



Canadian Boiler Society Newsletter

THE CANADIAN BOILER SOCIETY MEMBER COMPANIES

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INSIDE THIS ISSUE

News from the President	2
CBS Editorial and Opinions	2
Article - Murphy's Lawyer	3
News from the Chairman	4
Board of Directors	4
Fall General Meeting October 2004	5
Annual General Meeting May 2004	6

Editors: Louise McColeman
Richard Barnes, David
Duthie and Ryan Tangney

News from the President - Richard Barnes

CHANGE

It is obvious to me that the CBS, as an organization, is going through a climate of change. Change is always difficult as no one can ever be sure what the end result will be; success or failure. I believe change can always lead to success and failure occurs when change is resisted. In order to achieve success the areas of change must first be identified and then implemented. Easier said than done but with hard work it can be accomplished.

As a result of a strong foundation and the aspiration to continue to build the CBS into the society that it can be there have been definite changes in the daily operation of this organization. The transition has been hard and slow but the change is obvious.

The new CBS Board of Directors is bringing new ideas to the society as it becomes more aware of the needs and issues presently shaping the industry. There is an energy motivating this new Board of Directors as they seek innovative methods to achieve effectiveness to lead and guide this organization while providing leadership in the industry.

There is change with the relationships of the membership and the new sense of responsibility needs to continue to develop in order to accommodate the changes in the nature of this society which are essential to its success. Due to the

growing expectations of the public to maintain a clean environment a unified voice is essential. CBS provides that unity to the industry.

To provide effective input and leadership it is essential to become involved in the various task groups established by the government which provide a vehicle for communication between the government and the industry. This requires more dedication and participation from the CBS members. If this challenge is accepted by the membership, those who become involved will have the opportunity to contribute to the future development of this industry. The jurisdictions also recognize the need to have strong industry groups providing feedback to the government on industry issues, as they also attempt to meet the demands placed on them by both the public and the industry. Again the CBS can be a united front representing both members and industry.

There has been change in the President's activities in which the members are now more actively involved in the society with assistance from the President and the staff at the CBS office. The new CBS office provides meeting facilities creating a visual and continuing presence to the industry. It also provides effective links with external organizations while receiving recognition by other organizations acknowledging the need to work together in areas

Continued on page 5

CBS EDITORIAL AND OPINIONS

PLEASE NOTE: Starting August 1, 2004, there will be an increase in the CBS Annual Membership Fee. If you have any questions please direct them to David Duthie, Chairman and Membership Committee Chair, david@mcraeeng.com

WEBSITE:

The website will be launched this month. Here is a sample of the CBS website homepage. If you haven't submitted your information please forward it to Ryan Tangney as soon as possible rtangney@otsq.com

If you have something to say or interesting facts to share - put it in the newsletter! All submissions can be faxed to Louise McColeman at 416-252-5335.



canadian boiler society

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products

BOILERS [click here>](#)
Boilers include a wide variety of fossil fired water tube and firetube designs. Boiler may also be used for waste heat recovery in institutional, industrial and utility applications.

BOILER SERVICE [click here>](#)
Boiler services include:

- routine inspection and maintenance services
- engineering assessments
- performance improvements and upgrades
- specialized testing and inspection
- parts and material for emergency shutdown.

BOILER EQUIPMENT & SUPPLIES [click here>](#)
Boiler equipment and supplies includes major boiler auxiliaries such as:

- fans
- tubing
- burners
- controls safety systems
- instruments
- soot blowers
- valves and gauges

Canadian Boiler Society Newsletter

MURPHY'S LAWYERS

Watching for whatever can go wrong, because it will.
by Paul Sharke, Associate Editor, ASME ME Magazine

Steve Goldman, the late proprietor of Goldman Machinery Dynamics Corp. of West Nyack, N.Y., once wrote a book on vibration spectrum analysis, partly in response to what he called a "reluctance to travel." an engineer at Nash Engineering in the 1970's, Goldman began training technicians there in the fundamentals of machine vibration. He hoped that by their learning to analyze vibration spectra he could avoid having to go "throughout the known universe solving problems."

Training those future analysts bought him time to pursue machinery crises of his own choosing—because they were especially tough, politically sensitive, or right around the block. Meanwhile, a cadre of technicians roamed the greater globe. A book grew from his teaching.

Predictive maintenance, an umbrella term covering such techniques as vibration analysis, lube oil evaluation, and thermography, has since matured to the point that it wears its own designer label. In recent years, major manufacturers have been busily buying up PdM equipment makers.

GE Power Systems purchased Bently Nevada Corp. of Minden, Nev., in 2002, for instance. That same year, ABB acquired DLI Engineering Corp. of Bainbridge Island, Wash. A few years earlier, in 1997, Emerson purchased Computational Systems Inc. of Knoxville, Tenn. Clearly, the industry has cycled from pupa to adult.

Despite the progress in automation, communication, and data manipulation that has allowed PdM companies to "monitor tons of machines efficiently and accurately"—as DLI's senior engineer, Alan Friedman, put it—the technology has not displaced people from the picture altogether. What has happened, as if fulfilling Goldman's wish of long ago, is that the machinery experts now get to stay home.

"Today I can sit in my office and monitor a water pump in Mongolia or an offshore windmill in Sweden," Friedman said. "I can add my 2 cents to an automated analysis, and the owner or operator and service center can be informed the minute I hit 'Accept.' "

That's some distance from the way DLI employees worked in 1977, when the company was formed. Among its first clients was the U.S. Navy. Back then, engineers would have to haul dozens of cases of analog gear on board aircraft carriers. Everything from setting up the equipment to analyzing the data took intense effort in those days—a real "chore," Friedman explained.

Along came computers, of course, and a crackle of digital development in portable data collectors, bar code readers, expert systems, Web communications, and PC cards that followed. Core vibration technology relating to transducers and data analysis methodologies remained stable by comparison.

Soon, plants could afford to train and outfit their own predictive maintenance staffs. No longer did DLI's engineers have to hop aboard ships to gather vibration data. Instead, they could teach a ship's force how to gather data and how to run the collection through a computer expert system while at sea. The computer, in turn, would spit out detailed reports on the health of the ship's machinery. DLI engineers on land audited the calls of the expert system to ensure its accuracy.

Now, the trend is reversing. "Companies are finding it more cost-effective to funnel the data to the experts instead of maintaining their own experts on site," Friedman said.

LEARNING TO SEE

The steam plant at the University of North Carolina in Chapel Hill consists of two coal-fired circulating fluidized bed boilers and one gas- or oil-fired backup boiler. Together, they deliver as much as 750,000 pounds of steam hourly to the campus and hospital. A small generator provides 28 megawatts of co-generated electricity.

Dwight Morgan, mechanical maintenance superintendent at the plant, said many of the station's 100-plus machines are enrolled in a vibration survey program, and have been in it for at least six years.

A single technician runs the quarterly survey and acts as the main communications contact with DLI, which analyzed the data and recommends repairs. Spectral data files grow quite large, so DLI acquires the university's machinery information by way of a file-transfer protocol site. Morgan mentioned two examples in which the PdM program made good in its promise of prediction.

The first was the case of an 800-horsepower primary air fan motor controlled by a variable frequency drive. Morgan called the fan "a single source of failure." If it



A deteriorating bearing was monitored closely until it could be replaced during a scheduled outage.

Continued on page 5

News from the Chairman — David Duthie

As I take over the role of Chairman of the Canadian Boiler Society for the next 2 years, I have a number of items on my agenda that I hope to move along. I say I, but really it is the group of directors who run the CBS, and they are all very dedicated to developing CBS for all members.

#1- More Members

For most of its history CBS has had about 30 members to sustain it. Names have changed and companies come and gone- and this goes back a good way. I have been the membership committee beating up on potential new members for a number of years, and I hear all the lines about tough times, costs, lack of payback, or what does it do for us.

We have a new website now- that should directly help all members- there are always groups looking for Canadian suppliers.

We have a regular newsletter- that is always open to any news from members and any articles they feel the industry might.

We hold 2 regular meetings a year, with great site tours and new technical presentations related to our industry.

All members should pass our newsletter around to customers and related suppliers they feel might benefit- keep us in mind.

#2-More and better meetings

CBS in addition to the above 2 meetings are looking for other ways to help members. We will be sending a questionnaire out to survey everyone, and look forward to some real suggestions. There must be areas of interest you can tell us about.

#3- Sharing the news

A lot of what we do at meetings of the directors and general meetings of CBS is connecting to find out what new developments in our industry are happening. This is hard to evaluate as a benefit, but we all acknowledge it is

a significant part of staying on top of the market. We will try to pass on news as we find it- but we encourage everyone to pass on data they get that applies to this industry. For example TSSA is developing new guidelines for firetube boiler ratings.

Perspective on CBS History

A short note on where CBS seems to be moving in focus. In the beginning CBS was mainly the large boiler makers, and vendors and topics tended to lean that way. Much more now it is the small boiler makers who are the active participants in CBS and directing more of what we do. The demand for large boilers is very limited now- especially in Canada, so the market moves to the smaller sizes- and that is where concerns and issues come to CBS. We hope to continue to be the main market to field issues and develop discussions for the boiler industry.

Power market in Ontario

Quebec Hydro and now the Ontario government have started to move on electrical power development strategies to encourage more plants and more green power options. This should create markets for industrial boilers of all sizes. Currently there is one plant being built by the airport and with this new program, we expect several large plants will move ahead. The interesting area could be the smaller industrial waste boiler area, which could happen all over the country. You can see the request for power at OntarioElectricRFP.ca.

I have been selling and servicing the boiler market in Eastern Canada for over 25 years, and have my perspective. As Boiler OEMs, I am sure you all see things properly and will correct me as time goes on. I look forward to the next 2 years.

BOARD OF DIRECTORS

President	Mr. Richard Barnes	
Chairman	Mr. David Duthie	Membership Committee
Vice-Chair	Mr. Bryan Heppell	
Past Chair	Mr. David Frost	
Treasurer	Mr. Kerry Johnson	
Member	Mr. Glen Harrison	Program Committee
Member	Mr. Glenn Adgey	Technical Committee
Member	Mr. Ryan Tangney	Communication Committee
Member	Mr. Frank Morrison	
Member	Mr. Lee Lama	

2004 FALL GENERAL MEETING

The Fall General Meeting is scheduled for **Friday October 22, 2004 in Cambridge ON.**

The theme for the Fall General Meeting is **Energy Audits For Steam Plants**

There will be a presentation delivered by our member company **Enbridge Consumers Gas.**

The tour will be hosted by our member company **Babcock and Wilcox Canada**

Babcock & Wilcox Canada is a world-leading supplier of steam generators and related equipment for the nuclear utility market, providing more than 260 steam generators to nuclear plants around the world, including every nuclear power plant in Canada.

**PLAN TO ATTEND!
MARK YOUR CALENDAR TODAY!**

The registration form will be emailed to you in September. Book early by calling the CBS office @ 416-253-2760

News from the President Continued - by Richard Barnes

of common interest.

The new CBS Website will also have a positive effect on the society and its membership. Improving and maintaining the website will need to be a top priority to continue the success of this society. All suggestions and ideas are vital for the success of the website and how it will serve the members best.

The final outcome of these changes will depend on the response from membership and membership contribution. I encourage all members to provide input to the board of directors.

Remember simple thoughts lead to large results.



The FMC trona mine in Green River, Wyo., is a locale where rotating machines and reliability engineers alike have to keep working in spite of harsh conditions.

went down, a CFB would go out—half the coal-fired capacity.

"You could feel the high-frequency vibration on the outboard motor bearing with your hands," he said of the fan. DLI engineers examined spectral signatures of the fan and predicted bearing failure. They advised university personnel to step up the frequency of monitoring bearings and to plan on replacing them. The plant suspected bearing fluting, a problem associated with VFD-controlled motors. It began taking measurements once a week.

In short, the plant avoided an unscheduled CFB outage and disruption of the steam supply on which the hospital depends. The fan continued running for several months until the maintenance department could replace the bearing at a planned outage. In the period between, personnel kept a close vigil on the bearing's health.

When the bearing finally came out, the plant's staff returned it to the motor vendor. Vendor personnel sawed the bearing open and found clear evidence of fluting. In all likelihood, the fluting stemmed from stray charges developing in the rotor by way of the variable frequency drive. These charges would discharge across the bearing and generate flutes on the race, Morgan explained.

Shaft brushes have since alleviated the condition, he said. The plant has also purchased a spare motor to have on hand for this critical service.

Morgan's other example involved an induced draft fan that was diagnosed as having loose anchor bolts. What makes the case stand out is the way in which the data collection box itself made the diagnosis immediately after the data had been gathered.

Further investigation by Morgan and his engineering staff discovered out-of-spec anchor bolts that were yielding before they could be turned to the desired torque. A solution is in the works, Morgan said.

These examples demonstrate the range of diagnostic possibilities within a PdM program: in one, a fairly easy call within the reach of a computerized diagnostic system; in the other, a complex bearing analysis that required the additional well-rounded judgment of human engineers. In both cases, identifying the problem led investigators not only to the source of vibration, but to the mechanisms that were causing the damage in the first place.

Richard Adler, a long-time reliability engineer at FMC Corp.'s trona mine in Green River, Wyo., has talked more than a few maintenance supervisors into letting him have the failed parts. He's compiled a list of resources on his way to fighting a battle against an attitude he sums up as, "If it breaks, it breaks." He wants to know why something breaks.

Surprisingly enough, sales skill tops his list, "A lot of engineers aren't taught to sell," Adler said.

That can be peculiar handicap for a fresh-faced maintenance engineer hoping to be welcomed into a plant because he wants to solve problems. "He can be considered a real threat" by works, Adler explained.

Continued on page 7

Annual General Meeting 2004 - Montreal, Quebec

The Canadian Boiler Society's Annual General Meeting was held on May 30, 31 & June 1, 2004, at the HOTEL GOUVERNEUR Ile Charron, Longueuil, Quebec.



THE GOLF TOURNAMENT

The golfing tournament was held at La Seigneur Golf Club, in Mount Saint Hilaire, Quebec. It was a more challenging course than in previous years which was very exciting for the participants. Our congratulations go out to Lena Johnson, the winner for the "longest drive", Gord Sharp the winner for "closest to the hole" and to the "winning foursome" Bryan Heppell, Gord Sharp, Glen Harrison, and Mark Ingham. Everyone had a great time.



THE TOUR

The tour was hosted by our member company Le Groupe Simoneau. The CBS would like to thank Nancy Simoneau for her benevolence by allowing the AGM participants the opportunity to tour Le Groupe Simoneau Inc. They all had a wonderful experience.



THE CHAIRMAN'S DINNER

The Chairman's dinner was a great success. The CBS was honored to have dinner with Rick Mile, of TSSA, William and Nancy Testa, of TODD Combustion, and Nathalie and Besty Duguay, of NATCOM. It was a wonderful evening with every participant winning a prize.

THE BUSINESS MEETING

The CBS Business Meeting was held on Tuesday June 1, 2004. There were a number of new issues that were addressed at this meeting. It was very informative. There was a decision to have a membership fee increase from \$900 to \$1000. This fee has not been increased for many years and this increase will support the Society. The scheduled events do not make a profit as in they have made in previous years. The number of member participation at the scheduled events has decreased

over the years and therefore it was decided that a survey should be distributed to the CBS members, past members and prospective members in order to better meet their needs. Kerry Johnson will be collecting the information and preparing a report of the results, that will be presented at the FGM in October 2004. A new member company was present at this AGM CH Ljungberg. The representative at the AGM was Mark Glover.

There were changes to the Board of Directors. David Frost, of MBB Power Services, completed his two year term as Chairman of the Board. The CBS would like to thank David for all of his hard work and success as Chairman for the Canadian Boiler Society. David Duthie, the Vice Chairman, was welcomed as the new Chairman and Bryan Heppell was elected as Vice Chairman.

Rick Mile, of TSSA, gave a brief presentation informing the participants of the changes occurring at TSSA. He also urged the CBS members to participate on the committees and councils at TSSA as this would create quite an impact. He also informed the group that a Quality Control Program for repair organizations and new piping installations would be mandatory by May 2005 and companies failing to have a program working by the end of 2005 will be penalized and/or shutdown.

This is to move the industry to enhance safety. Ryan Tangney, Communication Committee Chair, urged all members to send in their information for the website if they had not already done so. The new website should be up and running by the early August 2004. All suggestions for improving the website are welcome. Please forward all suggestions to rtangney@ots.com

Glen Harrison, Program Committee Chair, encouraged the CBS members to send in their ideas or interest for the next AGM.

The theme of this meeting was **Low Emission Technology for Large Burner Applications.**

The guest speakers were Normand Brais of NATCOM and William Testa of TODD Combustion. The CBS would like to thank both gentlemen for their time and for their informative presentations and enlightening discussions.

The Board of Directors would like to remind all members that the AGM and FGM business meetings are for all CBS members and that member participation is vital to the success of the Society. Overall the 2004 AGM was a great success. See you next year!

Adler can be found around repair sites poking his nose into machines as mechanics take them apart. He's the one asking for a look at damaged pieces as they come off the broken machine. He's not afraid to interrupt a few mechanics who are under fire to get the machine repaired and buttoned back up.

It was his first boss who taught him to look at damaged parts for clues to why they failed. None of his subsequent bosses directed him any further toward that responsibility, he said. It was something he kind of took upon himself.

Adler earned the trust of maintenance workers at the mine by serving as a shift relief foreman. It's a typical assignment for maintenance engineers, he said. For an engineer wanting to analyze failures, however, such a job should be only temporary. You can't push a crew and do engineering work at the same time, he explained.

Adler wended his way into failure analysis "one failure at a time," he said. As management began to understand failure analysis as a key to reliability, Alder began tackling tougher problems than many considered routine repairs.

Adler's work begins after the predictive maintenance has finished. He sees the stuff that doesn't show up in very many handbooks.

A new pump, for instance, runs just 36 hours before its discharge rate falls off and its outlet pipe starts shaking. Spectrum data shows vibration predominant at running speed, a strong indicator of imbalance.

A directive comes down to remove and repair the pump. When they've opened the housing, mechanics discover that 15 of the pump's 20 impeller vanes have nearly disappeared. Some have been digested completely. The culprit? An unintended introduction of acid into the pump stream.

Or, consider the case of the bearing that ran for 14 months. The mechanic who greased the original bearing overfilled it regularly—a maintenance no-no, as everyone knows.

A reliability-centered approach aligns a plant's business objectives and maintenance strategy to decide upon the best way to monitor assets.

But, in this case, regular overfeeding kept trona out of the bearing better than any seal could.

After that first mechanic changed jobs, his replacement lubed the new bearing by the book, which cautions appropriately against over-greasing. The particular machine turned slowly enough so that churning the lubricant wasn't an issue there, as it is for higher-speed equipment. The invasive trona, which shows up everywhere in the plant, made its way into the new bearing and, soon enough, destroyed it.

Anecdotes? Yes, but here we are down in the basement where prediction and reality shake hands.

"Engineering graphs are curves that are nicely fitted to a scattered array of data," Adler said. "Maintenance exists because equipment is pushed to the realm beyond that curve."

A TREND IN NEED

Needless to say, Adler opposes a cookbook approach to reliability engineering. Many of the machine failures that he has solved over years have been cracked only through creative analysis. He cautions against relying on artificial intelligence alone to resolve machine breakdowns.

James Taylor, president of Tampa, Fla.-based Vibration Consultants Inc., is no fan of automated alerts and alarms either. He equates the current emphasis on machine data trending to "applying deodorant under one arm." By that, he means that predicting the frequencies that bearings can generate as they're failing, in order to monitor them, can miss things.

Taylor, who has written several books on vibration analysis, has a few anecdotes of his own.

A crack, it seems had developed along the inner race of a spherical roller bearing on a paper machine. A time-based waveform measured at the bearing showed two or three rollers striking the crack every time it cycled through the bearing load zone.

A spectrum display of the same point plots vibration amplitude against frequency, telling the analyst what levels of vibration are happening at which multiples of machine speed.

In this case, the bearing generated no fundamental ball pass frequencies in spite of a defect on the inner race.

Harmonics of the inner race ball pass frequency turned up in the spectrum, but at levels so low that any noise or looseness would have masked the signal, Taylor explained.

This signature characterizes a well-damped pulse, he said. There's very little energy generated as the rollers hit the crack.

Taylor pointed out that an automated vibration monitoring program using alert and alarm levels might never have found this very serious bearing defect.

For this reason, Taylor recommends analyzing every data point measured on a machine through the work of a skilled analyst, or the application of a rule-based diagnostic system. He discourages relying on predetermined alert and alarm levels to indicate trouble.

TOWARD A NEW RULE

According to Eric Huston, vice president of business development at SKF Reliability Systems of San Diego, only a few failures are genuine surprises.

"Detecting bearing failures has developed into a science," Huston said. PdM can provide "adequate warning" of imminent bearing failure in almost every instance, he added.

In some ways, though, the science has leapfrogged the need. Since the early 1990's, when a deluge of sophisticated, inexpensive, portable data collectors led to the practice of monitoring everything, the industry has gradually moved away from a broad-brush approach.

"That approach today is often considered overkill," he said. These days, PdM and its predecessor, preventive maintenance, form part of a strategy known as reliability-centered maintenance.

Briefly put, RMC attempts to align business objectives with equipment maintenance, Huston said. It look at machinery from several perspectives. An assessment of each machine gauges how its failure could affect financial, environmental, or safety concerns at a plant, on a ship, or in a factory.

From that perspective, each machine can be fitted

Continued on page 8



Canadian Boiler Society
701 Evans Avenue Suite 601
Toronto, Ontario, M9C 1A3
Phone: 416-253-2760
Fax: 416-252-5335
Email: info@canadianboilersociety.ca

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with some combination of four approaches to its maintenance. Inexpensive motors, for example, or machines that do not perform critical functions, might be allowed simply to run to failure. At one level beyond that, operators would watch a machine for signs of trouble. At a higher level of sophistication, a machine would be enrolled in a time-base maintenance program.

At the highest level, where a machine's failure could severely affect a plant's safety environment, or profit, a full arsenal of PdM weapons, including periodic or continuous vibration monitoring, lube oil analysis, and infrared thermography, would keep its eyes on things. "The idea is to form a fusion between measurements and maintenance strategy, aligned with business goals," Huston said.

Part of that strategy has to deal with attrition and across-the-board staff reductions, where a great mass of hard-won, tacit knowledge can disappear with a single analyst's departure.

Many organizations consider the knowledge of their production machinery to be intellectual property, just as an old-car owner knows his auto's idiosyncrasies better than anyone else does and knows what he must do to keep it alive.

For these organizations, buying the technologies and investing in PdM training makes sense.

For other companies that recognize value in predictive maintenance but don't have enough machinery to justify full-blown, in-house programs, hiring an outside service to gather and analyze data is a better fit than maintaining a staff to do it.

A hybrid version of the two approaches increasingly makes a logical choice for many organizations. Coupling an employee who gathers data to an outside analysis service offers the best of two worlds. It minimizes travel expenses and guarantees a supply of experts.

One way of hanging onto expert knowledge is through the use of decision support systems. Not exactly expert systems, decision support attempts to capture the information that, 10 years ago, a maintenance engineer would have kept in his head, Huston said. Such systems

are giving plants a structured way to classify the various failure modes of their equipment.

The coming of age of predictive maintenance has spawned other trends. Some companies are outsourcing PdM programs to better concentrate their own maintenance resources on improving reliability and equipment availability.

Others are passing on the complete responsibility for life cycle costs to the equipment makers, and demanding that they, in the case of compressor manufacturers, for instance, deliver a certain volume of compressed air over the course of a contact. Maintenance of the machines involved in producing that air then becomes the responsibility of the original equipment manufacturer.

Still other companies are moving to centralized diagnostics, Huston said. This trend prevails especially in large, decentralized industries, such as power generation or pulp and paper making.

It was power generators that first took up predictive maintenance an couple of decades ago, according to DLI's sales and marketing manager, Ronald Bodre. Today as some of the pioneers in the field near retirement, electric utilities are puzzling over whether replacing lost machinery experts or outsourcing their tasks makes better sense. Other industries that adopted PdM later may soon have to face similar decisions.

There can be little dispute that human analysis are an important element in the PdM equation according to Bodre. Typically, 80 percent of machines will pass a PdM survey, he said. An automatic screening program or a decision support system can quickly separate good actors and bad, freeing up human analysis to devote their time to figuring out how the other 20 percent are going wrong.

In the 10 or 15 years that it's taken PdM to enter the big time, machinery balance and alignments and their cures, Bodre said.

Today, bearing troubles account for a big portion of machine maladies. Finding the root causes of stresses that lead to premature bearing failures has become a priority for many maintenance departments.

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Some industries rely on plant staff for acquiring machinery data, but send the data outside for interpretation and analysis.