

HOW A MAJOR CAR MANUFACTURER AVOIDED LOSING \$0.5M IN UNPLANNED DOWNTIME

A CASE STUDY IN MACHINE HEALTH MONITORING

Automotive OEM stamping plants encompass millions of square feet and may house more than a dozen stamping lines. These lines typically operate 20 shifts per week, producing parts that are shipped to numerous facilities across the United States and worldwide. If a stamping line unexpectedly ceases operations, the revenue loss can quickly escalate to more than \$1 million per hour.

\$1M/Hr
Lost
Revenue

These stamping lines are significant capital resources, each costing upwards of \$40M with an expected operational life of more than 20 years. Given the extreme stresses to which the machinery is repeatedly subjected, the risk of equipment failure increases over time. Much of the older equipment lacks embedded sensors, so engineering managers cannot readily see the actual health of critical assets. As a result, machinery may be taken down for maintenance more frequently than necessary, and unforeseen equipment problems can lead to unplanned downtime and potential injury to personnel.

Preventing losses
of **\$0.5M** in less
than **6 months**

Reducing costs means minimizing downtime. A system that provides accurate, real-time assessments and predictive insights into machine health allows production facilities to maximize equipment life while reducing the risk of failures. The GraceSense Machine Health Monitoring Solution delivered this outcome for a major car manufacturer's stamping plant, preventing losses of \$0.5M in less than six months.

SPOT EQUIPMENT FAILURE BEFORE IT HAPPENS

GraceSense provides powerful, data-driven decision support tools for asset managers, engineers, and operations and maintenance teams who need to act on real-time information. The integrated solution of wireless

sensors, gateways, the cloud-based Maintenance Hub, and advanced analytics delivers actionable information that improves maintenance processes and helps avert potential failures.



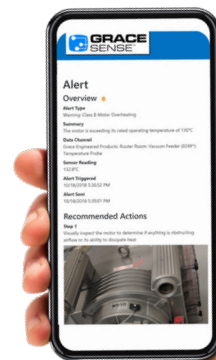
GraceSense architecture is flexible, and our team brings deep technical expertise. The technology has been proven in some of the world's most challenging operating environments, from long-span bridges to U.S. naval warships. It can be customized in a cost-effective way to meet automotive-specific needs.

END-TO-END MONITORING AT THE STAMPING PLANT

The automotive stamping plant requested a staged deployment that would demonstrate end-to-end machine health monitoring before enabling full prognostic capabilities. The pilot was deployed on two tandem stamping lines and designed to:

- Provide real-time temperature and electrical current information from the electronics control panels that run two stamping lines.
- Send alerts directly to the appropriate maintenance team when sensor values fall outside of user-specified limits.

Because the stamping plant operates 24/7, alerts can be triggered at any time, including when engineers are unavailable. GraceSense was configured to include remediation instructions with each alert, allowing a less experienced person to address the issue independently.



When an alert condition occurred, an email and/or SMS was sent to each recipient with a link to a web page containing detailed information about the alert, including step-by-step resolution instructions. Personnel reported that this feature significantly improved their ability to respond to issues.

PILOT PROJECT PREVENTS EXPENSIVE LOSSES

Nearly 14 million data points were gathered during the 12-month pilot. Other than a brief issue with a necessary third-party service in mid-January 2017, essentially no

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data points were lost during the project. More importantly, the system provided alerts that prevented two probable downtime incidents, saving \$0.5M in losses—almost ten times the cost of the project.

- **Robot controller cabinet overheating:** An alert identified excessive temperature. The investigation revealed that the cabinet door was not completely closed, which caused the limit switch that activates the air-conditioning unit to turn off. This would likely have gone unnoticed until a catastrophic failure occurred. Instead, the team corrected the issue immediately and restored proper temperature.
- **Failed AC unit in a control cabinet:** Another alert for excessive cabinet temperature prompted personnel to follow the troubleshooting steps outlined in the GraceSense message. They quickly detected an abnormality in the AC unit, which was determined to have prematurely failed. The team replaced it before the condition escalated into a significant issue.

Due to the pilot's success, the stamping plant scheduled a plant-wide deployment, encompassing all stamping lines and several related ancillary systems. In addition to monitoring temperatures and currents, the expanded scope includes hydraulic systems (fluid levels and pressures) and vibrations in transfer lines and conveyor belts.

The manufacturer and Grace Technologies also discussed additional opportunities within the facility, including monitoring assembly equipment, tracking energy consumption (including assessing power factor), and other related applications.

NEW INNOVATIONS ON THE HORIZON

As the deployment continued, Grace incorporated customer feedback with enhancements to the GraceSense system:

- **Virtual channels:** User-defined channels created from one or more inputs to provide added functionality. For example, a cooling fan not operating is a concern only if the main motor is running. By logically combining main-motor and cooling-fan signals into a virtual channel, alerts are triggered only when the main motor is operating and the cooling fan is not.
- **Prognostics and trending:** The system roadmap enables trending on all channels so alerts can be tied to data trends. This gives plant personnel earlier indications of future behavior and additional warning time to respond to potential problems well in advance.

GraceSense Machine Health Monitoring empowered the automotive OEM to identify developing problems sooner, guide personnel with clear remediation steps, and scale monitoring across critical assets to ensure uptime, safety, and productivity.



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