



**How can we help make
your turnaround more
efficient and effective?**

As you prepare for turnaround season, Bently Nevada's experienced Services team can help you with the following:

- Conduct a customized site survey.
- Generate a variety of detailed condition monitoring reports.
- Assess your machinery and other equipment assets.
- Provide specific turnaround activities.

Site survey

Site surveys are performed to verify suggested parts lists, provide technical recommendations and monitoring system firmware review, which would be the first step to ensuring you have a productive and effective turnaround encompassing all your critical assets.

Spare parts assessment

- Provides detailed overview of all recommended spare parts.
- Helps ensure that required spares are available when you need them with proper planning so that instrumentation and monitoring rack issues do not cause unnecessary delays to the turnaround.
- Requires access to all transducers, junction boxes and monitoring systems.

Technical recommendations

- Offers detailed review of Bently Nevada Technical Information Letters (TILs).
- Reports are issued for all necessary recommendations.
- Delivers notifications and information on all known issues.
- Provides clear description of any issues, plus advisory and/or technical recommendations on how to resolve.
- Appropriate TILs brought to attention of the customer-nominated authority to develop action plan.

Monitoring system firmware review

- Review version of Bently Nevada system firmware and recommendations on critical updates and feature enhancements.
- Maintains monitoring systems to latest versions of firmware.

Machinery health reports

Machinery health reports provide insight on the asset condition during startup and normal operation after the turnaround.

Machinery health report (pre-turnaround)

- Performed while machine is running in steady state.
- Includes review of historical data.
- Provides detailed analysis of rotor dynamic behavior and includes recommended actions for the turnaround.
- Includes comprehensive evaluation of current machine conditions, and provides insight into general machine health.



- Identifies machinery and equipment/system malfunctions, eliminating surprises when machine is disassembled during turnaround.

Machine shutdown report

- Performed as the machine is shutting down.
- Includes detailed machinery shutdown data analysis.
- Transient data provides information that is difficult to detect in steady state conditions, especially when historical data is unavailable.
- Transient data is used to evaluate the static forces acting on the shaft.
- Helps evaluate malfunctions like shaft cracks, misalignments and rubs, etc.

Machine startup report

- Performed as machine is starting up.
- Offers real-time support and data evaluation during startup.
- Identifies any machinery or equipment malfunctions.
- Includes recommendations about safe operation of the machine.
- Includes preliminary evaluation of turnaround quality.
- Rotating Machinery experts and Systems Engineers available to assist during machine startup (either onsite or remote).
- In-situ balancing of the unit as and when needed basis to avoid downtime of the assets.

Machine baseline report (post-turnaround)

- Performed while machine is running at normal operating speeds.
- Includes comparisons to pre-turnaround baseline data.
- Includes detailed analysis of rotor dynamic behavior.
- Includes comprehensive evaluation of current machine conditions, and insight into general machine health.
- Verifies turnaround work has achieved desired result and no underlying malfunctions exist.
- Documents baseline condition for future audits.

Pre/post-turnaround assessment services

Assessment services assist in planning the appropriate work to be performed on each asset based on its condition. A pre-turnaround assessment is normally scheduled three to six months prior to the turnaround, allowing you adequate time to evaluate the report's recommendations without jeopardizing schedules and deadlines. To evaluate the effectiveness of the maintenance performed during the turnaround, it is also highly recommended to conduct a post-turnaround assessment to document results. This is generally performed during startup.

The turnaround assessment...

- Service reports with outage documentation, test results and information
- Helps to identify necessary maintenance and avoid unnecessary maintenance.
- Focuses on actionable information – what to work on, why to work on it, its relative priority, and root cause.
- Includes Rotor dynamic analysis (shaft/casing/foundation vibration as appropriate and startup/shutdown data analysis).
- Includes thermodynamic performance analysis (if applicable performance package is available).
- In-situ balancing of rotating machines.
- Can be custom-tailored to fit unique assets and situations.
- Includes comprehensive documentation of Bently Nevada systems (monitoring & transducers along with PNs & SNs) provided via Turnaround Assessment Service Report.



Turnaround field services

Recommended activities in turnarounds consist of an overall health check of your primary monitoring system to verify that is in optimum working condition, plus verification, removal, and re-installation (as needed) for all transducer systems throughout the entire plant. The table below provides a list of activities typically performed in turnaround by our services team:

Field instrumentation

Ensuring Proximity Transducer System components compatibility.

Visual inspection of field instrumentation to verify physical integrity (wear, tear and scratches).

Calibration and linearity checks of vibration points to verify the integrity of the installed systems in the field.

Performing loop checks using proper and calibrated test equipment (TK-3e and Shaker Table).

Installation and gapping of proximity probes as per vendor best practices.

Zero-Adjustment of axial displacement probes in coordination with plant mechanical team.

3500 Systems (and other BN monitoring systems)

Audit Rack Configuration as per vendor best practices.

Collecting system events/alarms and information for analysis.

Perform self-test for all monitors to verify all are in healthy condition.

Upgrade the firmware of the monitor (if applicable).

Testing system hardware for any faults and correct if any (rack modules, wiring connection in rack modules, and server connectivity to the system).

Grounding checking for all MMS cabinets (will perform the pre-power up checks, grounding checks, and shield termination checks).

Take complete backup.

System 1

Fine tuning of System1 server for data collection sampling rates and resolutions.

Perform optimization of the historical database to ensure the availability of quality data with enough storage time span.

Data synchronization between 3500 racks and System1.

Startup support (to verify all BN instruments are installed and function properly).

Mechanical health assessment of the assets.

Start-up support

Instrumentation startup support to ensure proper functionality of all Bently Nevada systems.

Machinery Diagnostics Start-up support to check machinery health conditions to provide unbiased recommendations.

System hardening services

System1 servers will undergo a series of hardening procedures to maintain a secure environment, protecting against cyber attacks or other threats. This service will require a valid M&S agreement. The following activities shall be performed by Seller:

Hardening of network switches within the VMS (vibration monitoring system) network. Devices outside the VMS network are not part of Seller scope in this proposal.

Hardening of System1 servers as per Seller's recommended Best Practices in compliance to Buyer's applicable standards.

Installation of Windows updates and security patches as approved by seller for the platform software. Thereafter Bently Nevada will provide updated list of approved OS patches on monthly basis.

Supporting antivirus update service and scanning/rectification.

Supporting services for RBAC (role-based access control) applicable to all Bently Nevada software.

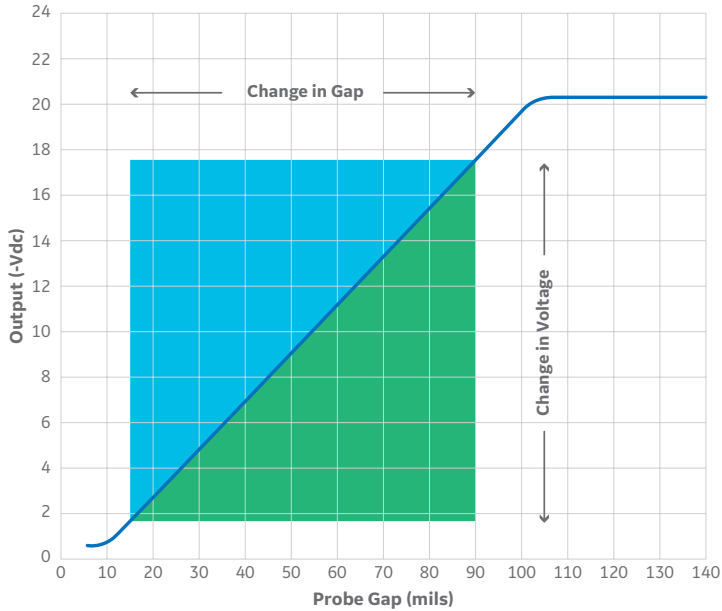
Post hardening completion security baseline report.

Significance of turnaround activities

Significance of linear and fully compatible system

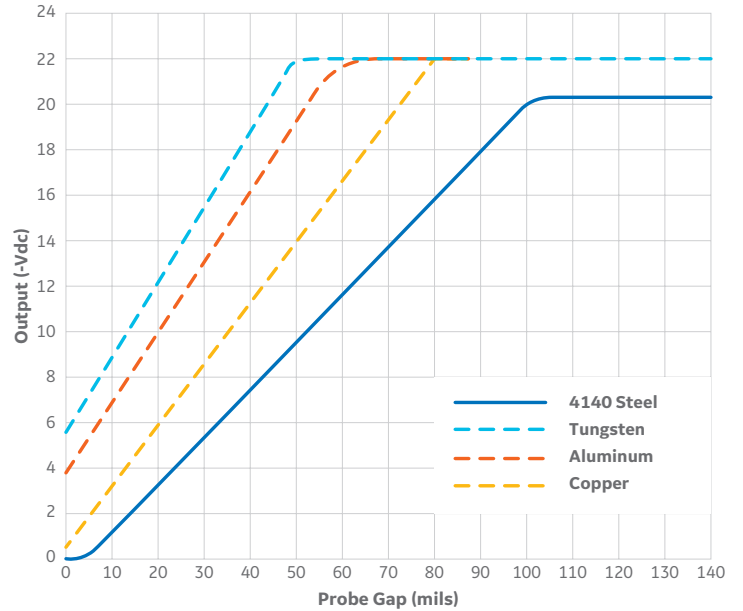
Probe response curve

Operational verification



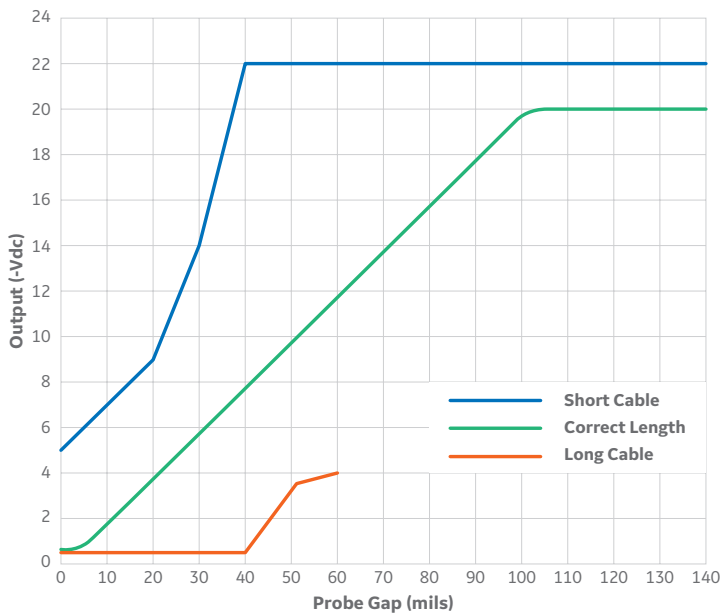
Inappropriate target material

Measurement error sources – transducer system



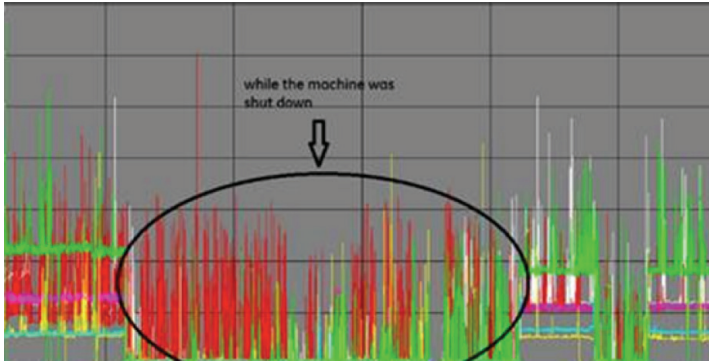
Mismatched components

Measurement error sources – transducer system



Significance of proper grounding

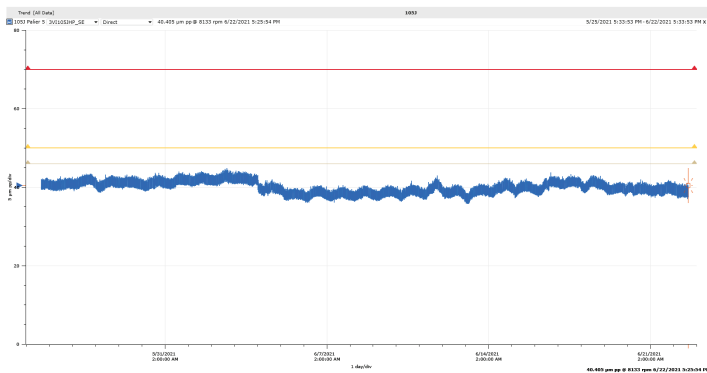
System having ground faults



Healthy grounding



Significance of optimized System 1

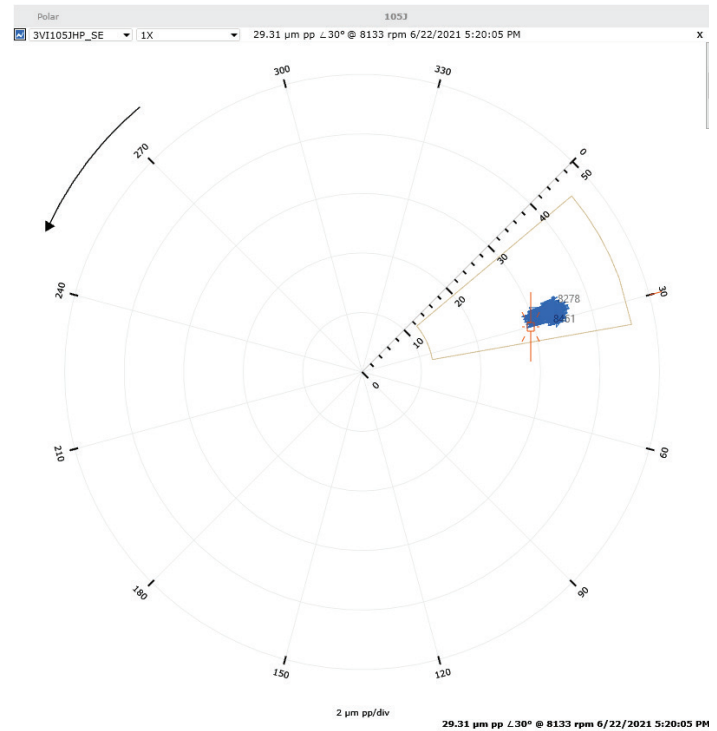


Alarming

Acceptance regions:

Used for changes in vectors 1X, 2X (and odd harmonics in System 1)

– 4 severity levels



Reference data

- Waveform references
- Gap voltage references
- Slow roll references
- Transient overlays

