By: CLIFF KNIGHT
Owner/President
KnightHawk Engineering

The right machine — You need it, but it does not exist

Most of us have been in a situation at a production or manufacturing facility where we have asked ourselves the question, "Why was this equipment specified for this service?" Problems with the equipment have caused you to delay your vacation or had you out at the plant on the weekend. Your boss keeps asking you, "If we have all this technology and resources, why can't we fix it?" The equipment manufacturer has been in business for 100 years and has a good reputation, so you think, "We must be doing something wrong or there is a design problem." You appreciate all the responses from the equipment manufacturer and they have a good relationship with your company. But the fact still remains, it does not work.

Well, maybe the answer is simple. There is a mismatch between the equipment specified and the process. Typically, a major part of a product's research goes into the process design and not the static and rotating equipment used for the process. A process development usually starts in the lab. Later, a pilot plant is developed and the process is proved out. The process looks good, the economics look good and management says to build a proto plant.

However, there is one problem; the pilot plant only had to run a week at most. A production plant needs to run at least a year without a shutdown. The process developers put together a set of piping and instrument diagrams and a process flow sheet so the engineering and construction contractor can design and build the plant. Typically, a parade of vendors will perform all their sales pitches and the best equipment is chosen for the process application. There is a lot of pressure to get the plant built and running and start producing the product. Rightfully so, management is also aware that you can only "hammer" on a plant design so long and there will still be unforeseen problems that need to be worked out. The plant starts up and immediately a piece of equipment becomes infamous due to its lack of performance.

Take a step back and ask yourself, "What is the best equipment for the application?" It probably does not exist. You do not have time for your mechanical group to develop a new piece of equipment.

Well, maybe the right decision is the "Mean Machine." The Mean Machine is simply a "tweaked" or modified form of a particular vendor's piece of equipment. It frequently contains components from other vendors that normally do not conduct business together. But in the end, it works. The process of developing the Mean Machine begins with an analysis of the required application of the existing equipment and its associated problems. The goal is to put existing technologies together to develop the equipment that best fits the application. Usually, an engineering group capable of analysis and design of equipment can perform and coordinate the design efforts.

Case study

A process production facility required a piece of equipment to grind its product for preprocessing. This was not anticipated and was discovered in the middle of a startup. Without this the plant could not run. The application was high temperature and high pressure. Grinders were available for the process but none at high pressure and high temperature. Pressure vessel shops were available to build containment equipment. The solution was to marry the grinder application with the vessel and machine shop. The grinder was successfully completed in days instead of 28 plus weeks for a complete independent design.

The Mean Machine does not always have to be a complex research and development project. Look at putting technologies and companies together to fix your problem. One of the greatest aspects of American heavy industry is its ingenuity, innovation and "out of the box" solutions to complex problems that demand high resources in a short time. An implementation policy that should be considered is as follows:

1. Define the requirements for the device.
2. Create process and mechanical specifications.
3. If an existing device is in service, analyze and determine the limitations and problems.
4. Conceptualize using "out of the box" thinking for the new design.
5. Evaluate the process and mechanical response.
6. Perform risk assessment of the new design/HAZOP.
7. Design a detailed design.

As always, the designs should be reviewed by a professional engineer competent in machine design.

For more information, visit www.knighthawk.com or call (281) 282-9200. ❑