

the BETA BULLETIN



Training

Technical training for reciprocating and rotating equipment at Beta in Calgary and Houston for 2007 starts in February. Registrations are now being accepted. You can find the schedule on our web site, www.BetaMachinery.com. Click on Training and then click on Schedule. You can access course descriptions and registration forms from the schedule.

New this year, a one and a half hour web-based Pulsation Vibration seminar. The first one is scheduled for April 11, 2007, 9AM (MST)

Ask the Expert

Send in your questions about machinery analysis and we'll answer them in future issues of the Beta Bulletin.

Q - When is a Thermal Analysis required for my reciprocating compressor package?

(editor's note: thermal analysis refers to Piping System Flexibility, M11 study under API 618)

A - Such a study is usually only required if the pipe temperature is "significantly" different from ambient (either above or below) and if the lengths of pipe are "significantly" long. The pipe expands or contracts in proportion to both the differential temperature (between installation and operating) and the length of the pipe. (A 35 foot pipe will grow about ¼ inch when heated 100 Fahrenheit degrees.) For normal compressor installations, the discharge piping on a stage would be a candidate for thermal analysis if the runs of pipe exceed 20 feet.

It is recommended that the same analysis team do the thermal study as does the dynamic analysis of the compressor mechanical system. This is because the two types of study will lead to changes in the piping design in opposite ways if not coordinated. Piping can be designed to allow for thermal growth while at the same time being able to tolerate the dynamic forces associated with reciprocating compressors. The upcoming 5th Edition of API 618 will include this recommendation.



*Brian Howes, Chief Engineer
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Some Thoughts on Machinery Optimization

Cut through the confusion

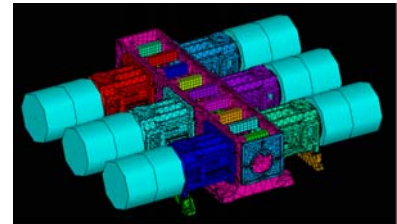
Optimization is a common buzz word in the literature and in advertising products and services. Everyone seems to be optimizing these days. But there is a lot of confusion about the term as it can apply to many different aspects of machine performance, characteristics, costs, and operations. For those interested in machines such as compressors, we can look at optimization from several perspectives.

Let's look at four of them:

1. [Design Optimization](#)
2. [Operational Optimization](#)
3. [Redesign/Revamp/Reconfiguration](#)
4. [Fleet Management Optimization](#)

1. Design Optimization. This refers to balancing many competing factors during the design phase of a compressor package, such as:

- minimize initial capital cost
- minimize operating costs (reduce HP losses)
- maximize capacity or throughput; and
- maximize reliability (and ensure low maintenance costs).



In other words, the optimum design will meet the specified throughput while minimizing life cycle costs including energy, maintenance, and opportunity (lost production) costs. Although it sounds easy, it takes a team effort between the customer, engineer, packager and Beta to deliver these tangible results. This effort can achieve significant payoff for the customer. (see **Case Study O1**)

2. Operational Optimization. Production supervisors need to meet aggressive production goals, including



high availability targets. On the other hand, pushing too hard causes premature equipment failure, expensive downtime and capacity/performance issues. This type of optimization involves monitoring critical parameters: throughput, load, component temperatures, energy rate and other factors, and identifying ways to generate incremental flow. A simple example is optimizing valve performance to increase efficiency, or change load steps in a compressor. (See our **MAO program** for other examples).

3. Redesign/Revamp/Reconfiguration. Machine changes are required or, at least, justified after some time. Changes in the operating environment (e.g., declining reservoir pressures in gas compression applications) may require reconfiguration. A de-bottlenecking project could require increased capacity. Improved technology could justify an upgrade to improve efficiency and/or reliability. Many of the initial design optimization techniques come back into play, as well as creative mechanical solutions by the packagers and Beta.



4. Fleet Management Optimization. Managing a large number of compressor assets requires another aspect of optimization, often called fleet management. The objective is to bring the poorest performers up to the best performers. When operating a number of machines in a similar service, there will inevitably be differences in the performance results. In many situations, units are added over time and differ in initial characteristics. In due course, there will be additional differences through operating practice, maintenance activities, and upgrades. Comparing key

attributes, such as availability, reliability, production, and efficiency will likely identify significant differences. Analysis can lead to an understanding of what would be required to bring the poorer performers into line with the best. Further assessment then determines whether such efforts are justified.

There are other optimization programs that include the facilities process, or in the case of upstream oil and gas, the gathering or pipeline system.

Companies are achieving higher cash flow through effective optimization programs. We have a number of customers who pay off their optimization efforts in weeks and generate handsome returns. However, it requires effective organizational planning, skills, and support to keep the programming on track.

In upcoming issues of the Beta Bulletin, we will highlight some optimization tips and examples in each of the categories discussed above. We look forward to your feedback on these or other examples you may want to share with our readers.

Dr. Bryan Long is the Director of Business Services at Beta. Among his other responsibilities, he leads the development and delivery of Beta's "Monitor/Analyze/Optimize" (MAO) service offering low cost and effective condition and performance monitoring for industrial machinery.



Humour

...speaking of optimization

Engineers are notoriously frugal. This is not because of cheapness or mean spirit; it is simply because every spending situation is simply a problem in optimization, that is, "How can I escape this situation while retaining the greatest amount of cash?"

Beta News

Condition Monitoring and Optimization Contract

In conjunction with Dresser-Rand, Beta Machinery Analysis has been awarded a multi-plant condition monitoring program in the air separation industry. This contract includes Beta's MAO service offering (monitor, analyze and optimize), and includes vibration, lube oil, performance and machinery analysis.

By outsourcing this specialist work to the experts at Dresser-Rand and Beta, the customer is able to focus on their core business.

Trade Shows and Conferences

We hope to see you at these trade shows and conferences in 2007:

- **March 4**, Gas Compressor Association ([GCA](#)), Galveston, TX. Make sure to stop by our booth to see how we can help you achieve your optimization goals.
- **March 11-14**, Gas Processors Association ([GPA](#)) in San Antonio, TX. Dr. Bryan Long presents a technical paper, "Enhancing Compressor Productivity: How to get more from your machinery assets."
- **March 22-23**, European Forum for Reciprocating Compressors ([EFRC](#)) in Prague, Czech Republic. Kelly Eberle presents a technical paper, "Dynamic Analysis of Reciprocating Compressors on FPSO Topsides Modules."
- **May 16-17**, [Peace Region Petroleum Show](#), Grande Prairie, AB. See us at booth #131 to talk about your Condition Monitoring issues and see how we can help.
- **Sep 10-13**, [TurboMachinery Symposium](#), Houston, TX. Stop by our booth #132 as we focus on optimization and what it means to you.
- **Oct 1-3**, [GMC](#), Dallas, TX. More details to come.

We welcome your comments. So, let us know what you'd like to see in the Beta Bulletin. Keep us updated with your correct contact information and remember to sign up for our informative technical courses.

Sincerely,
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Additional comments:

Thank you for your feedback.



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