IMPACT BRIEF

PREDICTIVE MAINTENANCE UNCOVERED –
Benefits, Challenges & Use Cases

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COMTRADE
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This Impact Brief distills a wide range of reports and analysis on predictive maintenance, exploring its benefits, challenges and use cases. **Brought to you through the objective lens of InsightBrief with the support of Comtrade Digital Services, a provider of strategic software engineering services and solutions.**

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OVERVIEW

- Predictive maintenance (PdM) techniques are designed to track changes in the condition of equipment, using sensors, data analysis and pattern recognition, to pre-emptively identify when an item or component is likely to fail. This allows any identified issues to be addressed before the asset fails.

- By forecasting equipment failures ahead of time, Deloitte reports that PdM can:[1]
  - Increase productivity by 25%
  - Cut breakdowns by 70%
  - Reduce maintenance costs by 25%

- Poor maintenance strategies, on the other hand, can lower a plant's overall productive capacity by 5-20% from the baseline. [2]

BENEFITS

- The predictive maintenance market is forecast to be worth $4.9bn globally by 2021, growing 28% each year and having tripled in size since 2016. This growth is not surprising given the smart factory market is projected to be valued at $205.42bn by 2022. [3]

- Objectives for PdM programs differ across industry sectors. 91% of automotive and discrete manufacturing companies surveyed identify reducing repair time and unplanned downtime as their primary priority. Meanwhile, 93% of those in process manufacturing are focused on improving their aging industrial infrastructure. [4]

- The main goals of companies deploying PdM, according to PwC, are to:
  - Improve asset uptime (51%)
  - Reduce costs (11%)
  - Reduce risks relating to safety, health, environment and quality (SHEQ) (8%)
  - Extend the lifetime of assets (7%)
  - Improve customer satisfaction (12%)

- Traditional preventive maintenance, based on schedules, can reduce the incidence of machine failure. However, it is typically highly manual and requires worst-case assumptions to be made about equipment lifespans, resulting in inefficiencies. In contrast, PdM enables continuous, automated monitoring and just-in-time maintenance, only replacing parts/assets that are about to fail.
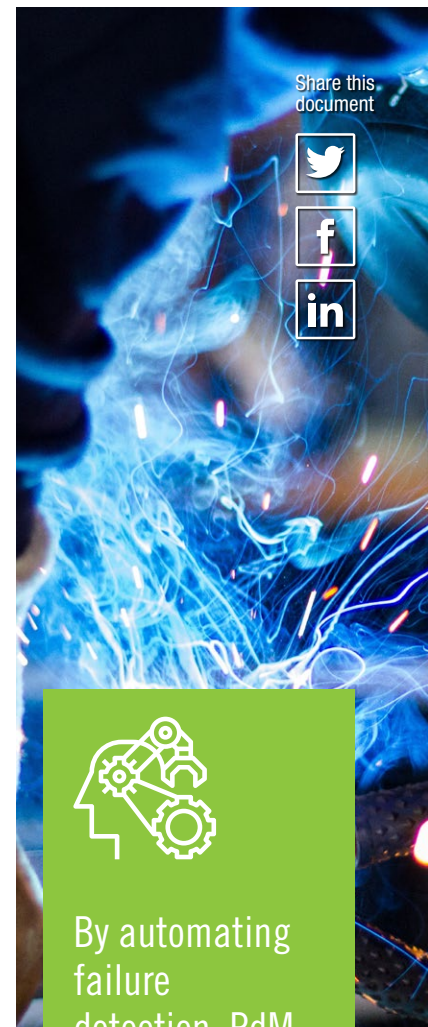
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BENEFITS (cont.)

► PdM should significantly reduce the incidence of unplanned downtime, with maintenance scheduled and prepared for in advance. However, real-time performance monitoring can also reduce the potential impact of deteriorating equipment on production quality and on safety; and it can prevent the wider damage that may be caused by catastrophic failures.

► Using PdM, companies can:

- Better detect issues in assets and infrastructure
- Predict when assets may fail
- Estimate assets' remaining useful life
- Identify why assets fail and find patterns connected to systemic problems
- Quickly identify required maintenance actions

► By enabling businesses to assess the health of assets, PdM allows the stocking of replacement parts and devices to be optimized. Tackling unplanned downtime, PdM eliminates unpredictable production rates.

► PdM can boost employee productivity by reducing or eliminating:

- Routine and preventive repair work and maintenance callouts
- Downtime work stoppages
- Health and safety risks caused by breakdowns
- The need to access difficult-to-reach locations (such as wind turbines)
- The stress of addressing emergency situations and repairs

► By automating failure detection, PdM significantly reduces human error. It also moves technicians from repetitive, low-value tasks (such as data collection) to more high-value work including analysis, planning and process optimization.

► 95% of companies that had deployed PdM found it improved one or more key maintenance value drivers, 60% saw an improvement in uptime, and similar percentages saw cost reductions; increased asset lifetime; and reduced risks associated with health, safety, quality and the environment. [4]

USE CASES

- Organizations deploying PdM include: [3, 5]
  - Lift and escalator manufacturer KONE, tracking doors, temperature and stopping accuracy
  - French energy company EDF, monitoring 70 power turbines to detect faults in the reactor structure
  - Danish wind turbine manufacturer Vestas
  - Siemens, monitoring NASA cooling systems at the Armstrong Flight Research Center

- Vying for an edge in a highly competitive landscape, transport operators are leading the way in deploying predictive maintenance initiatives. 72% of those surveyed have launched pilots, while 25% are already seeing business impact. [3]

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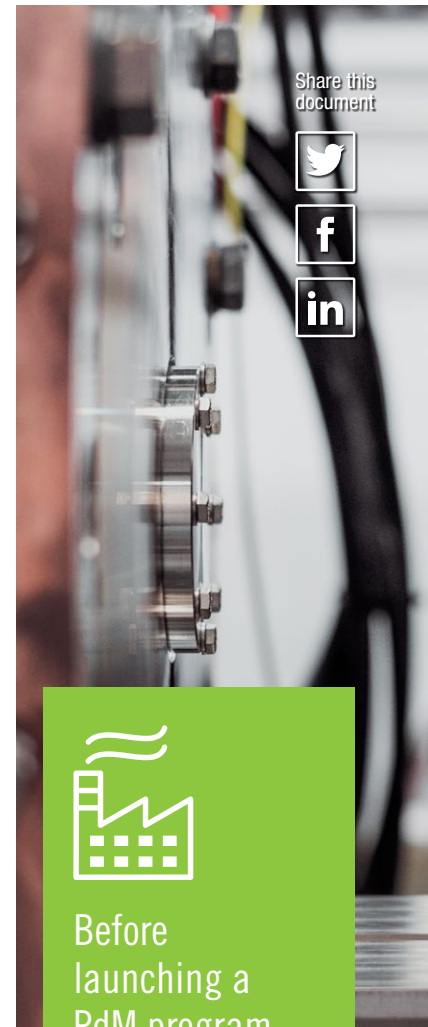
USE CASES (cont.)

- State-owned Belgian rail company Infrabel has built a PdM network that includes: [4]

  - Measurement trains to inspect tracks, ties and overhead lines
  - Cameras to monitor trains' panthographs
  - Sensors to detect overheating in trains' shaft sleeves
  - Vehicles to check sign-post visibility
  - Monitors gauging changes in power consumption

- UPS reports that it has saved millions of dollars by using PdM to extend equipment lifespan and to reduce breakdowns. The company tracks engine performance; vehicle condition; and speed, stops, mileage and miles per gallon. [5]

- As part of a PdM initiative, Dutch rail organization ProRail has deployed a network of sensors across its infrastructure. This has reportedly resulted in a 25% drop in failures in overpasses, sign-posts, switches and detection systems; and an increase of 3% of trains running on schedule. [4]

COMTRADE DIGITAL SERVICES' OFFERING

- Comtrade Digital Service's Building Block solution allows OEMs to offer their clients a predictive maintenance prototype at lower risk, cost and time. Focused on two areas: IoT data collection and cloud-based services supporting the solution, progressive OEMs are able to offer ancillary services, generating additional revenue streams.

- Predictive analysis performed on data gathered from devices using IoT technologies using Comtrade Digital Service's Building Blocks solution can pinpoint the weakest links and allow infrastructure expansion without fear of downtime or unexpected failures.

- Optimizing maintenance of wind turbines, especially after a lightning strike during stormy weather, has historically been costly, both from a downtime and resources perspective. With Comtrade Digital Service's PdM solution for this industry sector, site visits are minimized, maintenance is improved and as a result, profits increase.

- Smart use of IoT data that tracks battery usage, combined with machine learning and AI, can be used to prolong expected lifespan and identify which batteries will expire sooner. This type of use case is core to the PdM solutions that Comtrade Digital Services develop for their clients.

CHALLENGES

- Before launching a PdM program, businesses should consider a feasibility study. Deloitte recommends establishing: [1]

  - Critical production system assets
  - Current failure rates of these assets
  - Current maintenance costs
  - Available data that is not being used effectively
  - Whether the appropriate technological/advanced analytics expertise is available in-house

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CHALLENGES (cont.)

✎ Companies deploying PdM may source data from both internal and external sources, including:

- Equipment temperature, vibration and noise measurements
- Environmental readings (including humidity and wind speed)
- Details of materials being processed
- Usage history (output, load and activations)
- Maintenance logs and metadata (accessed via text mining/machine vision)

✎ False alarms issued by PdM systems can be costly. Grounding an aircraft due to incorrect forecasting is likely to result in knock-on disruption and delays; while stopping a production line could lead to significant revenue losses. To minimise these events, it is critical to align model evaluation with appropriately weighted performance metrics.

✎ Organizations not planning to implement PdM cite reasons including: [4]

- No good business case/not relevant (63%)
- No data/not enough data available (23%)
- Limited data analytics capability (8%)
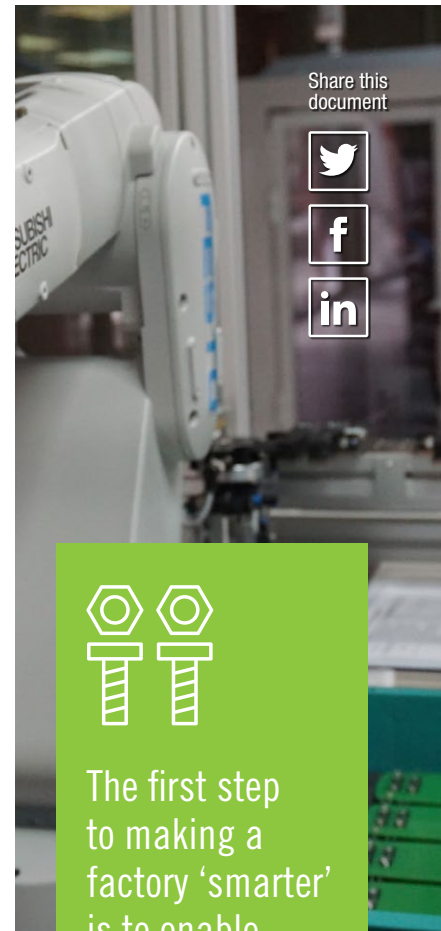- No commitment from upper management (4%)
- Other (2%)

TAKEAWAYS

» PdM was identified as the most widely adopted or 'planned for' key digital technology of 2018 in a PwC global digital operations study. 60% of companies surveyed, reported at least plans/intentions to deploy PdM in the near future, a number increasing by over 10% between 2017 and 2018. [4]

» The first step to making a factory 'smarter' is to enable predictive maintenance (PdM) capabilities. The drive for increased production, improved operational efficiency and safer working conditions underpin the growing demand for PdM. This capability must work with both new and old manufacturing equipment.

» 66% of German industrial executives surveyed stated that PdM would be in use by 2022, compared to just 28% in 2017. However, deployment is only a first step and continued optimization is required to achieve the greatest benefits. [6]

» Organizations that have seen the greatest success with PdM disproportionately use environmental data (72% compared to 41% of all others). These 'champions' are also respectively 20-30% more likely than other businesses to employ reliability engineers, data scientists, quality inspectors and/or IT specialists. [4]

» Roadmap for mastering Predictive Maintenance (PdM): [4]

1. Plot PdM strategy for the next 5 years; gain CxO buy-in
2. Create initial pilot projects for suitable assets
3. Define capabilities needed; use lessons learned
4. Develop expertise in data analytics
5. Transform into a digital maintenance organization
6. Actively plan an ecosystem approach; collaborate with partners

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The first step to making a factory 'smarter' is to enable predictive maintenance (PdM) capabilities. The drive for increased production, improved operational efficiency and safer working conditions underpin the growing demand for PdM.

SOURCES

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- The Impact of Predictive Maintenance on Manufacturing
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- A Practical Guide to setting up an IIoT-based Predictive Maintenance Program
  https://www.elp.com/Electric-Light-Power-Newsletter/articles/2018/11/a-practical-guide-to-setting-up-an-iiot-based-predictive-maintenance-program.html

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Comtrade Digital Services is a provider of strategic software engineering services and solutions. Serving clients for over 25 years, we enable companies across different industries to innovate faster and reinvent their business models digitally, by using agile development methodologies, innovative technology and business acumen.

Our uniqueness lies in the way that our 1000+ software engineers build custom IoT end-to-end solutions in an open or closed-source environment, using pre-developed, industry-specific building blocks. Our main clients are leading domain experts from Intralogistics, Manufacturing, Smart Energy, Medical Devices, Automotive and Telco.

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