The Benefit of Flexible and Hygienic Expansion Joints

Expansion joints are flexible connectors which compensate for vibrations between rigid and movable components in industrial production plants. To prevent contamination of the product, e.g., foods, it is essential that these expansion joints, beginning with their manufacturing, adhere to the strict guidelines regarding their structural shape and materials.

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Background

Eastern Germany is home to one of Europe's most modern dairy plants. The manufacturing facility processes roughly 2 million tons of milk every year, and uses 12 vibration feeders, each connected to one silo and two pipelines, to do so. To ensure vibrations are not transferred to the rigid pipe systems or silos, expansion joints are installed at the connection points.

Due to the multitude of silos, the expansion joints need to be switched from one connection to another daily during the filling of the silos. Up until recently, this process involved a time-consuming dismantling and installation. High changeover times resulted in reduced plant availability.

The Challenge

When assessing the integrity of the installed expansion joints, it became evident that they showed high signs of wear. The abrasive nature of the lactose together with the mechanical stress caused by the vibration feeder led to a quick wear of the expansion joints. While the pressure requirements for the application are low, the expansion joints must be able to withstand the high temperatures of the cleaning process. When cleaning with acid, temperatures of up to 65 °C can occur. The use of water as cleaning agent can result in the temperature rising as high as 80 °C. The lifetime of the expansion joints amounted to only a couple of months, after which a replacement was necessary.

Furthermore, the operating conditions required a time-consuming daily change of the expansion joints. More specifically, the change of expansion joints with conventional fasteners causes high downtimes, especially in applications in which the expansion joint is permanently switched from one connection to another.

To avoid unnecessary downtimes and increase efficiency, a more viable solution was sought after.

The Solution

By means of custom-made quick lock expansion joint designed with a more wear-resistant material, a solution was provided which fulfilled the requirements regarding wear, while at the same time significantly reducing the changeover time.

The quick lock solution was equipped with a new and patented quick lock system seen in Figure 1. With the new system in place, the process to change the expansion joints is now reduced to a few simple steps and takes less than a minute.

The new quick lock expansion joints were designed to rectify the shortcomings of the pervious system while simultaneously adhering to the strict hygienic and safety requirements in the food industry. These include, suppressing microbial growth and facilitating the daily cleaning by preventing the accumulation of product or cleaning agent in CIP/SIP, gaps, and cavities. In addition, the expansion joint materials must be resistant against the corresponding cleaning agents, in this case a 1.5% solution of nitric acid.

Figure 1: New patented quick lock system.

The fabric used for the new expansion joint was white nitrile, Figure 2. The soft material is heat-proof and abrasion-proof. Due to its high elasticity and wear resistance, the nitrile achieves a long lifetime despite the vibrations. All materials which meet food (Food Contact Material = FCM) were tested according to relevant guidelines such as DIN EN 1935-2004. These guidelines for example stipulate that FCMs may only release substances or absorb product in very small quantities.

The Result

Apart from the improved material properties, the cleanability was also improved compared to the previous expansion joint. Regarding the realm of 'Hygienic Design', the size of the area between the flange system and expansion joint in which product can collect was held to a minimum. The obtuse angle at the flanges and the added nose design for safe clamping and reduced formation of crevices reliably prevent accumulation of the product. Furthermore, the quick lock system withstands all cleaning agents in use.

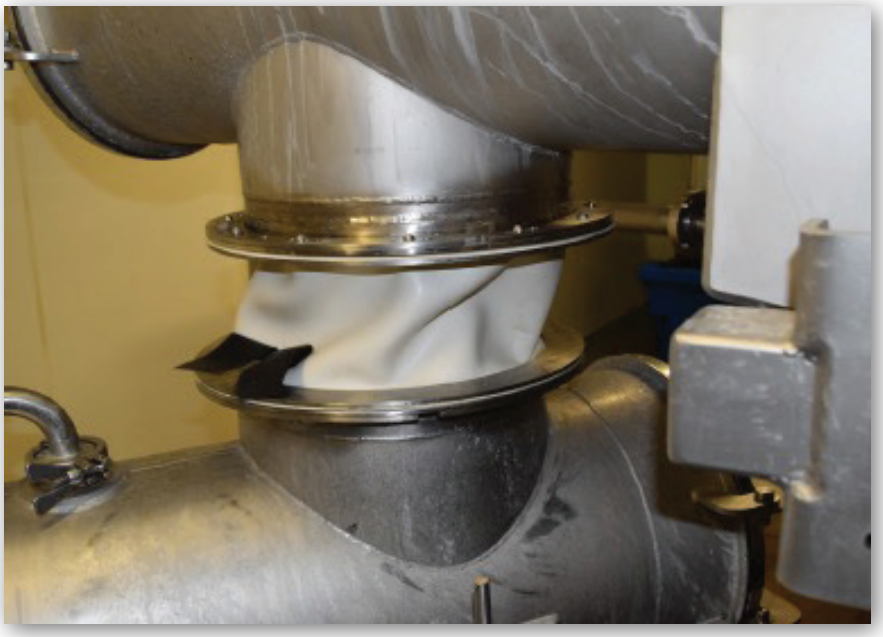

Figure 2: Prototype of new quick lock system in application.

ABOUT THE AUTHOR

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