Reliability in operation: seal monitoring in a blanching system

In the food industry, the monitoring of mechanical seals is crucial to guarantee the quality and efficiency of production processes over the long term. A customer in this industry wanted to know if it was possible to extend the life of their pump seals and contacted pump manufacturer Packo Inox (a Verder company) for support. As one of the leading pump manufacturers, Packo Inox wanted to gain full insight into the seal and contacted us to explore this together.

» The challenge

In this case, we are dealing with a pump in a blanching system. During blanching, the vegetables are cooked briefly in boiling liquid and then quenched with ice water so that the cooking process is stopped immediately. The vegetables retain their color and remain firm to the bite.

The conditions during blanching are particularly critical for the seal, as the pumped medium is pumped close to the boiling point and this often leads to evaporation in the sealing gap. Contamination from the field is an additional factor. The service life of the seal is therefore often shortened. For the seasonal production of vegetables, it is important to know how the system is doing and whether the seal needs to be replaced.

» Aim

Once the operating conditions that lead to damage to the seal (if they occur over a longer period of time) had been successfully investigated on the test bench, the measuring system was used in the field. The BeMoS controller was used, which can precisely record and document the lubrication condition in the seal. The aim was to use the collected data to filter out the process sections in which the seal is running in a poor condition so that it can then be adjusted. The condition of the lubricating film is crucial for the service life of the seal. Regular operation of the seal within the planned hydrodynamic range minimizes wear and maximizes operational reliability.

Since the measurement technology knows the condition of the lubrication in the seal at all times, a service life estimate can also be derived from this. In other words, the service life is shortened if the condition is poor.

» The advantages of seal monitoring

- Increased safety with long operating intervals: e.g. during the harvest season
- Extended hardware service life: the collected data can be used to improve the process and reduce service and spare parts costs
- Optimized maintenance intervals: improved predictability through early warning of leakage or total seal failure
- Reduced effort and costs for maintenance personnel in times of a shortage of skilled workers
- Prioritization of maintenance assignments possible: Which unit should maintenance personnel look at first?
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» The results

With our BeMoS measuring system, we were able to successfully measure critical conditions. The system shows which part of the process is causing increased wear.

It detects dry running and other critical situations for the seal. In this way, condition monitoring can minimize the risk of failure and avoid breakdowns and unplanned stops.

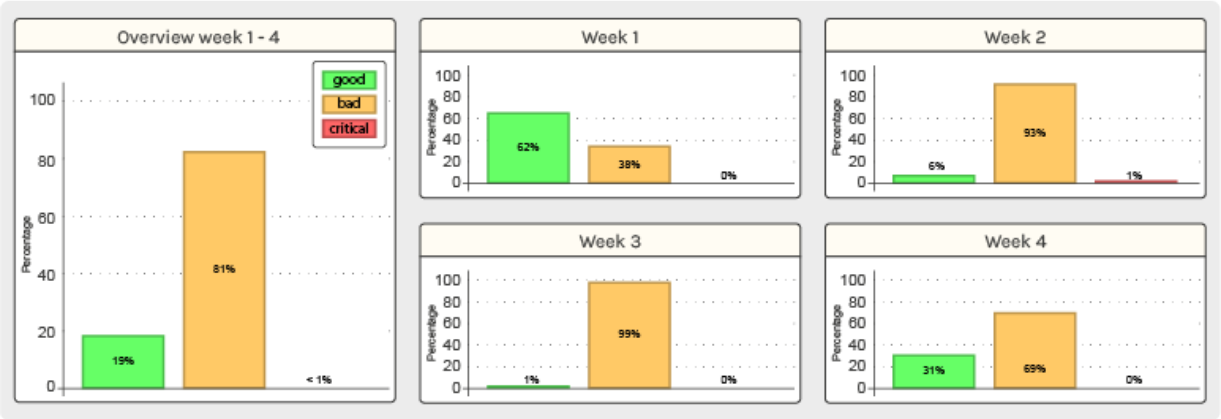

Figure 1: Weekly overview and complete overview of the process of a pump in the blanching system

Figure 1 shows the overviews of a pump process in the blanching system. The ideal condition (green) rarely occurs from week 2 onwards. The seal often runs in a poor lubrication condition (yellow) and week 2 even shows the critical condition (red) of dry running.

Now let's take a look at Figure 2 and observe the chronological sequence. This allows us to determine exactly when the seal was running particularly badly. The dry running occurs in week 1, day 2 between 12:00 and 24:00 (marked by the red area in the lower diagram).

The upper red area clearly shows a kurtosis far above 10, which indicates particles between the sliding surfaces. It is very likely that these are contaminants such as sand or soil. This temporal assignment enables the operator to check and adjust his process in a targeted manner in order to avoid such phases in the future.

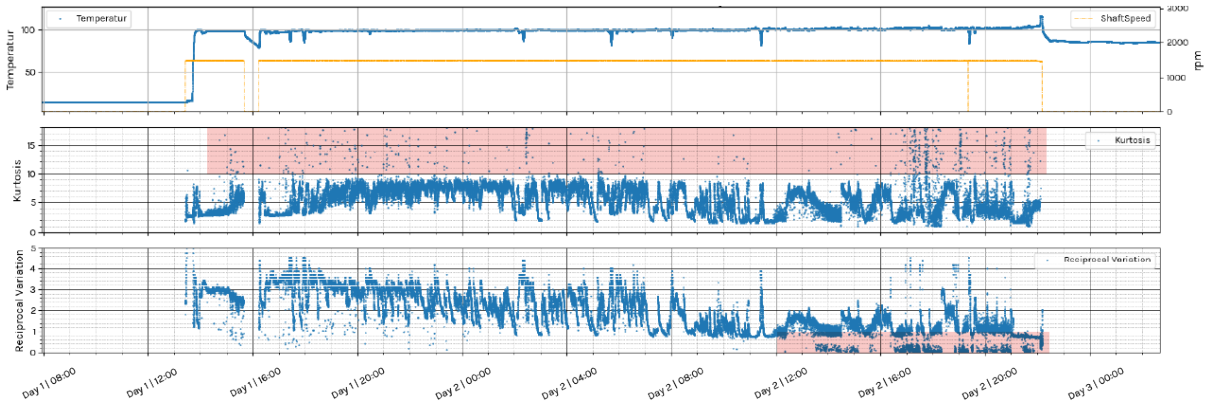

Figure 2: Dry running in the seal

Figure 3 shows an example of the measurement data for the running-in process of a single process step in a blanching system.

The data indicate that the seal is settling during this time. Up to time T1, large fluctuations in the value range (yellow marking) of the characteristic values for kurtosis and Reciprocal Variation can be seen, which is typical for a running-in process. In the period between T1 and T2, the high Δ values indicate that the mechanical seal is running poorly despite a successful running-in process.

This could be a process-related poorer running of the seal caused by slight impurities that got into the seal during blanching.

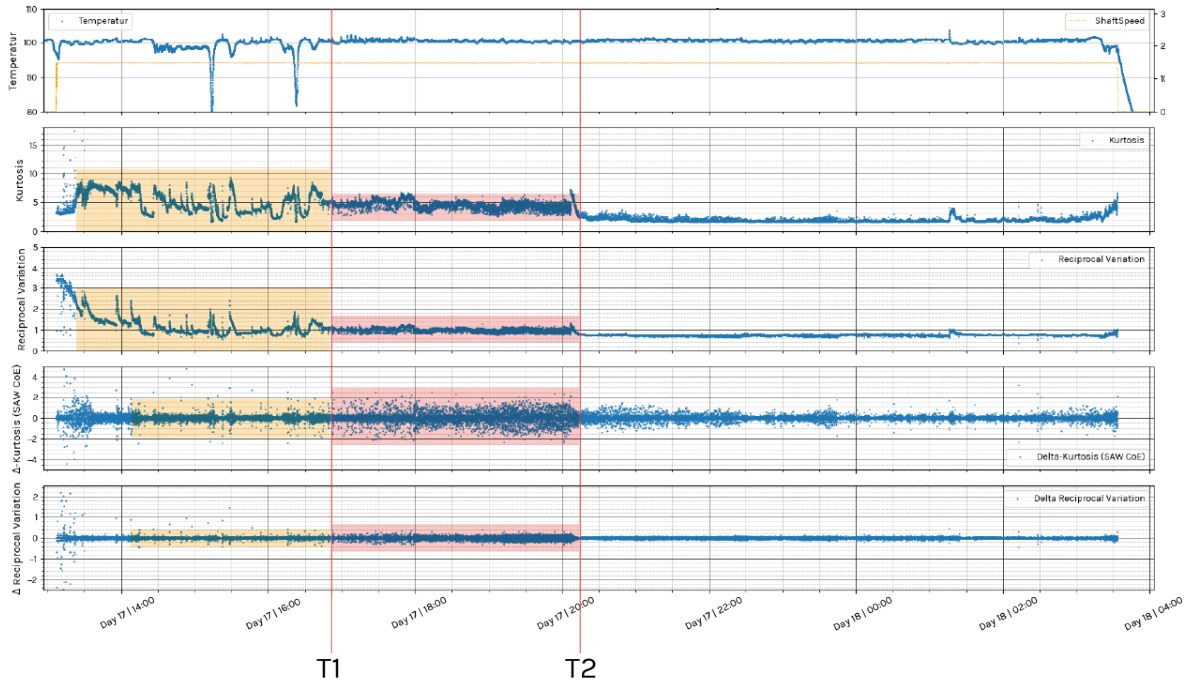

Figure 3: Run-in process and stabilization of the seal

After around six hours, the mechanical seal (T2) stabilizes and runs much more smoothly and stably. The fluctuations shown depend heavily on the process or the properties of the medium.

» Conclusion

The installation of the smart mechanical seal monitoring system shows that critical conditions that lead to seal failure over a longer period of time can be clearly detected. The same principle can also be used for all other seal applications without any problems.

The use of seal monitoring not only shows that the condition of the mechanical seal can be detected, but also that this results in a direct benefit for the operator. In this application example, the processes are gradually adapted together with the operator. The reduction in critical conditions significantly extends the service life of the seal and minimizes maintenance and downtime costs.

» Statement by Mr. Wim Bonte | BU Manager Pumps at Packo Pumps

„ We can finally see from the measurement data what I have wanted to know about the seal for around 30 years and the conditions that I have suspected ever since."

» Packo is the specialist for hygienic stainless-steel pumps

Packo has been designing and building stainless steel pumps for various industries since 1975. The first pumps developed were intended for the dairy industry, where hygiene and cleanability were essential requirements. This led to the use of stainless steel and the standard application of electrochemical surface treatment (electropolishing). These two factors still characterize Packo today.

In 2020, the extensive range of centrifugal pumps was expanded to include rotary lobe, circumferential piston and twin screw pumps. Packo is the market leader for pumps in the vegetable industry, especially for blanching pumps.

» High-performance sealing technology from METAX

High technical competence and many years of experience with a strong team of engineers make METAX Kupplungs- und Dichtungstechnik GmbH a recognized partner in technology. The focus is on the rotary sealing of machines in plant construction and process engineering. This specialization enables us to provide expert advice to customers from a wide range of industries. The main products are application-specific designs of mechanical seals and associated supply systems. Other sealing technologies complement the product portfolio. In-house production and on-site warehousing ensure the highest level of quality and service.

» About BestSens

BestSens AG develops, produces and distributes high-tech sensors, software and electronics for monitoring pumps and rotating equipment. Patented and technological highlights include the monitoring of mechanical seals and bearings in pumps. With the expertise gained from practical experience over the past decade, we develop solutions from the field - for the field, so that our customers' digital transformation can be implemented cost-effectively and immediately. This is how we continuously set new standards in industrial process automation.

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