Plant-wide Condition Monitoring Solutions
Something for every Asset
In addition to the most important assets found in industrial facilities, there are often a host of “supporting” assets that make up the balance of the plant such as pumps, motors, blowers, heat exchangers, fans, and others. This auxiliary or plant-wide equipment may be spared or unspared, and its impact on the process stream may vary from moderate to minor. Regardless, such machines—just like their more highly important counterparts—can benefit from condition monitoring. Bently Nevada provides affordable, effective portable and permanent condition monitoring platforms for these assets connected to Bently Nevada’s common System 1 software—proven solutions that are delivering tangible benefits for tens of thousands of customers around the globe.

Financial Justification
For many assets, failure can mean substantial or total loss of production, often worth millions per day. Or it can lead to the release of hazardous substances, fires, and even explosions—resulting in a severe safety hazard as well as fines for violating environmental regulations.

Maintenance Costs
When viewed on a per-asset basis, maintenance costs for plant-wide assets can appear modest. However, when viewed collectively across the dozens, hundreds, or even thousands of assets in a typical plant, these costs can be appreciable. Reducing the maintenance costs on each asset through effective condition monitoring—even by a mere 10%—has a large impact on plant profitability. Condition Monitoring is a planning tool that allows more effective insight in planning and asset management, allowing maintenance to be done in advance of a functional failure.

- 90% of failures are NOT time-based
- +25% Production
- -70% Machinery Breakdowns
- -40% Downtime
- -50% Maintenance Costs
- 50% Site maintenance and reliability as a top priority
- 50% Of workforce to retire in the next 5 to 10 years. Knowledge & experience is not being transferred
- 60% Estimated increase in EHS spending among global E&P companies
- 6x the cost for unplanned events vs. planned maintenance in process industries

A move towards Predictive Maintenance

Why Bently Nevada?
We have earned your trust. For six decades, Bently Nevada product line has supported the most demanding applications in multiple industries, from oil and gas, power generation and industrial markets. And even as we protect and monitor your most critical machinery, we constantly strive to refine and improve our offerings—and help enable your success.

We design and deliver solutions for all of your monitoring needs—including sensors, portable analyzers, distributed and rack-based monitors, software, and supporting services—with the following goals in mind:
- Increased availability and production
- Lowered maintenance costs
- Reduced risk in terms of safety, environmental, and asset upsets

And we have impressive statistics to back up our extensive experience:
- More than 240 international patents issued, including over 150 in the US
- More than 360 international patents pending, including over 95 in the US
- Over 100,000 monitoring systems installed globally
- 4MM+ sensors installed globally
- 10k+ Overspeed protection systems installed globally

Certified field engineers

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Certified field engineers
SCOUT* and COMMTEST* Family of Portable Instruments – Offline, Route-Based Data Collection and Analysis

Not every asset is best addressed by online monitoring. For some, a portable approach is ideal, allowing operators, machinery specialists, and others to collect data at regular intervals and on-demand. Bently Nevada offers a wide range of data collection instruments to meet your needs, all fully compatible with our industry leading System 1 condition monitoring software. These feature rich data collectors come in multiple form factors; a traditional instrument with buttons-based user interface and a revolutionary Android smartphone/tablet interface to open up Wifi, cellular and Bluetooth networks.

**SCOUT 200 Series**
Bently Nevada’s SCOUT200 series is comprised of easy to use, small form-factor portable vibration data collectors. The SCOUT220-IS (2 channel) and SCOUT240-IS (4 channel) are Intrinsically Safe (IS) hazardous-rated portable data collector designed for ATEX Zone 1 and CSA Class 1 Zone 1 hazardous areas.

The SCOUT200 series represents the next generation of smarter, intrinsically safe portable data collectors from Bently Nevada. The SCOUT200 Series comes with a choice of industrial handheld devices which eliminates the need for a PC or other software packages at the data collection site. Fully supported by System 1 condition monitoring and diagnostic software, the SCOUT200 series integrates with your suite of Bently Nevada portable and monitoring products for a comprehensive condition based maintenance solution.

**COMMTEST 200 Series**
The COMMTEST220 (2 channel) and COMMTEST240 (4 channel) share the same performance and functionality specifications as the SCOUT220/240-IS but without the hazardous area rating and at a lower cost.

**vbx and SCOUT 100 Series**
Bently Nevada’s SCOUT and vbSeries* portable vibration analyzer instruments are built to robust professional standards, with thousands of users globally today. SCOUT models are certified for an ATEX Zone 2 hazardous rating, whereas the vb series models are rated for CSA Class 1, Division 2.
**Intrinsically Safe**

SCOUT 200 series are Intrinsically Safe, no need for a hot work permit.

**Multipurpose Device**

COMMTEST and SCOUT 200 series accommodate the Android OS – Additional apps and functionality can be added to your smartphone or tablet.

**6Pack Data Collection**

With a press of a button, capture twelve readings simultaneously (dual channel) with spectrum and waveform of:
- Normal Frequencies
- High Frequencies
- Demodulation

**Configuration Wizard**

Technical Associates of Charlotte’s “Proven Method” with ISO 2372 & 10816 alarming methodology. 30,000+ bearing database.

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### SCOUT and COMMTEST Family of Portable Instruments Feature Comparison

<table>
<thead>
<tr>
<th>Key Feature/ Function</th>
<th>vb7</th>
<th>vb8</th>
<th>SCOUT100-EX</th>
<th>SCOUT140-EX</th>
<th>COMMTEST 220</th>
<th>COMMTEST 240</th>
<th>SCOUT 220</th>
<th>SCOUT 240</th>
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<tr>
<td>Channels</td>
<td>2</td>
<td>4</td>
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<td>4</td>
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<td>4</td>
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<td>4</td>
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<tr>
<td>Fmax (Max)</td>
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<td>80 KHz</td>
<td>40 KHz</td>
<td>80 KHz</td>
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<td>Lines of Resolution</td>
<td>6,400</td>
<td>12,800</td>
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<td>12,800</td>
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<td>12,800</td>
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<tr>
<td>System 1</td>
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<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
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<tr>
<td>Cellular, Wifi &amp; Bluetooth</td>
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<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
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<tr>
<td>Integrated Camera w/ color display</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
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<td>✔</td>
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<tr>
<td>Tri-axial sensor</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>Coming Soon</td>
<td>Coming Soon</td>
<td>Coming Soon</td>
<td>Coming Soon</td>
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<tr>
<td>Signal Processing</td>
<td>6Pack Demodulation</td>
<td>6Pack Demodulation</td>
<td>6Pack Demodulation</td>
<td>6Pack Demodulation</td>
<td>6Pack Classic/Peak Demodulation</td>
<td>6Pack Classic/Peak Demodulation</td>
<td>6Pack Classic/Peak Demodulation</td>
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<tr>
<td>Balancing</td>
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<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Coming Soon</td>
<td>Coming Soon</td>
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<tr>
<td>Hazardous Area Ratings</td>
<td>CSA C1 Div2</td>
<td>CSA C1 Div2</td>
<td>ATEX Zone 2</td>
<td>ATEX Zone 2</td>
<td>General Purpose</td>
<td>General Purpose</td>
<td>ATEX Zone 1 &amp; 21</td>
<td>CSA C1 Div1 Grp A,B,C,D,E,F</td>
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<td>Memory</td>
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<td>1GB</td>
<td>16GB Expandable</td>
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<tr>
<td>Warranty</td>
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<td>5 year</td>
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<td>5 year</td>
<td>5 year</td>
<td>5 year</td>
<td>5 year</td>
<td>5 year</td>
</tr>
</tbody>
</table>
The 3500 and ADAPT flagship platforms are our most flexible and feature rich machinery protection and condition monitoring systems, which can be utilized on any type of machinery in any industry. Our 3701 ADAPT distributed architecture builds on the rich features of 3500, designed for specific applications with built in machine-specific algorithms. With a smaller footprint, the ADAPT platform is typically installed on the machine skid, ideal for OEM’s.

Certifications
Both of these platforms combine over five decades of condition monitoring expertise, designed to fully comply with the American Petroleum Institute’s Standard API 670, the world’s most widely used specification for machinery protection systems. For reciprocating compressor applications, the 3500 meets API 618 requirements as well. These systems can be ordered with DNV and Class NK certifications for maritime applications such as offshore platforms and ship propulsion. Further, used as part of a safety instrumented system, TÜV Functional Safety Certification can be supplied for applications requiring up to Safety Integrity Level (SIL) 3. In addition, the 3500 is approved to meet relevant Canadian Standards Association (CSA), Factory Mutual (FM), GOST, ATEX, and CE requirements.

Reliable
We understand that our systems are routinely used not just for indication, but to provide auto-shutdown protection. That’s why – even in simplex mode – the 3500 and ADAPT are the most reliable monitoring systems we have ever offered with extensive self checking and fault tolerant design features. It’s also why the system can be configured with various levels of redundancy, ranging from the addition of a second fully redundant power supply to complete triple modular redundant (TMR) configuration of selected or all channels - allowing even your most mission-critical applications to be addressed with confidence.

Connected
Connecting to condition monitoring and diagnostic software has never been easier. With the 3500 and ADAPT there are no bulky external modules, no additional wiring, and no extra rack slots required. Simply use the Ethernet port on the system module and a single network cable to communicate with our System 1* software. Connecting to plant control and automation systems is straightforward as well. Simply add a communication gateway interface. You can even add multiple gateways when communication redundancy is required or when multiple systems must be supported with differing protocols.

Flexible
The 3500 and ADAPT Series features the industry’s most extensive selection of machinery measurement parameters combined with software configuration for virtually all monitor options. A variety of locally or remotely mounted displays are available, or you can operate the 3500 or ADAPT without a display. The result is unparalleled flexibility to address almost any application.

Field Proven
The 3500 and ADAPT Series systems have proven its value and dependability with customers everywhere, year after year with more than 90,000+ racks are installed globally.

Sensors, Probes and Transducers
Bently Nevada’s vibration sensors, position sensors, speed sensors, pressure sensors and power sensors or transmitters, and rugged probes of various tip diameters and thread sizes/configurations. Our sensor, probe and transducer solutions are built on a legacy of premier condition monitoring from heritage companies like Druck, Bently Nevada and Naxys and are designed to last even in the harshest industrial environments.
1900/65A and 2300 – Affordable, Continuous Vibration and Temperature Monitoring

For the assets in your plant that warrant continuous monitoring and/or machinery protection 24/7, but not the channel count, features and costs associated with a conventional rack-based system, the Bently Nevada 1900/65A and 2300 Small Machine Monitor is the right fit.

The 1900/65A and 2300 are stand-alone, self-contained packages incorporating the functionality and integrity necessary for auto-shutdown protection of general purpose machinery. 1900/65A has a compact 8-channel design that accepts up to four vibration (proximity, accelerometer and velocity) and four temperature inputs. The 2300 has a compact 3-channel design that accepts up to two vibration inputs (proximity, accelerometer and velocity), one speed or three process variable inputs in any combination. Both these platforms provide the level of alarming programmability, configuration flexibility, and signal processing normally associated with larger, more expensive systems.

Both platforms contain 4-20mA outputs and ability to communicate via Modbus over Ethernet back to the plant historian for trending and integration to plant historians and DCS systems.

Certifications, Installation and Field Installation

Both these platforms are designed and contain ratings (Class 1, Div 2 and ATEX Zone 2) to be installed near the machinery, with the optional fiberglass housing, weatherproof installation requirements can be easily addressed to meet IP66 ratings. The local displays will allow operators to verify vibration data while in the unit and predictive maintenance teams can connect to the BNC connectors on the front of the unit for further data collection through a portable data analyzer.

Diagnostic Capabilities

In addition to the built in alarming capabilities at the hardware level, the 2300 monitoring system can connect to our System 1 Condition Monitoring platform through our Advanced Package. System 1 expands the value of the monitoring platform by capturing rich dynamic data that can be used to capture machine events and proactively understand the machines conditions prior to hardware alarms.

AnomAlert* Motor Anomaly Detection

AnomAlert Motor Anomaly Detectors continuously identify existing and developing faults on electric motors and their driven equipment. AnomAlert utilizes an intelligent, model-based approach to provide anomaly detection by measuring the current and voltage signals from the electrical supply to the motor. It is permanently mounted, generally in the motor control center and is applicable to 3-Ø AC, induction or synchronous, fixed or variable speed motors. Accompanying AnomAlert Software is used to view the data.

AnomAlert provides both mechanical (unbalance, misalignment, roller bearings, etc.) and electrical (loose windings, short circuits, etc.) anomaly detection as well as electrical parameters such as voltage and current imbalances and power factor. In addition, it can detect changes in the load the motor is experiencing due to anomalies in the driven equipment or process such as cavitations or plugged filters and screens. Since it doesn’t require any sensor installation on the motor itself or associated load, AnomAlert is especially attractive for inaccessible driven equipment and is applicable to most types of pumps, compressors, and similar loads.
vbOnline* Pro, Trendmaster* Pro and Ranger* Pro – Online Scanning Condition Monitoring at a Fraction of the Price

While all machinery may not warrant continuous, dedicated machinery protection such as from Bently Nevada 3500, 2300, ADAPT or 1900/65A Monitoring Systems, they require more frequent surveillance than the weekly, monthly, or quarterly rounds generally made with a portable data collection program. Getting Actionable Information to operations in a timely manner so that corrective action can be taken results in huge preventive savings. The Trendmaster Pro, Ranger Pro and vbOnline Pro each have unique features and capabilities for the wide range of assets and locations around your plant.

vbOnline Pro

While the Trendmaster Pro system allows for up to 256 various sensors to be connected in series to provide periodic data collection, the vbOnline Pro has twelve channels that can accommodate 2-wire acceleration measurements, all sampled simultaneously along with two channels dedicated to speed. The vbOnline Pro system is more appropriately applied to a grouping of machines or larger machine trains with roller element bearings and gearboxes, where machinery protection is not warranted. The vbOnline Pro has a built in buffer to store event information before, during and after events, which is then sent over the network to our System 1 software platform. This buffer will capture data in the event the network connection is lost, allowing the platform to be ideally situated for hard to reach and wireless communication methods.

The vbOnline Pro provides dual Ethernet connections to System 1 and to transmit overall values to the plant DCS via Modbus. The system can be configured for state based applications to alarm and pinpoint bearing fault frequencies on variable speed applications. The vbOnline Pro also has built in patented algorithms to detect fault modes on complex gearboxes, in addition to high and low speed bearing defect detection.

<table>
<thead>
<tr>
<th>Key Feature/Function</th>
<th>vbOnline Pro</th>
<th>Trendmaster</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Input Channels</strong></td>
<td>12x vibration 2x Speed</td>
<td>Up to 255 sensors per SPA line</td>
</tr>
<tr>
<td><strong>Vibration input types</strong></td>
<td>2 wire accel Keyphasor*</td>
<td>Accel, Velocity, Proximity, Pressure, Speed &amp; Temperature</td>
</tr>
<tr>
<td><strong>Outputs</strong></td>
<td>Dual Ethernet Modbus</td>
<td>Ethernet Modbus</td>
</tr>
<tr>
<td><strong>System 1 (Dynamic Data)</strong></td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td><strong>Signal Processing</strong></td>
<td>Acceleration Enveloping</td>
<td>Acceleration Enveloping</td>
</tr>
<tr>
<td><strong>Hazardous Area Ratings</strong></td>
<td>CSA C11 Div2 ATEX Zone 2</td>
<td>CSA C11 Div2 ATEX Zone 0</td>
</tr>
<tr>
<td><strong>Warranty</strong></td>
<td>3 year</td>
<td>3 year</td>
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</tbody>
</table>

Trendmaster Pro

The Bently Nevada Trendmaster Pro System has been validated by thousands of customers and is specifically designed to address Zone 0 applications. Using an innovative “sensor bus” architecture, a single cable can host hundreds of permanently mounted sensors ranging from pressure to vibration, temperature to seal leak, and virtually any other compatible signal up to 4000 ft.

Compact, centralized signal processing stations, known as Dynamic Scanning Modules (DSMs) are strategically placed throughout your plant and accept from one to six sensor bus cables, resulting in a distributed network of condition monitoring sensors. All sensors on each bus are polled sequentially every few minutes, allowing the system to collect condition monitoring data from thousands of connected points, yet without the installation and hardware costs associated with traditional, centralized architectures relying on point-to-point wiring rather than a distributed bus. Wireless Ethernet connectivity can be implemented for timely, cost effective installations.

Although the Trendmaster Pro System can accept signals from virtually any commercially available sensor or monitoring device, a wide range of special vibration, temperature, seal leak, pressure, and other sensors have been specially developed to complement the system. These sensors offer the ideal balance of robustness, ease of installation, and low cost, allowing the benefits of permanent monitoring while remaining highly affordable.
Ranger Pro Features

- ATEX/IECEx Zone 0 (Ia IIC T4) Class 1 Div 1
- Truly wireless: sensors embedded in package
- Velocity (5-1kHz), Acceleration (5-10kHz)
- ISA100 Wireless Network Protocol
- Replaceable lithium-thionyl chloride battery
- IP67 hermetically sealed electronics
- Class 1, Division 1, Groups A,B,C,D
- IECEx and ATEX Zone 1
- Temperature: -20°C to +85°C
- Modbus for static values
- Range: 200 meters (line of sight)
- Security: 128-bit AES encryption
- Battery life: up to 5 years
- System 1 Connectivity

Ranger Pro Wireless

The wireless sensor Ranger Pro is available in a single or triaxial form to measure velocity, acceleration and casing temperature. Ranger Pro provides a simple and easy to implement solution for use in hazardous (Class 1 Div 1 or ATEX Zone 1) or hard-to-reach environments where wired solutions are impractical or cost prohibitive. You no longer have to traverse and collect data from each unit and address the safety aspects of data collection in hard to reach or hazardous environments. This technology allows your qualified personal to spend time analyzing data based nearly real-time information, versus spending time capturing data in the field on healthy assets.
**System 1 – Improve Equipment Reliability, Uptime and Efficiency**

System 1 represents Bently Nevada’s flagship condition monitoring solution that seamlessly integrates with our industry leading products including online and portable devices. System 1 provides scalability by adapting to the condition monitoring requirements at your facility, as well as flexibility by connecting to any Bently Nevada field devices. Our products are designed for diverse applications and equipment failure modes at industrial facilities. We offer flexible packages ranging from portable to comprehensive plant-wide condition monitoring. We recommend understanding your equipment and defining your operation and maintenance goals first. Then, choose the software package and field devices that help you achieve those goals.

**User Experience**

Modern consumer software applications have pushed the envelope when it comes to user experience; we believe the same expectations apply for industrial Condition monitoring applications:

- Modern and intuitive interface
- Continuous user involvement
- User driven condition monitoring and diagnostic workflows

**Capability**

System 1 provides scale when it comes to database management, diagnostics, and work prioritization:

- High resolution trend, alarm and startup/shutdown data
- Bulk template configuration
- Best in-class rolling element and hydrodynamic bearing diagnostics

**Accessibility**

Successful Condition monitoring programs require collaboration between departments and controlled access to the tools:

- Distributed client/server deployment model
- Data replication to view data on a business network
- Remote portable data transfer
- User security profiles

**Embedded Expertise**

Bently Nevada differentiates itself by providing equipment focused solutions and best practice configuration and diagnostics:

- Equipment templates
- Technical Associates proven method wizard
- Embedded iso 10816-3, 10816-7, and 14694 wizards
Bently Nevada Architecture – One Solution, Endless Possibilities

Bently Nevada machine condition monitoring solutions combine advanced hardware, intelligent software and trusted service and support – providing a broader, connected view of your operations. Together, they enable you to mitigate risk, boost safety and reduce maintenance costs. From highly critical to less critical equipment, our technology enables better data collection and improved insights across your operations.
Services and support

**Design and Installation**
Let our experts help retrofit or modify your existing machinery (such as turbines, compressors, and fans) for the installation of monitoring systems or transducers. By combining our services with our hardware and software, Bently Nevada delivers fully installed, fully engineered solutions tailored to your specific requirements. We have completed more than 1,000 design and installation project retrofits to rotating and reciprocating machinery.

**Maintenance and Support Agreements**
A one-year renewable Maintenance and Support Agreements (M&S Agreements) 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, email, and Web-based support from our global network of experienced support experts.

**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 to help your instrumentation to perform well and to provide hands-on assistance that allows you to realize the full potential of your condition monitoring system.

Your SSA can include remote monitoring and diagnostic (RM&D) services to help your facility managers and operators recognize problems before they occur. Our dedicated team of global engineers is available 24/7 in our Remote Monitoring Centers to provide timely machine health information, analysis, and collaborative resolutions that help you realize lower project costs, reduce your outage costs, and improve your bottom line.

**Machinery and Diagnostics Services (MDS)**
Our more than 150 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 complex machinery problems. They can work onsite, offsite, and in our Remote Monitoring Centers.

**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 coursework in the fundamentals of rotating machinery behavior and diagnostic techniques. Our courses can be provided at any of our 50 global training centers or even brought to your site.