

Air Liquide Breaks Down Condition Monitoring Information Silos

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In an industry where it is not uncommon for companies to allow individual mills or plants to maintain their own autonomous condition monitoring operations, Air Liquide chose to go down a different path when it announced that it would partner with **Azima DLI** to manage all of its plants across the United States. The contract was one of the largest in the condition monitoring industry and indicates a growing trend for leading companies to instill consistency within their operations as opposed to allowing their own mills or plants to compete against each other.

Flexibility has proven to be a key issue as each plant has its own specific technological and personnel considerations. While some plants require remote web-based monitoring, others prefer their data be collected and analyzed by their on-site workforce. The major difference between Air Liquide's approach in comparison to the "divide and conquer" strategy of others is that despite each plant deploying its own customized condition monitoring program, all of the reporting was set up to be delivered in a centralized Azima DLI web-based portal.

In this article, Azima DLI's Heather de Jesus will discuss the implications of this landmark partnership, explain the execution of the program and provide an update on the results of the ground-breaking deployment. The two speakers will analyze critical factors leading to the program's overall success including work-culture changes and training issues. While training staff on new predictive maintenance (PdM) technologies such as databases, routes and data collection techniques for the vibration, infrared, thermography, tribology and motor testing programs requires dedication and hands-on practice, effecting change in a company's culture can prove to be more challenging.

How Azima DLI is helping Air Liquide

The AzimaDLI / Air Liquide Reliability program currently covers 105 plants across 6 zones. Each zone is unique in its own way – with its own needs, priorities and budgets. Therefore treating each zone let alone each plant the same was not an option for Air Liquide. It was important that each zone have the flexibility to customize the portion of the program.

Azima DLI's suite of services was one of the contributing factors in the vendor selection process. All of Azima DLI's services are scalable and interchangeable – making for an "a la carte" style PdM. The suite of services that Azima DLI offers include: vibration analysis, oil analysis, infrared thermography, motor/battery testing and reciprocating compressor analysis. In addition – results and recommendations across all technologies are made available through a secure web portal; "Reliability Portal." The portal is what helps Air Liquide maintain continuity across all 6 zones, 105 plants and all technologies in the PdM program. Figure 1 details a map of all the plant locations as well as Azima DLI offices.

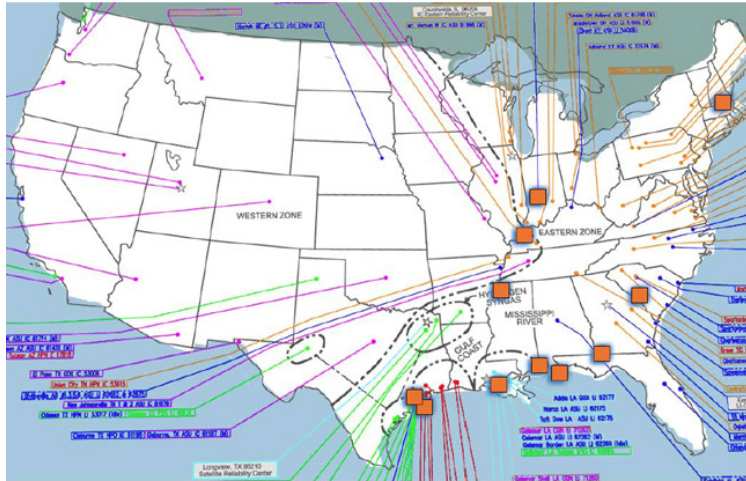


Figure 1: Detail map of Air Liquide Plant locations and Azima DLI offices

The vibration component is by far the most significant piece of Air Liquide’s Reliability program. Azima DLI’s vibration services include three different levels of service; Onsite data collection and analysis, Autowalk analysis and Remote Online analysis. Onsite data collection is the traditional means of data collection – where Azima DLI personnel not only analyze the vibration data collected – but also collects the vibration data.

Autowalk analysis is similar to Onsite – but with a twist. Azima DLI personnel perform the analysis but Air Liquide personnel collect the vibration data. Route files, which are used to define what vibration data is to be collected, are made available through the reliability portal for download. Once Air Liquide personnel have gathered the data on the pre-defined route, they simply upload the data through the reliability portal for analysis.

Lastly – remote data collection allows for more frequent data collection for critical equipment. Remote online systems allow for rapid data collection and provide a comprehensive view of the overall health of the monitored equipment. This allows for analysts to react quickly to rapidly changing conditions of the more critical machinery in the plant.

Maintaining continuity and transparency across the entire fleet of plants is of major importance to Air Liquide. From an Air Liquide corporate level – Chad Broussard who serves as National Maintenance and Reliability Programs Engineer, the reliability portal allows him to stay in tune with each zone, each plant and each technology. The design of the reliability portal is such that each individual user may customize his/her view. Someone like Broussard would want to see all of the Air Liquide fleet of plants. However, someone who works in one particular zone may only care to see his/her own zone and its corresponding plants. On the Azima DLI side – this was also quite an endeavor to try to manage as well. Therefore Azima DLI included a dedicated Program Manager to help coordinate the roll out, as well as is the point person to Air Liquide for any questions/concerns.

The overall breakdown of the vibration portion of the reliability program at Air Liquide shows that 85 plants are utilizing the Autowalk data collection approach, 13 plants using the Onsite data collection approach and 31 plants using Remote Online monitoring in addition to the Autowalk method. The initial roll out / set up of such a program took significant effort for both Air Liquide and Azima DLI. In the following section, we will highlight that effort and discuss lessons learned from that experience.

Implementation The implementation was broken into 6 major phases: Database creation, Route creation, Autowalk training, Remote Online IT Assessment, Remote Equipment Staging and Remote Equipment installation. Figure 2 shows a high level timeline that was used to coordinate the different activities required for each of the 6 major phases of the roll out.

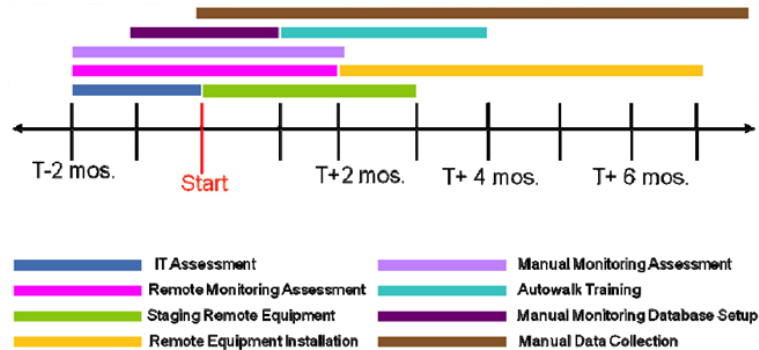


Figure 2: High level Roll Out plan

As shown in Figure 2 above, the first 4 months of the program had several activities running in parallel. The most critical of those activities was the Autowalk Analysis database setup and training. This activity served as the backbone of the entire program. During this phase Azima DLI personnel visited each and every plant to construct the database and route definition files to be used for data collection in the future. They also marked points on the machines to make it easier for Air Liquide personnel to collect data in the same locations in the future (for those plants on the Autowalk option). In addition, during this phase Air Liquide personnel were trained in the overall Autowalk analysis program including proper data collection techniques, how to upload and download data and lastly how to use the Reliability Portal.

This was an extensive effort to visit 105 plants and mark points on over 2100 machines. It also was a great marketing effort not only for Azima DLI but also for Air Liquide Corporate and Regional personnel to help get the word out about the new program and the new vendor. Some of the ways that Azima DLI and Air Liquide worked together to get the word out during this phase was through email blasts, regional and/or zone specific conference calls. Azima DLI also held Autowalk specific training sessions for plant personnel to attend across the country.

Each zone had its own individual approach to the implementation of the program. Of the 6 zones, some of the regional Air Liquide managers accompanied Azima DLI during the initial visit to: step the plant personnel through the new contract details, show support of the new program and set expectations and let the plant personnel know that this program was here to help better their particular plant. This helped rally the plant operations personnel onboard with the program.

In an effort to promote information sharing, Chad Broussard and Heather De Jesus have frequent conference calls to allow them to “check in” with each company. These calls are open to all – and are required for the regional zone managers. This has proven to be helpful. In addition, Azima DLI holds zone specific conference calls to discuss specific challenges for that particular zone.

In addition to the conference calls, Air Liquide sends out periodic online surveys. The intent of the surveys is to get a better understanding of the overall satisfaction of the various levels within the organization and also to give vital feedback to Azima DLI on areas of

improvement. The first online survey focused on personnel within Air Liquide who are collecting data as part of the Autowalk analysis program. The first results showed that plants whose regional zone managers visited the individual plants during the initial phase had much higher overall satisfaction rates. In addition, these plants are rarely late on their data collections – whereas data is often late from those plants that did not have a more aggressive approach.

One of the ways that Air Liquide and Azima DLI help keep on top of the overall reliability program is by tracking key metrics on a monthly and quarterly basis. This helps to show both Air Liquide Executive Management as well as Azima DLI

On a monthly basis, the following items are tracked:

1. **Data collection compliance:** Is data being collected on the agreed upon schedule within 5 business days of due data
 - a. This is more relevant to the Autowalk analysis where Air Liquide personnel collect the data for Azima DLI to analyze
2. **Report delivery compliance:** Are the Analysts' reports being generated and posted to the Reliability Portal for Air Liquide to access within 5 business days of receipt of the data
 - a. No matter which technology, nor who collected the data; Azima DLI is required to generate a report within 5 business days of receipt of data
3. **Work Orders generated:** Specifically, Work Orders generated as a result of a recommendation by Azima DLI
 - a. In an effort to ensure that recommendations are indeed acted upon in a timely matter, Air Liquide tracks Work Orders generated against total number of recommendations from Azima DLI each month

On a quarterly basis, Customer Satisfaction Surveys are sent out to specific focus groups. The first of the Customer Surveys – as mentioned above – was focused to the Autowalk data collection personnel. Subsequent surveys will be targeted at different focus groups. The idea is to touch every level within Air Liquide.

Challenges and Lessons Learned

One significant challenge in the program has been the installation of Remote Online monitoring equipment. For most of the remote online monitoring, Azima DLI will be tapping into existing proximity probes and drivers. To do so safely, it has been agreed that isolation devices will be installed between the existing proximity probe output and the Azima DLI remote data collection devices. The isolation not only helps ensure that the remote equipment does not accidentally trip the machinery – it also has proven to ensure that other outside influences do not trip the machinery either. Because of this – the installation costs associated with the remote online monitoring equipment was much greater than originally planned. This has made it more difficult to complete the installation work to date; not only because the price but also because of the scope of work.

One of the ways Azima DLI and Air Liquide are trying to minimize these issues with the remote equipment installation, is to assist in the creation of the Engineering Change documentation. These documents detail how the equipment will be installed, including any necessary conduit. One of the ways to reduce the amount of conduit needed – is to take advantage of existing cable trays and free standing piping to attach or run cables through.

Another way to help reduce costs that some zone managers are taking is to utilize plant personnel to perform some, if not all, of the Air Liquide portion of the installation work.

The remote online systems also require both inbound and outbound Internet connectivity access. To accomplish this – Azima DLI would need access to the Air Liquide LAN at each plant where remote equipment is to be installed. Doing so obviously has some risk to Air Liquide. To mitigate this – Air Liquide provided Azima DLI restricted VPN (Virtual Protocol Network) access to the Air Liquide LAN. As an additional level of security, Air Liquide IT personnel created a dedicated subnet on their LAN to ensure that Azima DLI equipment and personnel could not gain access to any of the Air Liquide business traffic.

As with most IT departments – getting this cleared in a timely matter was extremely challenging. Azima DLI and Air Liquide had initially started these conversations months before the official start of the contract. IT can be a show stopper if not properly coordinated. Azima DLI has had extensive experience with IT departments and IT policies that we were able to work with Air Liquide IT to find an agreed-upon execution plan. A way to help ensure continued success with IT – Azima DLI continues to have implementation conference calls with Air Liquide IT personnel.

Overall, the reliability program has been a success thus far. There were some growing pains during the initial implementation phase as can be expected with such a large endeavor. Azima DLI's suite of offerings and Reliability Portal has helped give Air Liquide the flexibility needed to ensure adequate and cost-effective solutions across their fleet of plants. The Reliability Portal offered by Azima DLI helps maintain continuity and quality across the zones and plants. In addition, the portal allows for corporate level personnel a way to monitor the entire Air Liquide fleet of plants.

Another key ingredient for the success of the program has been constant communication. An endeavor this large needs constant communication not only between the two companies – but also constant communication internally as well. Air Liquide accomplishes this by having fleet-wide reliability conference calls monthly with each Reliability Engineer for each zone. In addition, Air Liquide has corporate-level technical experts available to each Reliability Engineer implement the Reliability program they have chosen for their zone. This helps maintain a knowledge base across the fleet of plants and allows for Air Liquide to see patterns in issues with particular types of machinery as well as help implement best practices learned.

Azima DLI works to constantly communicate internally as well. Azima DLI has compiled a dedicated team to help ensure the success of the Reliability program. The team is lead by a dedicated Program Manager. In addition, there is a lead Vibration Analyst, lead Oil Analyst and lead Infrared Thermography analyst. To help support the team – there are engineering resources available to help develop tools to ensure the success of the program.

Communication has proven to be the key for success. Azima DLI and Air Liquide strive to ensure that we are all communicating at every level of the organization. This includes everyone from Corporate technical experts to Plant Operation personnel, Air Liquide IT to Azima DLI field personnel and Reliability Engineers to Azima DLI analysts. The two companies use various means to communicate internally and externally. Some of those methods include: bi-monthly conference calls, customer satisfaction surveys, automatic alerting via the Reliability portal, period training sessions and email newsletters.