THE PUMP GUY

“Let’s Play The Mechanical Seal Game”

Okay Kids, Let’s Play the Mechanical Seal Game. To play this game we need one industrial plant. A Paper Mill, Oil Refinery, Thermo-electric Power Plant, Pharmaceutical/Chemical Plant, or Municipal Water plant will do. Next we need a few hundred pumps. We’ll want all the major mechanical seal manufacturers (you already know who they are), and maybe a regional seal supply shop on hand. And, it’s also a good idea to have a couple of Seal-less Pump distributors in the vicinity. Toss in a recent corporate merger and a few memos pledging more production with less people. Now you have all the elements and pieces to begin playing...”The Mechanical Seal Game”.

Start by aligning yourself with one of the major national seal companies. Hold joint corporate meetings and commit to use only their seals in all your pumps, wherever possible. After a frustrating 24 to 36-months, kick-out this seal supplier and bring in another major national seal company who just recently swallowed-up it’s competitor and has a disjointed line of un-matching seals and a fractured corporate philosophy. Our goal here is to get about 5 to 8 years of mechanical seal life on our cooling tower re-circulating pumps, transfer pumps, and process pumps. This was the promise of the corporate bigwigs when they assigned us our very own in-house seal technician and said we were working toward a common goal. Are we having fun yet?

After another 24 to 36-months of exchanging blame and pointing fingers, kick them out and move on to either another national seal company or possibly one of the regional seal houses. It’s important to note that the regional seal manufacturer got it’s start from a cancelled distributor or possibly disgruntled workers who made and built one of major seal companies, and then were downsized in the merger.

This new alliance begins with a round of seal seminars, and a new and REALLY motivated in-house seal technician. We’re still trying to get about 5 to 8 years of seal life on the cooling tower water pumps, and we know it’s possible because we can get this type of seal life on the radiator water pump of the family car, and on the freon compressor of the fridge. Even the new seal literature says the seal faces are rated for 40,000 operating hours. But for some reason we can’t seem to get more than a few weeks or months. Is the blur coming into focus?

By now we’ve rotated the maintenance engineer out of the department (and he’s glad to leave), and the mechanical seal bigwigs don’t come around anymore. The purchasing agent is making decisions based on price, when suddenly a Seal-less Pump distributor comes onto the scene. His pumps don’t use seals, and the purchasing agent is tired of buying cheap seals. The sales agent can’t brag on his price, or the efficiency of his pumps, or the fact that they generate more heat than they can remove from the process, and they take larger motors, BUT THEY DON’T USE MECHANICAL SEALS. God Bless the Seal-less Pump.

12-months later the Seal-less Pumps have left a 2-mile trail of blood for every success story. The frustration has reached the point that the chief engineer is ready to buy compressors and string pneumatic lines all over the plant to replace the electric motor drives with air operated diaphragm pumps. And then a new seal comes onto the market called the “dry gas” seal and the new seal technician explains the logic why we need to develop an intimate relationship with the nitrogen supplier.

Let’s raise the frustration level even higher. The new engineer decides to stop playing the seal game. He figures the real problem is in the poor design of the pumps, so he’s going to change pump manufacturers. Because the piping, the pump bases, and mounting bolts are already in place, he tells the new pump supplier to quote a pump that fits on the same base, and mounts to the same piping as the previous pump supplier. Let's say that he changes a Brand "A" 3 x 4 x 10 pump for a Brand "B" 3 x 4 x 10 pump. As my teenage daughter would say..."DUH, Daddy!" If a Bayer Aspirin won't cure the headache, chances are a St. Joseph Aspirin won't cure it either.

If you've made it through the article to this point without laughing or crying, or showing it to your friends, you're probably thinking...This dribbidge either comes from a really sick mind or The Pump Guy has been around the block a few times and knows what he's talking about. Well, the answer is...you're right!

By now Kids, I'm sure you've already guessed that the Mechanical Seal Game is played on the same board, with the same men, equipment, pieces, and rules as "The Bearing Game." But enough about that, let's take just one thing at a time.

The real reason you can't get good seal life, play the mechanical seal game, and experiment with seal-less pumps; is not in any corporate marriage, or finding the right seal company, or right price, or right maintenance engineer or philosophy. It's a process that began after your plant was designed and built. The process started on the day your plant was commissioned. Let's consider what happens once an industrial plant is commissioned.

Read your Cheat Sheets from previous PUMP GUY articles (they're on the internet at www.energy-tech.com) and remember that the system governs the pump. Here we go.

To begin, the plant designers performed a truly magnificent feat of engineering when they started with an empty field of weeds, and ended with an industrial plant whose pumps were running within 5 % of their best efficiency point. But six months after a new plant is commissioned, most of the design parameters are invalid because scale forms on the inside diameters of the piping. 4" ID pipe eventually becomes 3 1/2" ID, and this moves the pump on its curve. In a maintenance function, to keep a plant running, 4" schedule 40 pipe is exchanged with 4" schedule 80 or schedule 20 pipe, and this moves the pump on it's curve. Cast iron pipe is replaced with carbon steel, stainless steel, or PVC pipe. Ball valves are exchanged with butterfly valves. Globe valves are substituted with cheaper gate valves. Long radius elbows are replaced with short radius elbows, or even welded mitered elbows to open space for more equipment. These changes move the pumps on their curves. An instrumentation tech installs a flow meter into a pipe, and this adds friction. Probes and sensors are installed into the piping and this affects the friction head.

The K values (friction constants) for valves are based on full flow, totally open valves. A Process Engineer tells the operator to throttle a valve because production has decreased. The pump moves on its curve. The process needs more heat so a heat exchanger is installed into the piping, and this moves the pump away from its best efficiency point on the curve. The K values for basket strainers and filter presses are based on clean filters. A partially clogged strainer is like a partially closed valve. As the pump moves away from its best efficiency point, consumption of bearings and seals, and maintenance goes up.

Then along comes a filter salesman with a 30% discount on a case of new and improved filters. The new filters have a tighter screen for better filtration, and they fit right into the old strainer cans. Does the purchasing agent or the storeroom tech, know how this will affect the pumps on their curves? Does the process engineer care? You can bet that they never considered it before. The filter salesman gets his commission on a case of filters, and at the same time finances a new car and vacation for the mechanical seal salesman. The mechanical seal salesman is happy and winning awards, but what he doesn't know is he's about to be kicked out of the plant because his seals still can't get 5-years service life on a cold water pump.

Here's a good question. Is it possible that a mechanic would install a check valve in reverse or backward in the piping? Bet on it. What do you think this does to the pump on the curve? This pump will go through a mechanical seal and set of bearings before this error is discovered and corrected.

These are the days of variable speed drive motors. Most process engineers use variable speed to govern flow in blowers, fans and pumps. A 20% change in speed will bring about a 20% change in flow (gpm), but it will change the pressures and heads (including the discharge head, friction head, and net positive suction head) by the square of a 20% speed change. This is one of the affinity laws. As the system changes, this will cause the pump to move away from the Best Efficiency Point (BEP) on its curve.

You've become an expert at the mechanical seal game when management files a malpractice lawsuit against the Design Engineers. Remember them? The guys who designed with pumps within 5 % of their BEP? The real credit (or blame) for this lies in the fact that a plant's pumping system is extremely dynamic. In the short term, levels in the tanks go up and down, pressures change, and valves are opened and closed according to the needs of production. In the long run, old equipment is changed with new equipment, scale forms on the inside of the pipes, and pumps lose their efficiency. On the other hand, the pumps are specified and bought with a best efficiency point (BEP), as though the system flow and head are static. Pumps should be specified with a best efficiency range.

The mechanical seal companies have also played a role in this farce. They're not guilty of manufacturing shoddy product, and they don't start the day thinking of ways to cheat their customers. But they are guilty of not paying attention to their customers needs. Back in the 1960s and 70s, the U.S. automobile manufacturers were not paying attention, and they lost valuable market share to Asian and European auto manufacturers. To this day the U.S. auto Industry is still playing catch-up.

Read mechanical seal literature. They manufacture and sell seals to resist the fluid pumped, and they manufacture seals that are easy to repair and easy to install. This is like manufacturing cars for the paint and body shops. DUH!

Well let's ask the question this way. Have you ever read literature promoting a mechanical seal for a cavitating pump? Cavitation is responsible for about 30 to 40% of all pumps in the shop today. Have you ever seen mechanical seal literature promoting a seal for a dead headed pump, or a dry running pump, or an intermittent service pump, or an inadequate NPSH pump? The Process industry needs seals that can handle these everyday conditions. These are the reasons pumps spend so much time in the shop. It doesn't really need a seal that any apprentice can install in 5 minutes, every 4 months. DUH!

The Pump Guy will jump over the cliff and say that the mechanical seal industry brought about and inspired the competition and popularity of the seal-less pump. The mechanical seal industry invented the seal-less pump. It did so with its lack of attention and vision.