opentext™

Embracing predictive maintenance to drive greater asset utilization

How IoT and AI can sustain "always on" operations

> **"In the environment of Industry 4.0, maintenance should do much more than merely preventing downtime of individual assets. Predicting failures via advanced analytics can increase equipment uptime by 20%"**
>
> – Deloitte[1]

Business backdrop

Unplanned downtime costs industrial manufacturers an estimated $50 billion annually,[2] an expense no business can afford. When things inevitably malfunction and break, the consequences can range from inconvenience to major business disruptions, and even injury or loss of life.

How can companies implement maintenance strategies that boost customer satisfaction levels, increase productivity, reduce costs, and improve employee and customer safety? Predictive maintenance is the key.

Today, many manufacturers are implementing smart production lines, and, in some cases, entire smart factories to support next-generation manufacturing processes. Whether supporting existing manufacturing processes or next-generation manufacturing facilities, companies can embrace predictive maintenance technologies across their end-to-end processes. Internet of Things (IoT) based technologies stand to transform how companies detect problems and artificial intelligence and machine learning (AI/ML) technologies can provide actionable insights.

Implementing a predictive maintenance process will help build resilience around business operations and ensure an "always on" approach to production and service operations.

Predictive versus "proactive" or preventive maintenance

Proactive service sounds good in an advertisement, but all too often, proactive services equate to preventive services. In other words, vendors consult service histories and other relevant data to predict when a piece of equipment may malfunction or fail.

Predictive maintenance, on the other hand, takes preventive maintenance to an entirely new level of accuracy and speed. IoT sensors embedded into serviceable assets can analyze vast numbers of data points, such as those relating to temperature, stress, and humidity levels. This information can be used to identify potential component failure. When AI/ML is applied to this data, patterns can be used to predict when and how a piece of equipment will fail, possibly far in advance.

But how does it all work?

How information management solutions support predictive maintenance

There are several information management requirements to support predictive management processes:

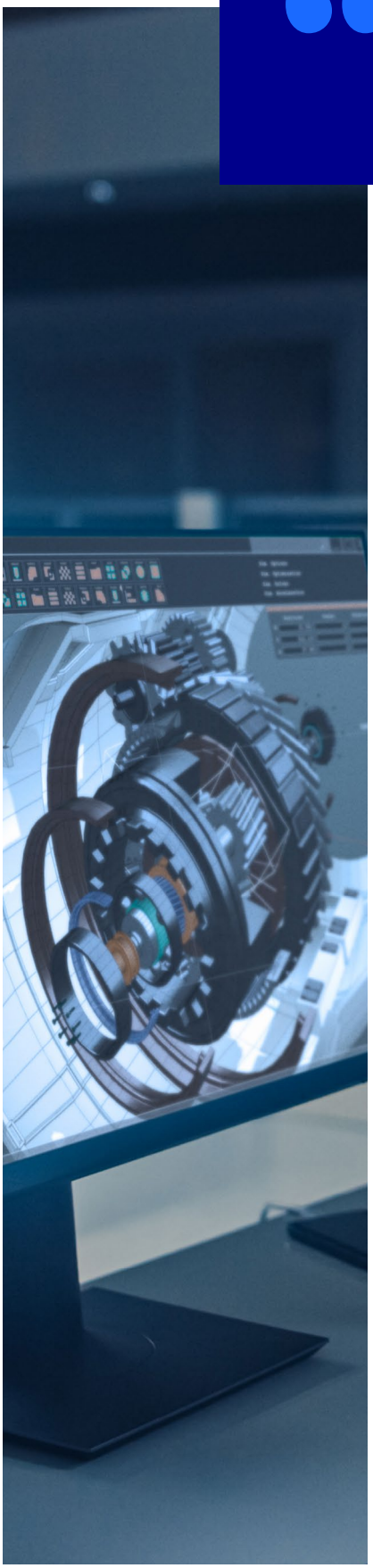
Leverage IoT to gather actionable performance data

IoT helps establish a "digital twin" of the physical piece of equipment or asset by placing sensors on key parts to monitor performance. Additional sensors measure operational behavior and the conditions that the equipment operates in—e.g., capturing data around location, weather, humidity, and possible strain applied to every component. IoT technology is key for monitoring remote assets in the field. This sensor data can then be uploaded to a central data lake for analysis via a dedicated telematics link, typically provided by a 5G connectivity module.

1 Deloitte, Predictive Maintenance: Taking pro-active measures based on advanced data analytics to predict and avoid machine failure, 2017

2 Deloitte, Predictive Maintenance and the Smart Factory

> **"IoT-enabled predictive maintenance has become a preferred pilot initiative for technology-led digital business transformations among different industries."**
>
> – Gartner[3]



Advanced AI/ML can help to predict the likelihood of component failure

After receiving complex volumes of IoT sensor information, an AI/ML platform can then analyze the data and assess the likely failure of a component. AI can examine historical operational information about the piece of equipment to see whether any similar equipment has failed in the past. Combining this information with operational data, maintenance schedules, and failure rates of each component, AI can make a prediction of whether a component will fail or whether it can be repaired.

Access to a central content archive containing a digital twin of the equipment

Many companies today build a digital representation of their products using advanced product lifecycle management (PLM) solutions. These 3D engineering models can be used as part of service support operations or for virtually training maintenance teams in how to disassemble products. In addition to the 3D engineering models, there may be videos, specifications, instruction manuals, and other documentation necessary to maintain equipment. 3D engineering models can also be used to support 3D printing parts that need to be replaced.

All this digital information needs to be held in a secure cloud-based content management environment that is accessible anytime and anywhere around the world. Even when PLM data is held in a central content management platform, it is important that it is integrated and synchronized with PLM systems. This not only ensures that PLM data can be used downstream in other business systems but also provides access to anyone in the extended business ecosystem. Implementing a design and manufacturing "digital thread" is key to establishing these integrated information flows.

Establishing a digital backbone to integrate people, systems, and things

The success or failure of predictive maintenance is down to the efficient exchange of information between different parties and back-end business systems. A common digital backbone needs to be established to facilitate the quick and efficient exchange of data. This should not only connect to IoT devices and associated business systems to interpret and act on the sensor data, it should also extend outside the enterprise to digitally connect all suppliers, logistics carriers, and any other trading partners in your business ecosystem. A common digital backbone helps facilitate the procurement of replacement parts and ensures they can be tracked through to the point of delivery.

Provide role based, secure access to enterprise information

Maintaining equipment or assets in the field may use third-party contractors for conducting repairs or service activities. To help with efficient repair, technicians will need secure access to the digital twin. Identity and access management can be used to assign a digital identity to both internal and external users and ensuring they have

3 Gartner, IoT-Enabled Predictive Maintenance Solution Vendors, (22nd June 2021), Gartner ID G00743049

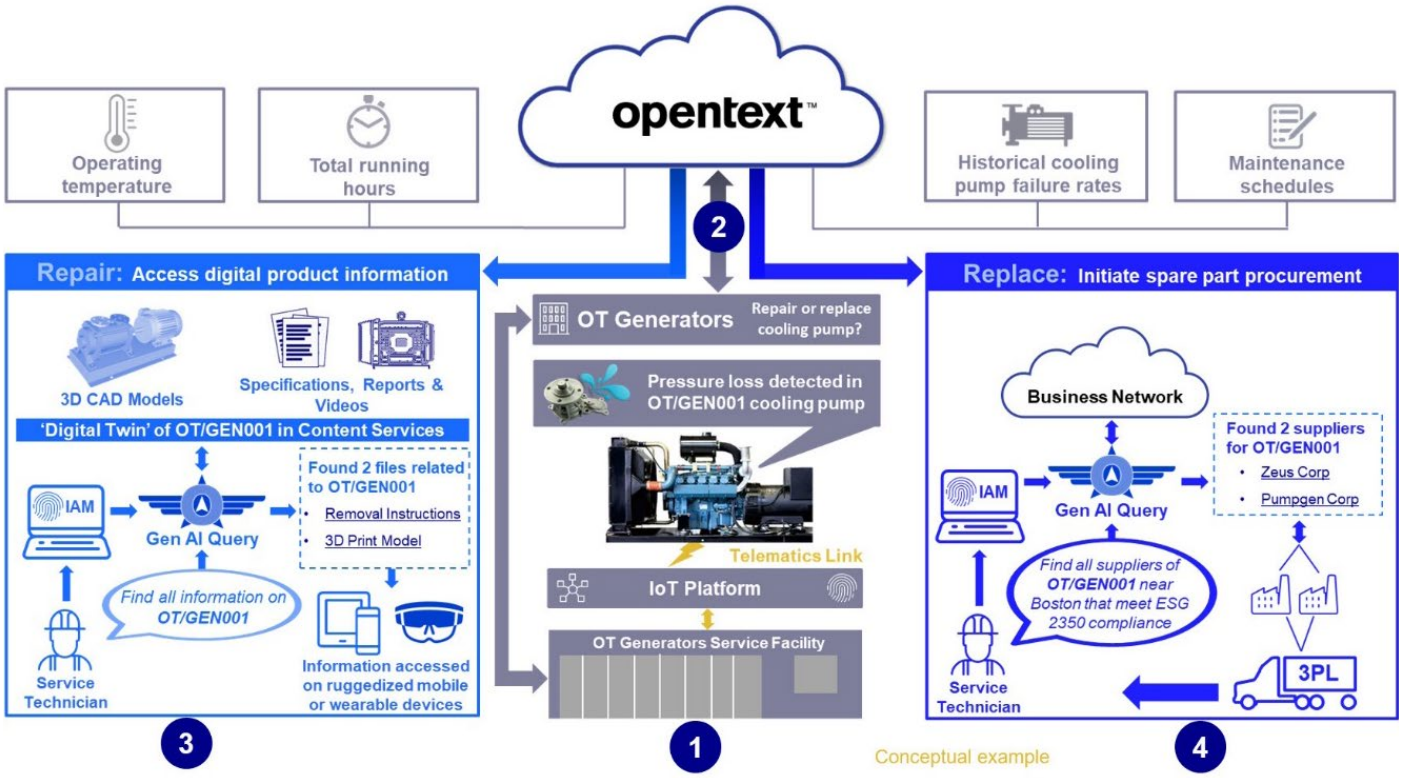
access to the necessary information and applications. Secure access is particularly critical in industries, such as defense and aerospace, where various security certifications must be adhered to.

Information-driven predictive maintenance in action

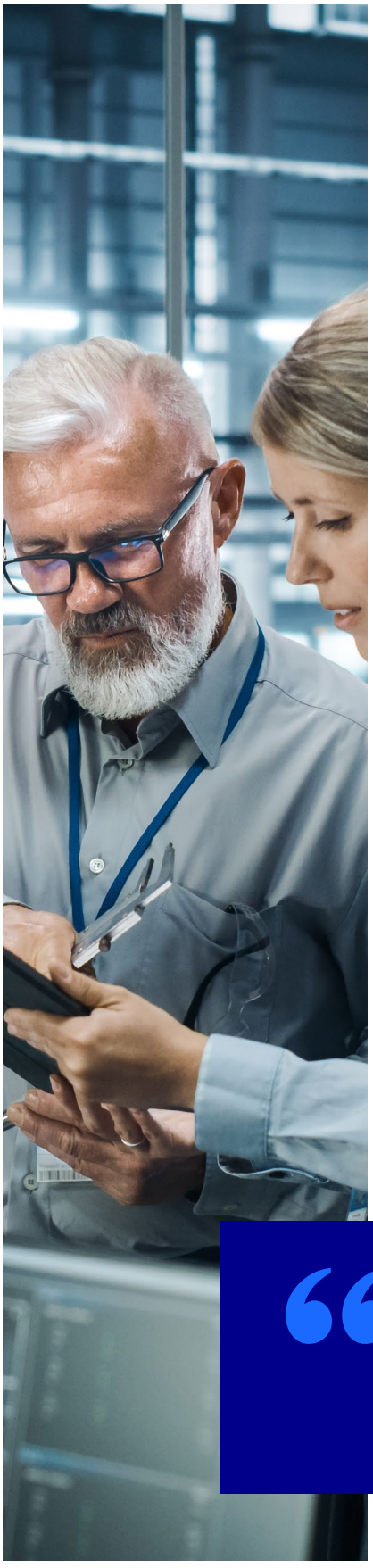
From vehicles to production equipment, from aircraft to military equipment, the use cases for predictive maintenance are virtually endless.

The five solution areas described above each add tremendous value to a predictive maintenance process on their own. However, when combined they can completely transform the process and improve customer satisfaction levels, as equipment operates with minimal downtime.

Let's now look at how information management supports a predictive maintenance related process for a diesel generator set.



- **Step 1** - IoT sensors monitor a remote diesel generator set, like those used to provide back-up power if the electricity supply fails. Sensors on the cooling pump detect a loss of pressure, which could signify a leak. This information is sent via a telematics link to the IoT platform, which communicates to the service and maintenance facility.
- **Step 2** - The generator's manufacturer connects into the OpenText Cloud to analyze the operational behavior of the generator. For example, what temperature was it operating at, running hours, analysis of historical pump failure rates, and to review maintenance schedules. Aggregating all this information and comparing it with historical data from similar generator sets allows the OpenText Cloud to make a recommendation, either that the pump will be repaired or replaced.



- **Step 3** – If a *repair* decision is made, the service technician securely signs into the content management system to find all digital assets related to the generator set. They can use a GenAI (OpenText™ Aviator) query to accelerate the search for relevant information. Once the relevant information has been found, they can download it onto a ruggedized tablet or device and carry out the repair process.
- **Step 4** – If a *replace* decision is made, the service technician securely signs into the spare parts procurement portal. Once inside, the technician can use an OpenText Aviator query to identify the supplier of the pump unit. They can order a new pump from the supplier connected to the business network. This pump is then delivered to the service facility, where it can then be fitted to the generator set during the next maintenance window.

The introduction of GenAI will transform the service sector as companies begin to embrace this technology and allow their customers to literally "speak" to their own equipment and ask about its operational condition. Based on feedback, GenAI could even initiate a process automatically, for example ordering a replacement part.

However, large language models used in such a process would need access to the central digital twin of the diesel generator set. The need to query a digital twin of a physical piece of equipment highlights the importance of digitizing and centrally archiving this information in the first place.

Key benefits of an information-driven predictive maintenance process

Predictive maintenance stands to transform the operation and maintenance of any serviceable asset. Technologies such as IoT and AI help to remotely monitor equipment in ways that have never been possible.

However, key to the success of such a project is ensuring that every piece of information associated with a piece of equipment is digitized and centrally managed, ideally in a cloud-based content management environment. If a company can implement the aforementioned technologies they will provide the business with a number of key benefits:

- **Maintaining competitiveness:** Ensure that your production equipment or other serviceable assets are in operation 24×7 and running at peak performance.
- **Reducing costs:** Major issues with equipment can be detected before they have serious impacts on business processes. This helps minimize service and repair costs.
- **Improving efficiency:** Connecting all information sources to a centralized digital backbone will help accelerate the exchange of digital information across the extended enterprise.

> **"On average, predictive maintenance increases productivity by 25%, reduces breakdowns by 70% and lowers maintenance costs by 25%"**
>
> – Deloitte[4]

4 Deloitte, Predictive Maintenance: Taking pro-active measures based on advanced data analytics to predict and avoid machine failure, 2017

- **Minimizing business disruptions:** Build resilience to the next business disruption and protect the investment your business has made in equipment and plant.

Why OpenText

For companies to implement a successful predictive maintenance strategy, they must first have a process in place for digitizing and managing all information related to the piece of equipment. Making this information available to anyone in the extended business ecosystem is important if you are going to quickly resolve equipment issues and ensure 24×7 availability of key operational assets.

OpenText can support a comprehensive information management strategy to build, host, and maintain a complete digital twin of your physical assets. OpenText Information Management solutions help build resilience around your business operations, improve your competitive position in the market, and achieve increased customer satisfaction levels.

Together, we can outline a vision and identify opportunities to improve your operational excellence key performance indicators quickly and successfully. Below are suggested next steps to ensure your Command Center journey is in lock step with your information management journey.

- **Introductory meeting:** Bring together the OpenText Global Account Director or Senior Account Representative with your organization's Account Business Unit President, COO, CTO, or decision maker on IT infrastructure investments.
- **Joint roadmap exchange:** Hold a day-long information exchange with operational leaders (Directors and above) and OpenText. OpenText will gather insight about your maintenance processes and associated digital transformation initiatives, current approaches, and obstacles, then provide an overview of information management technologies and best practices that support those initiatives.
- **Business Value Consulting workshop:** Engage OpenText Business Value Consulting with supporting lines of business to assess their current state and define a vision and roadmap for how information management solutions can support an end-to-end predictive maintenance process.

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