



predictronics

WE KNOW **WHAT HAPPENS NEXT**

PERSPECTIVES AND CASE STUDIES ON PHM TECHNOLOGIES FOR MANUFACTURING



ABOUT

Our Mission is to deliver predictive software solutions that enable users to make data-driven decisions that increase productivity and reduce downtime.”

Predictronics has been bringing **predictive analytics solutions** to the market since 2013.

Our solutions help customers collect and analyze data to monitor critical assets and discover the key to a proactive maintenance policy and **increased productivity**.

Predictronics has saved companies **thousands of dollars** in unplanned downtime and maintenance costs.

Consulting



Our solutions combine expertise in predictive technologies, industrial systems and business impacts.

Analysis Platform



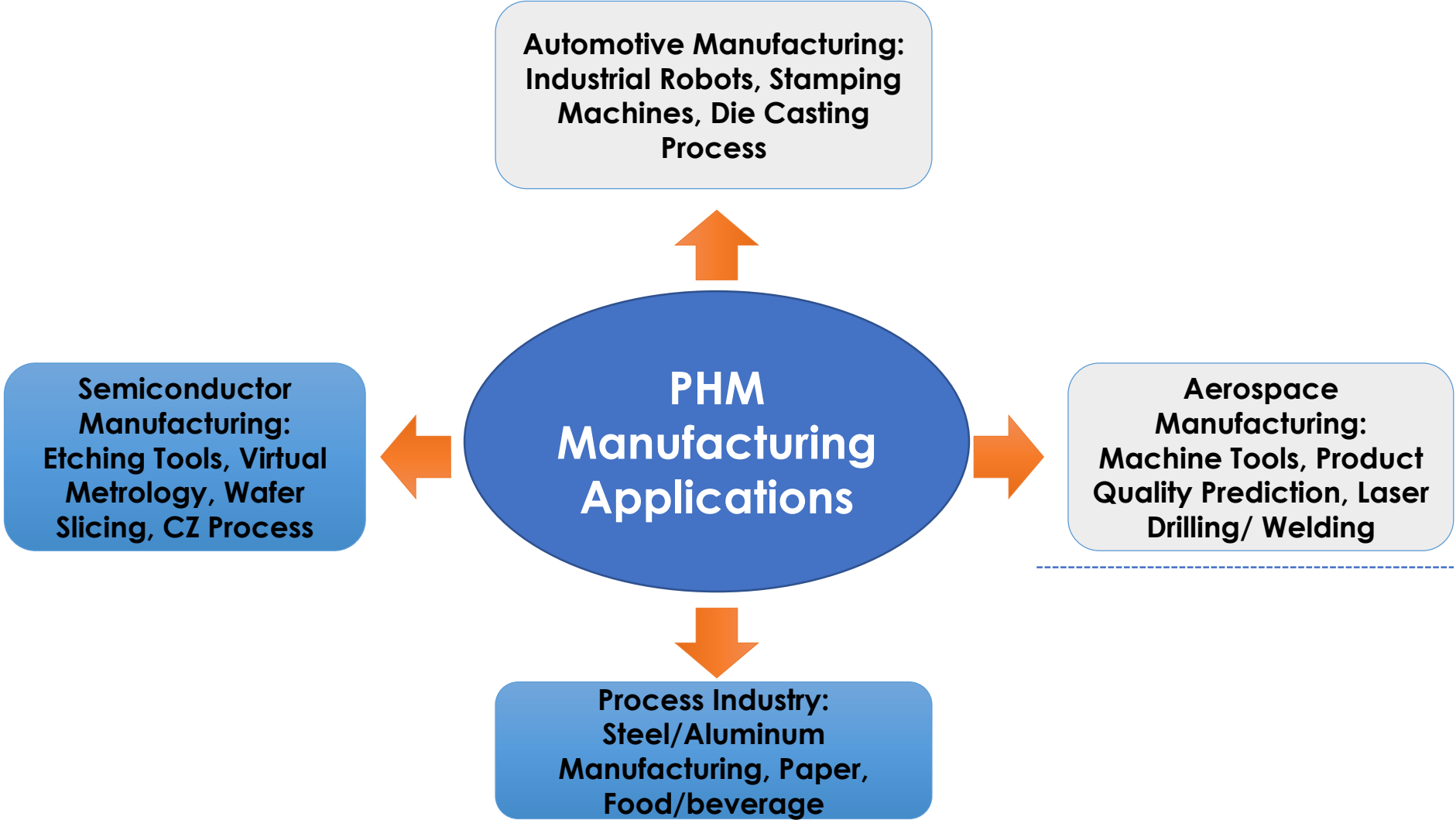
An end-to-end predictive analytics solution that monitors critical assets by collecting and analyzing big data.

Vertical Software



A predictive analytics solution that provides critical health information used to prevent industrial robot failures.

OVERVIEW OF MANUFACTURING SECTORS AND EXAMPLE PHM APPLICATIONS



COMMON ASSETS AND PHM RELATED PROBLEMS IN DISCRETE MANUFACTURING

1. Machine Tool Predictive Monitoring
 - i. Spindle Predictive Maintenance
 - ii. Linear Axis Predictive Maintenance
 - iii. Tool Wear
 - iv. Predictive Quality

2. Industrial Robots
 - i. Predictive Maintenance

3. Stamping Machines
 - i. Predictive Maintenance
 - ii. Predictive Quality

4. Die Casting Machine / Process
 - i. Predictive Quality

BUSINESS CASE FOR HEALTH MONITORING OF INDUSTRIAL ROBOTS



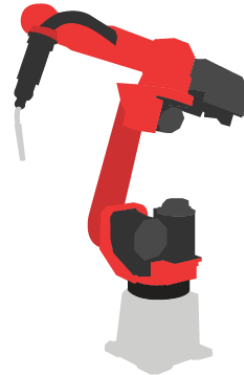
500

Robots in a Factory



\$10,000

Average Cost of 1-Minute
of Downtime



30

Number of Robot Failures
During Production in 1 Year



30 minutes

Average Unplanned Downtime
for Each Robot Failure

\$300,000

Cost of a Single Robot Failure

50%

Assumed Numbers of
Failures FS Predicts

\$4,500,000

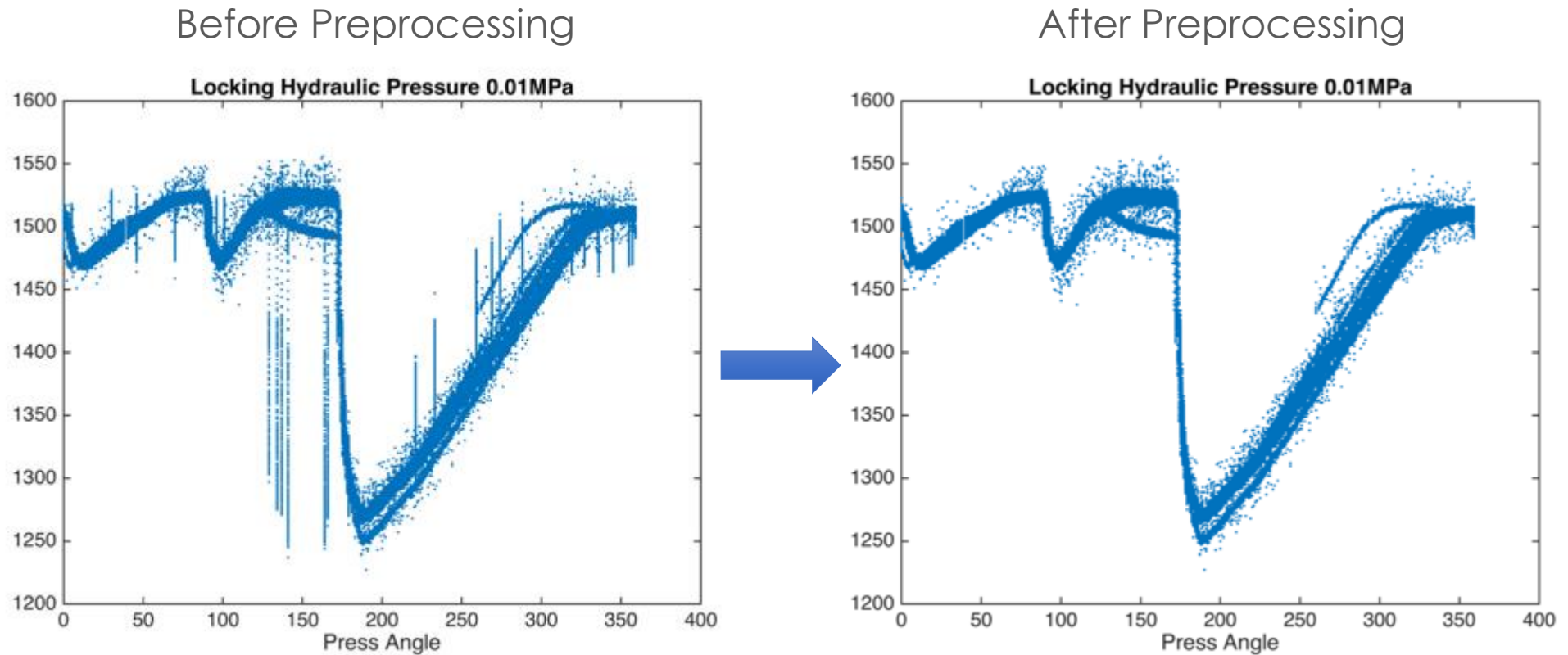
Estimated Annual Savings per Factory

PRESS MACHINE USED IN AN AUTOMOTIVE MANUFACTURING LINE

- 35 recorded maintenance events in total
 - 20 resulted in zero stoppage time
 - 10 resulted in 5-10 minutes stoppage
 - **5 resulted in 15-25 minutes of stoppage time**
- Most of the events are **abnormal locking events**
 - **Root cause is typically leakage.** One time the root cause was a resistor breaking in the circuit board

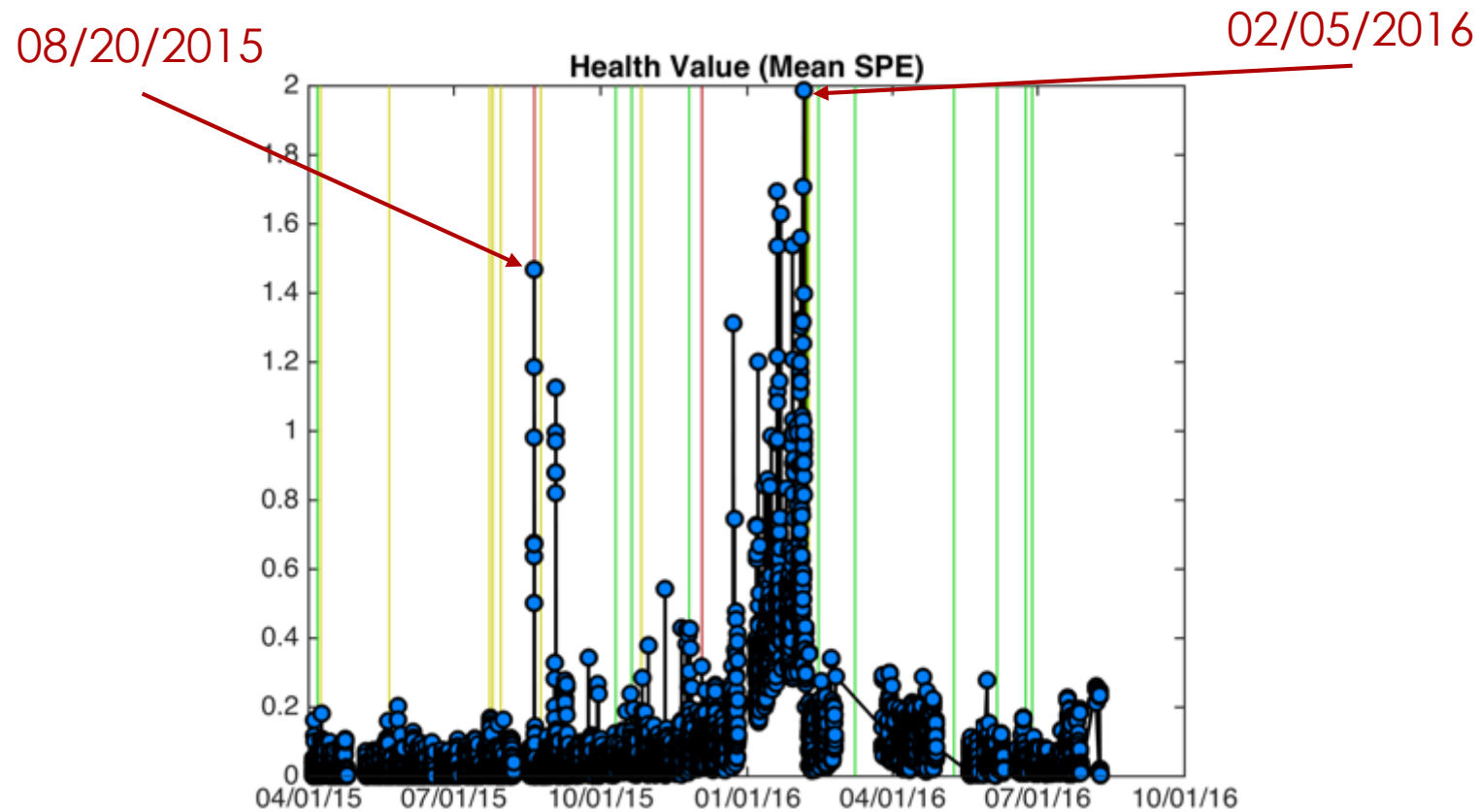
DATA PREPROCESSING RESULTS

- After removing the constant press angle parts the relationship between press angle and locking hydraulic pressure became more clear



EXAMPLE HEALTH RESULTS

- The health value increased significantly over the month of January 2016, then dropped back down to normal after 02/05/16.
- The health was also noticeably high on two days with frequent abnormal locking (08/20/15 and 02/05/16).



DEPLOYED SOLUTION

HEALTH

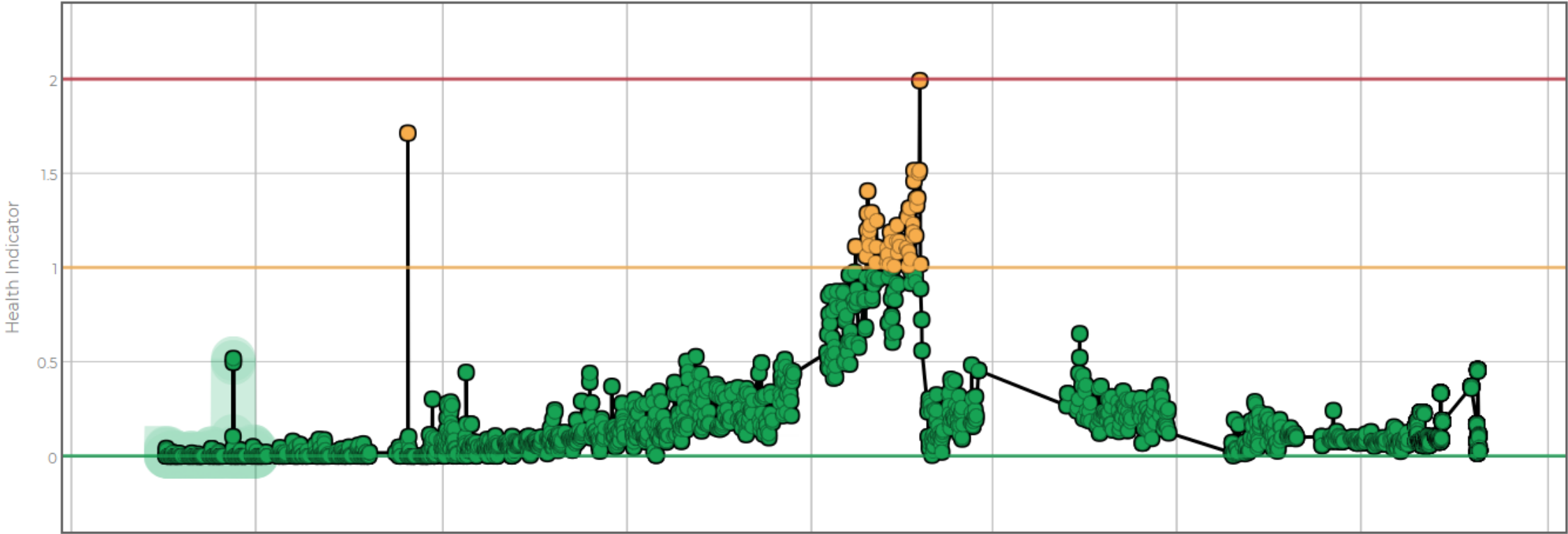
FEATURES

RAW DATA

SHOW PREDICTION

EDIT AXIS

BASELINE LEARNING



THE CURRENT SITUATION AND CHALLENGES IN WHICH STANDARDS COULD HELP

1. What to monitor, what data to collect, what sensors to use is based on judgement/expertise from solution provider, end-customer, and OEM.
2. Getting data from machine controllers, especially legacy machines can be quite difficult – data collection can be a bottleneck.
3. In many cases, context data from different data sources would help (maintenance events, quality records) but are typically not integrated.
4. Reference use cases and data sets for component ,machine, and system level PHM would accelerate PHM development.
5. Customer education on the typical development and deployment time/effort, what value can be provided, and what are reasonable expectations would be beneficial.

THOUGHTS / WISH LIST FOR MANUFACTURING PHM STANDARDS

- Robotics PHM – Is it possible to have a more open standard for data collection?
- Reference use cases, data sets, and test-beds for system level PHM.
- In general, reference PHM guidelines for the following machines /process would be helpful:
 - Machine Tools
 - Industrial Robots
 - Stamping Machines
 - Other automation systems (conveyor type systems)
 - Additive Manufacturing
 - Die Casting
- Guidelines for verification and validation of manufacturing PHM.
- What about process manufacturing? What is out of scope?

Predictronics Webinar

How Predictive Analytics Eliminates Robot Failures for Worry-Free Uptime

TUESDAY • MAY 22, 2018 • 2:00 PM

Presented by
Matt Buzza
DATA SCIENTIST





Thank you for joining us today.

To learn more about Predictronics, visit predictronics.com
or reach out to us at contact@predictronics.com



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