Case Example

Ashland Water Technologies, Drew Industrial, Division of Ashland Inc.: Improving a Tire Manufacturer's Process and Product Quality with a Chemical-Free System

A Drew Industrial customer was in need of an improved microbiological control program to three of its treadline cooling systems. Treadline cooling systems are a critical component of the tire manufacturing process. These recirculating cooling systems include a series of spray nozzles, which spray cooling water directly on tread as it is carried on a conveyer belt within a cooling tank. Due to direct contact of cooling water with tread, water quality, microbial control and selection of treatment chemicals all have a significant impact on both equipment and product quality.

Average microbiological plate counts at the tire manufacturing plant were typically elevated at 10^5 CFU/mL. Microbiological excursions are common in these systems due to raw material composition contributing to high organic loading. Such microbiological activity has a direct impact on product quality as well as cooling performance and equipment failures. Lack of consistent, effective microbiological control was costly for this facility. In addition to an increase in the rate of tread reject, frequent equipment maintenance was necessary. Clogging of spray nozzles was common and required periodic removal of fouling and debris. Biofilm accumulation occurred throughout the system and especially in shell and tube heat exchangers. Complete system cleaning was performed a minimum of twice per year and required a complete shutdown of the process.

The treatment program consisted of isothiazalone dosed at 50 ppm twice per week. Due to direct contact of cooling water with product components, microbiocide selection and dosage are extremely limited. As a result, this facility was interested in a non-chemical means of controlling bacterial growth and biofilm.

In addition to microbial activity, these tuber cooling systems are plagued by the presence of fine particulate matter originating from rubber components. Besides impacting water quality, this particulate causes costly equipment problems throughout the process and often results in unscheduled down time. Basket strainers are used to remove particles and, depending on throughput, can be a costly, labor-intensive process.

Ashland Solution

The SONOXIDE® ultrasonic treatment was recommended as a microbial treatment solution in place of the chemical microbiocide program. The SONOXIDE system was installed on one of the three cooling systems for evaluation. Since this cooling water is subject to particulate contamination, the SONOXIDE system included an optional LAKOS[1] separator to facilitate uninterrupted flow throughout the ultrasonic treatment chamber. For comparison purposes, the other two systems remained on chemical microbiocides.

Results

Upon start-up and throughout the evaluation period, the SONOXIDE treatment system performance exceeded all expectations. System water was exceptionally clean. Total bacterial counts were significantly reduced averaging 10^3 CFU/mL. There was no evidence of biofilm in the sump. Equipment performance was optimized as evidenced by clean spray nozzles, lack of fouling and debris, and lack of interruption to conveyers. Non-routine maintenance and shutdowns were eliminated.

While the SONOXIDE treatment system provided optimal biological control and improved water quality, the remaining two systems on chemical microbiocides struggled with the same historical problems of increased bacterial counts and intermittent excursions. In addition, the cooling system receiving the SONOXIDE®

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ultrasonic treatment did not require frequent cleanings or experience interruptions in process.

In addition to microbial control, the SONOXIDE ultrasonic treatment system provided an added benefit by removing significant amounts of particulate contamination. As a result, this facility experienced a 50 percent reduction in costs associated with filter replacements and labor.

Most importantly, the SONOXIDE ultrasonic treatment system significantly improved tread quality and, therefore, production throughput. Since cooling water is in direct contact with product, better microbial control, elimination of biofilm, and elimination of chemical microbiocides all contribute to improved tread quality. This facility experienced a 50 percent improvement in the volume of tread waste that would have been rejected due to poor quality. This 50 percent improvement in product throughput because of improved quality significantly reduced overhead to multiple areas of the production process.

Benefits

- Microbiological activity reduced by 75 percent and controlled at 10^3 CFU/mL.
- Elimination of biofilm throughout the entire tuber system.
- Improved water clarity.
- Improved product quality through the elimination of chemical microbiocides in direct contact with tread.
- Reduced equipment maintenance.
- Fifty percent reduction in filter cleaning and associated labor.
- Improved reliability and the elimination of nonscheduled production outages.
- Fifty percent improvement in tread waste and product throughput.
- Elimination of all discharge issues associated with chemical microbiocides.
- Improved safety and risk management resulting from elimination of chemical storage and handling.