KNIGHTHAWK TECH NOTES

PHONE: (281) 282-9200 • FAX: (281) 282-9333
WEBSITE: www.knighthawk.com

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"Performance Upgrades – It's Time"

You have just gotten out of Engineering School and you landed a job in a production facility. It is not a new facility but 30+ years old. It is easy to be mesmerized by all the plant equipment. Just look at the size, the horsepower, and the fact that it runs 24/7. As an engineer you are amazed at the fact that some of the equipment runs for five years before it is serviced. But there is one thing that really bugs you. Does anybody worry about the efficiency and performance of all this old equipment? With all the new technology in the world, what about the technology at your facility? Reliability groups are touting how they have increased the run time between failures and you know that is good. This old technology still bugs you. You recall in your mind that there are many performance products that improve trucks and autos, both in horsepower and efficiency. This leads you to wonder about both the process and mechanical efficiency of what is running.

Those are all good questions. Any combination of varying feedstock, like we see in today's production environment, with old technology is a formula for failure. Large production scale plants with the latest technology are going on line in Asia and the Middle East. Not only do they have the latest technology, they have lower cost feed stocks, and cheaper labor. To compete in this environment it is necessary to upgrade existing facilities on both process and mechanical equipment.

Process equipment has great opportunity for improvement, and assessments can be made through the evaluation of energy loss due to detrimental localized effects caused by poor heat transfer and flow distribution. These effects can be studied by evaluating the fluid dynamics including heat and mass transport in local areas. These may include the performance of tower trays, heat exchanger inlets, agitator performance etc… the list is almost endless. Mechanical equipment could include items like impeller changes in compressors and pumps. It could also involve blade changes in axial turbines and compressors as well. Many approaches have been looked at for rerating of equipment through "debottlenecking" or simply increasing production rates. While these are certainly good, the focus here is mainly the local effects in equipment.

A methodology for approaching these questions is as follows:

1. Select a production unit suspected of lower process and mechanical technology. Typically ask the question what the return would be for a 5% to 10% or even more increase in production using the same energy would mean to the profitably of the unit. Sometimes it is difficult to evaluate what piece of equipment is costing the most money. Executing a Reliability, Availability, Maintainability and Safety (RAMS) Analysis will aid in determining what needs to be looked at. This analysis addresses all aspects that effect the operation of the equipment.
2. Establish a target goal of performance level that is reasonable. Items might include reliability or process performance. Determine if the expectation is met, how it will impact the bottom line of the facility.
3. Once the equipment is selected, and it is believed that a pay out of any modification will be approximately one year or less, then a preliminary analysis needs to be conducted to address all the technical issues. It's possible a first pass HAZOP (hazard and operability study) needs to be performed.
4. Detailed Analysis – The detailed analysis will typically include, but will not necessarily be limited to, process, metallurgical, mechanical, controls, and environmental concerns for example. Use the latest technology available to evaluate the change. It is much better to prove out success in the "virtual world" rather than the real world.
   a. Base Line Analysis – It is also a good idea to evaluate the unit on a base line basis. This might include a field study to gather detailed data that might be more than what is normally available in the process control system. Some projects might involve pulsation and vibration studies. Others might be thermal imaging to evaluate heat transfer.
   b. Analytical Models – It is a good idea to check the models against the field data to assure there is a good match. If so, one can move forward with the process.
   c. Review – After the analysis is complete, operations, maintenance, materials engineering, process, and engineering personnel should all be involved in a review.
5. A final economic study should be conducted of the proposed change to see if the return on investment is there.
6. Select vendors through a qualification process to implement the goals and objectives of the project.
7. Perform a Decision and Risk Analysis (D&RA) to determine where the change fits in the overall operation. This analysis will be used as part of the final decision.

Too often we are so focused on reliability that we never question process performance. Now more than ever, the Petrochemical Industry needs not only Reliability Engineering Groups but Performance Enhancement Teams. All analysis should be done under the direction of qualified professional engineers.

KnightHawk Project Update

- Gas Pipeline Coupling Failure – Oil & Gas
- Water Pump Failure Analysis – Nuclear
- Hydrolyzer Analysis – Petrochemical
- Bearing Pedestal Monitoring – Petrochemical
- Bolting Failure – Automotive
- Centrifugal Compressor Failure Analysis – Petrochemical
- Jacketed Reactor Vessel Design – Petrochemical
- Compressor Redesign Startup Monitoring – Petrochemical
- Vessel Destructive Testing – Oil & Gas
- Cryogenic Tank FFS – Petrochemical
- Corrosion Analysis – Gas Pipeline
- Flare System Analysis – Petrochemical
- Reactor Failure Analysis – Petrochemical
- Filtration System Design – Petrochemical
- Oxidizer Redesign & Reconstruction – Petrochemical
- Creep Tensile Testing – Communications
- Gasifier Equipment Design – Power
- Pump Vibration Analysis – Petrochemical
- High Temperature Molten Salt Tank Design – Green Energy
- CFD Ethylene Furnace – Petrochemical
- Inlet Cone Design for TLE's – Petrochemical
- Bearing Design – Heavy Manufacturing
- Vaporizer Design – Petrochemical
- Transient Fluid Dynamics – Petrochemical
- Waste Heat Boiler Failure – Petrochemical
- Liquids & Solids Separation Technology Development – Coal

Cliff's Notes:

KnightHawk is your one stop shop for performance upgrades for both static and rotating equipment. KnightHawk has performed detailed modeling and analysis to ensure equipment works as anticipated. Call us and let us explain how we can help you.

I want to wish everyone a very Merry Christmas and Happy New Year. I want to thank our clients for their business and support. God Bless you and your families.

Cliff Knight
cknight@knighthawk.com