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From Pioneers to Present: How System 1 Continues to Revolutionize the Asset Condition Monitoring Space

For over 60 years, Bently Nevada has been the industry leader in asset condition monitoring and protection. Our portfolio of solutions has evolved through perpetual innovation, but our mission has remained the same: to help Industrial Operators achieve the highest level of asset reliability possible.

In 2001, we redefined the asset reliability space when we introduced System 1. For the first time, customers could expand their condition monitoring beyond rotating and reciprocating machinery to all production assets within their plant. This unified asset management platform, along with Bently's established and best-in-class machinery analysis tools, enabled holistic asset management like never before.

Below, we revisit an Orbit Article from 2007 to recall how System 1-enabled capabilities – such as reliability, performance, and remote monitoring – continue to enable effective asset management in your organization. The article serves as a timely reminder of the continued relevance of these "Fruitful Results" as our customers continue to digitally transform their reliability programs.

In process-intensive industries, a major component of the current digital revolution is the adoption of Asset Performance Management (APM) tools, which seek to optimize the availability of operational assets. The potential for more informed decisions is driving Industrial Operators to seek out a single asset management tool that spans all asset levels – from machine case to entire facilities – and incorporates analytic insights. To meet these customer needs, Bently Nevada is working to elevate System 1's visualization and workflow capabilities across the entire asset fleet. Those customers with many assets and System 1 databases will be able to prioritize assets using Key Performance Indicators (KPIs) provided by Decision Support, perform first line analysis of asset health supported by a plotting toolset, directly interface with System 1 Evo for deeper diagnostic analysis, track and manage asset health over time, and interface with Enterprise Asset Management systems for sharing insights across external systems.

In the next issue of Orbit Magazine, we will introduce the continued evolution of System 1 – as it expands from site-based condition monitoring into the APM space. Until then, we hope you will enjoy this lookback at our past innovations and pause to reflect on the transformations they have enabled in your organization.

Fruitful Results: How System 1* Software Pays for Itself

With online and offline condition monitoring software steadily gaining in acceptance over the last 25 years, it is very rare today to encounter rotating machinery, reliability, and maintenance professionals that don't instinctively understand the needs for these tools. However, articulating the value in a manner that allows a compelling business case to be constructed requires more than just a list of features, functions, and technical specifications.

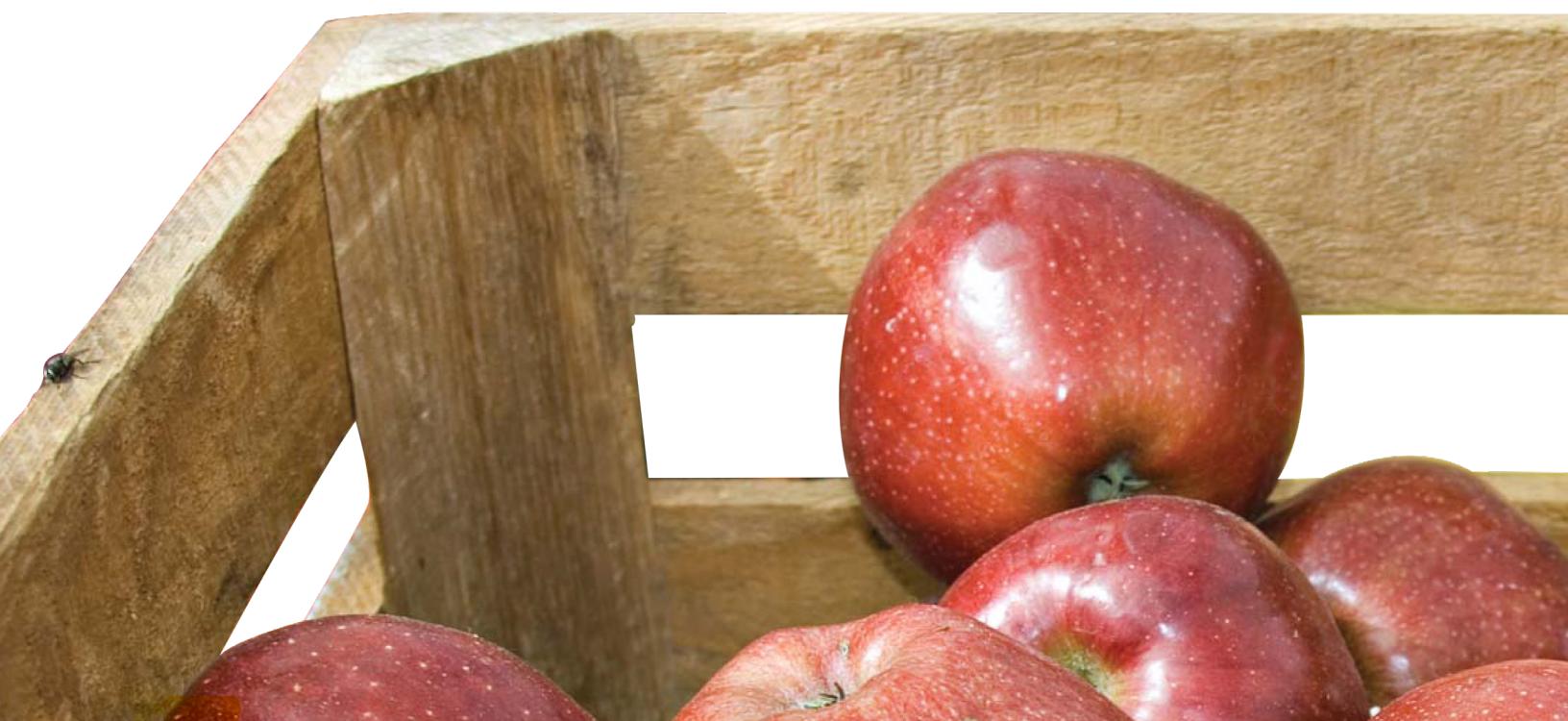
In my job as product line leader for System 1 software, I meet with our users and our sales professionals regularly. Over time, you begin to identify a number of recurring strategies that have been employed to help build the business case for condition monitoring software. Knowing for quite some time that this issue of ORBIT was going to be devoted to several articles on System 1 software, I contemplated what I could say that would be most beneficial to our readers. While the temptation was to talk about technology, features, and functions, it occurred to me that perhaps the most valuable thing I could do would be to provide a look at the ways users have told us they receive value from their condition monitoring software. To that end, I've summarized 16 of the most common and effective strategies that users have used to build the business case for condition monitoring software in their own organizations, showing that it isn't a cost—it's an investment.

#1 – Think Safety and Environment

While justifications based on reductions in maintenance costs and unplanned downtime are certainly valid, don't forget about safety and environmental issues. For example, many plants have relied either partially or completely on financial justifications for their condition monitoring systems that emphasize the ability to detect seal failures that can result in fires or toxic substance leaks into the atmosphere. These "events" can be enormously costly, both in terms of direct financial impact and the harder-to-measure (but nevertheless important) indirect impact of negative publicity. Finally, although personnel injuries or fatalities are rare due to machinery failures, this is still a very real concern. Thrown blades, thrust bearing failures, and overspeed events are just three examples that could be cited where people have been injured or killed. Condition monitoring systems can identify problems in running machinery at a distance. They can also provide early warning of developing problems before those problems progress to catastrophic failures.

#2 – Think Performance

Rotating machinery engineers and mechanical maintenance personnel tend to think in terms of vibration diagnostics and mechanical condition. It's important, but it can sometimes be difficult to make the business case because it often relies on "negative events" (mechanical failures) as the basis for justification—and failures, as we all know, are by their nature somewhat unpredictable. People are understandably skeptical about what "might" happen in the future versus things that are more certain. But System 1 software is not limited to just mechanical condition. It is also capable of sophisticated thermodynamic performance monitoring. It is typically much easier to develop a financial "payback" estimate for things that relate directly to machinery efficiency, throughput, and





fuel costs because a literal “per hour” or “per day” business case can often be developed showing efficiency and fuel cost savings. The incremental cost to add mechanical condition tools to the already-present thermodynamic performance tools is quite modest. Thus, a strategy to “sell” System 1 to management based on its thermodynamic performance monitoring capabilities, rather than strictly its mechanical condition capabilities, can be quite effective.

[Editor’s Note: For an example of how one customer is using the thermodynamic performance aspects of System 1, please see the Case History on page 24 of this issue.]

#3 – Tap Into Your Plant’s Operations Budget

Increasingly, we hear users lament that their maintenance budgets are not just tight—they’re sealed. But that’s rarely the case for the plant’s operations budget. Many of those in Maintenance are telling their counterparts in Operations, “If you want me to support you properly and keep your machinery running, you need to equip me with the right tools.” If your maintenance budget has no room for the tools to do your job, consider going to Operations. In many cases, they understand the value of this software because they understand the implications of unplanned downtime and the importance of making real time decisions that impact the production of the plant.

#4 – Think Reliability

Condition monitoring software is one of the single most important tools for improving plant reliability. While an average plant spends between 5% and 8% of replacement asset value per year on maintenance, best-in-class reliability performers spend less than half that amount—only 2% to 3%. These companies are spending less than half on maintenance than their competitors, yet outperforming them in nearly every meaningful metric.

#5 – Think Emissions

Closely tied into tip #2, it is becoming increasingly common to see the emergence of taxes on emissions such as CO₂ and NOx. For example, the CO₂ taxes on a typical gas turbine running on offshore platforms in the Norwegian

North Sea are in excess of 2.5MM USD per year, and new NOx taxes have recently been introduced as well. Even a modest improvement in efficiency of 1-2% can have a direct affect on those emissions and help reduce taxes. And as noted previously, once a System 1 installation is in place, the incremental costs to add mechanical condition monitoring to the thermodynamic performance monitoring capabilities are quite modest.

#6 – Use Historical Records

Chances are, your plant has kept records on the number of forced outages, machinery failures, and other “events” over the years. Use this data to make your business case. While knowing exactly when the next failure is going to occur is never absolutely certain, a data-driven, objective business case that quantifies the number of failures, the amount of the downtime, and the financial costs is always preferred because it establishes a baseline against which improvement can be measured.

#7 – Avoid Sweeping Generalizations

Words like “eliminate,” “never,” and “always” are sometimes appropriate, but be realistic. Don’t over-promise and under-deliver. It isn’t necessary to say things like “this system will eliminate unplanned outages” when the reality may instead be that it can reduce their duration when they do occur. Many of our users tell us repeatedly that the value of their systems is that when a machinery problem occurs, they know about the condition and can plan accordingly. Often, they are able to trim a day or more off the downtime. Instead of spending time inspecting the machine to look for problems, they already know exactly what the problem is. They have been able to order the necessary parts and mobilize the necessary personnel ahead of time, rather than doing everything at overtime rates with expedited delivery charges.

#8 – It’s the Process

While labor costs and repair parts represent non-trivial expenditures, the process itself is often where the real money is found. And this ties back to point #3. Instead of relying solely on financial justifications that help reduce maintenance costs, think about ways that condition monitoring reduces process interruptions and look for ways to monetize that. If necessary, position the condition monitoring software not as a maintenance tool, but as an operations tool, designed to protect the process. Leverage the fact that process conditions and machinery life are often inseparable. Indeed, one user has observed, “machines don’t die, they’re killed” referring to the ways that operating machinery in offspec conditions (such as pumps unwittingly operating in cavitation or hydro units running in their rough load zone) can dramatically accelerate wear and shorten useful life. System 1 software can put these conditions in front of operators, allowing them to make decisions that balance the needs of the process with the needs of the mechanical assets.

#9 – Think Remote

The remote monitoring capabilities of online condition monitoring tools have come a long way in the last decade. While at one time it was simply impractical to think that machinery could be adequately monitored from arm's length using a phone line and a computer monitor, high-speed networks, the internet, video conferencing, and other technologies have truly made it possible to "move data, not people" without sacrificing the quality of machinery management. For users with multiple facilities, this can be especially important. Today, it is entirely practical to monitor a number of facilities from a single, centralized location. While the old model required a machinery expert to be physically present at each facility, we are seeing more and more users adopt an "Operations Center" approach where a centralized group of machinery experts is able to monitor a number of plants, often at ratios of 2:1 or better. For example, a user with 10 facilities would have at one time required at least 10 dedicated machinery engineers (one for each plant) to monitor the equipment. Today, those same users can do the same thing with five people or less by putting the experts in a single location and streaming the data to a centralized location where the experts reside. This model is also very important for machinery OEMs and service organizations that maintain a large number of long-term contractual service agreements and need to monitor this equipment remotely.

[Editor's Note: For an example of how one customer is using remote technology to continuously monitor 13 separate facilities with a team of just 6 people, see the Case History on page 24 of this issue.]

#10 – Tag Along

When a large project comes along, such as a process or machinery control system upgrade, the incremental costs to include condition monitoring software are often quite small in relation to the overall project cost. The economies of scale are better, too, as the electrical contractors to pull wires and install cabinets, the project management team, and the resources to generate drawings and other documentation will already be on-hand. Try to combine a project to install condition monitoring software with a larger project when possible. The costs will generally be lower and everyone will usually be more receptive because it is less disruptive than a stand-alone project.

#11 – Make IT Your Friend

Users are finding it increasingly difficult to purchase special-purpose computer servers, software, and network infrastructure for things like control and monitoring applications. In fairness, Information Technology departments generally recognize the necessity of such systems, but they are trying to lessen the burden of having to maintain and support so many different applications. As such, there are often tremendous pressures in most companies to reduce the number of software packages and consolidate functions onto single servers and computing platforms when possible. Because System 1 software combines numerous applications that used to reside on independent computers and required separate software packages, it has a definite impact on lowering the cost of ownership, regardless of whether you

face IT obstacles in your company. Examples include training (since training is only required for one product, not several) and the elimination of technical support agreements from multiple vendors for multiple products. Several of our users have employed these IT/maintenance considerations to help augment their financial justifications for purchasing System 1 software because it represents less hardware and software to support and maintain. Often, your IT department will already have financial data in-hand regarding the total life-cycle costs represented by each new computer, network cable, and software application. Use this data where possible to help augment your financial case for an integrated condition monitoring environment rather than numerous stand-alone applications.

#12 – Make the Insurance Company Your Friend

Most plants carry industrial insurance to cover process interruptions. It is very, very common for these insurers to look at the installed instrumentation systems on machinery and adjust premiums accordingly. Plants with a high degree of machinery protection and monitoring sophistication

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obtain better premium rates than those that do not because machinery failures relate directly to process interruptions. While at one time, the insurance companies looked primarily at just the monitoring hardware, they are increasing looking at the installed software systems as well because they recognize the proactive capabilities the software provides. If your insurance company provides more favorable premiums for those users with online software installed, obtain this data and use it as part of your financial justification.

#13 – Sell the System Internally as "Knowledge Retention"

Companies are coming to the realization that many of their most knowledgeable people are retiring, and with those retirements, valuable knowledge is being lost. One estimate is that as much as 50–60% turnover will occur in the next 10 years at many companies. While all of that turnover will not be due to retirement, a sizable amount will be. And, even if those vacancies are filled with experienced people, they often don't possess knowledge specific to your own processes and procedures. Systems that allow users to embed knowledge



are consequently becoming more monitoring sophistication be mistaken with sophisticated “expert systems” designed to automate machinery diagnostics. Instead, by embedding knowledge we mean systems that allow users to capture notes, correlations, and other information that typically only comes from years of hands-on experience dealing with the idiosyncrasies of a particular piece of equipment or process. While these systems aren’t designed to replace people, they are designed to capture the knowledge of individuals so that it can be more easily retained and shared.

#14 – Sell the System as a Planning Tool

Closely tied into item #6 above is the concept of outage planning. It is easy to get caught in the trap of thinking about a condition monitoring system as only an “alarm” system that tells you when there is a mechanical or process problem. But consider the flip side of this: it also tells you when there isn’t a problem. Users have repeatedly told us that their systems are providing value because they don’t waste time working on things that don’t require attention, such as replacing parts based on calendar intervals rather than actual useful-life -remaining. In some cases, this translates directly to extending the intervals between outages or eliminating a planned outage entirely. An excellent example of this is in the article “25 Years of Condition Monitoring Experience at E.ON Benelux” which appeared in ORBIT Vol 26, No. 2, 2006. Even when an outage is planned, its duration can generally be made shorter and its costs reduced because time and money is not wasted inspecting or replacing items unless condition data warrants. So remember, your condition monitoring system can provide value not just in what it tells you, but in what it doesn’t tell you.

#15 – Turn Negative Events Into Opportunities

Nobody wants to experience process interruptions, machinery failures, and mechanical catastrophes in order to create a compelling business case, but the truth is that following such events, people are more acutely aware of the costs and repercussions of failure. If a failure does occur in your plant, use it as a learning opportunity to quantify the implications of the failure and reinforce the business case for condition monitoring software. You may find the business climate distinctly receptive to investments in technology that can help prevent a reoccurrence.

#16 – Don’t Put All Your Eggs in One Basket.

Sounds like conventional investment advice, doesn’t it? As crass as it may sound, some items, such as term life insurance, are sold purely on fear. Equally crass, other items are sold purely on greed, such as high-return, short-term stock market investments. In reality, though, many industrial expenditures represent a complex mix of these two factors. When possible, provide multiple reasons, with both positive and negative reinforcement (i.e., “fear” and “greed”) to help build your case.



Summary

Developing the justification for a needed expenditure is never a particularly enjoyable activity, but it is a reality of business. And because the language of business is inherently the language of finance, it is important to be able to recognize as many ways as possible in which condition monitoring software can contribute financially to a business. Here, I've offered 16 ways that users have built the business case for their purchase of System 1 software. Although many are common sense, I hope you have found it helpful to have them summarized in a single location. In closing, although the list is reasonably comprehensive, it is not exhaustive. If you have found additional ways to justify the purchase of condition monitoring software in your organization that would augment the points I have summarized here, I encourage you to contact me. I'd love to hear your story regarding not just how you developed your organization's business case, but also in how your software is delivering benefits now that it is installed.

Support contacts

For support information, contact the Bently Nevada technical support team by e-mailing bentlysupport@bakerhughes.com, by calling: +1 775-215-1818 or by logging into: www.bntechsupport.com.

You may also visit us at www.bently.com and navigate to Technical Support for a list of technical support phone numbers specific to your global location.



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