

2010

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Institute for Business
Leadership**

University of New Brunswick



BRETECH ENGINEERING LTD. FROM ONE MANE SHOP TO INTERNATIONAL CONSULTING FIRM

Jonathan Westphal prepared this case with assistance from Professor Dan Doiron, UNBSJ
for the purposes of classroom discussion.

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Introduction

Mike Robichaud, President of Bretech Engineering Limited, worked on his speech as the Airbus began its descent into Copenhagen. He was heading the Canadian delegation to an International Standards Organization (ISO) conference on condition monitoring and diagnostics for industrial machinery. Bretech Engineering Limited (BEL) had come a long way since he first founded the company in Saint John, New Brunswick, Canada twenty years previously. In that time, he had turned the company into a world leader in the specialized field of vibration analysis and diagnostic testing services. However in the last few years, the question of how best to manage BEL's continued growth had begun to preoccupy Robichaud.

Non-destructive Testing

Non-destructive testing (NDT) is a quality control method used to examine an object, material or system without damaging it, destroying it, or impairing its future usefulness. NDT is used to investigate the material integrity of the test object, which is a finished item (e.g. a paper machine) rather than a material sample, using infrared radiation, radiography, ultrasound, x-rays, and other techniques to detect fatigue effects, structural flaws, and other such defects (see e.g. Appendix 1). NDT is concerned in a practical way with how long the test piece can be used, and when it needs to be tested again.¹

In a typical NDT engagement with Bretech Inspection Limited (BIL), a client - usually the maintenance manager or foreman at an industrial facility such as an oil refinery or paper mill in Atlantic Canada – would contact BIL to schedule non-destructive testing or inspection. The work would typically be conducted while the equipment was shut down, either for scheduled maintenance or due to a breakdown. BIL's NDT Operations Manager would schedule the resources (certified personnel, equipment, materials, and vehicle). BIL's NDT Technicians would travel to the client site, set up the equipment, and perform the non-destructive testing on the machine in question (see: Exhibit 1).

Before restarting the machine, the NDT Technicians would finish the field measurements, and bring the collected data and field notes to a report writer at head office. In the case of periodic inspection, with data trending, an existing database would be updated and status reports generated. Alternatively, BIL would supply testing and inspection services, such as radiography of piping welds, for large construction projects such as nuclear generating station refurbishments or construction of liquid natural gas storage terminals.

By 2009 the NDT industry was in a state of flux; important changes had taken place in both NDT technologies themselves, and the applications for which these technologies were used. Many of the industries which had traditionally used NDT, such as pulp and paper, were experiencing a significant downturn, while new technologies such as

¹ The American Society for Nondestructive Testing, <http://www.asnt.org/ndt/primer1.htm>, accessed on July 24, 2009.

computerized radiographic testing (CRT) were replacing older technologies such as film-based radiographic testing.²

Vibration Analysis

Vibration analysis is a means of monitoring the actual mechanical condition of a piece of rotating machinery in order to determine the optimum interval between repairs. This type of monitoring can minimize the number and cost of unscheduled machine outages due to component failures. When done properly, it is a means of optimizing equipment availability and therefore maximizing efficiency. As a rule, 80% of such failures result from either imbalance or misalignment, which if not diagnosed and addressed in a timely fashion, can lead to premature wear on bearings, couplings, shaft seals, and gears. Improving maintenance standards and procedures will address the majority of such issues.³

Vibration analysis can be applied with periodic monitoring to inform maintenance decisions, as well as with diagnostics and troubleshooting, to provide a more sophisticated root cause analysis of vibration problems.

In a typical engagement, a client - usually a reliability engineer at an industrial facility such as a paper mill – would contact BEL about a complex vibration or equipment reliability problem. Often the problem might be attributable to some change in the process parameters, such as the client deciding to increase the run speed of a paper machine. A senior BEL engineer would travel to the client site, conduct a presentation on BEL's capabilities and methodology, present a plan to assess and solve the specific problem, and in many cases, develop a test plan. Once a purchase order was issued, BEL's ENG Operations Manager would assign and dispatch resources to the client site.

BEL's Field Reliability Engineers would travel to the client site and conduct the appropriate tests and measurements (see: Exhibit 1). They would backup the data in the field, and take it back to the office for data review, post-processing and reporting.

BEL would later return to the client site to review the report and any recommendations for vibration control. Recommendations could include such measures as load balancing or structural modifications. BEL has a Ph.D Engineer on staff to provide detailed engineering plans for the implementation of any BEL recommendations. If the client accepted the recommendations, it would either engage BEL to perform the work, or another third party contractor.

² Nondestructive Testing Industry Review <http://www.marketresearch.com/product/display.asp?productid=1055233>
Accessed on July 17, 2009.

³ <http://vibration-analysis.com>, accessed on August 9, 2009

Alternatively, a client would engage BEL to apply vibration analysis and condition monitoring technologies plant-wide on a periodic measure and trend basis. This would provide the client with an overview of asset health, help increase overall plant reliability, and allow any high-priority equipment condition problems to be immediately identified and corrected. In longer term client engagements BEL's engineers and technical specialists would work at the client facility daily.

Periodically, BEL would be called to a client site where there had been a catastrophic equipment failure. To avoid recurrence of such problems, BEL would install an online vibration monitor, which BEL engineers could access from home office. Continuous condition monitoring would be performed, with the objective of detecting and preventing similar repeat failures before they occurred.

BEL's condition monitoring practice was largely concentrated in the pulp and paper industry, however the company was expanding into other industries which it had identified as offering the potential for further growth. Robichaud believed that the oil refining industry, for example, was beginning to appreciate the advantages of continuous monitoring, which would enable them to acquire and analyse sophisticated data on the condition of each machine and intervene to avoid breakdowns rather than simply switching out defective components when they failed.

Company History

Robichaud incorporated Bretech Engineering Limited (BEL) in January 1989. His vision was to establish a technical services firm offering vibration analysis and diagnostic testing services to resource based industries such as oil refineries and pulp and paper plants. He recognized that there was a gap in the market; while there were a number of firms that had the technical expertise to provide vibration measurements of industrial equipment; it seemed to him that there were few companies with the ability or interest in doing advanced analysis and troubleshooting.

Robichaud was familiar with the latest vibration analysis technology, having recently graduated with his B.Eng in mechanical engineering, but he believed that the technology was not yet regarded as fully mature or widely accepted by the industry. He realized that he needed to find some way to break into the business.

Bretech Inspection Limited

Some years before, Robichaud's father had started a company called Bretech Inspection Limited (BIL). The firm offered non-destructive testing (NDT) services for industry – primarily weld inspection, radiographic and ultrasonic testing. While NDT was an established, well understood service, the market was very competitive. The industry was cost sensitive; most contracts were tendered, and price was the determining factor in awarding the contracts. BIL was moderately successful but had struggled at times over the years, doing little business outside Southern New Brunswick, a largely rural province on Canada's East coast.

BEL was able to share office space and clerical staff with BIL to save on overhead, and began to establish its own client base by leveraging BIL's contacts in Atlantic Canada in the NDT field. From its inception, BEL had enough business to employ two engineers who were in the field year round visiting client sites. The company's long term strategic plan; however, was to grow the company into other services.

Bretech Engineering Limited: First Steps

As a springboard to get the firm up and running, Robichaud began offering balancing and alignment services for rotating equipment such as pumps, fans, compressors, and turbines. Working with large regional firms in the oil and power industries, BEL was able to provide a service that the marketplace understood. This allowed the company to begin to establish a base and a reputation within the industry.

Robichaud later broadened BEL's service offerings to include vibration analysis, and quickly established a niche within the field, offering high end, multi-channel, advanced diagnostics and vibration control services. After seven years of solid work, BEL established a foothold in the industry, having grown to 15 employees. Business expanded to the point that Robichaud was concerned with generating a strong revenue stream.

By the mid '90s BEL fostered a reputation for expertise in vibration analysis across Canada and worldwide. Robichaud travelled widely to meet with clients personally, published a number of technical papers⁴, and was actively involved in professional associations such as the Canadian Society for Non-Destructive Testing, Canadian Machinery Vibration Association, the Vibration Institute, and the American Society of Mechanical Engineers. Still, he was not yet satisfied with the firm's growth.

Strategies for Growth

In 1990 the company embarked upon on what the management team felt was a risky strategy. In order to further increase BEL's visibility, the company created a training program, offering to train BEL's client base in the basics of vibration analysis. "We gave away a lot of our secrets", Robichaud said later, "and a lot of folks thought we were crazy, but it was a calculated risk, because in this field reputation is everything. I knew our training programs were solid, and our technical knowledge was solid, but we needed to establish ourselves as the leaders in the field." Robichaud considered that this strategy had paid off, in that sharing its expertise in this way enabled BEL to establish its reputation, and more effectively market its higher end vibration analysis and diagnostic control services.

In addition, BEL formed a joint venture with Allied Reliability Limited (ARL) in 1994. The joint venture was split 50/50 between the companies, while BEL managed the new company, Allied Reliability Canada. ARL specialized in equipment maintenance

⁴ <http://www.bretech.com/reference/reference.html>, accessed on July 28, 2009.

planning on a wider scale, setting up systems to determine schedules for equipment maintenance based on anticipated failure rates. The joint venture enabled BEL to branch into industries such as potash and pharmaceutical manufacturing, which required the setup of complex reliability and maintenance systems for entire manufacturing plants rather than on a machine by machine analysis.

In 1995, Robichaud's father retired and Robichaud began managing BIL as well as BEL. While the two companies marketed themselves as "Bretech", both continued as separate legal entities (see: Exhibit 2). Given the different corporate cultures – BIL was a unionized environment employing primarily NDT technicians, while BEL was a non-unionized firm marketing engineering consulting services - the companies remained separate. The management team felt that maintaining both NDT and engineering services under a single umbrella was important, in that some years NDT generated more business than the engineering side, while in other years the reverse was true.

By early 2000 the business was successful enough that BEL was able to invest in developing its own technical measurement tools, founding SmartSystems International as a wholly-owned subsidiary.

SmartSystems International supplied instruments, equipment, and services for vibration monitoring, including vibration monitors, data collectors, sensors, cables and other hardware. The instruments produced by SmartSystems were used as "babysitters" for continuous monitoring of heavy industrial equipment. The instruments could be remotely accessed by Bretech technicians from anywhere with an internet connection. This enabled continuous data collection and trending over time in order to detect and prevent catastrophic equipment failure (see: Exhibit 3).

Change in Ownership Structure

Robichaud acquired majority (60%) ownership of BIL in a 2002 reorganization. Robichaud took over full ownership of BIL in a 2007 reorganization. Both BEL and BIL continued to grow; by 2009 the Bretech group employed over 100 employees, and had operations worldwide.

In 2008, BIL delivered 36% of the NDT business in Atlantic Canada (New Brunswick, Nova Scotia, Prince Edward Island and Newfoundland). The company estimated that its share of this market would grow to 45% by the end of 2009. In addition, new technology was driving an increase in the NDT business; 5% of BIL's business was currently in computed radiography testing (CRT), and this segment of the business was growing⁵.

The market share of BEL was more difficult to measure. The management team felt that comparing Bretech Engineering's business with "Engineering Services" or "Consulting Engineers" was not meaningful, as these other firms tended to focus on design and construction management. BEL viewed itself as an end to end solution provider. As the

⁵ Interview with M. Robichaud, July 2009

company was fond of saying: “We tell you what’s wrong, we tell you how to fix it, then we help you fix it”.

BEL’s view of their target market was that most of its competitors did not have the capability or the willingness to provide the services that BEL did. The competition tended to be the service arms of large manufacturers of industrial equipment, such as paper machines, who were primarily in the business of providing warranty work to their customers. In contrast, BEL was generally retained by customers to provide post warranty service. The company had noticed that it was increasingly common for manufacturers to retain BEL when their customers experienced more complex vibration related issues.

Key Challenges

By 2009, it was clear to Bretech’s management team that growing pains had become a problem for the company. Robichaud, in particular, felt that as the company grew, it was becoming increasingly difficult to find a balance between spending time on strategic planning, and managing the day to day business. While sales remained strong, the company had been challenged by the world economic downturn (see: Exhibit 4), and he believed the company needed to focus on how to position itself for future growth once the economy turned around.

Robichaud felt that a top down management style, which had worked well when Bretech was a smaller, entrepreneurial company, might not be as appropriate for the medium sized organization the company had become. He believed there was a need to empower the senior management team so that he could devote more effort to planning the company’s strategic direction. Striking the appropriate balance, however, had proved difficult in practice; at times Robichaud felt he was perceived as taking an overly “hands off” approach.

Kevin McKenney, Bretech’s Business Manager, as a relative newcomer to Bretech, had the benefit of an outsider’s perspective. McKenney observed a culture that believed “it’s easier to just do it than to show someone else how to do it”. While this culture had served the company well when it was small and aggressively expanding, the business had grown to the point where Andrew Costain, BEL’s Operations Manager, and Jamie Guidry, BIL’s Operations Manager, were often so busy managing day to day service delivery that they did not always have time for high level strategic planning. Robichaud worried that senior managers operated in silos and did not always have the time to focus on the growth of the organization as a whole.

Costain wondered whether Bretech had outgrown its existing corporate structure (see Exhibit 1). When the company was smaller, “everyone was involved in everything”. While the company’s structure had become more formalized than it was previously, he still saw a need for a structure that would provide employees with more feedback and support. McKenney for his part saw Bretech’s organizational structure as an impediment to increased efficiency; he felt it was important to reduce the number of direct reports to

the senior management team. While BEL had reduced the amount of direct reports, in his opinion this continued to be an issue on the NDT side of the business.

Leveraging Synergies Between BEL and BIL

Another issue that had arisen recently was how to create and leverage synergies between BEL and BIL. Robichaud believed that incomplete communication between the NDT and engineering sides of Bretech was leading to lost productivity, and he fretted that some opportunities were probably missed as a result. Robichaud felt that if each operations manager increasingly engaged the support departments for assistance, they would have more time to focus on the clients and on driving business to the other side of the company. This would require some organizational changes, yet finding the time to design and implement such changes was difficult for everyone.

McKenney felt that leveraging synergies was problematic because Bretech was comprised of two such different business units. BIL, while represented in many ways Bretech's "bread and butter", was primarily focused on heavy industry in a local market, and was thus vulnerable to fluctuations in the local economy. BIL's challenge, thought McKenzie, was to determine how best to expand more of its business into other regional markets, rather than maintaining its current level of growth in a geographically limited market.

McKenney believed that BEL had the opposite challenge in that its target market was widely geographically distributed. The company was active in the US market, but in recent years had been involved in some large contracts as far afield as Scandinavia and China. Although it had traditionally focused on the paper industry, BEL had in recent years expanded into the oil and gas, potash and seed mill sectors in Western Canada, establishing a quasi regional office in Saskatchewan. Managing this office from New Brunswick had presented a challenge, but BEL had not yet found a local, established resource to manage the office more independently. In addition, foreign exchange had presented an issue, since most of the company's contracts were quoted in Canadian dollars, and the rising value of the Canadian dollar against the US dollar had made BEL's services more expensive in the US.

Costain noticed over the course of his 10 years with BEL that BEL's business in commodity based industries such as pulp, paper and mining had been affected by falling commodity prices due to the economic downturn in 2009. BIL's business had continued to increase due to a number of resource intensive industrial expansion projects in New Brunswick, chief among them a liquefied natural gas terminal and a refurbishment program at the region's only nuclear power plant. Costain wondered how BEL might better address the challenge of a variable market vulnerable to fluctuations in commodity prices.

Costain wanted Bretech to be a "one stop shop" for the right customers, their service provider of choice for both NDT and engineering services. While Costain and the NDT Operations Manager, Jamie Guidry, always kept their eyes open for opportunities on the

other side of the business, this was complicated by the fact that the two companies usually got involved during different stages of a project. While NDT was an essential part of the construction phase of a project, BEL tended to get involved in the post warranty phase unless called in earlier by the OEM.

Recruitment and Retention

While Bretech prided itself on treating its employees well and offering attractive pay and benefits, Robichaud thought the recruitment effort itself could be more focused; currently some recruiting was done on the administrative side of the business, but the operations managers also recruited directly, and there was no real long term recruitment planning or strategy.

For Costain, the issue of recruitment and retention had gained more urgency in recent years. The growth of BEL's business had increased the need for more aggressive recruiting. The services BEL provided were so specialized that engineers with the requisite skill set were difficult to find. The only way BEL could fulfill its recruiting needs was to spend more resources on hiring experienced engineers with the required skill set, or to recruit engineers directly out of university and invest time and money in their training.

However the fact that BEL's clients were so geographically dispersed meant that the engineers needed to spend a significant amount of time travelling. Recognizing the high cost of employee turnover, BEL did its best to provide more work/life balance for longer serving employees, seeking to place them in longer term contracts wherever possible, but BEL's growth into the oil, gas and potash industries meant that an increasing proportion of the company's work was in Alberta and Saskatchewan, at the other end of the country. Furthermore, the large number of overlapping construction projects in Southern New Brunswick over the past three years meant BIL had been faced with the challenge of continually seeking and recruiting enough trained and certified professionals to accommodate the requirements of each project. As Guidry saw it, BIL would eventually be faced with maintaining enough work for all of the technicians that it had hired. Overall, he felt, BIL needed a long term strategy to deal with the cyclical nature of the NDT business.

The Road Ahead

While Bretech had achieved significant success over the past 20 years (see: Exhibit 5), it had become clear that the company could benefit from a greater focus on strategic management. Bretech was busy to the point where the management team was often forced to take a reactive approach to the company's business, as there didn't seem to be the time to develop and maintain a more formal approach to managing the company's growth.

On the NDT side Robichaud believed that new technology would provide significant growth opportunities. He was very proud of Bretech's computed radiography testing (CRT) service offering, which provided an efficient means of tracking corrosion trends over time. While Bretech did not develop the tools for this process, the signal processing algorithms it used in its CRT offering were proprietary. In 2009, BIL's CRT business was 5% of its overall business and growing, and Robichaud believed that CRT could be leveraged to provide a significant competitive advantage over BIL's competitors, only one of whom used the technology.

While Robichaud believed that it would be a challenge to grow this business geographically - Bretech would first need to be established as one of the core regional NDT service providers before offering CRT - it had become clear to him from the work BEL was doing in this market that the industry was underserved in NDT. BEL had had some success breaking into the market, with the recently established Saskatchewan office.

Furthermore, Robichaud had noticed that while competition for diagnostic work among some of the larger industry players had become much tighter due to the economic downturn, there were a large number of smaller players in the market that did not appear to have any service contracts in place for condition monitoring or diagnostic services. In the past few years, Bretech had been contacted by a number of these smaller pulp and paper plants, who had found Bretech through its website. But Robichaud wondered what the company should be doing to market to them directly. They did not appear in industry literature or professional organizations, but he felt they potentially represented a large untapped market. Additionally, Costain believed that Bretech tended to take a somewhat reactive approach to marketing; most of its business came from leveraging existing relationships or from referrals rather than from aggressively marketing its services. "We've been living off our name forever", he opined. While some marketing and sales was done on the administrative side of the business, this was mostly limited to trade shows and conferences and advertising in trade journals.

In addition, Robichaud wanted to increase sales of instrumentation through Smart Systems International. While only 25 of Bretech's customers had adopted this technology thus far, these were major Fortune 500 companies and Robichaud felt that this could potentially be an opening to fuel future growth for BEL. Costain, on the other hand, was more pessimistic about Smart Systems International, and felt its growth potential was limited due to the relatively small number of clients that appeared interested in adopting this technology.

With the growth of interest in renewable energy, additional opportunities beckoned on the horizon. While renewable energy remained outside Bretech's traditional areas of expertise, the company was beginning to explore opportunities in the burgeoning wind farm industry, where there seemed to be a growing demand for NDT, vibration analysis and condition monitoring services due to the high stress loads to which wind turbines were subjected.

As he disembarked the plane in Copenhagen, Robichaud knew that Bretech's senior management team needed to make the time to develop a detailed strategic plan with short, medium and long term objectives for the company, and a process for periodically monitoring Bretech's progress in achieving these objectives. The strategic plan had to be based on a thorough analysis of Bretech's challenges and strategic opportunities, and recommend initiatives to address these and drive the company's future growth.

Exhibit 1: Bretech Group Service Offerings

Bretech Inspection Limited

Non Destructive Testing

- CWB and AWS visual weld inspection and quality control
- Crane & Boiler Inspection Programs
- Construction Project Management, Quality Assurance, and Quality Control
- Radiographic Testing, including Computed Radiography
- Ultrasonic Testing, flaw detection, and thickness measurement
- Magnetic Particle and Liquid Penetrant Testing
- Positive Material Identification
- Material Hardness Testing



Figure 1: Ultrasonic examination of paper machine dryer cylinders to check for thickness variations, cracks and flaws

Bretech Engineering Limited

Condition Monitoring

BEL provides a full range of condition monitoring services, including

- Vibration Analysis
- Infrared Thermography
- Ultrasonic Evaluation
- Motor Current Signature Analysis
- Lubricant Analysis
- Inspection & Testing
- Dynamic Balancing & Precision Alignment



Figure 2: BEL Engineers acquiring multi-channel (128 simultaneous measurements) vibration data

Balancing and Alignment

Balance and Alignment faults are quite common on rotating equipment. Dynamic balancing or precision shaft alignment can complement BEL's vibration analysis services, ensuring that detected machine faults are immediately and accurately corrected. BEL field engineers perform single and multiplane balancing of equipment ranging from small fans to complex turbomachinery effectively. For paper machines, IN-SITU™ Roll Balancing provides in place measurement and correction within a continuous improvement approach. Using advanced laser technology, BEL field service professionals will check for misalignment and provide correction values accurately and quickly.



Figure 3: Load balancing on a paper machine

Vibration Analysis

Unexpected mechanical breakdowns can be virtually eliminated using Vibration Monitoring. This powerful technology is most effective when utilized as a key component of a periodic condition monitoring program.

Onsite Services

Bretech will supply the required instruments, equipment, and trained personnel to establish and maintain a periodic equipment monitoring program at your facility. This typically includes database setup, regular field measurements as required, and data evaluation and reporting. Close working relationships are developed between key representatives to ensure personalized solutions and good communications.

In-House Program

BEL provides a complete range of customized consulting, training, and startup services for in-house vibration monitoring programs. This service ensures that the program is established using a combination of established and innovative techniques for maximum effectiveness and payback. The required instruments, software, and equipment can be either owned by the plant or supplied by BEL. Benchmarking and program optimization will improve the quality of existing programs. Continued support, including advance diagnostics and training will provide continuous improvement.

Pilot Program

Organizations may evaluate the effectiveness of vibration monitoring for their facility by implementing a limited program within a specific area of the plant, such as the steam plant. Measurements can be conducted by either BEL or plant personnel.

Diagnostics & Troubleshooting

BEL provides a full range of fault diagnostics and troubleshooting services, including

- Operating Deflection Shape Analysis & Modal Analysis
- Transient Analysis & Speed Trial Analysis
- IN-SITU™ Roll Balancing
- Temporary On-Line Monitoring

BEL also provides customized vibration analysis for a wide range of specialized equipment and industries, such as paper machines, turbomachinery, and cooling towers.



Figure 4: Result of catastrophic failure of a paper machine

Acceptance Testing

BEL provides factory acceptance testing to verify that machines comply with tolerances and specifications. Acceptance testing also helps to determine and verify synchronous machinery characteristics such as critical speeds, amplification factors, damping characteristics, mode shapes, and potential problems

Engineered Solutions

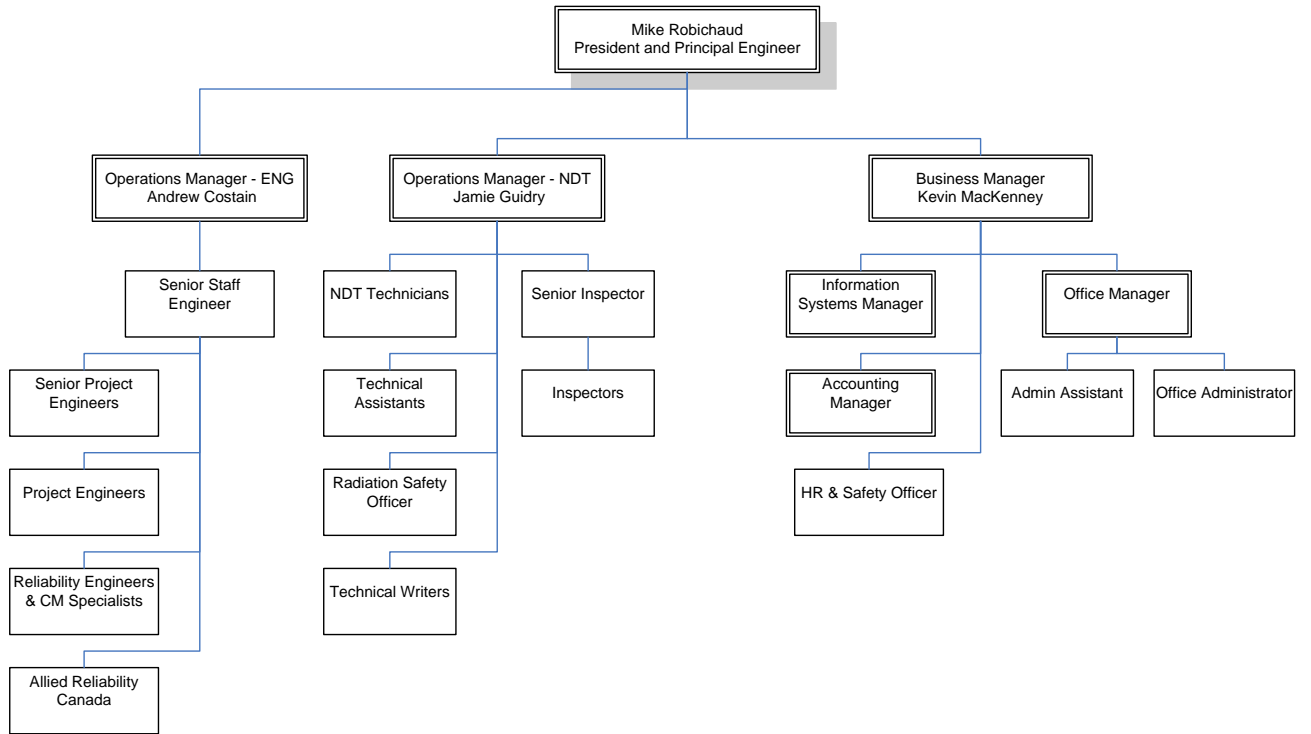
BEL also provides a range of engineered solutions for equipment reliability, including

- Vibration Control
- Structural Modifications - Concept and Detail Designs
- Root Cause Failure Analysis



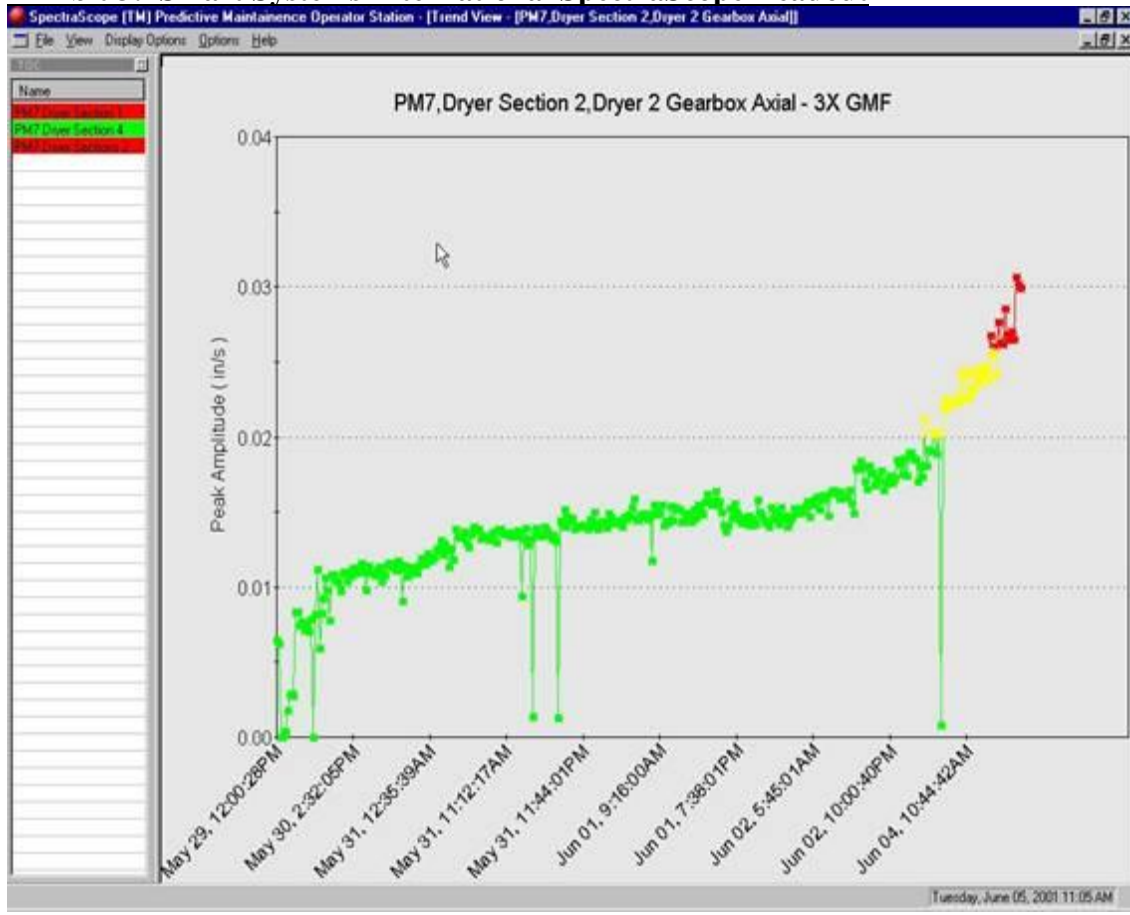
Figure 5: Structural modifications to minimize machine vibration
Source: <http://www.bretech.com>, accessed on July 14, 2009.

Exhibit 2: Organizational Chart- The Bretech Group



Source: The Bretech Group, 2009.

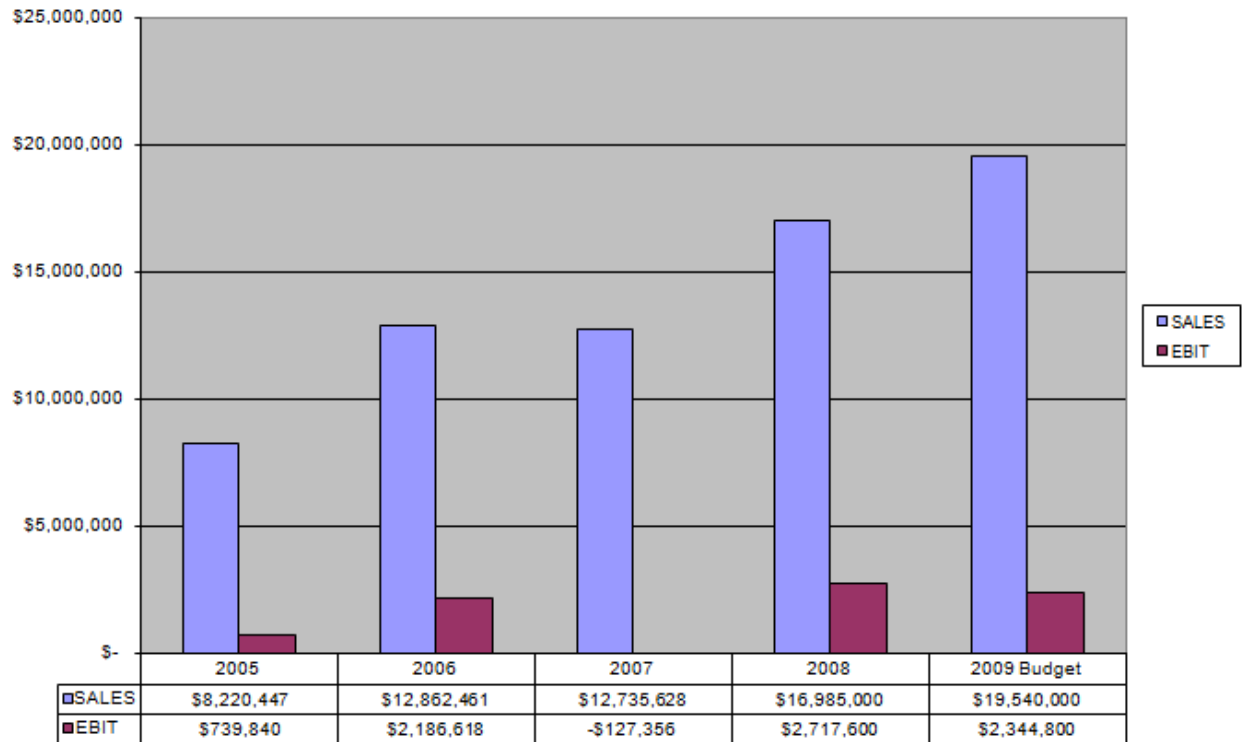
Exhibit 3: Smart Systems International SpectraScope Readout



Source: The Bretech Group, 2009.

Exhibit 4: Bretech 2009 Budget Summaries*4.1 Bretech Engineering Limited 2009 Budget Summary*

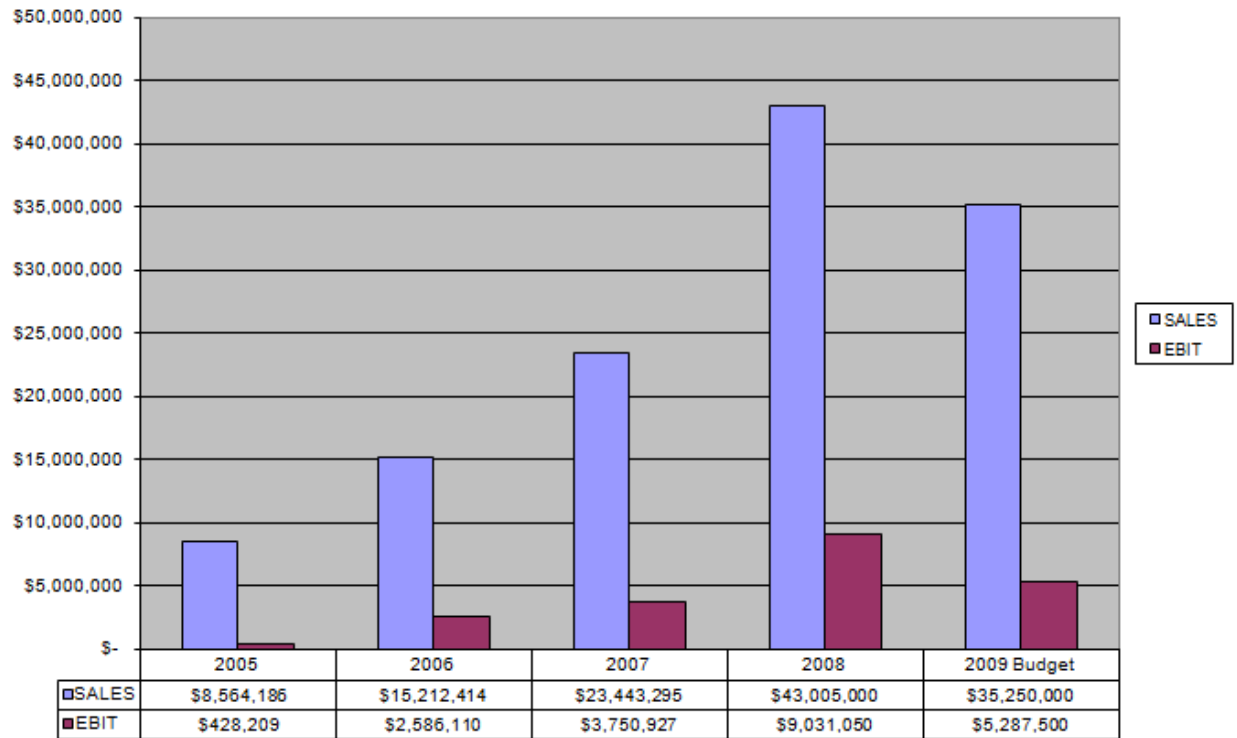
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Source: The Bretech Group, 2009.

4.2 Bretech Inspection Limited (NDT) Budget Summary 2009

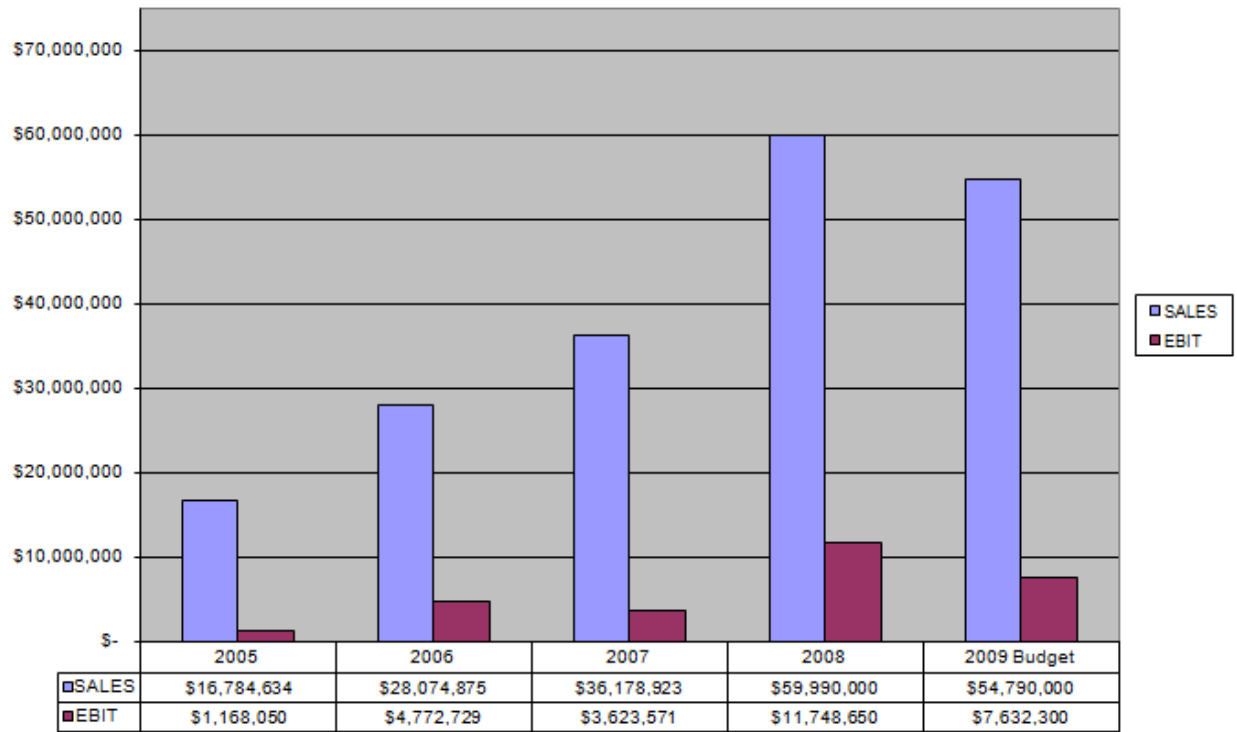
NDT



Source: The Bretech Group, 2009

4.3_The Bretech Group: Consolidated Budget Summary 2009

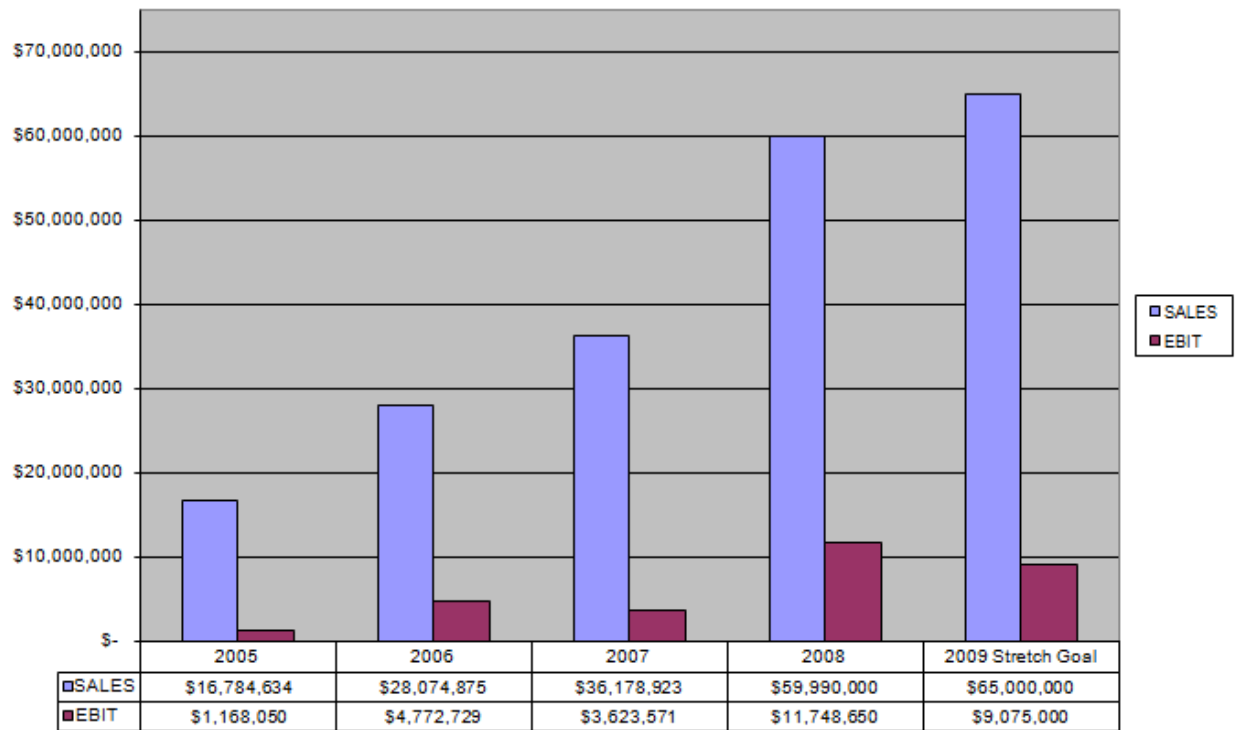
Consolidated



Source: The Bretech Group, 2009.

4.4_The Bretech Group - Consolidated Stretch Goal 2009

Consolidated Stretch Goal



Source: The Bretech Group, 2009.

Exhibit 5: Bretech's Clients



Source: <http://www.bretech.com>, accessed on August 12, 2009.