"Fit For Service"

You production facility is no different than many in the business. Despite your equipment running effectively for years, it will and does experience performance and reliability issues. Often times, the equipment can still operate when problems arise, although its safety and reliability may be in question.

While inspecting the system, you discover vibration has developed within the structure containing a pump and heat exchangers. A suspected tube leak is causing cavitation conditions in the pump. At this point, the cause in unclear, as it could be tube vibration in the exchanger or an NPSH problem in the pump. It appears to only occur at the higher loads; however, you have run at higher loads previously without incident. Fouling conditions in the exchanger can often affect the temperature to process to the pump. This is commonly overlooked and addressed at the next regularly scheduled shutdown. You recognize

that operational standards have come under increased scrutiny over the years and you are accountable for ensuring that your facility is safe and environmentally friendly. Prioritizing process safety management, you evaluate your next steps. You and your management must determine whether this system is "Fit For Service" (FFS) until the next shutdown. You are charged with answering this question. It is not known whether the root cause of the problem involves static or rotating equipment.

There are guidelines and methodologies to address whether equipment is fit for service for continued operation. API Recommended Practice 579 Fitness For Service involves "quantitative engineering evaluations which are performed to demonstrate the structural integrity of an in-service component containing a flaw or damage." This Code is an excellent document for static equipment. Methodology and approach for rotating equipment is on a case-by-case with the intention to satisfy all applicable Codes and Standards.

In general, there are two important things to remember for all FFS work:

- No analysis or solution can be more accurate than the input data given
- Nothing beats experience

For static equipment, our company considers API 579 a good resource. We recognize that the defect or flaw must be carefully characterized by a qualified professional. Many times, individuals charge forward in an FFS without properly identifying the details of the flaw or defect. It is important to note that an FFS is not merely a "stopgap" measure to keep the equipment running, but rather an engineering evaluation of its current status that determines its remaining life based on the conditions analyzed. It is a methodology to characterize flaws and defects and to address them in such a way so as to meet Code conditions. It is important to note that FFS should not be viewed as a short cut or workaround to effective and thorough Process Safety Management (PSM).

Specialists in Design, Failure Analysis and Troubleshooting of Static and Rotating Equipment

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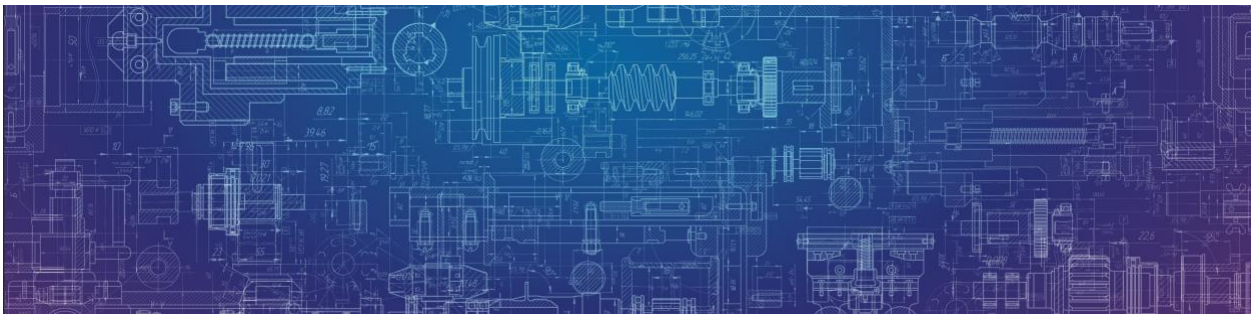

A proper FFS frequently involves the following considerations:

1. Process and operations assessment – Steady state, upset, startup, and any transients that the equipment may experience.
2. Condition assessment – Flaws, defects, and conditions are characterized by qualified personnel. This is a critical step because the failure to identify the actual condition of the operations may render all other assessments inaccurate.
3. FFS
    a. Static
        i. Determine the appropriate level of analysis. As in API 579, it can range Level 1 to Level 3, which involves in service monitoring.
        ii. See that applicable Code conditions are met
    b. Rotating
        i. Characterize the equipment condition
        ii. Risk assessment
        iii. Analysis – This may include hand calculations as well as detailed structural simulations.
4. HAZOP – Include a review of the FFS.
5. Recycle on the above steps
6. Process, Mechanical, Materials, Controls, and Operations sign off.
7. Implementation with a feedback loop on equipment.

The main aspect of FSS is that it is not a “cookie cutter” approach and each problem should be evaluated for its unique conditions. Finally, all FFS work should be directed and approved by a qualified professional engineer.

KnightHawk is your one stop resource for FFS. We have performed many Level 3 API 579 analyses for static equipment. We also have performed FFS on rotating equipment in order to keep operations running safely and smoothly. Our staff, which is made up of process, mechanical, metallurgical, instrumentation and controls engineers, many with an operations background, constitute a formidable team for those challenging problems.