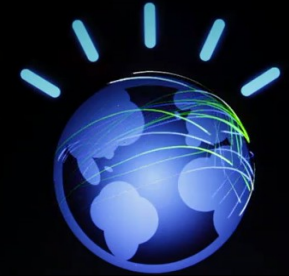


Smarter Analytics



Predictive Maintenance and Quality

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“All systems will fail, the only question is when, and how frequently”

Predictive Analytics helps connect **data** to effective **action** by drawing reliable conclusions about **current conditions** and **future events**.

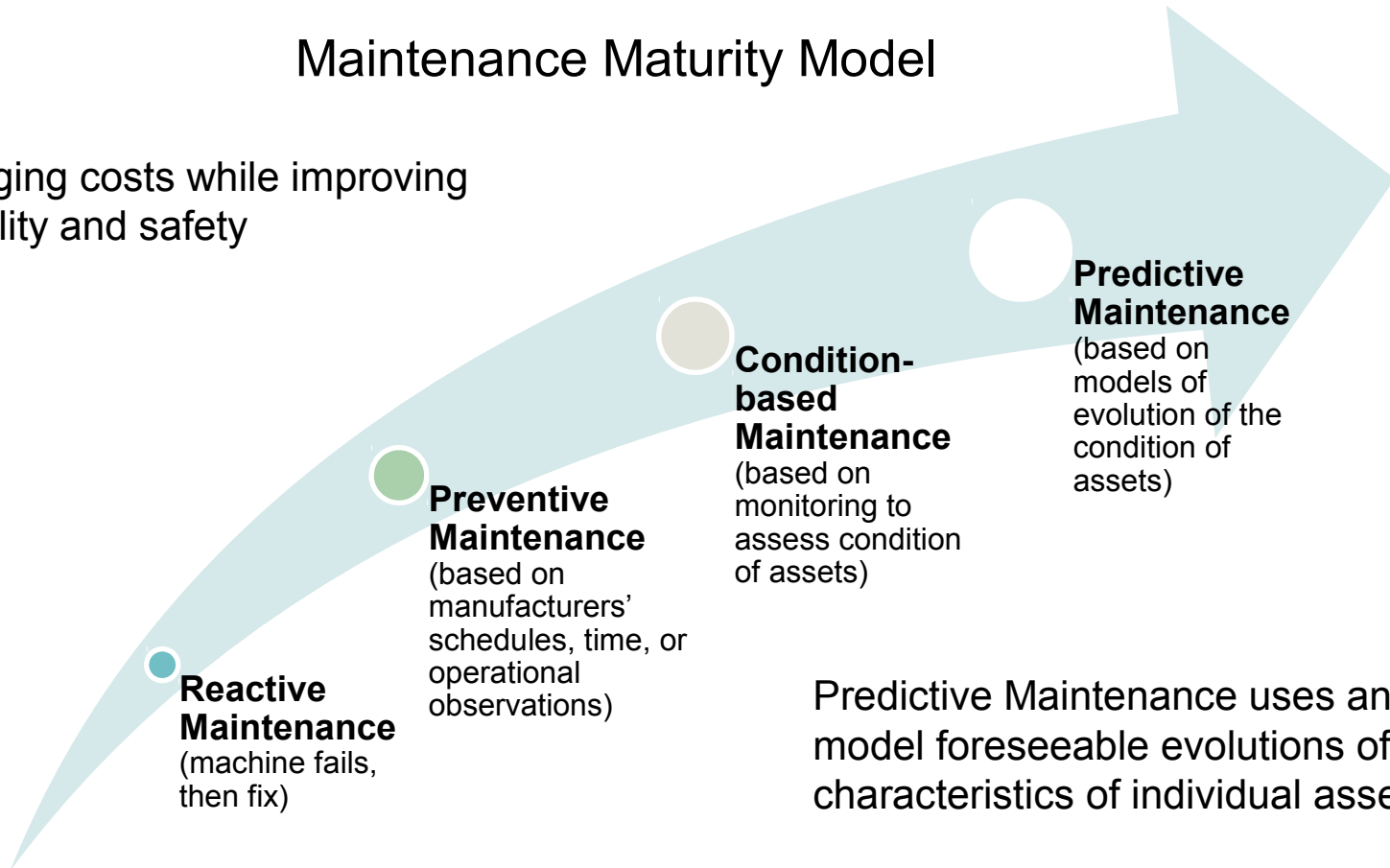
Predictive Maintenance is about understanding the patterns in data to determine the areas of **greatest risk** and **directing resources** *before risk becomes reality*.



Predictive Maintenance key to Asset and Process Performance

Maintenance Maturity Model

Managing costs while improving reliability and safety



Reactive Maintenance
(machine fails, then fix)

Preventive Maintenance
(based on manufacturers' schedules, time, or operational observations)

Condition-based Maintenance
(based on monitoring to assess condition of assets)

Predictive Maintenance
(based on models of evolution of the condition of assets)

Predictive Maintenance uses analytics to model foreseeable evolutions of the characteristics of individual assets.

Marketplace forces are amplifying day-to-day issues

Lean operations



Variety of moving assets



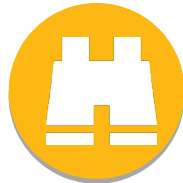
Recovering Warranties



Improving Asset performance



Aging workforce



Compliance and scrutiny



Poor asset performance

- Lack of visibility into asset health
- High costs of unscheduled maintenance
- Inability to accurately forecast asset downtime and costs
- Resultant unnecessary process proliferation
- Aging assets pushed to limits to meet consumer needs

Limited process integration

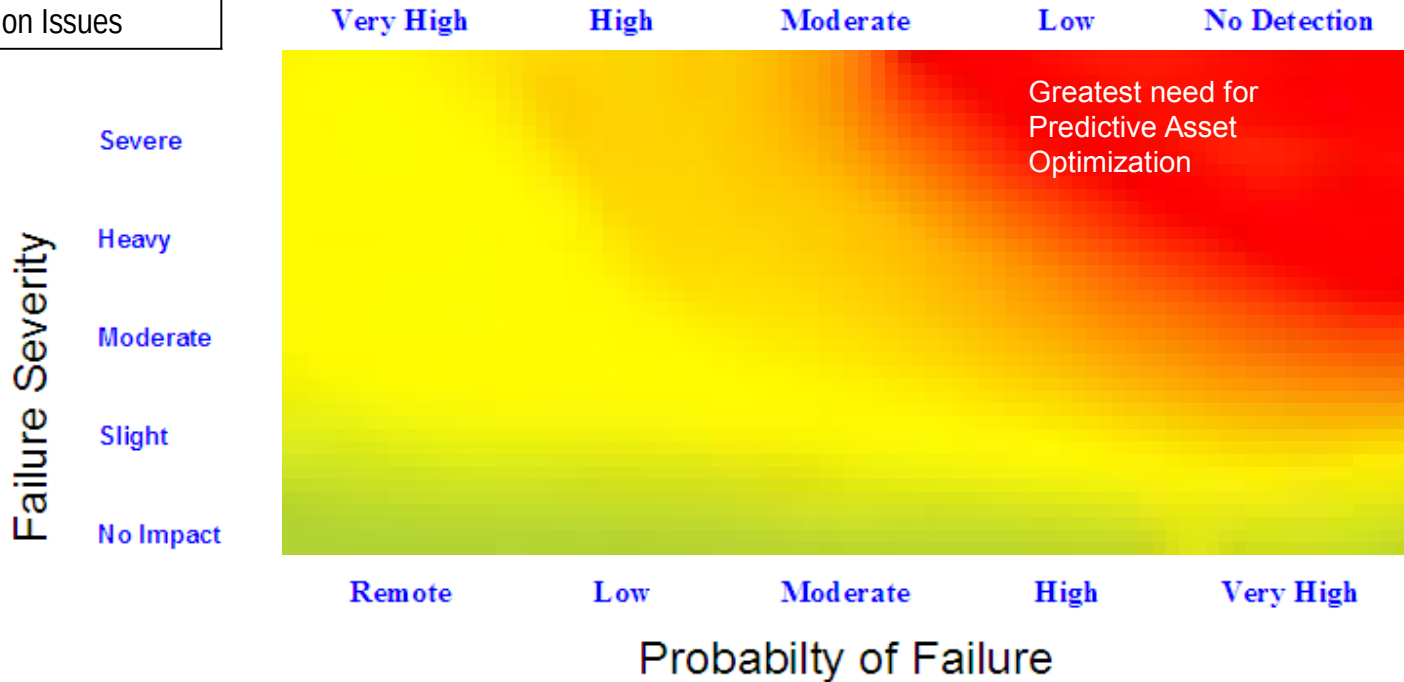
- Lack of visibility of predictors across organizational silos
- Difficulty synchronizing demand and supply
- Too many manual processes and information sources
- Losses in processes have become normal
- Resource complexity makes it harder to respond to changing needs

Predictive Asset Optimization – Predict critical asset failures before they happen

- Severity Factors**
- ✘ Health and Safety Issues
 - ✘ Asset Damage / Repair Costs
 - ✘ Loss of Revenue
 - ✘ Customer Satisfaction Issues

Asset Criticality Matrix

Likelihood Failure will be Forseen



IBM Predictive Maintenance and Quality applies to three business domains in equipment monitoring.

1) Manufacturing Quality

- Production quality management

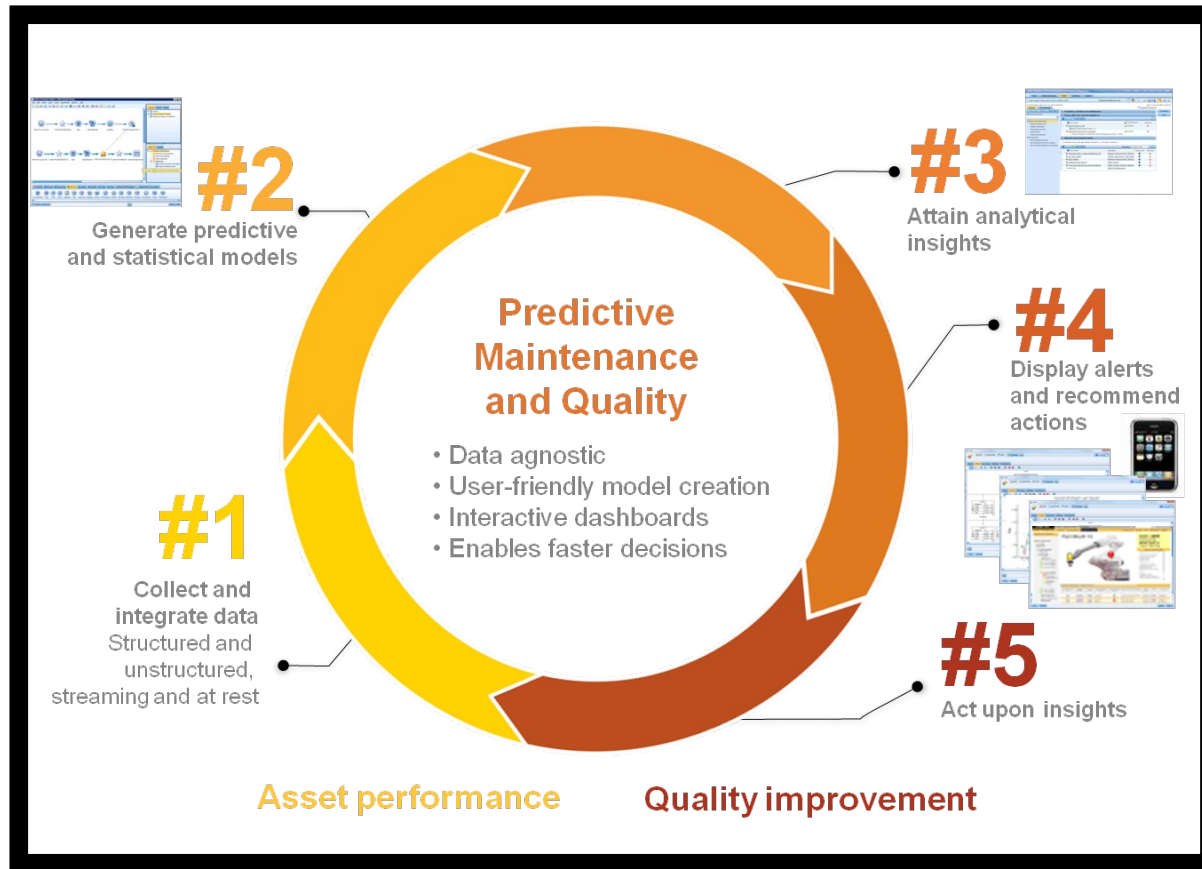
2) Predictive Maintenance

- Predictive maintenance early warning for equipment
- Equipment repair and maintenance optimization
- Optimization of service parts and technicians' schedules

3) Warranty Analytics

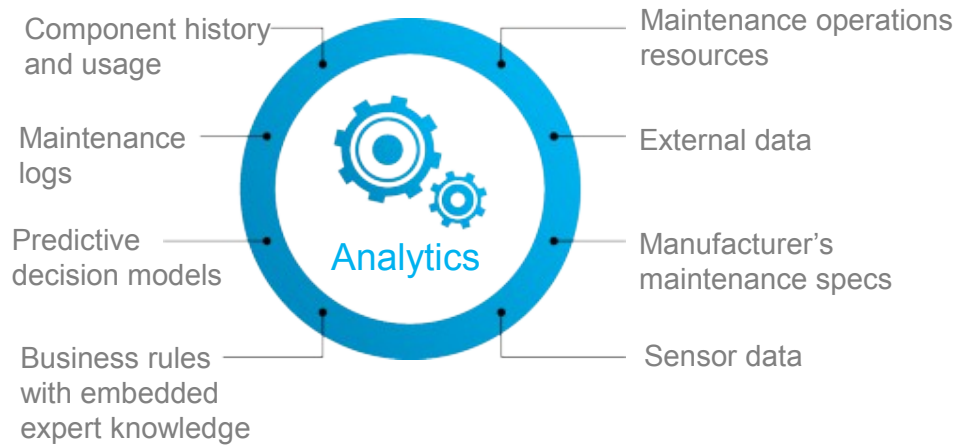
- Warranty monitoring and analysis
- Field quality early warning using warranty claim data
- Warranty accruals management

IBM Predictive Maintenance and Quality analyzes data from multiple sources and provides recommended actions



Predictive Maintenance and Quality

Monitors, maintains and optimizes assets for improved availability, utilization and cost. Facilitates the paradigm shift from reactive repairs to predictive maintenance.



Enables you to

- Increase reliability and safety
- Anticipate and avoid interruptions in service
- Reduce repair time and repeat cycles
- Reduce maintenance and repair cost
- Improve quality of maintenance and repairs
- Improve supplier and subcontractor selection
- Increase labor utilization and productivity
- Increase warranty recoveries
- Reduce scrap rate and increase yield

IBM Predictive Maintenance and Quality Examples..



Warranty

Minimizing repeat repairs – one example

Analysis based on SPSS Data Mining Platform

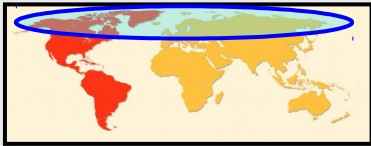
Automated Data Mining Services using the SPSS SOA platform

Automated analysis of patterns, trends and dependencies of fault memories by using e.g. correlation analysis, neural networks, logistic regression, decision trees etc.

Proactive identification of systematic failures and their dependencies

- ▬ Significant reduction of warranty costs

Example



Cars in **northern regions** very often have problems with the side mirror

J F M A M J J A S O N D

These anomalies to the rest of the world typically occur in the **winter**.



The problems occurred **1-3 weeks after a service in a garage**.

▶ Reduction of warranty claims by 5% equals > 11 mio € savings p.a

An aircraft engine manufacturer uses predictive analytics to prevent costly aircraft-on-ground engine events

100% prediction

of aircraft-on-the-ground events for high-risk engines

97% accuracy

in predicting engine events that lead to airline disruption

USD63 million

in extrapolated cost savings to airlines if prediction had been available in the previous year



Business challenge: This US-based aircraft engine manufacturer collects a vast amount of data about its engines through various databases and sensors, but it had no holistic way of integrating and analyzing the information to proactively address engine issues.

Solution: An analytics platform creates predictive models that automatically alert the manufacturer to different types of impending engine events. These alerts, and a 360-degree dashboard visualization of engine-fleet health and risk status, enable the company to take proactive measures such as ordering and arranging preventive maintenance. These can help prevent a range of engine issues and potentially help the company's customers avoid millions of dollars in costs associated with grounded planes.

The analytics solution helps us answer, at a glance, the big question: how is our engine fleet doing today?

Car manufacturer uses predictive analytics to improve the performance and safety of its electric vehicle batteries

50% reduction

in carbon dioxide emissions by commercializing EV technology

Boosts confidence

and customer satisfaction with EVs by improving performance

Improves design

by analyzing massive amounts of operating data



Business challenge: Because all-electric vehicles (EVs) do not use gasoline as do traditional or hybrid cars, they rely entirely on their batteries for power. The car manufacturer wanted to better understand what factors had the greatest effect on battery performance and longevity.

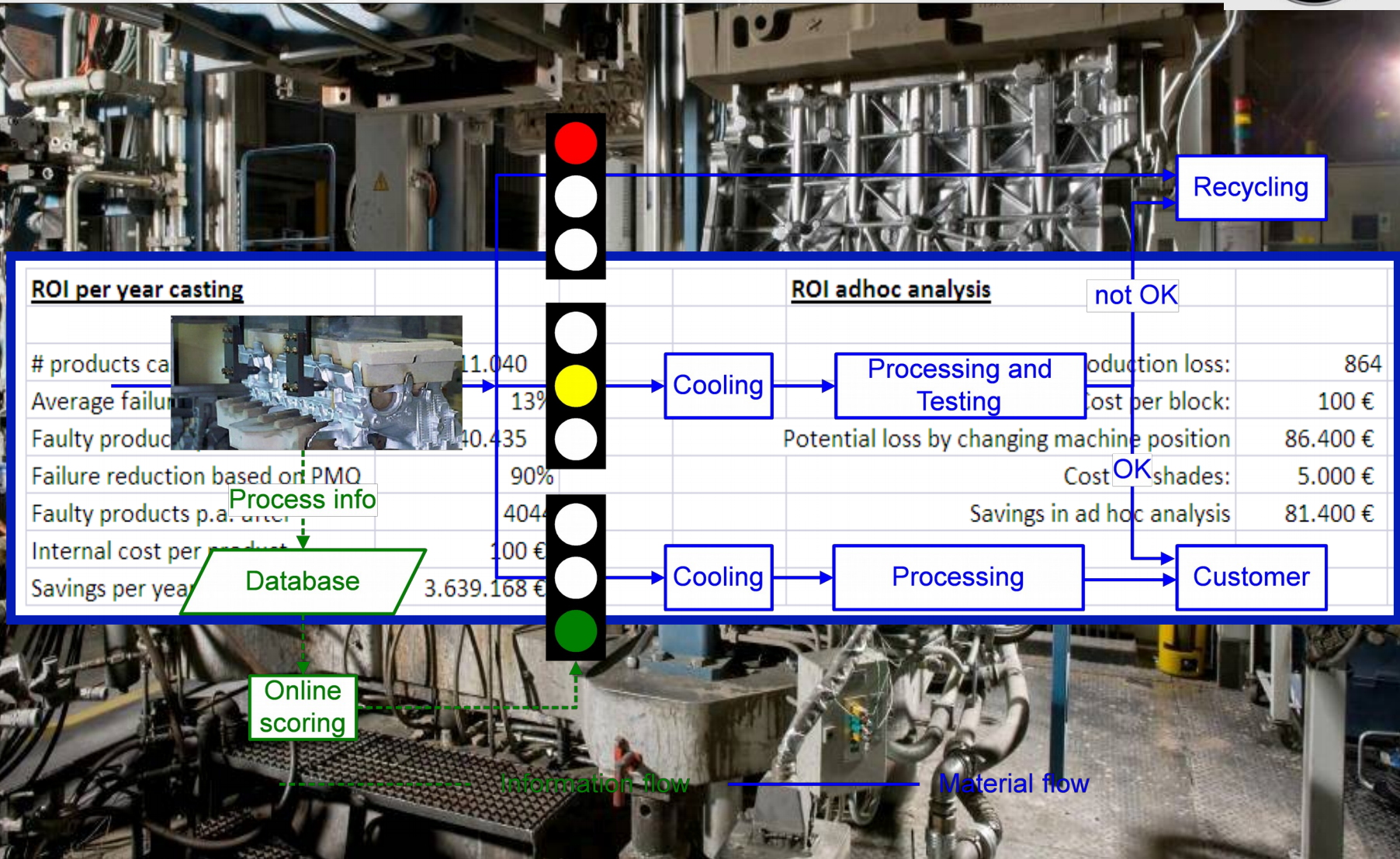
The smarter solution: They can now gather and analyze near-real-time battery data from their electric vehicles on the road in Japan and the United States. Analysis can identify which operating factors, such as road conditions, charging patterns and trip length, have the greatest effect on battery life. Further analysis can help the automaker predict when batteries need to be replaced so it can alert owners in advance.

“Data gathered from the real-world operation of our vehicles is critical to predict the longevity of current batteries and greatly influences future product design.”
—Senior chief engineer, Automobile R&D Center

Production: Analytics is used in the BMW light-alloy foundry for the production process to better understand and eliminate problems quickly.



Reduced scrap rate by 80% in 12 weeks



Thank You

