



MACHINERY ANALYSIS

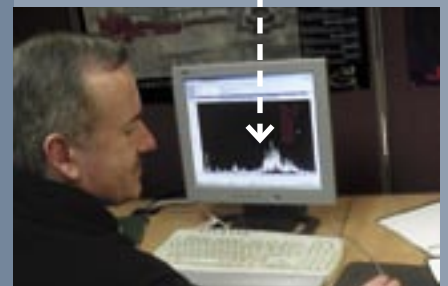
MAO Service

Monitor, Analyze & Optimize

- Reciprocating Equipment
- Rotating Equipment
- Heat Exchangers, Boilers, Structures and Other Assets



OPTIMIZATION SERVICES



MAO

Puts your data to work

Overview

Optimize Your Equipment and System

- Improve operating cash flow
- Maximize your equipment's performance
- Reduce unplanned downtime

Send BETA your machine data – and we do the analysis

- Applicable to any machine
- Scalable to meet your entire fleet or facility
- Field support to maximize program benefits
- Integrate with other monitoring programs
- Low monthly fee

The challenge with current monitoring & optimization programs:

- Facilities lack in-house staff to implement a program and optimize equipment
- Staff turnover or other priorities stall an in-house program
- Operators don't have time and, in some cases, experience to analyze data
- Proprietary software programs are expensive and difficult to maintain

Many of our customers face these problems and want an affordable alternative.

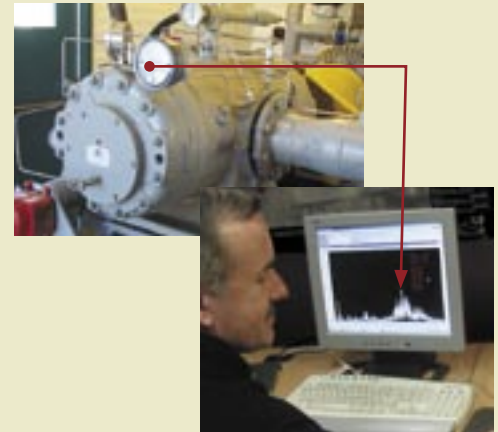
We have the answer – and it's MAO.

How it works

Monitor

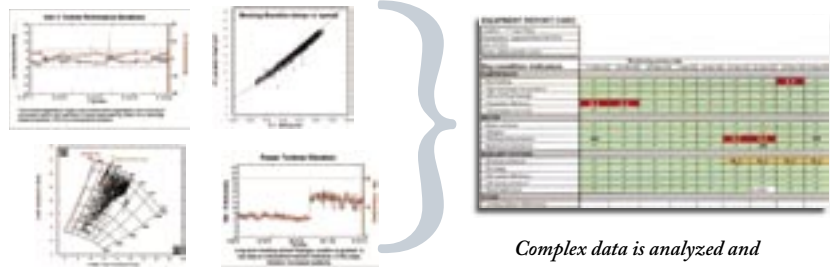
You are probably already collecting useful data on your machines, including log sheets from equipment operators and/or SCADA data on general operating parameters. Or, you are collecting vibration data from bearings, gears, impellers, rotors and other sources.

What you may often have is a situation where you are “data rich, but information poor.”



Analyze

MAO will alert you to potential problems earlier, therefore avoiding overtime or other last minute costs. We summarize equipment issues using our popular score card reports. When warning flags occur, we drill down and provide you with more detail on these events. Cash flow impacts are also calculated based on your specific situation. BETA identifies the condition of any machine type.



Complex equipment analysis data is reviewed by machine experts using advanced software algorithms.

Complex data is analyzed and converted into simple, colour-coded report cards that tell you what the data means to your bottom line.

Optimize

BETA Machinery Analysis is your partner when it comes to optimizing equipment performance. With a proactive strategy in place, your machinery will work at optimal levels across its life span through regular, tailored monitoring, maintenance and even redesign where necessary.

BETA's MAO service results in increased equipment utilization, increased availability, increased cash flow and reduced maintenance.



Equipment revamp to optimize field production capabilities.



Optimized equipment to improve plant throughput and reliability.



Monitor

Send us (or input) the data and we will manage it for you. BETA's machinery monitoring software accepts:

- Faxed log sheets
- Emailed files or web-based input forms
- Data directly from a SCADA system or your data historian
- Vibration data in hard copy or digital formats (or have us collect the data for you)

Our approach minimizes any extra work for your operations staff. This saves you money by avoiding expensive monitoring hardware, software, or additional data collection methods.

- What machines should be monitored?
- What type of monitoring program (trend log sheets, vibration, oil analysis, etc.)?
- What data should be collected and how often?
- What is the best monitoring approach for your system?

Analyze

- For each piece of equipment, we track key “failure modes” (by failure modes, we mean anything that prevents the machine from meeting its assigned mission in the most cost effective way possible).
- We analyze the data for these failure modes. In many cases, this involves trending the deviation from baseline performance, or the correlation between key variables.
- Customers are alerted when the equipment condition changes from green to yellow or red.

GOOD: Normal Operating (do nothing)
PROBLEM DEVELOPING: Alert Level (increase monitoring)
DANGER ZONE: Alarm (plan for maintenance or shutdown)

- BETA has a powerful software tool to calculate operating and performance metrics. Our proprietary tool is flexible and can meet any equipment requirement.
- Vibration data are correlated to process operating data.
- Comments and recommendations for improvement are provided.

- What is the appropriate level of analytical review for your specific machine?
- What is the best way to catch potential failures or inefficiencies?
- Who can interpret the results?
- How to develop and maintain this competence? How to address staff turnover (rebuilding experience base, training costs, staff relocation; are skills available)?
- Who is responsible for analysis? Is there the time to do this work?
- Ongoing expenses for system upgrades, changes, training.

Optimize

Optimization services generate cash flow improvements in the following three ways:

- 1. Performance Analysis:** BETA tracks the Key Performance Indicators (KPIs) for each machine in the program. Where opportunities exist, we recommend improvements.
- 2. System inefficiencies:** Working with your staff, we can identify constraints or operating inefficiencies. For example, evaluating the overall compressor station and piping (rather than just the compressor itself), will highlight opportunities to maximize production.
- 3. Fleet Management:** Our consistent approach is ideal to track performance of your entire fleet, enabling better asset management and lower overall maintenance costs.

BETA can also travel to your site to support optimization improvements, equipment revamps, and equipment troubleshooting.

- What is the most cost effective approach for equipment optimization?
- Do you have the right data to make decisions?
- Staff issues including access to experienced optimization engineers. Many companies can't justify full time staff for optimization projects.
- Finding the right blend of business, financial and technical skills.

Why BETA?

Monitor

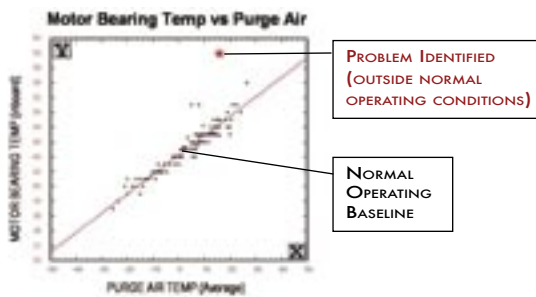
There are benefits to vibration-based, performance/operating, and other condition monitoring programs. BETA can help you develop and execute an appropriate monitoring strategy that meets the objectives of your production and operations staff



Analyze

Our analysis service gives peace of mind. You will understand the condition of your equipment and be made aware of potential equipment failures.

With over 38 years of reciprocating and rotating machine experience, including design, troubleshooting, performance assessments, and operational improvements, BETA has a proven process for analyzing equipment.



MAO's monthly reports provide the recommendations for equipment improvements and for improving your overall fleet/plant. In addition, our consulting specialists can help your staff identify and implement optimization opportunities for increased cash flow.



MAO Delivers

Information and Support to Optimize Your Equipment

- Cost of Downtime (customized by event)
- Cost of Production Loss (customized by event)
- Detailed Reliability/Availability Data

Fleet or Plant Summary

- Our proprietary report card showing status of each machine
- Cost-effective service, with no investment required in people, software or hardware
- Valuable information and recommendations including immediate alerts and alarms
- BETA can support any machine – a significant advantage

Equipment Report Card

- Practical report card approach
- Once a problem is identified, we can drill down to provide detailed data and recommendations

Follow-up and Implementation

- Includes start-up and follow-up site reviews and training
- We can also provide field experts to help with performance assessments, troubleshooting and many other services

With MAO you can expect payback to be many times the cost of the program.

Optimize

Example 1

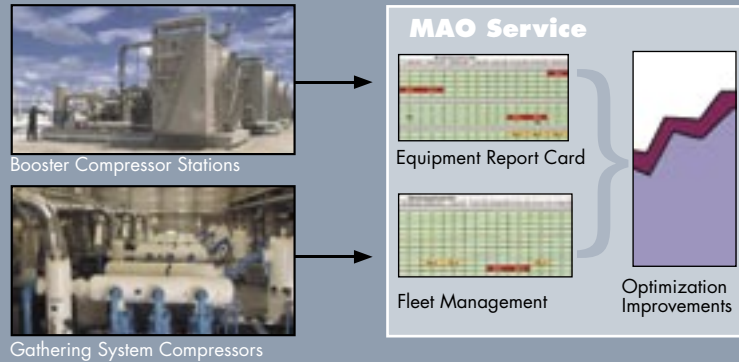
Gas Production Company (Field Operations)

Situation:

- Focus on low operating costs
- Limited investment in monitoring programs
- Many reciprocating and screw compressors (>300 units)

MAO Advantages:

- No investment in people or software
- No hassles for operators (fax log sheets to BETA or download DCS/Data Historian/SCADA data)
- Valuable optimization tool to increase cash flow
- Qualified field staff to assist with improvements



Example savings:

- Optimized compressor performance – MAO identified a compressor loading problem; when corrected, throughput increased significantly
- An abnormal exhaust gas temperature pattern in an engine identified a control problem, potentially preventing premature failure
- Customer collected vibration data using a BETA supplied portable analyzer and sent data to BETA for analysis, reducing field monitoring costs

Example 2

Gas Plant/Refinery

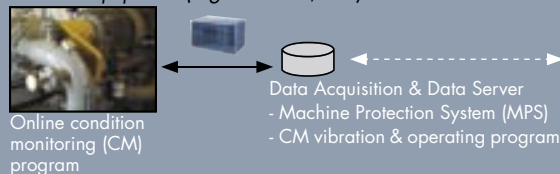
Situation:

- Critical equipment (turbines, pumps, recips) requires online condition monitoring
- Balance of plant requires moderate level of monitoring including vibration inspections
- Reliability important, but staff turnover crippled monitoring program
- High cost of inhouse monitoring software (including training, etc.)
- Monitoring of heat exchangers and other non-rotating equipment also required

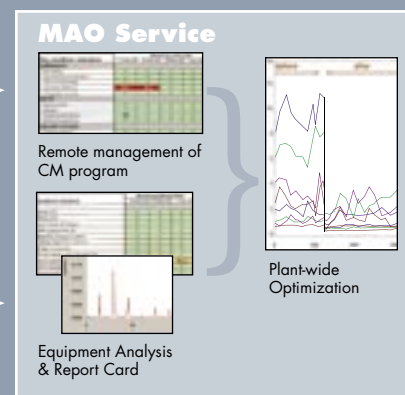
MAO Advantages:

- Implement/manage/support online monitoring for critical equipment
- Cost effective monitoring for balance of plant
- Integrate vibration, operating data and lube oil analysis into one convenient report card
- Regular equipment performance and vibration checks

Critical Equipment (e.g. Turbines, etc.)



Other Important Equipment

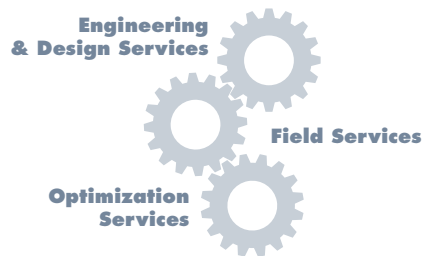


Example savings:

- Identified severe pump cavitation problem – made adjustments to prevent failure (and plant shutdown)
- Monitored winding temperature patterns in a motor showed an anomaly; early detection allowed for investigation and correction before the problem became serious
- BETA helped customer optimize condition monitoring program to use resources to greatest effect

BETA Advantage

Premier Machinery Consultants in North America
with 38 years experience in over 6000 projects.
Pioneered the development of engine/compressor analyzers.
Leader in vibration and monitoring/inspection services.
Trusted consultants for the most difficult and challenging projects.
Quick accessibility to machine reliability experts and
field staff to support your optimization needs.



INTERESTED IN LEARNING MORE?

Contact us for pricing, application assistance and case studies.

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www.betamachinery.com



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Keeping it running smoothly