

# KNIGHTHAWK TECH NOTES

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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's not a new facility; it's 30+ years old. You are mesmerized by all the plant equipment, how large, how much horsepower, and the fact 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... what 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? Reliably groups are touting how they have increased the run time between failures and you know that is good, but the old technology still bugs you. You recall you that there are many performance products that improve trucks and autos both in horsepower and efficiency. This leads us to wonder about both the process and mechanical efficiency of what is running in these old plants.



Those are all good questions. Any combination of high feedstock loads like we see in today's production environment with old technology, can be a formula for failure. Large production scale plants with the latest technology are going on line in Asia, Middle East, and the US Gulf South. Not only do they have the latest technology, operating facilities require less personnel and maintenance compared with older

facilities. To compete in this environment it may be necessary to upgrade the existing facilities on both process and mechanical equipment. Frequently we see "debottlenecking" projects from a process standpoint and the mechanical equipment is run at higher rates. But what does that do with reliability? Long term cost of ownership?

Process equipment can be assessed to improve 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, rerating of equipment through "debottlenecking" or simply increased production rates. While these are certainly good, the focus here is mainly the local effects in equipment.

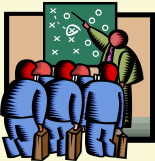
A methodology for approaching this question is as follows:

1. Select a production unit suspected of lower process and mechanical technology. Typically, ask the question, what would the return be for a 5% to 10% or even greater increase in production while using the same energy. What would that mean to the

profitably of the unit.

2. Establish a target goal of performance level.
3. Evaluate the energy balance of all major equipment.
4. Set priorities on all the major "energy hogs"
5. Ask how can we do this cheaper and better?
6. Maybe the answer is a new piece of equipment and/or controls change...but maybe it is a part change such as an impeller, baffling, re-reporting of valves, etc...
7. Conduct a process and mechanical performance review of the equipment and determine the return on investment.

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 Groups/Teams.



## ▼▼▼▼▼▼▼▼▼▼ ***KnightHawk Project Update***

- Reciprocating Compressor RCA
- Air Duct System Troubleshoot
- Auxiliary Burner RCFA
- Fracking Manifold Design
- Tank Fit for Service FFS
- Pump Water Injection Design
- Recycle Isobutane Feed System
- CFD Analysis of Down Draft Gasifier
- Code Calculations for Vessel
- Brittle Fracture Assessment
- Lump Breaker Design
- Hydraulic Analysis of Hydro Tester
- Spent Air Duct System Analysis
- Gas to Liquids Equipment Design
- Turbine Engine Failure Analysis
- Hydrotreater Design
- Ethylene Input Nozzle Redesign
- Compressor Wreck RCA
- Combined Cycle Generating Station Under Performance RCA
- Compressor Failure RCA
- Crude Oil Line Control System Analysis
- Turbine Pipe Stress Review
- Deaerator Internal Analysis
- Pump Failure RCA

### **Cliff's Notes:**

KnightHawk has worked many projects where the client knew what the debottlenecking would achieve from a process standpoint, but the owner was interested in whether the existing mechanical equipment could be upgraded or rerated. With our nearly 30 years' experience performing failure analysis of equipment, we know what to look for and the risk there would be in reliability.

We want to thank all our clients who came to us in 2018. The year was our most successful year. 2018 brought us clients from Europe, Asia, Middle East, and throughout the United States. Our company and its consistency of achieving results brings clients back time after time.

*Cliff Knight*

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