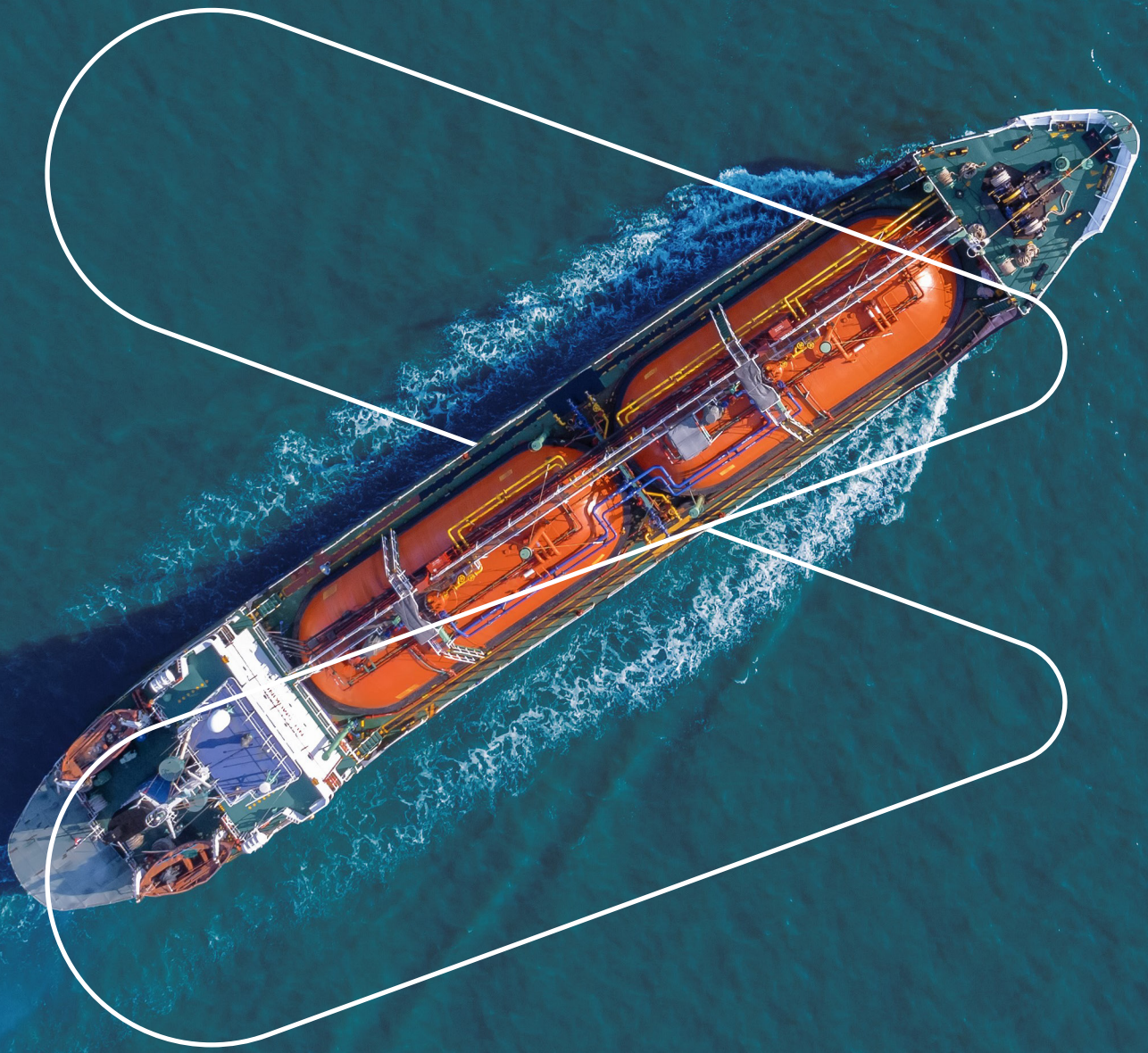


# Offshore platforms and FPSOs

Asset Condition Monitoring



# Introduction

Offshore oil and gas production began more than seven decades ago and continues to grow. With this growth, new challenges have arisen such as the operation of offshore facilities in difficult environments with increased production expectations. The two most common types of offshore facilities can be classified as either platforms or Floating Production Storage and Offloading (FPSO) vessels. Combined, this growing fleet plays a significant role in meeting the world's demand for oil and gas. In the pages that follow, we invite you to learn how our comprehensive capabilities can help you meet your business needs. Bently Nevada solutions can address your asset condition monitoring and protection needs, whether for a single platform or for an entire fleet.

## Your challenge

While offshore facilities have opened the vast frontier of the world's oceans to oil and gas exploration and production, they have also resulted in new and unique challenges for asset integrity. Financial data shows an hour of downtime for an offshore production facility is amongst the highest of any industry. Not only does the downtime equation consist of loss of production, but it also forces the asset operator to consider the complexity and logistics of staffing requirements, replacement parts and supplies to the remote location (as well as a number of other critical variables).

**As such, the following are absolutely vital to the success of offshore facilities:**

- Health, Safety, and Environment
- Proactive health management of your production assets
- Minimizing or eliminating unplanned outages and downtime
- Protecting critical machinery against catastrophic mechanical failures
- Quick and effective RCFA when an asset does fail
- Eliminating unnecessary maintenance
- Maximizing machinery reliability and availability
- Global access to asset information
- Eliminating downtime or schedule alterations associated to product offloading or transfer

# Bently Nevada is onboard

Bently Nevada Asset Condition Monitoring solutions have proven themselves time and again in addressing your challenges.

We understand your imperatives and we have created offerings to meet the unique needs of offshore facilities. Listening to our customer and the markets trends, Bently Nevada has designed:

- Unique solutions to address asset Condition Monitoring needs from highly critical assets to low level criticality assets.
- Systems that are remotely accessible, allowing remote monitoring and diagnostics of both machinery and instrumentation.
- Solutions that are compatible with your IT structures and cyber security requirements
- Systems that are capable of serving relevant data, notifications, and information to the appropriate departments and personnel
- Systems that are remotely maintainable, allowing: software updates, configuration changes, operating system patches and data archives.
- Hardware and software solutions that can integrate with third party applications. In addition, many of our products have been certified to meet the rigorous maritime approvals.



# Bently Nevada Asset Condition Monitoring systems don't cost...



## Payback through protection

Our solutions help protect your machinery from catastrophic failures and the costs of those failures.

For more than 50 years, the Bently Nevada name has been recognized for its industry leadership in machinery protection and condition monitoring. Today, with more than one million channels of machinery protection installed worldwide, customers have made us the proven choice for machine protection. We not only protect your machinery, but our legendary product quality, deep application expertise, and highly competent locally available service helps protect your condition monitoring investment as well.



## Payback through mechanical validation

Our solutions let you capture baseline machinery conditions, pre- and post-maintenance, giving you a reference for optimal decision making.

One of the most crucial times in the life of a machine is immediately after maintenance has been performed. We can tell you if "all is well" with systems that capture relevant data both before and after maintenance. You can instantly see if problems are present and make decisions accordingly. For many customers, the ability to knowledgeably continue with or abort the startup of a large compression train can more than pay for their entire system in a single event.



## Payback through predictive maintenance

Our solutions deliver information that allow you to perform maintenance when conditions – not calendars – dictate.

The results of a proactive maintenance program enabled by our condition monitoring solutions speak for themselves. Consider the recent findings from an offshore platform (producing on the order of 250,000 bpd and 50 mcf/d gas production) operator for a two-year period. The condition monitoring and maintenance program consisting of Bently Nevada hardware, software, and Supporting Service Agreement has resulted in the following:

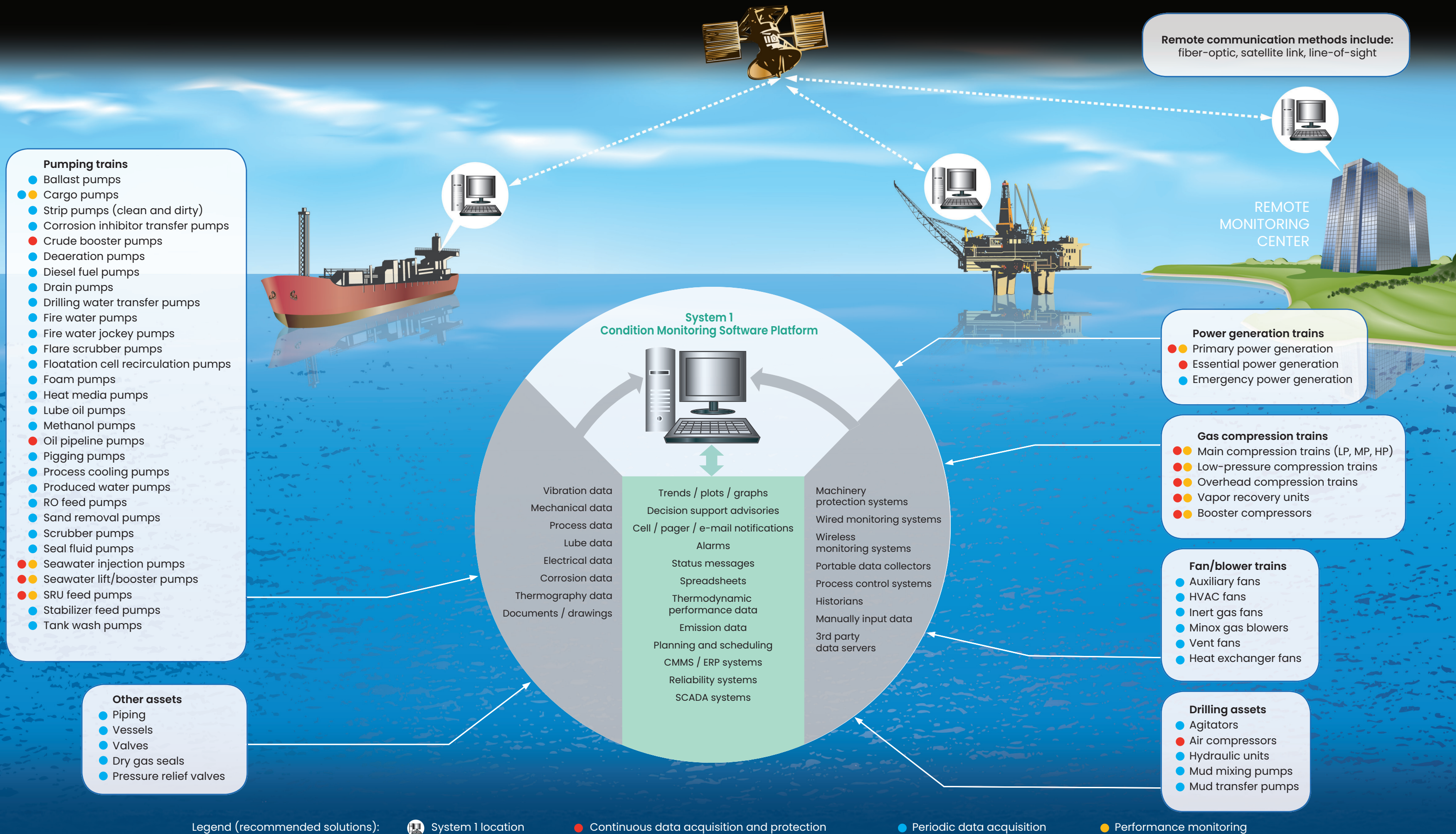
- Avoidance of equipment catastrophic failure = \$3,500,000
- Avoidance of production loss = \$180,000,000

Another customer realized a six-month system payback on their Bently Nevada solution set installed on a 250,000 bpd FPSO. This payback was achieved by utilizing System 1\* to predict equipment malfunctions, and by reducing the run to failure behavior. By taking these actions, the operator was able to avoid many abnormal incidents, reduce lost profit opportunities, reduce the maintenance budget and improve staff productivity.

...they pay



# Integrated condition and performance monitoring applications for offshore facilities



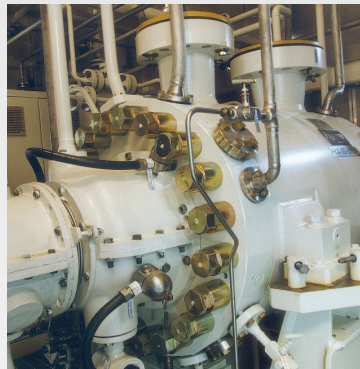
# Measurable results, tangible value

Plant-wide value through condition monitoring occurs asset-by-asset. Our solutions for platforms and FPSO's encompass your critical equipment where lost profit opportunities are the dominant economic driver. In addition, our plant wide approach encompasses the less-critical assets (which can affect critical equipment) as well as impact safety, health, and the environment. Below are just a few examples of the dozens of different asset types we can address.



## Power generation trains

Bently Nevada product line provided machinery protection and condition monitoring for power generation trains for decades. Our comprehensive solution combines protection with state of the art condition monitoring hardware and software for trending, high speed data capture surrounding an alarm, as well as high speed data capture during start up, shut down, and overspeed conditions. By combining this functionality with additional Bently Nevada modules such as Thermodynamic Performance monitoring, Predictive Emissions Monitoring System (PEMS), and Decision Support capacities, we are able to help you manage these assets to meet your requirements.



## Gas compression trains

Compression trains are a critical component to the production facility. Bently Nevada solutions successfully protected and managed these trains for decades. Our solution set combines the protection from our 3500 System, with the management capabilities of System 1. Our modular approach allows you to select the solutions to meet your needs. Examples include Thermodynamic Performance monitoring and Decision Support capabilities. One such Decision Support module designed specifically for compression trains is the Dry Gas Seal RulePak. This solution allows System 1 to monitor and identify important issues related to the malfunction of Dry Gas Seals and effects related to the compressor train.



## Pumps

Pumps are plentiful and absolutely vital to the operation of platforms and FPSOs. Unfortunately, pump failures can impact more than just maintenance costs and production losses - they can result in fires that may be catastrophic to your operations and staff. Our solutions for monitoring pumps detect and address the mechanical and Thermodynamic Performance conditions that - when left unchecked - can lead to seal leaks, bearing destruction and other costly malfunctions. To ensure that an economical yet appropriate solution exists for the spectrum of pumps, we offer portable instruments, conventional wired systems for online monitoring, and innovative new wireless technology that makes the benefits of online monitoring economically feasible for a larger percentage of your assets by dramatically reducing installation costs.



## Piping

The effects of corrosion and erosion represent a significant challenge for the oil and gas industry. Corrosion and erosion conditions cost the industry billions of dollars each year. As significant as those challenges are for land-based facilities, they are compounded when working in the extremes of offshore environments. To help you address this vital part of your asset condition management program, we offer both online and portable capabilities for measuring piping wall thickness, corrosion rates, useful life remaining, rate of change, and other critical data to ascertain the overall integrity of your piping and other corrosion-prone assets.



## Valves

Valve integrity is a critical part of any asset management program. Faulty valves can result in not only undesirable environmental emissions and energy losses, but can also jeopardize safety. Particularly important are Pressure Relief Valves (PRVs), which are used as part of pressure relieving systems. Components of such systems can include both the PRV and associated rupture disks. Bently Nevada product line provides an innovative monitoring solution that can address both - allowing you to help assure the mechanical integrity of these vital components as well as environmental concerns.



## Electric motors

AC Motors - both fixed or variable speed - require a variety of specialized protection and condition monitoring solutions depending on criticality, horsepower, duty and the type of machinery they drive. For critical motor driven applications, such as re-injection pumps, compressors, cooling fans, etc; condition-monitoring techniques may include vibration, temperature, speed and phase measurements. A new and simple alternative for motors, especially those that are difficult to access or are submerged is AnomAlert\* Motor Anomaly Detector. This solution utilizes motor current and voltage transformers to build an operational model, from which real time and future condition can be assessed. The user interface will automatically advise on electrical AND mechanical anomalies associated with the motor and the driven load. Corrective action to the electrical supply, stator, rotor, bearings or abnormal load from clogged filters, for example, is available from AnomAlert.

# Comprehensive, globally available services



## Technical support agreements

A one-year renewable Technical Support Agreement (TSA) is automatically included with every product we sell. Its structure consolidates all products installed at your site under a single agreement for ease of administration and entitles you to phone, e-mail, and web-based support from our global network of experienced support experts.



## Machinery diagnostic services

Our more than 70 machinery diagnostic engineers around the world are recognized globally for their expertise in gathering and analyzing data to document baseline conditions and troubleshoot even the most vexing machinery problems.



## Remote monitoring and diagnostics

In many cases, traveling to site to perform machinery diagnostics and assess machinery health is a thing of the past. We can even work with your IT department to engineer remote connectivity solutions that are fully compliant with your corporate data network requirements.



## Supporting services agreements

A Supporting Services Agreement (SSA) is a custom-tailored combination of individual remote and site-based service offerings that addresses the unique needs of your site and your installation. We work with you as a partner to keep your instrumentation performing optimally at all times and to provide hands-on assistance that helps you realize the full potential of your condition monitoring system.



## Training

Our customers routinely praise our in-depth technical training for its highly effective "learn by doing" labs coupled with classroom-style instruction. A comprehensive suite of product training courses is augmented by courses that teach the fundamentals of rotating machinery behavior and diagnostic techniques. Our courses can be provided at any of our global training centers or even brought to your site.



## Design and installation services

We can provide comprehensive project management services to install and configure our solutions, document the installation, contract and manage site craft labor, and more. You determine the scope, from simple installation consulting to full turnkey services to everything in between. Integration with your existing systems is our specialty, whether to a unit control, DCS or historian.



## Reliability services

We provide our customers with the tools, processes, and methodologies to identify and implement the proper condition monitoring technologies, strategies and predictive services for all maintainable assets required to meet their specific maintenance and operational goals.

- Outstanding Safety Record
- Global Experience
- Local Presence in 40+ Countries
- Deep Application Expertise
- 24/7/365 Technical Support
- Thermodynamic and Rotordynamic Expertise
- Remote Service Capabilities – Move Data, Not People\*
- Complete Turnkey Installation Capabilities
- 50+ Years of Condition Monitoring Innovations

For more information about Bently Nevada Machinery Condition Monitoring solutions for refineries, contact your local Bently Nevada sales professional or visit us online at [bently.com](https://www.bently.com)

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