional Burst cleaning using static spray ball

CIP program	Minutes	Consumption of CIP fluid in m3	Cost in €
First caustic burst	1.5	0.75	24.6
Wait time, allowing the chemicals to react on the soil	3 to 5	-	-
Second caustic burst	1.5	0.75	24.6
Wait time, allowing the chemicals to react on the soil	3 to 5	-	-
Third caustic burst	1.5	0.75	24.6
Wait time, allowing the chemicals to react on the soil	3 to 5	-	-
Acidic disinfection	10	5	16.1
Final water rinse	6.5	3.25	2.3
Total			92.2

Table 1. Traditional burst cleaning of a standard beer fermenter on a static spray ball with a flow of 30 m3/h.

Advanced burst cleaning using rotary jet head cleaning machines

The use of advanced burst cleaning with rotary jet head technology, such as the Alfa Laval Rotary Jet Head (multi-axis device) tank cleaning machine (Figure 2), provides high mechanical impact to all tank surfaces to effectively remove stubborn soils. The standard Rotary Jet Head are now optimized to be able to perform effective burst cleaning sequences (Figure 3).

Figure 2. Alfa Laval Rotary Jet Head (multi-axis device).

A standard rotary jet head distributes the cleaning liquid onto the tank wall usually through two or four nozzles. The nozzles are mounted on a hub, which rotates while at the same time the housing rotates around an axis perpendicular to the axis of the hub. This three-dimensional movement, along with a gear unit inside the rotary jet head, ensures a 360° coverage of the tank surfaces.

During the first cleaning cycle, the distance between the impact tracks of the jets on the tank wall is at the widest. With subsequent cycles as the cleaning cycle progresses, the pattern gradually becomes denser. After eight cleaning cycles, the tank walls have been completely covered by the high impact jets (Figure 4).

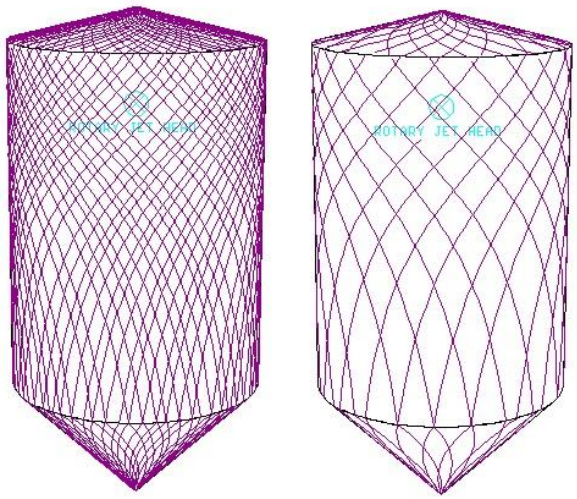

Figure 4. Simulation showing a standard burst coverage using a standard rotary jet head (left) and a burst sequence using a burst cleaning nozzle type Alfa Laval Rotary Jet Head (right). In both cases, the tanks are fully wetted, but the burst cleaning sequence provides fast wetting of the tank using a significantly reduced amount of cleaning fluids.

Note: Only the impact nozzle cleaning tracks are shown here

The impact forces from the jet machines are 40 times higher than those of a static spray ball device. When using a standard rotary jet head, it is necessary to provide a mesh pattern that is sufficiently dense in order to secure good distribution of the cleaning fluid on the tank wall. Using the new patent-pending burst cleaning nozzles, on the other hand, ensures quick and efficient distribution.

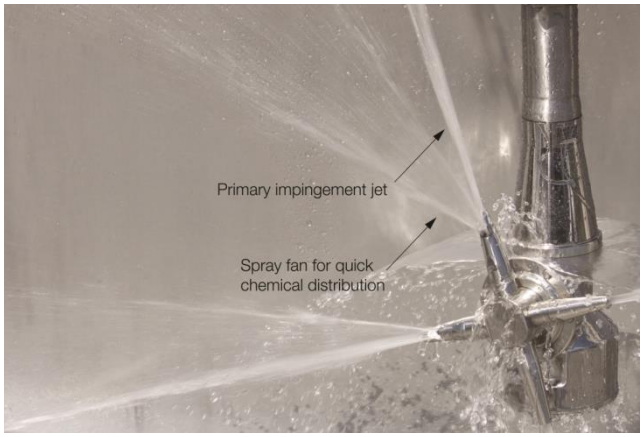

Figure 3. Alfa Laval Rotary Jet Head, type TZ-74SC, mounted with burst nozzles.

With the burst nozzle developed by Alfa Laval, a portion of the flow through the Alfa Laval Rotary Jet Head is diverted to a secondary spray fan outlet. This fan of liquid quickly provides full coverage of the tank wall without having to attain a full pattern of rotation cycles. This coverage is achieved because the fan has a wider wetting characteristic than the primary flow from the nozzle jets.

The spray fan does not interfere with the impact force of the primary jet flow. Consequently, Alfa Laval Rotary Jet Head with burst nozzle technology provides the optimal combination of fast coverage of the tank walls from the secondary fan spray and maximum impact force from the primary nozzle flow for optimal burst cleaning.

The rotary jet head with the burst nozzle technology combines the best of two worlds: the fast wetting of tank surfaces that is achieved by using static spray ball technology and the high impact made possible by the Alfa Laval Rotary Jet Head.

Advanced burst cleaning of a standard beer fermenter

CIP data	Minutes	Consumption of CIP fluid in m3	Cost in €
First caustic burst	0.8	0.15	4.9
Wait time, allowing the chemicals to react on the soil	3 to 5	-	-
Second caustic burst	0.8	0.15	4.9
Wait time, allowing the chemicals to react on the soil	3 to 5	-	-
Third caustic burst	0.8	0.15	4.9
Wait time, allowing the chemicals to react on the soil	3 to 5	-	-
Acidic disinfection	9.5	1.77	5.7
Final water rinse	6.5	1.21	1.7
Total			22.2

Table 2. Advanced burst cleaning of a standard beer fermenter using an Alfa Laval Rotary Jet Head with burst cleaning nozzle with a flow of 11.7m3/h.

Conclusion:

The new Rotary Jet Head cleaning machine with Burst Nozzles provides the optimum combination of fast coverage of tank surfaces and minimal chemical consumption of burst cleaning technology and the maximum impact forces and effective soil removal of the rotary jet head technology. This unique combination ensures the most effective cleaning of stubborn soils and minimal use of water, chemicals and cleaning time.