

Condition Based Maintenance

*Maximizing Your
Asset Return on
Investment*



WHAT IS CONDITION BASED MAINTENANCE (CBM)?



Condition Based Maintenance (CBM) is the evaluation of asset health and forecasted behavior that takes place during normal operations, in real-time, minimizing disruption to system operations. CBM assists with predicting when failures will occur and scheduling maintenance when it's the most cost effective. The predictive measures of CBM deliver a meaningful level of reliability and can provide greater insight into the historical operation of the equipment.

Value of Jacobs' CBM Approach

Jacobs CBM approach emphasizes holistic integration of solutions that span across the full facility lifecycle to manage the challenges of operational and maintenance programs while generating greater value in terms of time and cost savings. We ensure CBM program sustainability and continuously improve our client's operations by leveraging relationships with global professional organizations and our structured training and certification programs.

Featured Benefits:

- **Cost Savings** – Jacobs CBM program increases our customer's savings by providing Preventive Maintenance that identifies potential system failures before they occur, resulting in reduced maintenance action and costs. Plant availability is increased which allows more time for executing the mission and less down time for maintenance.
- **Safety** – A comprehensive CBM program delivers an inherently safer facility that is a result of scheduled and better planned maintenance actions and the identification of potential catastrophic equipment failures that elevate the risk to worker in the facility. At Jacobs, we look for ways to recognize and mitigate risks, on and off the job and extend BeyondZero safety culture to our business partners, clients, and families.
- **Jacobs Connected Enterprise (JCE)** – JCE provides integrated solutions that use technology to solve customer problems. JCE also supports a solutions mindset, creating smarter, safer, and more sustainable and secure solutions.
- **Certified Maintenance & Reliability Professionals** – Jacobs adheres to the principles and standards of the Society for Maintenance & Reliability Professionals (SMRP), a nonprofit professional society formed by practitioners to develop and promote excellence in maintenance, reliability, and physical asset management. We pride ourselves on employing large pool of qualified Maintenance and Reliability professionals to ensure the best level of resource management possible. Continuous Process Improvement is fundamental to our Whole Life Asset Management Program. Our asset managers also take strong leadership roles to ensure continuous development and improvement of training and certification for managers and technicians.

Our Condition Based Maintenance approach drives collaboration to improve both asset and business performance for our customers.

Condition Based Maintenance of Different Asset Class and Benefits

Asset Class	Technology	Benefit
Air Handlers	Differential pressure switches and transmitters on filters	<ul style="list-style-type: none"> Indicates pressure drop across filter banks potentially increasing the time between filter changes reducing material spend and avoiding unnecessary downtime
Cooling Towers	Accelerometers on pumps and gear boxes	<ul style="list-style-type: none"> Provides for real-time data collection and eliminates technician routes Increases reliability and reduces cost of repairs as gear boxes replacements and cooling tower downtime are both costly and disruptive
Motors	Motor insulation quality, motor system performance monitoring	<ul style="list-style-type: none"> Provides for real-time data collections and eliminates technician routes. Increases reliability of critical motor systems
Online Oil Monitoring	Monitoring of oil viscosity, water content, particulate content, temperature	<ul style="list-style-type: none"> Provides for real-time data collections and eliminates technician routes Increases reliability of critical lubrication systems
UPS and Substation Battery Monitoring	UPS, and battery status and health	<ul style="list-style-type: none"> Provides for real-time data collections and eliminates technician routes Increases reliability of critical battery systems
General Monitoring	Generator status and health	<ul style="list-style-type: none"> Provides for real-time data collections and eliminates technician routes Increases reliability of critical generator systems
Other Critical Systems	Leverage existing Facility Automation Systems to collect and trend data	<ul style="list-style-type: none"> Infrastructure already in place to collect data Provides the largest potential Return on Investment (ROI) due to high dollar value and revenue generation of research systems Provides maintenance engineers and technicians greater insight into the historical operation of the equipment

Applying CBM as part of our overall asset management program, Jacobs achieves outstanding results for our clients. As a result, our programs have been recognized as best-in-class by a 2014 rating of “Excellent” by LifeCycle Engineering, a leading asset management consulting firm chartered by the U.S. Air Force. In 2008 and 2010, UPTIME Magazine selected our CBM program as Predictive Test and Inspection (PT&I) Program of the Year, and in 2017, Jacobs NASA Langley Research Center was honored to receive *Uptime* Magazine’s 2017 Best Reliability Program of the Year Award.

Jacobs' Approach to Asset Management

Asset management is about maximizing returns on asset investments. Whether building reliability into capital plans for growth or extending the life of aging assets, Jacobs works in partnership with our customers to create tailored asset management programs that safely and dependably maximize and sustain their ROI of high-valued assets, throughout their full life cycle. Our proven approach has demonstrated decreased downtime, increased system availability and reliability, and reduced total maintenance costs. Key to this is our application of a disciplined Condition Based Maintenance Program combined with the application of new technology.

Our vision is to serve as the best value Condition Based Maintenance Provider in the world, delivering premiere solutions for the highest overall Return on Investment (ROI) or our client's physical assets.



JACOBS ASSET MANAGEMENT DELIVERY FRAMEWORK



“ A well-established CBM program can eliminate or reduce asset failures cost-effectively and helps in scheduling maintenance activities to minimize costs.”

Ramesh Gulati, Jacobs SMRP
Maintenance and Reliability Best practices, 2017
NetexpressUSA dba Reliabilityweb.com

Condition Based Maintenance is an integral part of the Reliability Centered Engineering spoke of the Jacobs Asset Management Delivery Framework.



OUR CUSTOMERS' SUCCESS IS OUR SUCCESS

Our approach to CBM has been developed and refined with over 50 years in the O&M business of large industrial facilities. While others are talking about what they can do to improve a client's operation with new technology and a comprehensive CBM program, Jacobs is actually delivering new levels of ROI to our NASA, DOD, and commercial clients.

Maximizing the Return on Investment of Langley Research Center's Critical Assets

As the operations and maintenance (O&M) contractor for the Center Maintenance Operations and Engineering (CMOE) contract at NASA Langley Research Center (LaRC), Jacobs' primary goal is to continually seek ways to gain operational efficiencies. Through partnership with LaRC and internal collaboration with our Jacobs Connected Enterprise (JCE) team, we deployed technologies to enable real-time monitoring and analytics of LaRC's critical assets, improving efficiency, reliability, and availability.

Jacobs Asset Management Deployment Strategies for Langley Research Center:

- Instrumented ~555 assets using ~5,000 discrete points to measure vibration data through a wireless network
- Applied data analytics capabilities to measure and analyze the data
- Introduced Building Automation and combined 11 disparate systems (primarily HVAC) into a single integrated system, now monitoring more than 110,000 points
- Designed and implemented the hardware and software to enable real-time asset monitoring and data capture in the Center's control room (Integration Operations Center)
- Leveraged our JCE cybersecurity experts to ensure the safety and integrity of data transfer and capture
- Linked floor plans using Geographic Information Systems (GIS) and attached control drawings to facilitate troubleshooting and quickly identify problem areas

Benefits to NASA Langley Research Center since rollout of our Asset Management Delivery Framework in October 2015:

- No failures or unplanned outages of instrumented assets
- Cost savings of 2-3% of the LaRC monthly budget equating to a 2-year return on investment
- LaRC program is now touted as a possible enterprise solution for all of NASA
- Recognition by other federal organizations including the National Reconnaissance Office and the Department of the Navy who have sent representatives to evaluate the LaRC program with plans of achieving similar successes
- Recognition by Uptime Magazine as the Reliability Program of the Year for 2017



WHO WE ARE

Who Is Jacobs?

Jacobs is one of the world's largest and most reputable providers of professional and technical services, including all aspects of planning, architecture, engineering, construction, asset management, reliability, Operations & Maintenance (O&M), and consulting. In 2017, Jacobs was ranked the #3 Most Admired Company in the World among engineering and construction companies by FORTUNE magazine. We have held a top-5 spot on this coveted list since 1999.

We are a solutions-focused asset management company with a breadth of experience supporting every facet of an asset's life cycle.

Jacobs at a Glance

1947

Founded by
Joseph J. Jacobs

\$10B

2017
Revenues

\$7.8B

2017
Client Savings

74,000

Employees

400+

Locations

40+

Countries



For over 75 years, Jacobs has provided government and commercial customers access to unrivaled, multidisciplinary skills across the globe. Drawing on a wide range of experience across industry sectors and global markets, Jacobs offers clients the best value for managing and maintaining the assets they own and operate. We deliver scalable solutions to meet individual customer needs, ranging from a comprehensive integrated services model to discrete, tailored services.



For more information contact:
Michael Stites
michael.stites@jacobs.com
or visit us at
Jacobs.com/JCE



JACOBS®

