**Overview**

HARMAN® Quick Predict is an Industrial Internet of Things (IoT) solution which has been developed based on Intel’s intellectual property (IP) and design expertise to provide substantial savings for industrial end users by reducing process downtime and repair costs. HARMAN Quick Predict is an end-to-end Industrial IoT solution that provides early detection of problems with rotating equipment in industrial settings. Using advanced machine learning algorithms at the edge, the solution enables prediction of potential failure based on real-time capture and analysis of abnormal vibration patterns at the gateway. These problems are detected using edge analytics and flagged with notifications or alerts for display in an easy-to-use, web-based interface. The system and the business model is flexible, scalable and customizable. The server provides a mechanism for machine analysts to classify the patterns further, resulting in enhanced capability at the gateway for fault classification.

**Preventing Failures and Delays**

Rotating equipment maintenance is expensive and resource intensive. In continuous operations, organizations typically stock spares so they can quickly repair their pumps, blowers, and fans in case of failure. Even with full spares in place, a pump failure on a line, for instance, can cause costly production delays leading to emergency work orders and hurried scheduling of maintenance crews. Spot manual vibration readings, collected by technicians on a weekly or monthly basis per preventative maintenance programs, simply do not provide the data needed to identify all problems early enough to allow for planned repair. Unplanned downtime means emergencies and disruption in productive operation. Detecting a potential failure enables a planned shutdown to avoid expensive emergencies. It also ensures that Mean Time to Repair (MTTR) is managed better, and there is minimal loss of productive time.

**Business benefits**

While preventative maintenance is important in industrial settings, but a predictive maintenance regime goes much further. With HARMAN Quick Predict, users are able to increase equipment uptime, decrease repair and spare parts costs, and optimize the use of their workforce by reducing the number of emergency repairs. Increased uptime leads to direct productivity gains. Operations departments will benefit from fewer process disruptions. HARMAN Quick Predict collects the high-resolution vibration data needed to detect problems early and continually. The solution learns from analytics, helps map abnormal vibration and rotation speed patterns to potential failures. Preventing a single catastrophic failure – that avoids substantial downtime – could pay for the cost of the solution many times over.

**Why HARMAN?**

- **Reduced Time-to-Market**
  Shorten your time from concept to delivery using our best practices, turn-key delivery models and rich talent pool.

- **Cross-platform**
  Leverage our experience in multiple industry verticals and leading platforms to rapidly exploit new market opportunities.

- **Global delivery footprint**
  Receive timely support from our skilled, talented engineers who deliver solutions to companies like yours from centers throughout the world.

- **Flexible Business Models**
  Choose between flexible licensing models or managed services model along with licensing

- **Solution accelerators**
  Get access to leading edge innovation and best practices by using our solution accelerators and global pool of partnerships.

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How does it Work?

The rotating equipment is equipped with a set of accelerometers and a tachometer, which connects over BNC (Bayonet Neill-Concelman) connector or Twisted pair to a vibration sensor hub. Each sensor hub is connected to a HARMAN IoT Gateway, which runs machine learning algorithms on the real-time time-series data to classify vibration signatures and detect anomalies. Signatures recognized as normal are simply logged in the gateway. In the case of an abnormal signature (e.g., potential bearing failure), operators are immediately notified, and the data is transmitted to a server located either on premises or in the cloud for further analysis, diagnosis, or expert review. Cloud based implementation allows monitoring of distributed assets and helps reduce the overall cost of implementation, maintenance and management.

By implementing statistical machine learning algorithms on gateways at the edge, the solution greatly reduces the amount of data that must be transmitted to the cloud. Continuous monitoring of all rotating equipment in a manufacturing facility would result in terabytes of data per day. By leveraging edge computing, the amount of data transmitted, stored, and analyzed is reduced by more than 99.9 percent, to only megabytes per day. This is achieved by real-time analysis of time-series data on the gateway. Data can be sent from the gateway using hardwired connections into existing control systems, or to the cloud through Ethernet, Wi-Fi, or cellular networks, depending on end user preference.

General

- Early detection of problems with rotating equipment
- Real-time data capture and analysis of abnormal vibration patterns to detect potential failures
- Use of machine learning algorithm and edge computing to identify and report anomalies in real-time

Solution Benefits

- Improved uptime
- Reduced unplanned downtime
- Efficient use of maintenance crews
- Reduced emergencies leading to potential catastrophes
- Reduced preventative maintenance
- Smaller spare parts inventory

Solution components

- Integrated electronic piezoelectric (IEPE) accelerometers
- Tachometer
- Vibration Sensor Hub
- HARMAN IoT Gateway with Edge Analytics
- IoT Vibration Analytics & User Interface

Analytics

- Easy-to-use User Interface (UI), accessible over a web browser
- Capable of notifying and alerting through email, web, and text
- Predicts failure on the basis of real-time instead of historical data

Partner with an industry expert

HARMAN Connected Services, a leader in software design and development, helps global brands dramatically reduce time-to-market while improving quality and productivity. Our end-to-end software engineering, IoT and data analytics services enable the world’s top Automotive, Industrial, Mobile and communications and software-enabled businesses drive innovation-led growth. Via our over-the-air (OTA) software update, virtualization and device management solutions we keep billions of mobile, automotive and IoT devices of all sizes and complexity continuously and reliably relevant and secure. The mobile devices and intelligent systems that we power are connected, integrated and protected across all platforms and reach every corner of today’s digital world. HARMAN Connected Services is a division of HARMAN (NYSE:HAR), the leading global infotainment, audio and software services company.

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