



EDITORIAL

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Case Study - SPX maintenance expertise quickly restores a flooding separator to correct operation

Introduction

The technical services staff at a poultry processing plant were considering replacing an expensive pump because the separator stage of the evaporation unit was flooding. The pump is there to extract concentrated chicken broth from the separation vessel and push it into the next stage, so it was a reasonable conclusion that product building up in the separator indicated that the installed extraction pump was not working correctly. However, a call to SPX quickly established that the pump was unlikely to be the problem and that the plant could almost certainly be restored to correct operation by appropriate maintenance.

Result

A visit by Bob Vail, SPX commissioning engineer, had the plant up and running again in just a few hours and saved the cost of a new pump, which, as predicted, would not have solved the problem in this case leading to yet more down time and a great deal of frustration. The key ingredient is experience. SPX has over 53 years of experience in separation technology and over 2000 installations worldwide. SPX specialists like Bob Vail know just what to look for, saving clients' time and money.

A Proven Methodology

Bob approached the problem using a proven methodology. The first step was to eliminate the two possible but rare causes which can both be checked quickly and easily to eliminate them. The first was the pump itself which is very rarely the cause of the problem. Why? Because pumping power depends mainly on the speed of the pump and the impeller size. The pump was turning the impeller and was not connected to a variable speed drive that could have been reset, so no changes there, it was almost certainly working correctly.

The second step was to eliminate a blockage. The extraction pump pulls product out of the separator vessel and pushes it into the plates of the next stage. If there is a blockage at the discharge of the pump or the plate orifices are blocked then the separator vessel will flood. However, except where the product is over concentrated or pre-filtration has failed this is very uncommon and, in this case, was quickly eliminated.

Since there was neither a pump failure nor blockage, the probable (and most common) cause was a vacuum leak at or around the pump. When a vacuum leak occurs on the suction side of a pump, for example at the inlet mechanical seal, it allows air into the pump at the impeller which changes the performance to a greater or lesser extent depending on the severity of the leak. A typical symptom of a minor leak is that the liquid in the separator builds to a certain level and stays there; partially flooding. The increase in height of the liquid creates a positive inlet pressure to the pump that compensates for the minor vacuum leak. In extreme cases, flooding above the vapor duct from the plate pack results in violent shaking of the entire separator vessel. This is dangerous, the steam should be stopped and the vacuum broken immediately.

There was no level control for the separator, which indicated that it was a self-leveling system and therefore should have no residual liquid level. Whether vertical or horizontal, these are designed such that the capacity of the system to extract product exceeds the rate at which it enters, thus ensuring that there is no build up. Any residual level therefore normally indicates a vacuum leak somewhere below the water line.

The next step was to confirm it, then localize it.

To confirm that the problem was a vacuum leak, Bob switched from product feed to water and shut down the steam. When the process had cooled, he turned off the vacuum pump and slowly broke the vacuum. As expected, the flooding stopped and the vessel pumped out. This showed that there was a vacuum leak at or near the flooded effects extraction pump and that the pump was sucking air and would work fine once the net positive suction head was restored.

As a further check the water was kept circulating so there was water in the separators without vacuum and shut down everything else. The feed flow control valve was then manually closed to isolate the system on the feed side to prevent water from the balance tank being sucked in when vacuum was applied. Next, the vacuum was started to look for bubbles in the discharge area of the separator vessel caused by air being sucked in through the leak. A trail of small bubbles indicated a small leak, a larger leak may result in violent eruptions. Note that it is important that the vessel and the water are cold, otherwise the water may boil under vacuum giving a false result. This usually shows up as bubbles on the entire surface of the water.



To localize the leak, all of the clamp fittings were tightened to see if the bubbles subsided – success! If the leak had been from the pump’s inner mechanical seal it would be sucking air in from the service water discharge tubing along with the service water that should be going on the floor. The service water line is the ¼” poly-flow tubing coming out from between the pump head and the motor. The test is to turn off the seal water to the pump and pick up the discharge tube to feel if air is being drawn into it which would indicate a front seal leak. The seal should then be replaced.

As a final step, the process should always be repeated to verify that all leaks have been corrected. There may, of course, be more than one. This can involve breaking down all the product lines below that vessel’s water line, replacing gaskets, and maybe even replacing clamps with good quality SPX brand clamps. A final word of advice: It is vitally important that the lines and gaskets align without stress. Cut and weld new lines if needed. If the lines have to be pulled into position there will be problems in the future. For more information, please contact....

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About SPX:

Based in Charlotte, North Carolina, SPX Corporation (NYSE: SPW) is a global, multi-industry manufacturing leader with approximately \$5 billion in annual revenue, operations in more than 35 countries and over 14,000 employees. The company's highly-specialized, engineered products and technologies are concentrated in Flow Technology and energy infrastructure. Many of SPX's innovative solutions are playing a role in helping to meet rising global demand for electricity and processed foods and beverages, particularly in emerging markets. The company's products include food processing systems for the food and beverage industry, critical Flow components for oil and gas processing, power transformers for utility companies, and cooling systems for power plants. For more information, please visit www.spx.com.

CONTACT DETAILS:

Bob Vail

Commissioning Technician

SPX Corporation

Tel: 716-744-2305

Mobile: 716-863-1639

Email: bob.vail@spx.com

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