6 steps to increase availability, safety and profitability through remote equipment monitoring

Whether you manage a refinery or chemical facility, critical business challenges are all interdependent and have cascading effects. For example, a single unplanned slowdown or shutdown impacts throughput, costs, and profit margins, and can even cause safety and environmental incidents, while also draining efficiency and reliability across your facility.

The ARC Advisory Group recently reported that the global process industry loses $20 billion, or 5 percent of annual production, due to unscheduled downtime and poor quality. ARC estimates that nearly 80 percent of these losses are preventable through better quality and increasing Overall Equipment Effectiveness (OEE).

- **As much as 43%** of unplanned downtime is caused by equipment failure.
- **It costs approximately 50% more** to repair a failed asset than if the problem had been addressed prior to failure.
- **Every 1% gain in availability is worth $8.4M** of additional margin capture per year in a typical 200,000 bpd refinery.
- **50% of all process safety incidents** occur during transient operation time.

IoT-enabled remote monitoring involves collecting data from critical assets from anywhere and then using that data to trigger automatic alerts and actions to improve availability, safety and profitability.

Manual, time-intensive procedures can now be automated by connecting and monitoring streaming, real-time data from sensors, transmitters and other smart devices in order to analyze untapped data and create new intelligence that can improve reliability in these 3 key areas:

Availability – Gain visibility into previously out of sight areas, improve operational decision-making across departments, provide timely, accurate information to quickly identify abnormal situations

Safety – Keep personnel out of harm's way while still continuously monitoring and protecting critical assets, reduce "operator rounds", receive early warning on equipment degradation to prevent leaks, fires and emissions

Profitability – Reduce repeat failures of equipment and unplanned maintenance costs, determine appropriate levels of maintenance and intervention, realize rapid ROI paybacks

Continuous, real-time remote pump monitoring

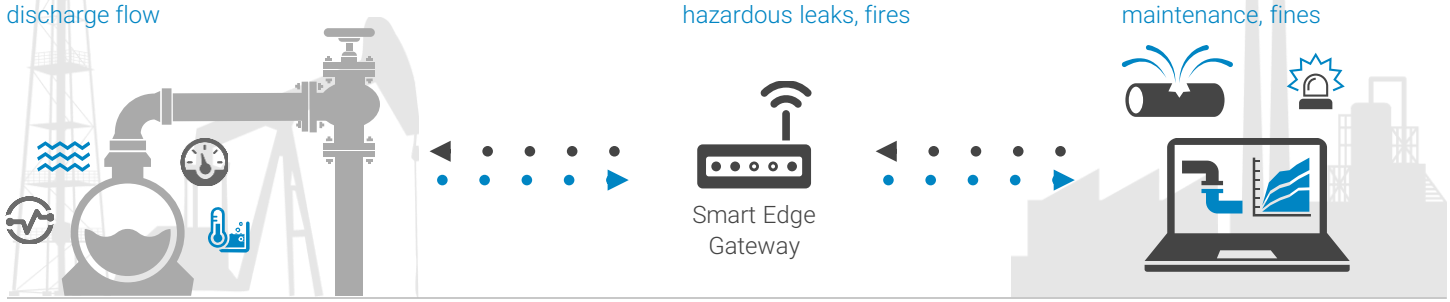
The following example illustrates how remote equipment monitoring works to detect changes in process variables and equipment condition which, are keys to preventing costly damage, unplanned downtime, environmental incidents and negative business impact.

Monitor changes in critical equipment conditions such as; restricted suction or discharge flow

Detect abnormal situations such as; vibration, cavitation

Prioritize impact response on equipment and environment such as; bearing wear, seal and pump failure hazardous leaks, fires

Prevent consequences such as; reduced throughput, process upsets, unnecessary maintenance, fines



Follow these 6 steps to plan your Remote Equipment Monitoring implementation

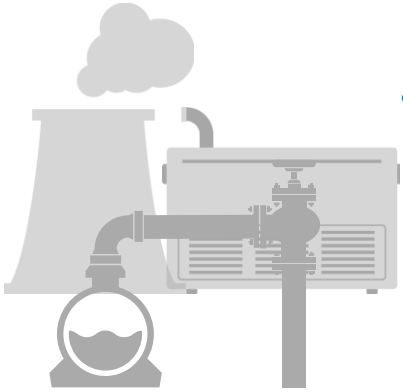
1 | Identify your highest value business opportunities

Begin by identifying any processes, equipment issues, or insights into asset performance that you would like improve. Next, define any scenarios or desired results that your remote monitoring solution should support. In order to maximize your ROI, focus on the unique problems that will benefit most while managing risk. Consider these questions to identify key areas to improve reliability:

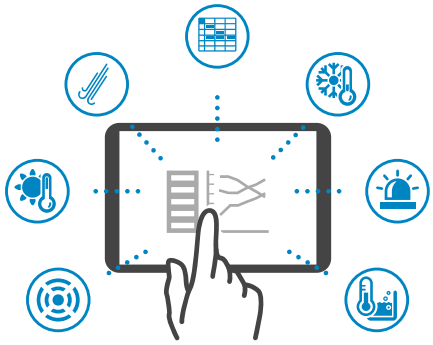
- If a remote pump motor overheats for days undiscovered, how do we get it fixed?
- How can we use IT systems and technologies to make best use of this data and automate our operational processes?
- How can we increase our response times to equipment issues, or gain better insight into asset performance?
- If we want roaming maintenance technicians to receive real-time alerts of equipment problems, how do we equipped them with information and devices that deliver those alerts?

2 | Inventory and profile the critical assets involved

Create an inventory profile of the critical assets involved including categories such as; asset type, age, condition, location, connectivity, protocols and what existing data is being collected. This will help you map these selected assets to deliver the desired outcomes for your solution. Consider starting a device registry, which enables you to define individual device identities and associate a specific device (or device group) with the data it generates. It is also important to plan for device-level security, including who has access to what devices, and what data they can view. Upon completion, the inventory should offer data on the potential ROI impact of a remote monitoring deployment to further gain stakeholder support.



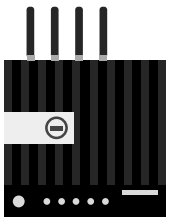
Identify critical assets equipment and system candidates such as; pumps, compressors, exchangers blowers, cooling towers



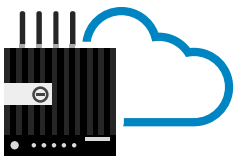
Asset type, age, condition, location, operational schedule, historical data

3 | Determine where to run your analytics

Establish an advanced analytics foundation based on your specific needs. For example, Edge (remote, field) and Cloud (enterprise) analytics can be balanced to reduce the burden and latency issues of streaming perishable data on your cloud deployment. Whereas, a distributed approach enables you to detect and respond to remote events in the field as they happen. This allows you to take immediate action on real-time data, while simultaneously integrating additional data sources in the cloud. The Dell Edge Gateway can analyze streaming data in memory for real-time response and filter out unnecessary data rather than relaying it to the cloud.



Push insights from the Edge to the Cloud



Edge analytics **combined** with deeper processing in the data center or cloud

Pull insights from the Cloud to the Edge

Edge Analytics

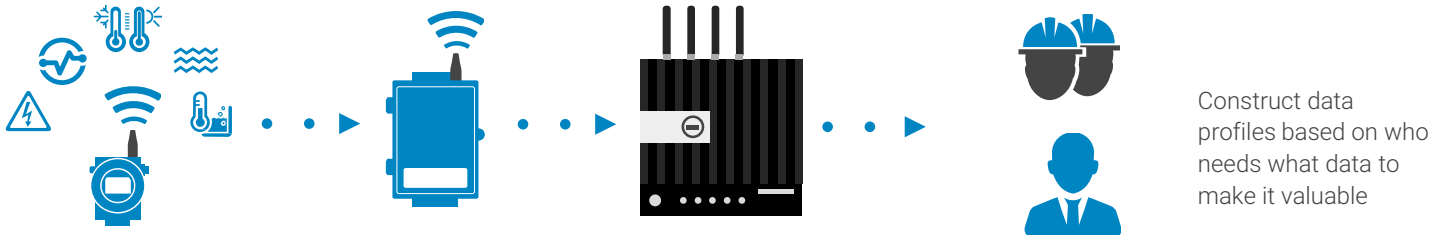
Distributed Analytics

Cloud Analytics

DELL | Microsoft

4 | Understand the data to gain precise insights

Understanding the data you can collect is an important step to validating that you can successfully achieve your desired results. For example, often times the root cause of a vibration problem is a process upset that leads to unplanned downtime. By gathering detailed diagnostic data such as; process conditions, vibration, temperature, flows, pressures, timestamps and trend data you now have the ability to determine root cause and avoid the consequences. Construct data profiles that include types and amounts of data your assets generate, how often new data is available, and where the data lives. Determine who needs which data, and how soon they need it in order for it to be valuable. Develop data profiles, which include: Data type, content (temperature, levels, vibration), format, size, frequency, where it is processed and stored and, if and/or how it is shared across systems.



Understand the data by developing data profiles

Collect data with Dell Edge Gateway

Construct data profiles based on who needs what data to make it valuable

5 | Define business rules and optimize the solution

A significant advantage of a remote monitoring solution is the ability to define business rules for conditions or events. For example, if the threshold of a pressure or temperature spikes, or remains in a certain range for a specific period of time, you can trigger an alert and/or action. You may decide to define certain conditions as critical, where you need to ensure that the closest qualified person or group receives specific data and instructions to enable them to take action immediately while, in non-critical scenarios you may simply want an email or text alert sent. If the asset can accept a condition-based command, you may want to send an action directly to the asset. Rules can be based on known values or you can determine a good starting point and fine-tune your model as you continue to learn more which is what makes this feature so valuable in gaining highly customized ROI which, will enable you to build a predictive analytical model that can serve as the foundation for a predictive maintenance program.

Capture data to learn, refine and improve models

Turn insights into action when a potential problem is uncovered

Send prioritized, automated alerts to personnel

6 | Translating your solution into measureable business ROI

Benefits from remote monitoring will vary, but often include real-time visibility into operating conditions, faster resolution of problems, and the ability to detect trends that weren't previously possible that lead to cost savings and operational efficiencies. You will likely require further integration with business applications and systems as you scale your solution. To gain the most value from the data gathered through a remote monitoring solution, particularly data that indicates normal conditions versus problem conditions.

Real-time visibility into process values and variables

Data Historian using PI Server

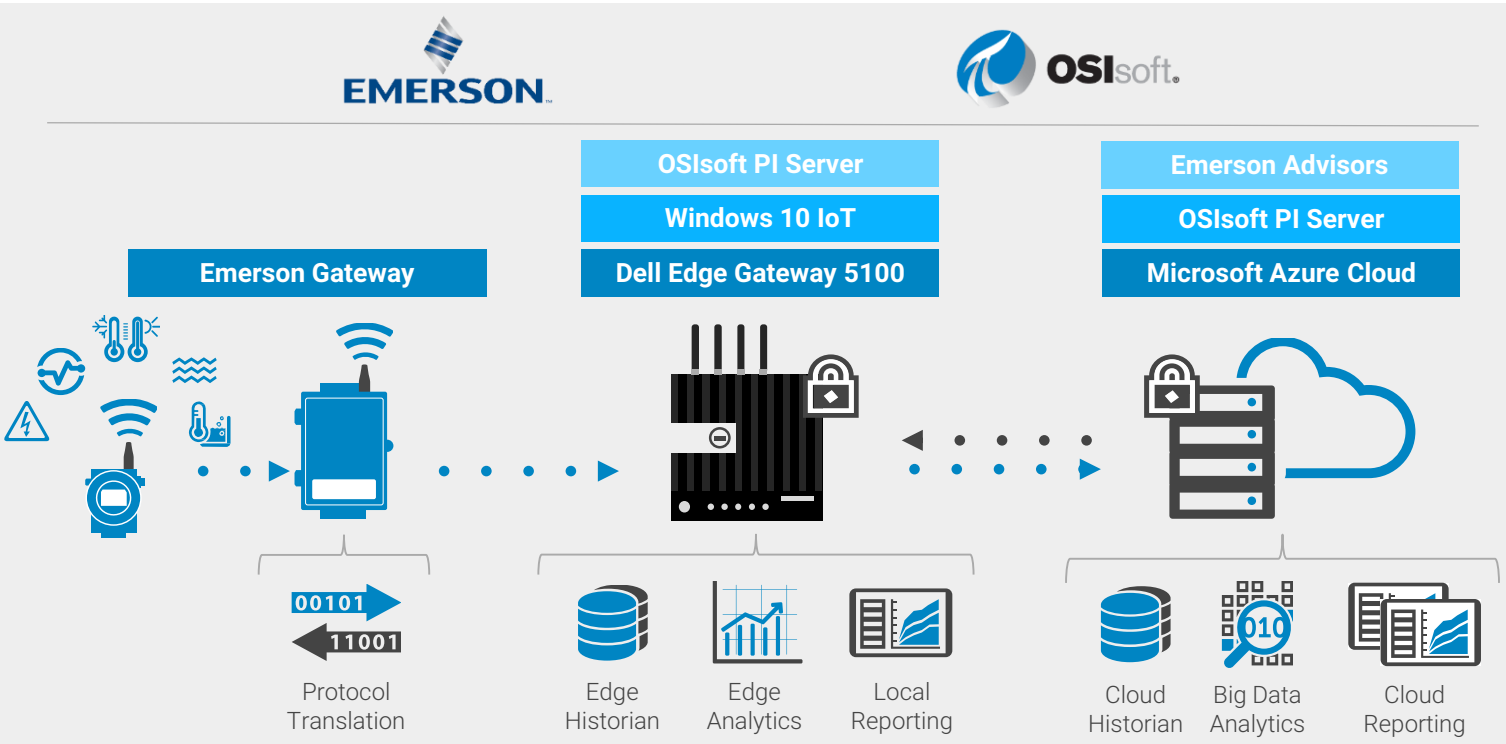
New insights into root cause and process changes

Implement business process changes. Scale and integrate with back-end systems and applications

Remote equipment monitoring solution example

This remote equipment monitoring solution example represents a single solution provided by the industry leading partners below as a reference. Your specific application may involve a combination of these and other technology providers within our IoT Partner ecosystem.

Dell, Emerson, Microsoft, and OSIsoft have teamed together to provide a critical equipment monitoring solution that collects, stores, and analyzes the process and diagnostics data from critical equipment and presents it to the appropriate stakeholders using an intuitive, web-based application. Data from Emerson digital valve controllers and other connected critical equipment is collected by an Emerson field gateway utilizing HART IP. The data is then passed on to the Dell Gateway 5100 with OSIsoft PI System and PI Connector for Hart IP software installed, which collects, manages, and contextualizes that data. That critical equipment data can also be combined with additional data from Emerson's wireless transmitters. Valuable data can then be transferred to the cloud for further, more in-depth analysis, using OSIsoft's Azure-based PI Cloud Connect to securely stream data to a second PI System running in Microsoft Azure, allowing the data to be visualized with OSIsoft's PI Coresight application. Emerson's Health Advisor, Performance Advisor, and Energy Advisor applications, also running in Azure, can then analyze the equipment data from the cloud-based PI Server and report status and alerts to operators. The equipment status is only a click away—and with that, process safety and availability increases, and profitability improves.



Along with our IoT Solutions Partners, we provide technology you can trust to help you get started quickly and efficiently.

Dell takes a pragmatic approach to the Internet of Things (IoT) by building on the equipment and data you already have, and leveraging your current technology investments, to quickly and securely enable analytics-driven action.

The Dell IoT Solutions Partner Program is a multi-tiered partner ecosystem of technology providers and domain experts to complement Dell's broad portfolio of IoT-enabling technologies.

To learn more visit us online at: www.delliotpartners.com

Contact Dell Sales to learn more about the Dell Edge Gateway 5000, our ecosystem of qualified partners, and to deploy this flexible equipment monitoring solution today.

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