Bently Nevada
a Baker Hughes business

Condition monitoring solutions for steel and other metals industry

The opportunity

Steel and other metals significantly impact our lives. From the vehicles we drive, the buildings we dwell and work in, the bridges we travel over, to the planes we fly in, and many other applications and many other uses, steel and metal are integral parts of our society. As steel and metal have grown in demand, so has the competitive production landscape. Thus, metal and steel producers strive to improve operational reliability, efficiency and profitability, and remain viable in the competitive global market.

The challenge

As a result of the changing competitive landscape, metal production's reliance upon its machinery has never been more important. Downtime is more expensive and uptime is more valuable. Operators need to maximize asset availability and output while optimizing processes to reduce maintenance costs. The risk of unplanned downtime and its spiraling costs must be mitigated and managed proactively. Most importantly, operators need to remain safe—for their families, communities, and the environment.

In steel and metal operations, reactive, time-based maintenance approaches create higher order maintenance costs and increased risk levels. Thus, maintenance represents an underleveraged opportunity, ripe for operational optimization with proactive maintenance via condition monitoring solutions.

The solution

Proactive maintenance via condition monitoring solutions enables steel and metal operations to use data-driven insights to manage operations and reach the proper balance point across competing priorities:

Outcome	Enabler
Maximize 'smart' uptime →	Understanding asset health, asset life
Minimize downtime →	Preventing unplanned downtime **before** it occurs
Ensure/enhance safety →	Automating machine monitoring to reduce risk
Meet regulatory compliance →	Tracking key metrics
Minimize maintenance costs →	Repairs are made at the lowest possible cost by scheduling them during planned outages and before any damage escalates prior to full failure

Condition monitoring

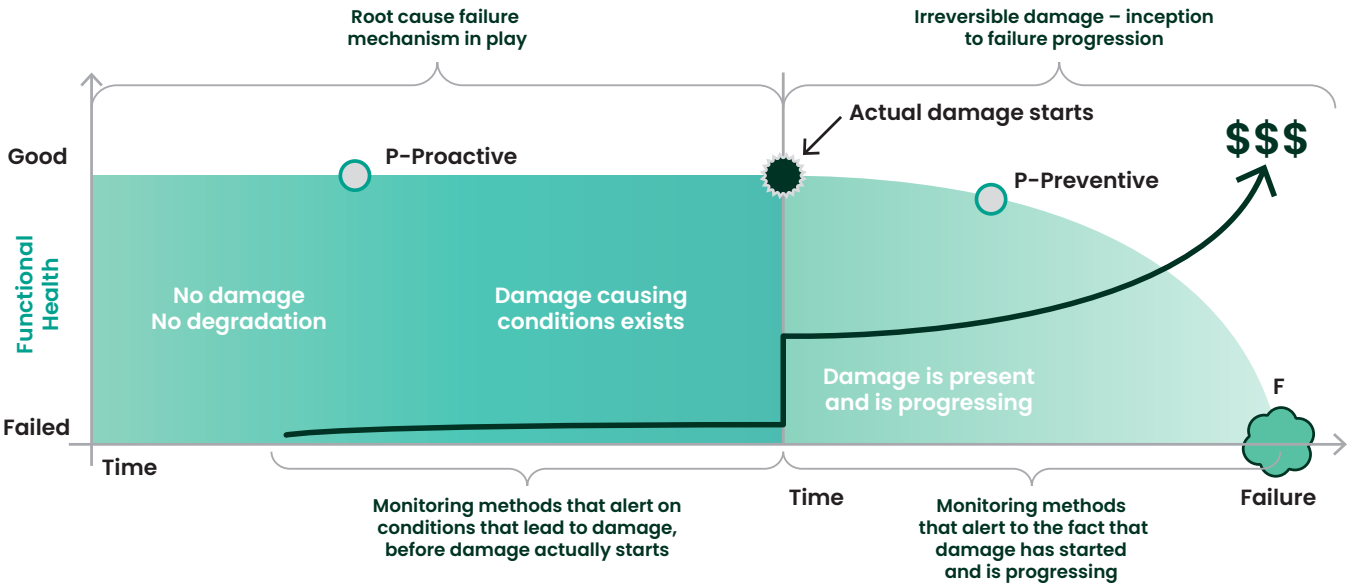
Condition monitoring obsoletes reactive, time-based maintenance approaches which are based on calendar intervals or running hours. Time-based approaches are only valid for about 15% of operational assets, and are poor "predictors" of failure for many assets, resulting in two major issues. First, the majority of assets are getting "maintained" when they don't need to be, creating a wasteful overspend in maintenance. Second, time-based approaches do not prevent full failures and can allow asset issues to escalate to unplanned downtime, causing costs to escalate in kind.

Failure is a process

By contrast, condition monitoring supports a proactive approach, based on the premise that failure is a process, not an event. The extended P-F curve depicts this concept by delineating a distinct span of time between the potential for failure and functional failure.

Potential for failure is detected via asset health monitoring that measures properties, such as vibration, temperature, efficiency, oil chemistry/particulates, and other physical parameters. Together with tailored algorithms, customized configurations, and set points, these parameters can identify both root cause failure mechanisms in progress, as well as irreversible physical damage that has already started. As a result, failure can be averted, sound data-driven decisions can be made and repairs can be scheduled at the most advantageous times and lowest possible costs.

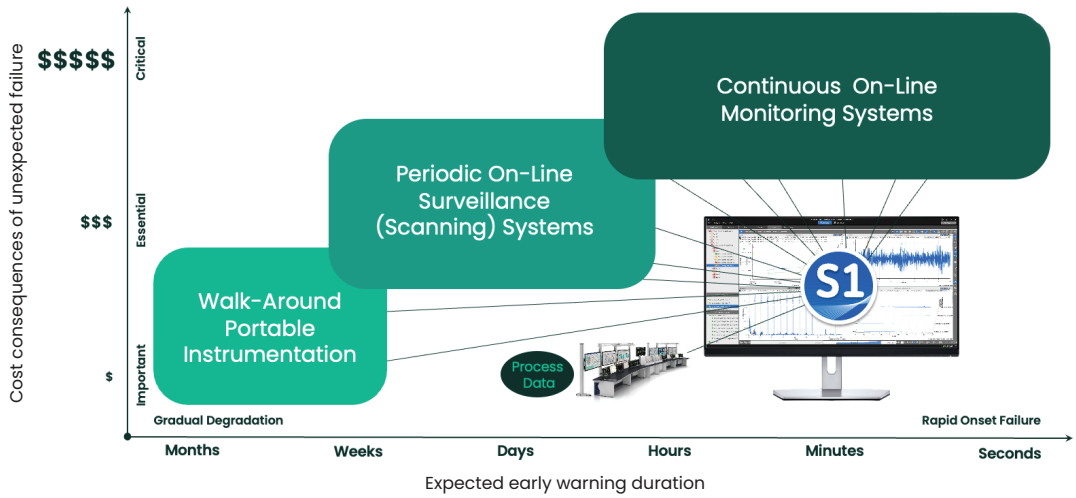
The Extended P-F Curve



Source: "Reliability-Centered Maintenance" by John Moubray, 1992.

Consequence-based technology implementation

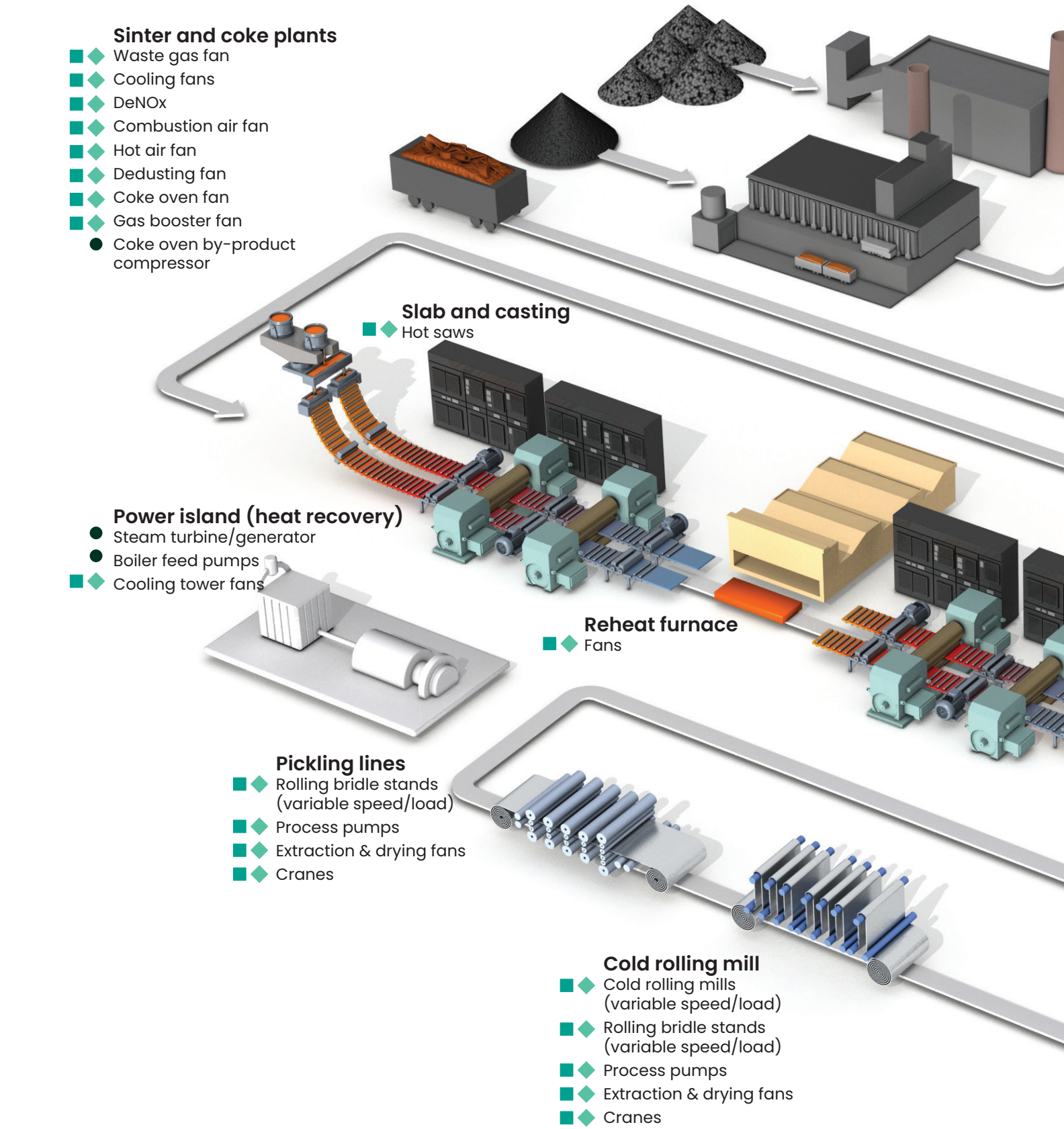
In terms of proactive condition monitoring, all assets are not created equal. Each asset has its own warning duration before failure. Also, asset failure can result in varying consequences, described below as Important, Essential, and Critical. For critical assets with shorter warning durations, operators monitor their performance with a continuous, on-line condition monitoring system. For essential assets with a longer warning duration, periodic on-line systems work well. Lastly, important assets that also have a longer warning duration are typically monitored with walk-around portable devices. Matching asset characteristics and impact on production is important for aligning the proper condition monitoring approach and achieving production optimization.



Bently Nevada helps customers get started

In steel and metal manufacturing, unreliable and underperforming assets have enormous consequences. Industry studies show that the average facility spends approximately 5% of its Replacement Asset Value (RAV) on maintenance each year. In comparison, best performers spend 60% less—just 2% of RAV—while enjoying better uptime, efficiency, and profitability. It's not simply about spending less on maintenance, it's about working differently—and smarter—to achieve more reliable steel and metal operations.

Bently Nevada solutions for integrated steel and other metal manufacturing plant



Sinter and coke plants
- Waste gas fan
- Cooling fans
- DeNOx
- Combustion air fan
- Hot air fan
- Dedusting fan
- Coke oven fan
- Gas booster fan
- Coke oven by-product compressor

Slab and casting
- Hot saws

Power island (heat recovery)
- Steam turbine/generator
- Boiler feed pumps
- Cooling tower fans

Reheat furnace
- Fans

Pickling lines
- Rolling bridle stands (variable speed/load)
- Process pumps
- Extraction & drying fans
- Cranes

Cold rolling mill
- Cold rolling mills (variable speed/load)
- Rolling bridle stands (variable speed/load)
- Process pumps
- Extraction & drying fans
- Cranes

CMMS/ERP System

Plant Data Network

S1

System 1*
Condition Monitoring Software

Continuous On Line Monitoring

Orbit 60

ADAPT 3701/40

2300 Series

AnomAlert

Scanning On Line Monitoring

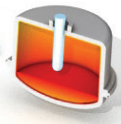
vbOnline Pro

Ranger Pro

Off Line Route Based Portable Data Collection

SCOUT 100, VBx series and COMMTEST/SCOUT 220/240

Blast furnace
Extraction & cooling fans
Conveyor



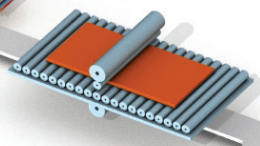
Oxygen furnace
Process fans

Arc furnace
Fans

Metallurgic drum

Vacuum degassing

Hot strip mill
Rolling mill stands
Process cooling pumps
Extraction & cooling fans
Saws



Warehouse/storage
Cranes

Annealing line
Cold rolling mills (variable speed/load)
Rolling bridle stands (variable speed/load)
Cold saws (if applicable)
Process pumps
Extraction & drying fans
Cranes

Bently Nevada services

		Key benefits	
Implementation services	**Get it right the first time** • Ensure your assets are protected and monitored when you're ready to startup • Avoid costly delays and rework • One source to design, plan, manage, and execute the installation • Avoid startup trips due to improper installation and configuration	**Up to $1M/day** Avoided cost from lost production, secondary process & equipment damage	**100%** Service work guarantee 1 year warranty standard on all service work
Proactive support	**Keep your system healthy and optimized** • Prevent instrumentation-related false trips • Prevent and minimize potential data loss events • Keep up-to-date and compliant with the best technologies available • Access the expert support you need when you need it most	**80%** Industry wide machinery alarms & events are due to instrumentation	**>90%** Typical reduction in non-actionable alarms & events
Asset health and consulting	**Actionable insights you can trust** • Understand your asset health to optimize outage and maintenance planning • Plug in to our global network of machinery experts with remote monitoring • Professional OEM-agnostic machinery diagnostics when and where you need it • Custom analytic development and tuning to pinpoint specific conditions	**100% ROI** A single machine save often, resulting in complete monitoring contract payback and more	**5-10X** Cost reduction for well-planned maintenance outage vs unplanned reactive outage
Cybersecurity[1]	**Stay ahead of evolving cyber threats** • Ensure your system is up-to-date and protected as threats continually evolve • Identify and mitigate cybersecurity risks to your operation • Keep your system both secure and accessible with advanced security technologies and architectures leveraging data diodes and database replication	**29%** Patch management can reduce your attack surface up to 29%	**243 days** Average time before detection that a system is compromised
Training and education	**Critical skills that amplify your machinery management capabilities** • Enable your personnel to operate and maintain your monitoring and protection system • Enable your operation to maximize the value of your system leveraging expert product and application training and knowledge	**400+** Customer courses delivered each year in 10 languages and over 45 global locations	

1. https://www.us-cert.gov/sites/default/files/documents/Seven%20Steps%20to%20Effectively%20Defend%20Industrial%20Control%20Systems_S508C.pdf

Why partner with Bently Nevada?

A trusted partner with a proven track record and deep expertise

We are a trusted partner with a proven track record and deep expertise. For over six decades, our Bently Nevada experts and offerings have supported the most demanding proactive maintenance applications across multiple industries. Our quantified results speak volumes, and we create significant benefits for our customers. Even as we protect and monitor your machinery, we constantly strive to refine and improve our offerings to enable your success.

We design and deliver integrated solutions for all of your monitoring needs—including sensors, distributed and rack-based monitors, software, and supporting services—with the following goals:

- Increased availability and production
- Lowered maintenance costs
- Reduced risk in safety, environmental, and asset performance

Quantifiable, proven results:

- **60+ years** of innovation in asset protection, condition monitoring
- **240+ international patents**, including 150+ U.S. patents
- **350+ international patents pending**, including 95+ U.S. patents
- **8+ million** sensor monitoring points
- **1,600+ System 1 software** users worldwide
- **Extensive services support** provided globally

You can rely on us

For more than 60 years, we've been supplying condition monitoring solutions to machinery-intensive industries. We also bring over two decades of experience implementing reliability improvement projects. Customers turn to us for a simple reason: lasting value. Our solutions demonstrate their worth, day in and day out, and often result in expanded implementations because of their proven ROI. We combine the highest quality products and responsive customer support with a service team that takes the time to understand the uniqueness of your plant, your personnel, and your goals.

Our products can be found in many of the world's metal plants. Today, many of those same plants are turning to Bently Nevada for a more comprehensive solution to their needs, moving beyond just machinery protection instrumentation on a few assets to plant-wide strategies and systems for improved environmental compliance, safety, asset production, quality and reduced operation and maintenance costs.

Please contact us here to speak with a subject matter expert about your specific needs.

Baker Hughes™

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