Taking cleaning into account during tank design.

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SIMULATING BEATS TRIAL AND ERROR

How to find the best cleaning nozzle for the job? One can always try it out—or save the hassle by using state-of-the-art simulation tools. — It's the optimal arrangement of the nozzles inside the tank that lays the foundations for reliable cleaning results. A new simulation software helps customers to find the most suitable nozzle system for the cleaning task at hand. Furthermore, it identifies potential weak points during the development phase and explores potentials for optimizing existing systems, thus avoiding planning errors, reducing downtimes, and ensuring more efficiency and process reliability.

BORIS SCHMIDT*

PROCESS-Tip

- Discover more about the **cleaning and sterilisation processes** for different industries as well as more **screenshots and details** of the Tank Clean software on www.process-worldwide.com (Search for 'Cleaning')
- Meet Lechler at **Powtech 2017**: Hall 1, Stand 450

Cleaning processes preferably run automatically nowadays. To ensure reliable results of the highest quality while meeting efficiency and ecology requirements, solutions have to be tailored precisely for the task in question. Static spray balls are no longer considered to be the universal, all-purpose weapon for tank cleaning. Tests impressively demonstrate, that dynamic rotating cleaners with full or flat fan nozzles or high impact cleaning machines deliver better and more economical results. The additional outlays are quickly recouped at significantly lower operating costs.

The Tank Clean simulation software from Lechler realistically imitates the cleaning process, showing how individual nozzles work by creating a visual representation of the spray procedure. The software illustrates, how and with what degree of coverage the cleaning liquid impinges the tank, thus revealing possible problems areas or spray shadows.

Lechler uses the software, which is not for sale, as an instrument for providing advice and visualizations: Manufacturers and users can compare different nozzle systems on the screen and are able to use the results to identify which system supplies the best cleaning result. Expensive trials on real tanks are no longer required, making the choice of the optimal nozzle system traceable and justified.

Mechanics, chemical action, time and temperature are the determining factors in the cleaning process. Nozzles with an optimal ratio of pressure, flow rate, and jet shape reduce the cleaning time. Operators place a lot of importance on this, since cleaning often has to take place incidentally. In most cases, innovative technology reduces the use of chemicals. Modern nozzles require a temperature that is just high enough to ensure cleanliness and sterility. With optimized nozzle systems, plant operators therefore save resources, reduce costs and protect the environment.

"Tank Clean is an extremely useful instrument when it comes to offering advice: We are convincingly able to demonstrate to our customers how they can achieve much better cleaning results with the right nozzle technology and minor adjustments to the tank, as well as avoid errors and save money," says Sebastian Rohacz, an application engineer at Lechler. As a supporting simulation software, it provides assistance across the entire plant life-cycle and beyond. It is advantageous to have the nozzle specialists of Lechler on board early on in the planning phase. At this stage, relevant factors concerning the nozzle technology can be coordinated closely with other interests. The tank geometry as well as design details such as the arrangement of tank connections, flanges and agitators are relatively simple to change with a view to delivering efficient cleaning results. If the quality of the cleaning results declines, if tanks have to be increasingly re-cleaned or are out of service longer than is reasonable, then the software will highlight room for improvement.

> "We are able to demonstrate how the right nozzle technology and minor adjustments to the tank avoid errors and save money."
>
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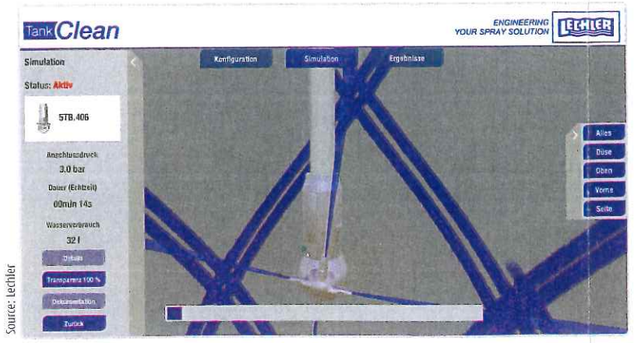
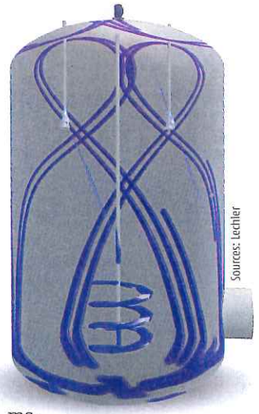
Until very recently, a well-known brewery relied on powered cleaning carts and high-pressure scrubbers to clean the racks in germination boxes. When a new fermentation tank needed developing, Lechler linked the final tank design with the search for a new nozzle system. The specifications covered the tank volume, a tank diameter of 20 meters, the pump output at an operating pressure of 5 bars and the maximum flow rate. The cleaning time for the complete tank was not to exceed 10-15 minutes.



Source: Lechler

The simulation demonstrates the potential of dynamic rotating cleaners with full or flat fan nozzles or high impact tank cleaning machines.



Sources: Lechler

Agitators, baffles and other built-in components are taken into account for the simulation of the tank cleaning process.

With the aid of Tank Clean, Lechler worked with the customer to create the design for the cleaning process, including an optimized nozzle arrangement in the modified boiler design. The simulator compares the rotating cleaning nozzle Xact Clean HP with its specially developed flat fan nozzles with the new high impact tank cleaning machine Intense Clean Hygienic from Lechler. Forty-four rotating cleaning nozzles of type Xact Clean, which are grouped in internal, central and outer rings, impinge the boiler wall. Result: Cleaning time 10 minutes, water consumption approx. 10,432 liters. Alternatively to this, the high impact tank cleaning machine Intense Clean Hygienic with 22 nozzles arranged in three rings. Result: Distributed over six cleaning cycles, the cleaning process took 15 minutes and consumed approx. 13,035 liters of water. The clear winner: Xact Clean HP due to its more economical overall performance.

A simulation is also expedient on existing systems, as operators generally quickly recognize where the weaknesses lies. "With the help of Tank Clean, we were able to convince a customer that a new, more efficient nozzle system would impinge his tanks seamlessly with water and consequently achieve a significantly better cleaning result," says Sebastian Rohacz.

The software solution can simulate almost all tank and equipment cleaning nozzles in Lechler's extensive product range. Inputting the data is easy and done via an intuitive interface: The software asks for data on the tank's diameter, volume, height and orientation (vertical or horizontal). Finally, the user specifies the shape of the tank (dished or conical), enters the dimensions of the floor and cap, and the virtual tank becomes visible on the screen. Tank connections, baffles and agitator are applied by drag&drop. The user selects the desired system and the positioning of the nozzles, done! The simulation begins, various perspectives and changes in transparency permit different views of the project.

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