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Prototype of the mobile Complex unit for pipe cleaning

Water-saving cleaning of pipelines at BASF

Efficient cleaning with air and water

Product changes in industrial plants always mean effort and downtime. Although the requirements differ depending on the system and product, the system and in particular the piping must always be clean before the new product flows in.

For water-based products, such as aqueous solutions, emulsions or dispersions, water rinsing is often used to remove remaining residues of the previously conveyed product. Depending on the purity requirements, more or less large volumes of wastewater are produced, which must then be disposed of. The costs for this often make up a large proportion of operational expenditure. In addition, industrial plants often contain critical substances that have to be collected separately and are more costly to dispose of. It is therefore obvious that flushing - or rather cleaning - should be designed effectively in order to generate as little wastewater as possible.

Air instead of pigs

One possibility is the use of pigs. For this cleaning process, sluices are required to

The pig can be inserted into the pipeline section to be cleaned and then removed again. Geometric changes in the pipeline such as nominal width changes, fittings with tight radii or certain valves are problematic with this method. Pumps, butterfly valves or non-return valves cannot be cleaned at all and may have to be removed. In addition, pigging can leave more or less thick product films on the inner surfaces of the pipe, especially in product lines for dispersions or viscous solutions.

The Complex process developed by Hammann is suitable for such applications. The cleaning method is based on the controlled, pulsed addition of compressed air into a pipe partially filled with water. This accelerates water blocks in the pipe to high speeds of up to 20 m/s.

Authors

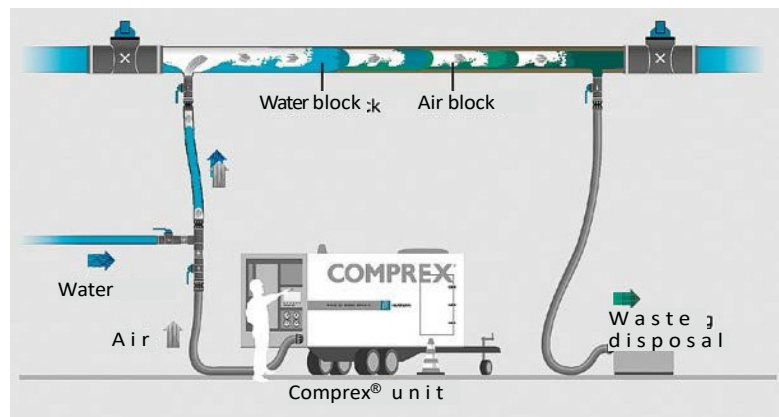
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Hans-Gerd Hammann, Managing Director, Hammann / Hammann Engineering

This mobilizes and removes impurities, deposits or, in the case of product lines, residues of the transported product. In contrast to conventional water flushing, however, Complex cleaning produces up to ten times less wastewater.

However, frequent product changes require technology that is available at all times. For this reason, the plant engineering division and the subsidiary Hammann Engineering were founded. This designs and builds equipment and accessories for Complex cleaning. These vary depending on the requirements of the production plant.

Concept development and test phase

At BASF's agricultural products plant in Ludwigshafen, where crop protection products are bottled, there are high demands on the cleanliness of the product lines when changing products. This results in special measures, above all to reliably avoid cross-contamination by product residues and to prevent microbial infestation of the pipelines. Previously, these requirements were met with water rinsing, which required large quantities of demineralized water. Complex cleaning should offer advantages over the previous, very labor- and cost-intensive measures.



The following general conditions had to be observed:

- numerous product changes per year,
- several product lines of different lengths,
- Minimal conversion work on the existing systems,
- not a fixed installation, but a mobile solution that can be used throughout the company,
- The simplest possible process flow with low operating costs,
- Cleaning with compressed air and demineralized water from the existing network,

compressed air
and water:
Schematic
representation of
the Complex
cleaning process

Coded dry disconnect couplings prevent errors when connecting the cables.

It is conveniently operated via touchscreen.

Pictures:
Hammann



- Drying the pipe after cleaning,
- the lowest possible quantities of demineralized water and thus product-contaminated wastewater,
- Cost savings mainly due to reduced waste water volumes and downtimes.

The first step was to prove the effectiveness of Complex cleaning. Several trial cleanings with Complex units in 2017 showed that the process is suitable. The reduction in water consumption by around 50 to 75 % compared to the previous water flushing process demonstrated the high savings potential for thermal wastewater disposal. The way was clear for the development and construction of a customized prototype.

Flexible cleaning technology for the business

The special device with the designation A8700 draws electricity, demineralized water and compressed air from the chemical company's corresponding operating networks. It is controlled by software adapted to the requirements of the bottling plant. The test cleanings confirmed the potential for added value. They also made it possible to refine the requirements for the final cleaning unit. These included:

- Mobile version for various feed-in points,
- Components and materials according to BASF specifications,
- coded dry disconnect couplings to prevent connection errors,
- Size of the internal compressed air tank of 1,000 liters,
- internal compressed air and water control,
- individual cleaning programs for each pipe section in the bottling plant,
- Simple touchscreen operation with symbols and the most important information,
- automatic cleaning and subsequent drying,
- Documentation of each process including compressed air and demineralized water requirements,
- Addition of additional cleaning agents possible.

The creation of the software adapted for the agro-products company as well as the planning and construction of the individual components according to BASF specifications was completed at the beginning of 2018 so that the device could be delivered in spring 2018. After commissioning in summer 2018, minor optimizations were made to the software together with the client. The device has been working reliably and successfully since the end of 2018. The investment paid for itself after a short time.

The operating team is extremely satisfied with the first few weeks of regular operation. The amount of product-contaminated waste water produced has been reduced by an average of 70%. This represents an important contribution towards sustainability. Last but not least, the operator saves considerable disposal costs every year and reduces CO₂ emissions for the environment. The incineration of waste water.

The accompanying laboratory sampling of the cleaning results was well below the limit value in all cases. The values indicate further potential for optimization with regard to water requirements. Further adjustments to the cleaning process are planned for the near future.

More on the topic at www.chemietechnik.de/1907ct611

Decision - maker facts

- Piping systems require regular cleaning measures to ensure clean and efficient operation. Pipes that transport different products in particular require thorough cleaning every time the product is changed.
- Established processes require a high level of integration effort or generate large quantities of wastewater and thus disposal costs.
- The process presented works efficiently and thoroughly with little water, produces little waste water and is easy to integrate into existing piping systems, and pays for itself quickly by saving on disposal costs.