

Pumps mean never a dull moment at Burns & McDonnell Engineering Company



Jay Zaffino, Principal
Rotating Equipment Engineer

Jay Zaffino is a principal rotating equipment engineer with Burns & McDonnell Engineering Company, an engineer-procure-construct (EPC) firm. As a part of the Process & Industrial division, Jay does a lot of design and construction of new process plants as well as expansion and debottlenecking of existing plants. Pump Engineer managed to track him down and asked him more about the sort of work he deals with on a day to day basis.

By Andrew Peers

"I am called upon to specify new rotating equipment to meet the needs of these projects", began Jay. "Because of my experience with an operator and equipment manufacturers, it is part of my job to make sure that equipment is specified and selected with long-term reliability in mind. During the installation phase of projects, I review the processes used to properly install and maintain the equipment before startup. When rotating equipment suffers a premature failure, I am called to the jobsite to perform a failure analysis and to oversee the repair or replacement of the failed equipment. I also serve to help our clients find solutions

to mitigate problems with installed pumps and compressors."

It is not easy to say what makes a typical day for this dedicated engineer. "Some days I am in the office all day; usually reviewing pump vendor information or performing quality checks on equipment requests for quotation. Other days I will be in the field trouble-shooting a faulty pump or reviewing new equipment installation. I can often be found studying the parts from a failed pump to evaluate why it failed. Since most of the plants operate 24 hours a day, I can be called to the field at any time. My day can change at any moment based on a client's need."



A vertical pump being installed at a new plant. The Plan 52 seal pot is not at the correct level to operate properly. The level of the seal pot was raised to the correct height before the installation was complete.

Keeping up to date: networking

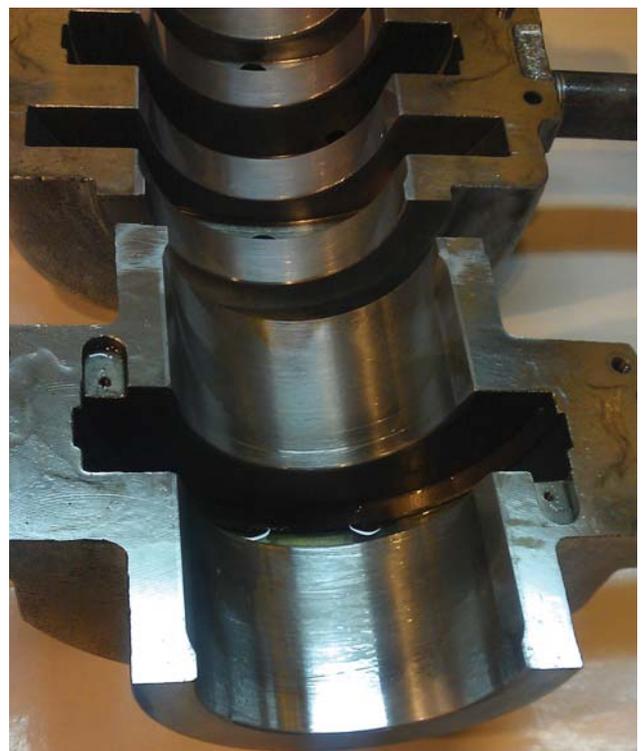
Having been in the rotating equipment industry for nearly 23 years, Jay has met a lot of people in the industry. "I keep in regular contact with several colleagues to ask for opinions, advice or experience with certain situations. Social networking on LinkedIn has allowed me to stay more up-to-date with the location of people in the pump industry. I am also a member of several LinkedIn discussion groups where questions can be asked to a large group of pump professionals." Burns & McDonnell is a participating member company of Process Industry Practices (PIP). The organization prepares practices and guidelines for many disciplines in the process industries. "I am on the machinery functional team, which is made up of rotating equipment professionals from end-users and engineering firms. The quarterly meetings allow our team to get together and discuss any issues or unique solutions that involve rotating equipment, as well as preparing common specifications and guidelines."



These are the inlet guide vanes from a forced draft fan that suffered a premature failure. The guide vanes were not properly attached to the fan plenum and fell on the impeller. The picture is of the vanes and inlet cone being repaired.

Current projects

"If a project has pumps involved, it is going to be interesting. One project I am currently working on involves pumps at a loading terminal that were misapplied. The product being unloaded from the trucks can contain a lot of vapor on warm days. That was not taken into consideration when the design firm originally procured the pumps. We are working with the client to specify the proper pumps and the terminal systems to maximize the net positive suction head (NPSH) available. Another current project involves the design and installation of a brand new natural gas liquids (NGL) fractionation facility. This project involves the specification, procurement and installation of over



This picture is of sleeve bearings being inspected after a successful test run in the vendor's shop.





This picture shows a pillow block bearing with accelerometers installed for continuous vibration monitoring on a new installation.

blowers. The pumps include horizontal API pumps, vertical turbine and sump pumps, ANSI pumps, REDA surface pumps, API magnetic drive pumps, and reciprocating pumps. The large quantity and variations between the pumps on this project make it very interesting.”

“A large number of pumps Burns & McDonnell addresses involve issues with procurement and installation. Getting proper documentation from the equipment manufacturer in a timely manner can be an issue. In order to properly

of the machine will cause a unit to shut down, a lot of planning is needed to eliminate the damage to the machine while it is running and to minimize the amount of time the unit will have to be down.”

Improving on pump performance

“The key to cutting down on unplanned shut downs is pump-health monitoring. Vibration monitoring is the first line of defense. At the refinery where I previously worked, all the critical rotating equipment had constant vibration monitoring. All spared and non-critical equipment was part of a monthly vibration monitoring program. This program greatly reduced the number of unplanned outages. We also developed a lubrication analysis program to monitor lube oil degradation of critical equipment. Management was committed to the health monitoring programs and that helped to make them successful. Pump-health monitoring programs are a big step toward keeping your equipment running. When specifying pumps, care should be taken not to add a large flow margin to the design of the pump. The pump is best when running at best efficiency point (BEP). If the design flow is very far away from the normal operating point, the pump will not run smoothly and could suffer from premature failure.”

“...we need accurate foundation and general arrangement information very early in the project.”

install the equipment, we need accurate foundation and general arrangement information very early in the project. Foundations must be planned and engineered. This cannot be done until we receive the information from the pump vendors. Another issue we face with installation is a lack of knowledge of some of the millwrights about seal systems and how they need to be installed with the pumps.”

Maintenance issues

“Whether own crews are used for maintenance or outsourced depends on the size of the equipment, the nature of the maintenance required and the size of the plant. A lot of smaller plants have a very small maintenance staff so only a small amount of maintenance is done in-house. In larger plants and refineries, they usually have a larger maintenance staff and will do their own work. The exception would be when large critical machines suffer a catastrophic failure. Assistance or even full repair is then requested from the pump vendor.”

“It is possible to wait until a scheduled shut down before conducting any maintenance but this also varies; the size of the equipment, nature of maintenance required, and size of the plant are all factors. Another factor in the decision is the criticality of the machine. If the loss

Training the next generation

“Operators should also be trained on how pumps work so they are more likely to keep them at BEP. While working at the refinery, I developed a 4-hour training class on pump operations to properly train over 400 refinery operators. I have attended many training classes on pumps, pumping systems, other rotating equipment and failure analysis.



Picture of the head of a reciprocating pump that suffered a fracture. Dye penetrant was used to help define the severity of the crack. The red line is the dye leaching out from the crack. The crack was discovered when the pump started leaking.

“I would also add vibration monitoring to every pump!”

I am Professional Engineer registered in Texas, a Category II Vibration Analyst and a Level II Machinery Lubricant Analyst. These all require regular training to keep the licenses active. I have also had a lot of training in the field working with very experienced rotating equipment professionals. Burns & McDonnell makes training a priority with its employee-owners. They have a training department that helps people get internal and external training. I have developed several classes for internal purposes on pumps, motors, compressors, pulsation and safety. They encourage in-house subject matter experts to share their knowledge with people in other parts of the company.”

Purchasing new pumps

“I am involved with all aspects of pumps. I purchase new pumps as well as troubleshoot problems with existing pumps. I also work on retrofitting pumps to work in a different service. If all vendors would supply sizing programs, this information would make my job a lot easier. These allow us to see if a vendor has pumps to meet our conditions. Pump vendors could also help by not over-committing their shops and missing drawing commitment dates and delivery dates.”

“If I could improve a few things with regard to pumps and pumping systems, I would change piping systems on many pumps to give every pump 10 pipe diameters

of straight run pipe to the suction and reduce the amount of net positive suction head (NPSH) lost in the system. I would also add vibration monitoring to every pump with automatic trending software that would alert on increasing vibration trends before they reach alarm stage. Using my experience and knowledge to solve an issue or build pump reliability into a site that makes or keeps a customer satisfied gives me a feeling of great satisfaction at the end of the day.”

About Burns & McDonnell

Burns & McDonnell Engineering Company, Inc., was founded in 1898 and is headquartered in Kansas City, Missouri, U.S.A. It is a full-service engineering, architecture, construction, environmental and consulting solutions firm with offices located globally. A staff of more than 4,000 employee-owners represent virtually all design disciplines in facilities all over the world.