

System review proves effective to solve Trona slurry pumping reliability challenges.

Pump Starvation Can Make or Break your Submersible Pump Operation

SUMMARY

One of the first things we learn in toddlerhood is not to put rocks and dirt in our mouths. There's one rock, however, that we eat every time we bite into a sandwich. Sodium carbonate (or trona) is the non-marine evaporite mineral used to make baking soda.

Processing trona into soda ash (or baking soda) requires combining the mineral with a significant amount of water. This resulting slurry must then be pumped through the facility. Without a properly sized slurry pump, trona operations can't run efficiently or reliably, leading to pump malfunction, lost processing time and decreased operational efficiency.

THE SITUATION

Increased global demand for trona created an opportunity for our client, a leading trona mine, to ramp up production. Unfortunately, one of the mine's slurry pumping systems was not up to the task. Submersible pumps were failing every two to three months, increasing maintenance costs and decreasing regular operational efficiencies. The team needed an answer—fast.

Trona processing comes with several unique challenges. In addition to requiring large volumes of water, trona processing uses heat to drive off unwanted gases from the slurry mixture. This can cause increased pressure on seals and motor windings and interfere with bearing lubrication. Our client's submersible pumps faced sump temperatures of upwards and occasionally over 200°F, which is more than twice the temperature required for the average mining application.

Our client's challenges were compounded by the fact that many of their pumps were operating outside their Best Efficiency Point (BEP) parameters. Operating outside of BEP increases stress on internal components and can cause damage to the equipment.

In other words, a high-temperature sump operating outside of BEP specifications is a recipe for pump failure.



Natural Trona



Upper Mechanical Seal Failure



Baking Soda

OUR APPROACH

Our client's existing submersible pumps were only lasting two to three months before failing, a far shorter Mean Time Between Failure (MTBF) than expected.

In order to allow the GPM team to determine the root cause of pump failure, the pumps were sent to GPM for a thorough inspection.

Our first step was to examine the complete pumping system (including existing pump size) to determine whether the installed pump was in fact appropriate for the system. GPM conducted a full, hands-on evaluation of the pump's performance. Factors used to determine a pump's running condition included:

- Pump cycles/hour (starts and stops)
- Discharge flow rate
- Discharge pressure
- Pump submergence
- Motor amp draw
- Sump in-flow
- Discharge piping system review

After evaluation, we used a pump reliability curve (fig. 3) to determine a BEP.

THE SOLUTION

Upon reviewing the critical application information provided by in-field sales engineers and the service technicians' disassembly findings, the GPM team determined the pump was operating at only 20% of BEP. Running this far back on the pump curve is detrimental to pump bearings and seals because it increases vibration and causes internal temperature to rise. When pumps operate under these conditions, the grease inside the bearings lose the ability to properly lubricate and the mechanical seal becomes unstable eventually failing. Looking at the bigger picture, our team concluded there were several opportunities for sump enhancements to improve the pump's performance and ultimately prolong the pump's life.

Our recommendations included:

- Ensure that sump screens remain clear of foreign debris to allow slurry/water mixture to be pumped
- Adjust sump level controls to minimize starts/stops per hour
- Maintain pump submergence as much as possible for motor cooling/heat dissipation

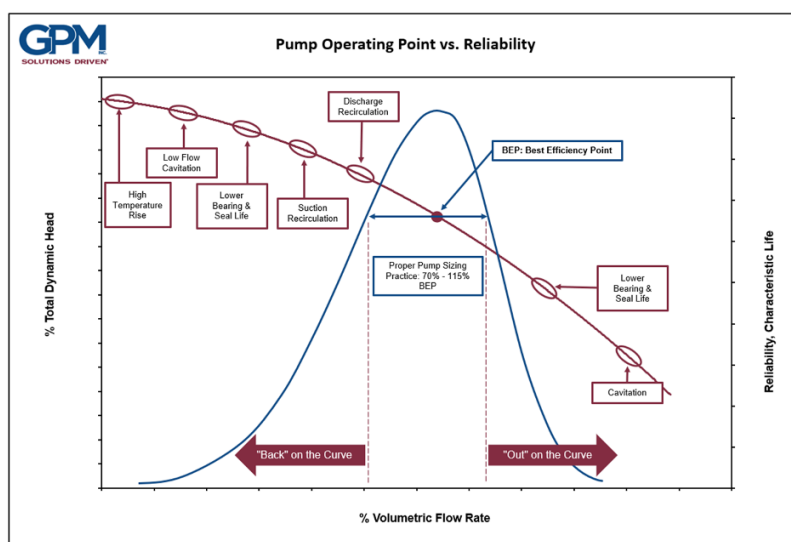


Figure 3

THE GPM DIFFERENCE

After recommending these system adjustments and making modifications to the sump and operating practices, our client experienced a MTBF increase of over 500%!

GPM's thorough, hands-on review of an entire pumping system was a critical step in improving their operations. GPM's Service and Repair team and GPM always strive to:

1. Review the entire system to determine the actual size pump needed for each application
2. Reduce maintenance costs with proper maintenance
3. Improve systems reliability
4. Increase MTBF

Our experienced team is here to help your operation run more efficiently. Contact us today to learn more!