KNIGHTHAWK TECH NOTES

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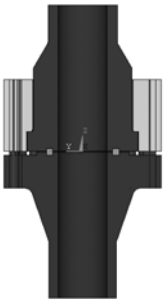
Flanges and Clamps – Should they leak?



You're off shore on one of the largest rigs in the world. It was put together with all the latest equipment with all the "bells and whistles". The rig was built, erected, and went into production in record time.

As with any new unit, it takes a while to get all the "bugs" out, tune things, and get lined out. While observing the rig, you see something you don't like — process fluid dripping out of a flanged joint. The flange connection is a new quick connect type joint (QCJ). The maintenance crew chief is called and he sends someone out there to tighten the blots on the QCJ and the small leak stops. Your relieved and in subsequent observations, you see no leak. A few weeks latter you walk by and you see that "drip, drip, drip ….". You call maintenance again, and they tighten the clamp and the leak stops. Once again you don't see it at first, but it pops up again in several weeks. You ask, "What is going on"?

Your company has approved the QCJ for this service, it has been tested and it is used widely all over the company. The QCJ comes from a well respected manufacturer and your company has had a long relationship with them. You ask yourself what is the problem and you call for help.

The situation described above is not necessarily an isolated case in the business. In cases where we have a line in a service that is cycling "hot to cold" due to the inherent design of the process, the QCJ is subjected to cyclic load and pipe stress loading. Depending on the QCJ design, typically a high seating stress or seal contact stress is required to prevent leakage. It is important to torque the QCJ properly in accordance with the manufactures specifications.

With all that said, in most cases the external pipe stress loading will derate the allowable pressure for the QCJ. Pipe stress loading must be included as part of the design. The combination of pressure and external loadings is usually complicated to calculate. Most applicable codes and standards handle the pressure only case quite well and even the manufactures own design tools usually do a good job. But when high external loadings are imparted onto the QCJ, the ball game becomes more challenging. Fortunately the finite element tool can be used to take a look at these QCJ's. The methodology is as follows:

1. Lay out the pipe design.
2. Perform a Code pipe stress analysis
3. Define the loads for the QCJ
4. Specify the type QCJ you want
5. Develop a FE model of the QCJ
6. Analyze the loads
7. Specify a large QCJ or move the clamp to a strategic location

The problem of external loads on QCJ is challenging in some applications, but it is also a problem with standard flange joints as well. Many times our leaks in the field are misdiagnosed as a gasket problem or whatever, when it is simply the external pipe stress loading and the cycling thermal load causing the problem.

It is recommended that a registered professional engineer competent in this field review any designs. As with any piece of hardware implemented in industry, the complete ball game has to be defined and analyzed prior to it being put into service.

Cliff's Notes:

Our staff has analyzed many quick connect clamps for industry both for the manufacturers and the owners. We have provided complete service including failure analysis, field service, and design regarding these clamps. We can help set allowable loadings for a range of clamp sizes. Another area we have worked in quite a bit is valve design. We have designed high pressure specialty valves for industry as well as NASA.

Well, I am sure most of you have watched the events regarding the War with Iraq. Our hopes and prayers have been and remain with the troops and their families. Here in the Clear Lake area of Houston, NASA is recovering from the Space Shuttle disaster. We look forward to the program getting up and running again. There has been much news lately, good and bad. In any case, I support our President and our troops. I have been all over the world for Church and work many times and regardless of what any one says, I know this is a great, blessed, and giving country. May God continue to bless America.

On the lighter side many of you have asked why I have a Ford F-350 4 x 4 Diesel Quad Cab as my company vehicle. Well, I really don't have a good explanation for other than it is a Texas "thing". In any case I am well prepared for snow storms and mud slides should they hit Houston.

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KnightHawk Project Update

- Inlet Cone Design for TLE's – Petrochemical
- Critical Pipe Stress analysis – Refinery
- Integral Gar Compressor Failure Analysis – Petrochemical
- Incinerator Failure Analysis – Petrochemical
- Transfer Line Exchanger Audit – Petrochemical
- Aerodynamic Study of Inlet of TLE – Petrochemical
- Flow Meter Vibration Analysis - Petrochemical
- High temperature mixer analysis – Petrochemical
- Cracked Gas Compressor Failure – Petrochemical
- Coal Gasification Reactor Failure Analysis – Power
- Waste Heat Boiler Code Assessment – Division II Appendix 4 – Petrochemical
- Rail Car Structural Dynamics – Petrochemical Transportation
- Custom Riser Flange Design – Off Shore
- Value Research and Development – NASA
- Axial Compressor Analysis – Petrochemical
- TLE inlet aerodynamics – Petrochemical
- TLE Failure Analysis – Petrochemical
- Pelletizing Die Design Second Order – Petrochemical
- Exchanger Failure – Petrochemical
- Pipe Stress – Refinery
- Structural Dynamics – Rotating Equipment – Petrochemical
- TLE Coking Analysis – Petrochemical
- Piping Failure – Refinery
- Pipe Stress – Refinery
- Waste Heat Boiler Failure Analysis – Petrochemical