

Solving Process Manufacturing Maintenance with IoT Technologies:

The NexVu IoT Solution for Predictive Maintenance Management





Introduction

Maintenance is essential for any industrial operation to ensure safety and productivity but is especially crucial for process manufacturing or other industries with hazardous areas that are prone to explosion, such as oil and gas, chemical, pharmaceutical, public safety and others with combustible environments. Maintenance is also a major contributor to the performance and profitability of a business. System failure can lead to costly stoppages in operation. Unplanned refinery shutdowns in the U.S., for example, cost customers more than \$20 billion per year, which equals nearly 5 percent of their total production. Some 92% of oil and gas company shutdowns in general are unplanned, costing an average of \$42 million a year and up to \$88 million per year.

To effectively prevent breakdowns or accidents, operators must monitor all technical, administrative and managerial actions during the lifecycle of an asset. New technologies can help. Tools such as IoT sensors and mobile devices that are purpose-built for hazardous environments can monitor operations for potential problems and help prevent or reduce the impact of any issues. Preventive maintenance and asset performance management (APM) that is assisted by predictive technologies is designed to inspect assets when they are still working properly so as to reduce the likelihood of unexpected equipment failure.

IoT technologies that can perform predictive maintenance without disrupting operations allow companies to better calculate when and how a critical asset may fail and act accordingly to ensure an asset functions more efficiently so that the overall operation can run more smoothly and cost-effectively.



The Problem

All refinery equipment deals with highly combustible materials and is located in Class I Division 1 hazardous areas where electronic devices are restricted because of their explosion risk, so personnel cannot have immediate access to data or communications while in the facility. Manual inspection of all assets is time-consuming, vulnerable to error in method or reporting, and delayed in the recording of data to ERP or other IT systems.

Current sensors that monitor equipment function report individual silos of data about vibration, temperature, corrosion, pressure and other factors, but they are expensive and do not necessarily communicate with one another nor incorporate the data of other interdependent assets to provide a complete, real-time report of asset viability and performance.

In the event of an abnormality, personnel working in the hazardous area hear alerts but cannot differentiate between a true emergency and a problem that could be solved with little risk, thus full stoppage of the operation is necessary to address the issue.



Solution

Operators want a safe, simple-to-install, cost-effective solution to improve monitoring of assets, improve communication among personnel and between personnel and management, and plan predictive maintenance in order to reduce maintenance costs and avoid downtime.

Technologies:



Intrinsically Safe Sensors



Intrinsically Safe Mobile Devices



Digital Maintenance Management Applications

Benefits:



Real-time Data Capture and Alerts



Access to Records



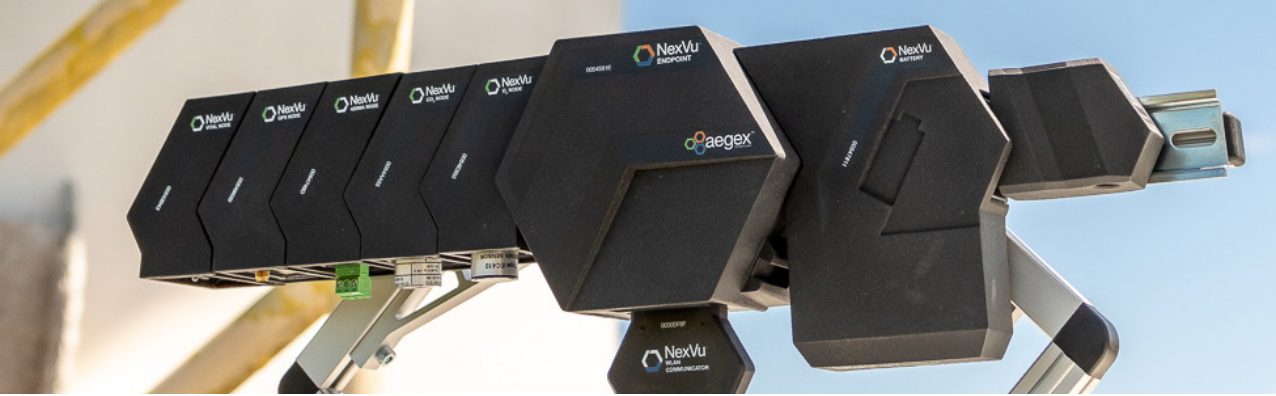
Documentation of Service



Planning Timekeeping



Decision Analysis



Intrinsically Safe Sensors: the NexVu IoT Solution

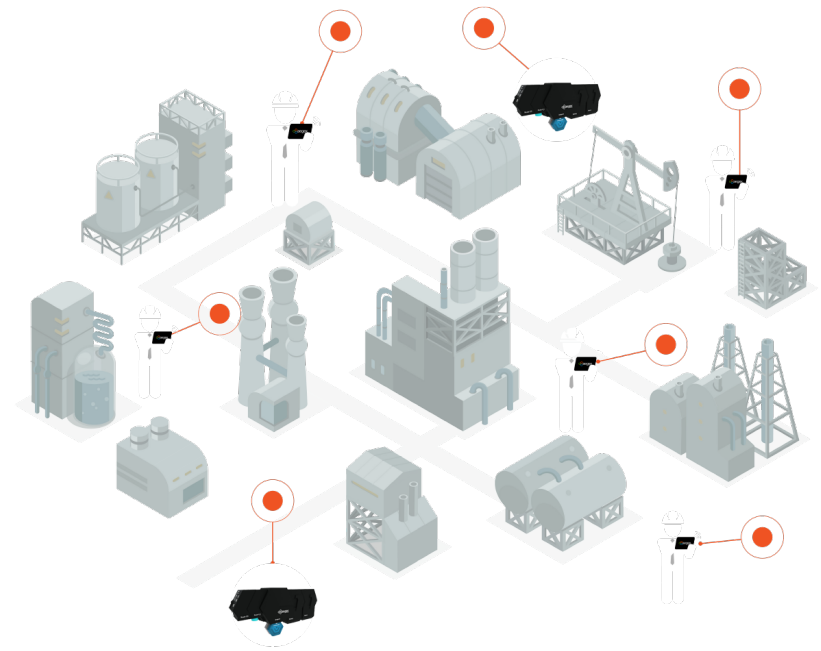
Gathering as much actionable data as possible about the various assets involved in the refining process is the first step to identifying potential problems and preventing them through predictive maintenance.

The NexVu IoT Solution from Aegex Technologies allows technicians to easily customize intrinsically safe IoT sensors and place them in Class I Div 1 hazardous areas to collect a myriad of actionable data points about the surrounding conditions. The NexVu sensor modules are customizable for thousands of configurations and a variety of data analytics and require only a few battery-powered and LTE-enabled components.

Up to 40 nodes including sensors that detect vibration, temperature, pressure volatile gases and others can be attached to each NexVu endpoint to ensure a complete conditional assessment. The “smart” sensors do not need prior programming – they are automatically recognized in the Cloud with pre-established hazard thresholds – so they are continually learning which data anomalies to report based on the selected combined data configurations.

For example, a turbine that reports higher than normal pressure combined with an excessive CO₂ concentration could trigger a specific alert for urgent maintenance, while a gear with abnormal vibration patterns but no excess heat may trigger a less urgent maintenance request.

NexVu sensors can be programmed to report only the data necessary for asset performance management so maintenance needs may be addressed only in the event of an anomaly, or ahead of an anomaly, based on the sensors’ learnings about what are normal and optimal operating conditions.





- **Customizable combinations** of 40+ different sensors
- **Up to 40 simultaneous sensor nodes** per endpoint yielding more than 60,000 possible configurations
- **Simple** plug-and-play design





Intrinsically Safe Mobile Devices & Maintenance Management Applications

The aegex10 Intrinsically Safe Tablet is an enterprise-grade, connected collaboration device for managing data and conducting communications in order to predict, prevent or prescribe maintenance.

Data from NexVu IoT Sensors can be safely viewed in potentially combustible environments on aegex10 Intrinsically Safe Tablets. These tablets are certified for the most explosive of environments - Class I, II, III Division 1 or ATEX/IECEX Zone 1 hazardous areas - so they will not cause an explosion in volatile situations where gases, dusts or other combustible materials are present. The tablets are also ruggedized to IP65 standards to withstand extreme temperatures, drops/impacts and water or particle ingress. Their Windows 10 OS allows for user-friendly operation and immediate, secure synchronization with most IT systems for easy data management. The tablets connect to the Cloud via LTE or WiFi or can be interact offline via Bluetooth and NFC communications.

For the refinery in which Class I Division 1 certified equipment is required, technicians can carry the lightweight aegex10 tablets by hand or in hands-free carrying cases without fear of igniting the volatile atmosphere. The tablets enable teams to communicate in real time for up to 12 hours on a single charge, and they can be operated with or without a stylus and/or gloves in the extreme environment, where high temperatures, water, gases and other hazards are present. The Aegex tablets ensure all personnel are connected and able to securely communicate.



aegex10™ Intrinsically Safe Tablet

- **Intrinsically Safe C1D1, ATEX/IECEX Zone 1**
- **4G LTE, WiFi, Bluetooth, GPS**
- **IP65, -10°C to +50°C operating temperature**
- **12-hour battery, 2.6 lbs**



Results

Improved Maintenance Efficiency:

After installing NexVu IoT Sensors throughout the facility to monitor ambient conditions and specific asset conditions, the refinery was able to:

- **Be alerted** of anomalies and potential emergencies
- **Identify** which assets were nearing end-of-life
- **Predict** which assets were close to needing maintenance
- **Determine** which type of maintenance each asset needed
- **Devise a schedule** of regular preventative maintenance for each asset



By running advanced maintenance management applications on Aegex Intrinsicly Safe Tablets, personnel could:

- **Plan maintenance** with the assistance of virtual reality apps
- **Capture and combine** data from IoT sensors, schedules and records for use in preventative and predictive maintenance plans
- **Be alerted and react** when equipment is reaching end-of-life
- **Check** vital maintenance procedures and ensure they were completed
- **Retrieve** documentation and history of previous maintenance
- **Check status** of tag-outs and verify completion before removing the tag
- **Check service** records for third-party maintained systems
- **Update** status of trouble tickets
- **Verify** independent functional testing completion following repairs
- **Attach** supporting images to equipment service records
- **Scan** instrument bar code serial numbers, trouble tickets, etc.
- **Support** “digital signing”
- **Consult** via chat/text/email with third-party maintenance organizations and attach correspondence to service records
- **Receive** local priority alerts
- **Perform** maintenance reviews and supervisor sign-offs



Improved Profitability, Performance and Safety:

By enabling customized sensor data and real-time communication among personnel in hazardous areas, the refinery was able to:

- **Discover** potential issues based on real-time data about asset condition from IoT sensors and plan accordingly to address or prevent those issues
- **Enable** technicians to more quickly and easily complete reliable preventive maintenance tasks onsite with intrinsically safe tablets
- **Learn** which assets needed attention at which intervals, minimizing maintenance frequency and avoiding unnecessary costs
- **Achieve** a 30% reduction in maintenance costs, 75% decrease in breakdowns and 45% reduction of downtime
- **Decrease risk** of emergencies and ensure better personnel safety through better asset health

Contact Aegex to learn more.



Aegex delivers innovative solutions that drive improved performance for industries with hazardous environments. Our globally certified intrinsically safe tablet provides cloud connectivity to personnel working in some of the world's most volatile environments in public safety, oil and gas, chemical, pharmaceutical and other industries with potentially explosive atmospheres. The tablet can work in conjunction with our NexVu IoT Solution of sensor modules and cloud services to form an Industrial Internet of Things (IIoT) that improves safety, efficiency and productivity in hazardous operations.

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