

WATCHMAN™ Reliability Services Enhance OEM Service Center Revenue

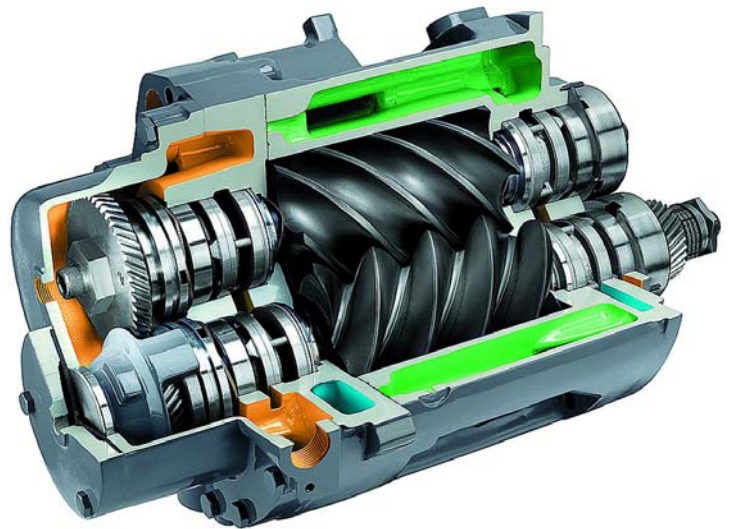
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In today's business climate, service centers are being asked to monitor more machines over greater distances, and to do it more efficiently. New technology available within Azima DLI is helping to get more efficiency out of the company's global vibration analysis services by standardizing vibration equipment and methodology, automating analysis functions and facilitating the transfer of raw data to and from clients in remote locations. This technology comes in the form of web-based systems with automated diagnostics, online systems and integrated portable data collectors. Together, these features make it easier for service centers to test more machines and get more important information into the hands of those who need it.

Azima DLI's experience and innovation has been incorporated into a number of well-proven products and services specifically designed to meet the demands of service centers worldwide. As part of this portfolio, the company has integrated individual technologies to provide a highly automated, efficient and successful service program for its customers. The success of this program can be seen in the partnerships Azima DLI is forming with global original equipment manufacturers (OEM) in the heating, ventilation and air conditioning (HVAC) industry. Azima DLI is helping this OEM provide a complete condition-monitoring program to its clients.

The OEM has pursued condition monitoring as a way of distinguishing itself from the competition by offering clients additional service options that augment their warranty agreements. With such agreements, clients can receive discounts on warranty packages if they agree to use the OEM's condition monitoring service as part of their maintenance practice.

By having service personnel visit clients more often, the OEM has found that they can generate more service and sales opportunities. In addition to providing the benefits of vibration analysis and condition monitoring to the client, the OEM has realized previously untapped sales and service opportunities by simply having a reason to send a service person to a client site. In fact, the OEM has recorded an increase of \$1.25 - \$1.50 of additional revenue for every \$1 of warranty service sold.



Azima DLI currently supports over 100 service centers in the US and Canada. Several more are located in China and on the Pacific Rim, and the number continues to grow. To initiate a condition-monitoring process, Azima DLI mails a pre-loaded data collector to a service center. Service personnel then visit their clients, collect data and mail the collector back, where it is unloaded. The data is analyzed at Azima DLI and a report is e-mailed (or surface mailed) directly to the service manager, who then presents it to the equipment owner. The report is branded with the OEM's name and logo, and is presented to the client as part of the OEM service offering. As the program evolves, more and more service centers, especially those outside the US, are purchasing their own data collectors and are transferring data back to Azima DLI for analysis. Additionally, the OEM is beginning to test new equipment as it rolls off the assembly line to establish baselines, and is including sensor mounts and barcode identification tags directly on the equipment. The OEM currently produces about 1,500 new machines per year. This process makes future condition analysis more accurate and cost-effective. The machines can be traced, via serial number identifications, throughout their entire useful lifetime.

The OEM's technical center retains a synchronized database of all machine tests and Azima DLI analysis

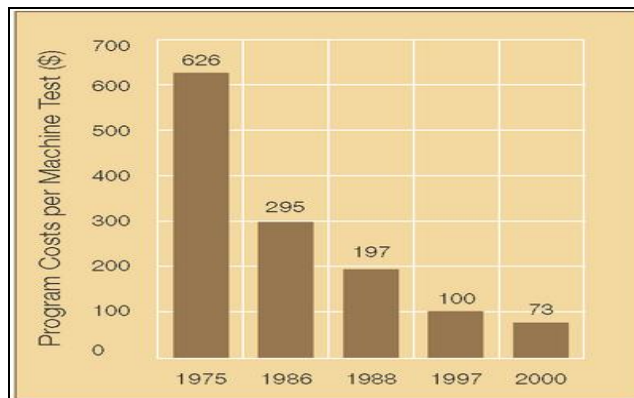
results. This database allows them to support the service centers directly when questions arise and provides the information necessary to understand how their machinery degrades over time. Ultimately, this information allows the OEM to improve its machinery design and remain a leader in a competitive market.

The OEM has been pleased with Azima DLI's support and has realized numerous benefits by allowing the company to standardize and streamline the OEM's vibration analysis offering to its clients. The sections that follow will discuss the technologies and methodologies that make Azima DLI's vibration services uniquely efficient.

Automated diagnostics - turning data into information

The ability to quickly analyze large amounts of data and accurately identify machine faults is a key element for efficient vibration services. In a typical plant, about 10 - 20 % of all machines tested will have inherent mechanical faults. Within this group, far fewer will require immediate service.

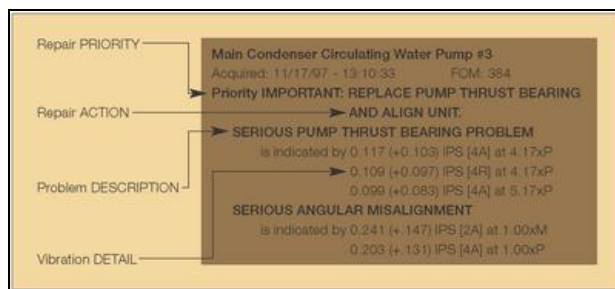
The distinguishing feature of Azima DLI's rule-based, automated diagnostic system is that it identifies problem machines and focuses on manually reviewing the data from these machines. This approach is far more efficient than analyzing data from every single installed machine. The efficiency of this system is unrivaled, and its accuracy, ease of configuration and ability to reduce analysis time and costs are well documented. Customers who use this automated approach typically receive a 20:1 benefit-to-cost ratio. An independent study carried out for the US Navy found that users receive objective results that are as accurate as analyses performed by engineers or vibration specialists with 2 to 4 years experience (See picture 1).



1. Cost reductions realized by the US Navy since 1975, when vibration services were first implemented

The diagnostic system contains over 4,500 individual fault templates. These templates are based on empirical data acquired from hundreds of thousands of machine tests conducted over more than twenty years. They can be applied to more than forty general machine component types, including motors, pumps, fans, blowers, gearboxes, compressors, generators, turbines and machine tools.

The system analyzes machine test data in a matter of seconds and produces a concise report that lists specific mechanical faults, the severity of each fault and an overall recommendation (See picture 2). Compared with systems that simply indicate that a machine is in 'alarm' mode, this very informative diagnosis illustrates how AZIMA DLI turns data into information. The efficiency of the diagnostic system is such that, with minimal manpower, it allows Azima DLI to process over 3,000 machine tests per month worldwide, thus providing concise and accurate machine condition reports.



2. Typical automated diagnostic system report

WATCHMAN Remote™ online monitoring

Another solution uses online monitoring of permanently installed data acquisition components to determine a machine's condition. WATCHMAN Remote is an accurate, cost-efficient analysis service provided to remote clients (See picture 3). This service reduces the labor burden associated with portable vibration programs, and monitors the machines with greater frequency and effectiveness. Users are alerted to machine degradation that takes place over time. Diagnostics are provided in the form of concise reports describing specific faults, the severity of each and recommendations for remediation.



3. WATCHMAN Remote for online monitoring of permanently installed data acquisition components

One of the instruments used for WATCHMAN Remote, is the Azima DLI SpriteMAX™ Expert Online Monitoring System. It runs on a Windows® embedded XP platform, and because of this it can be easily adapted to take advantage of evolving computer technology to enhance its capabilities. In addition, the system is easily customized for different applications and is equipped to accommodate wireless network and cellular communications capabilities.

It is based on 4-channel data acquisition hardware that can be multiplexed in increments of 16 channels, providing a capacity of up to 512 channels. Even though up to 512 channels can be monitored from

each unit, the design philosophy of the system makes it advantageous to locate individual units on or near the machines of interest and network them via IEEE 802.11 Standard networks (WIFI). This capability significantly reduces cabling costs and allows the system to be easily expanded.

By offering SpriteMAX as an upgrade to the equipment they sell, OEMs, such as the HVAC manufacturer described earlier, can effectively increase overall profit potential. Furthermore, Azima DLI allows OEMs to offer the advantage of increased reliability because SpriteMAX equipped machinery communicates directly with service centers and with Azima DLI monitoring centers when problems are encountered. So, rather than test machines only when service technicians can visit customer sites, they are tested every few minutes. This is a major benefit to clients who use equipment in critical applications.

Database replication - sharing data efficiently

Database replication allows two or more databases to be synchronized automatically via the Internet or other computer networks. This means that data collected at remote sites using portable or online systems can be transferred automatically to central sites for analysis and review. Additionally, database changes made at a central office can be implemented transparently at all desired remote sites. These changes include updates to test configurations, alarm criteria or edited fault diagnosis reports. Ultimately, database replication simplifies the task of remote information management.

The database replication network is set up like a secure, encrypted mailbox located on an FTP web server. Databases periodically check to see if changes have been made to other databases, and then automatically synchronize and update themselves as required. They can be configured to automatically check in as often as necessary, and they generate detailed messages when changes have been made. Database replication is achieved via the transfer of small files and requires minimal bandwidth.

The practical benefits of this technology are that it allows multiple sites to work independently of each other and then synchronize their information. It also allows the secure movement of data between remote sites in the presence of firewalls. Using database replication, a WATCHMAN Remote system installed in a copper mine in Chile can be monitored, updated and managed from an office in New York.

WATCHMAN Reliability Portal™

The WATCHMAN Reliability Portal provides the most efficient means of getting important data to the people who need it. Users can review diagnostic reports, machine history, trends and raw vibration data directly through a standard Internet browser. The Portal employs the above-mentioned replication technology to allow remote sites to synchronize with a database at the Azima DLI data centers. The data server database is visible on the web, thereby allowing any number of authorized individuals to access information of interest without having to purchase proprietary software.

Information from the WATCHMAN Remote system in Chile is available to the mine's owners in Canada and local service providers in Chile via the portal. Additionally, if the New York office is given the task of reviewing vibration results, these edited reports can be accessed via the Internet.



Portable data collectors

In many cases, companies monitor critical plant assets online, yet ignore their important auxiliary equipment. For optimum performance, auxiliary equipment should be monitored with portable data collectors. Lightweight and easy-to-use walk-around data collection systems are ideally suited to this application. Such systems can be pre-loaded with routes for ongoing monitoring programs, or may use embedded software that allows service personnel to define tests and troubleshoot machines in the field. The data collectors mentioned below use the same software and database as the WATCHMAN Remote system, thereby allowing online and walk-around data to be integrated into a single program.



4. Azima DLI DCA-60™ Vibration Data Collector / Real Time Analyzer

The Azima DLI DCA-60 data collector/analyzer is an all-in-one tablet computer, vibration data collector and machine analyzer. It is based on the same 4-channel data acquisition hardware found in the Azima DLI SpriteMAX, and in industrial mobile computers. In addition, the design allows users to benefit from the commercial PC market and is platform-independent, thereby making upgrades inexpensive and easy.

The DCA-60 is especially popular among service organizations because the user has all of the tools necessary to perform on-site data collection, analysis, troubleshooting and balancing. Furthermore, the user can write reports, connect to the Internet and e-mail the reports or replicate data to a central site for further analysis. The advantage of having a Windows® XP-based computer and a data collector in the same product is that it can be used for virtually any application.

Putting it all together

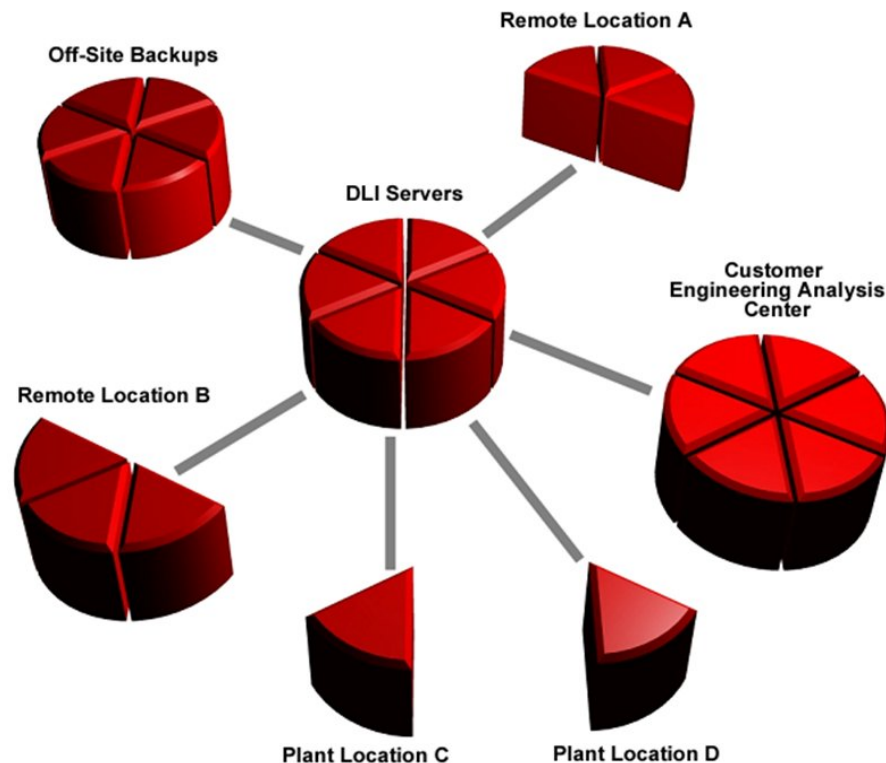
The following example illustrates how Azima DLI has implemented an efficient and successful machinery condition analysis service program for a global manufacturer using the technologies described above.

The manufacturer's service headquarters is located in the United States (the customer engineering analysis center in Picture 5). The company also maintains one regional service center (remote location) in the US and one in Europe. The main office requires online access to machine condition information so that it can better manage global operations, help acquire parts and plan work packages. The regional service centers are only responsible for facilities in their respective regions (plant location).

In the current implementation, Azima DLI is responsible for maintaining the databases for each site. This includes analysis, baseline criteria set-up and the entry of edited reports and recommendations into the database. The company also maintains the master database that includes information from all of the manufacturer's facilities. This is particularly useful because, as many of the sites have the same equipment, vibration signatures can be compared between like units at different sites. The master database replicates with the client's, giving the service headquarters access to information about each site,

and also with the two regional offices. Finally, each individual facility has a copy of its own replicating database containing only information specific to that site.

The master database at Azima DLI is available on the Internet via the WATCHMAN Reliability Portal, and can only be accessed via a web browser by authorized personnel. The active web pages, which are customized and branded with the client's logo, contain complete machine history, notes, comments, recommendations, trends and raw data.



5. Representing a global manufacturer



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