SENSEYE PREDICTIVE MAINTENANCE

The True Cost of Downtime 2022

How much do leading manufacturers lose through inefficient maintenance?

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Introduction

Unplanned downtime is costing manufacturers significantly more than even two years ago. The cost of every hour of downtime has soared so fast that, despite there being fewer incidents, the overall cost of downtime to manufacturers is rising sharply.

These are the key findings of this report – our second investigation into the true cost of downtime in manufacturing, covering the period 2021-22, and updating of our findings for 2019–20.

This new report suggests that unplanned downtime now costs Fortune Global 500 companies 11% of their yearly turnover – almost $1.5tn. This is up from $864bn (8% of turnover) two years ago. Among Fortune Global 500 companies, the annual cost of downtime is now $129 million per facility, up 65% on our last survey in 2019-20.

Breaking the costs down by sector, the cost of a lost hour now ranges from an average of $39,000 for factories producing Fast Moving Consumer Goods, to more than $2m an hour in Automotive.

Companies must therefore minimize unplanned downtime. But they also want to avoid the significant costs of over-maintenance – shutting lines unnecessarily and holding extensive inventories of costly and potentially unnecessary spares. Predictive Maintenance is the strategy firms are turning to – a solution proven to cut downtime in half without the downsides of over-maintenance.

This report covers the period 2021-22 and updates our last survey, which covered 2019 and 2020. It answers three critical questions in the field of manufacturing maintenance:

- What is the true cost of downtime for large manufacturing and industrial businesses?
- What savings could firms make by adopting technology enabling Predictive Maintenance?
- How many firms have adopted Predictive Maintenance strategies, and how many others are ready to do so?

We answer these questions using the results of an extensive survey of large manufacturing and industrial organizations around the world. The results are striking.

Executive Summary

- The costs of unplanned downtime are soaring. In every sector surveyed, an hour's unplanned downtime now costs the manufacturer at least 50% more than it did two years ago.
- The cost of an hour's downtime in an automotive plant is now more than $2m – up from $1.3m in 2019–20.
- In Oil & Gas, the cost of an hour's downtime has more than doubled in just two years, to almost $500,000.
- Inflation and stressed supply chains are key factors in increasing the cost of an hour's downtime.
- Total losses to downtime are also rising sharply. We estimate that the cost for an average large plant in the sectors surveyed is now $129m a year – up 65% in just two years.
- We estimate that Fortune Global 500 industrial organizations lose almost $1.5tn a year through unplanned downtime. This is a 65% rise in two years, and constitutes 11% of these firms' turnover.
- This rise in total losses could easily have been worse. It has been minimized by firms – with the help of Predictive Maintenance strategies and Industry 4.0 technologies – cutting the number of unplanned-downtime incidents they suffer.
- Among respondents, the average manufacturing facility suffers 20 downtime incidents a month – six fewer than two years ago.
- An average large plant still loses 25 hours a month to unplanned downtime – more than a full day's production.
- To counter these kinds of losses, Condition Monitoring and Predictive Maintenance applications have now become indispensable mainstream technologies.
- More than three-quarters of respondents are doing some form of condition monitoring, and a similar proportion see predictive maintenance as a strategic priority.
- The proportion of firms with an in-house Predictive Maintenance team has risen sharply to a third.

The true impact of unplanned downtime on manufacturers

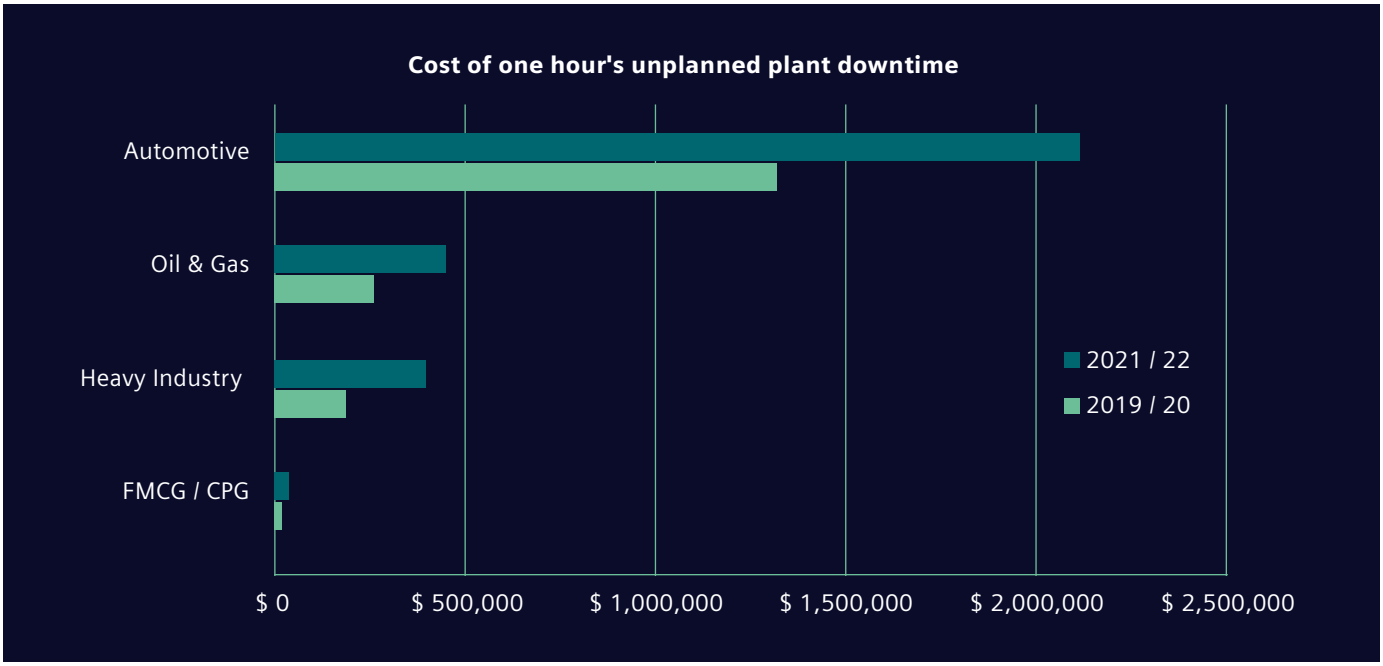
The cost of unplanned downtime to large manufacturing and industrial organizations has rocketed since 2020. This is the key conclusion of our 2022 True Cost Of Downtime survey.

1 Hour	of unplanned downtime costs manufacturers at least 50% more today than it did in the period 2019–20, due to spiraling inflation and production lines running at higher capacity.
$2 million	lost per hour in downtime within the automotive industry last year.

These figures come from extrapolating the results of a survey by Senseye Predictive Maintenance in 2021–22, asking large manufacturing and industrial businesses about unplanned downtime and its costs, as well as about how they collect data, and their use of condition-based maintenance and Predictive Maintenance.

Hourly costs of downtime up at least 50% in just two years

$2 million an hour	costs of unplanned downtime in certain sectors.
50% rise in costs	of an hour's downtime in every sector surveyed, compared with 2019–20. Downtime is getting more costly – much more costly and very fast.
In every sector surveyed	an hour's downtime now costs a firm at least 50% more than it did two years ago. Unplanned downtime is a drag on firms' profits that businesses can no longer ignore.



The cost to firms reflects the following:

- Loss of revenue (the loss of goods that would have been produced for sale in that period)
- The cost of wages (paying staff who can't work)
- The cost of wages of those involved in rectifying the problem
- The cost of emergency spare parts
- Any penalties incurred, such as contractual compensation

Senseye Predictive Maintenance estimates that the full adoption of condition monitoring and predictive maintenance practices at Fortune Global 500 industrial organizations could enable:

1.6 million hours

of downtime saved annually

$734 billion savings

through a 6% increase in productivity

$236 billion savings

through a 40% reduction in maintenance costs

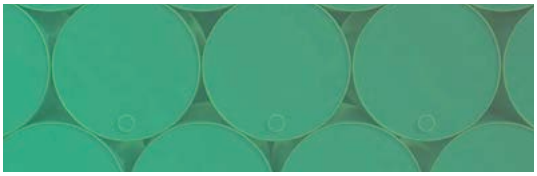
Why is the cost of an hour's downtime rising?

Firstly, pent-up post-lockdown demand means many factories have been operating at full capacity and are producing more products. Any interruption to production because of unplanned downtime means significant delays in meeting customer demand, and this costs money.

The exception to lines running at full capacity is the automotive sector. Here, despite strong demand, a shortage of components has been capping production levels.

The demand challenge is especially acute for electronic manufacturers, businesses providing components for both consumer and industrial applications. The global microchip shortage has led to even more pent up demand in this sector, and lines are running 24/7 to keep up. Any time lost is therefore not recoverable later on. Besides consumer demand, the needs of business digitization and Industry 4.0 strategies are exacerbating the problem. This surge in demand is likely to last at least another 18 months.

Inflation is also a key factor. Manufactured and processed goods are getting more expensive, with higher sales prices. Naturally, that raises the cost of downtime. For instance, losing an hour's oil production that you can sell for $115 a barrel (June 2022) is much more costly than losing an hour when oil was trading at $30 a barrel (March 2020).



$115 a barrel

There are also sector-specific factors at play.

In automotive, the average number of unplanned downtime incidents is markedly down (16 a month, compared to 30 two years ago), largely because lines are not running at full capacity. However, those incidents that do occur remain cripplingly costly. The growing complexity and interdependence of auto-production systems mean downtime in one process can halt production across a big part of a plant. Vehicle prices are also increasing, and plants are getting bigger, deepening the losses incurred when production lines stop.

These factors help explain why the cost of an hour's downtime has also risen sharply in automotive and now tops $2m per hour. Despite this, the key issue in the sector today is less downtime than the global silicon shortage, which is resulting in lines lying silent much of the time, despite demand for vehicles. Without silicon chips, producers cannot make vehicles.

In FMCG, the cost of an hour's downtime is rising because of a different set of challenges. As retailers protect their own positions with bigger non-delivery penalties, businesses in this sector are facing a higher penalty when downtime means they cannot supply those retailers in time. A second issue is FMCG firms' onward supply chain stopping working with them if they repeatedly can't deliver on time, leading to higher costs. They can also easily lose shelf space at supermarkets if downtime means products are regularly unavailable – again this is a serious business cost. And the end customer (the shopper) can move to rival brands because of delays in availability of product. This too is making downtime ever more costly.

16 per month

average number of unplanned downtime incidents in automotive sector instead of 30 two years ago

$2 million

the cost of an hour's downtime that has risen sharply in automotive

Total losses to unplanned downtime also up steeply in two years

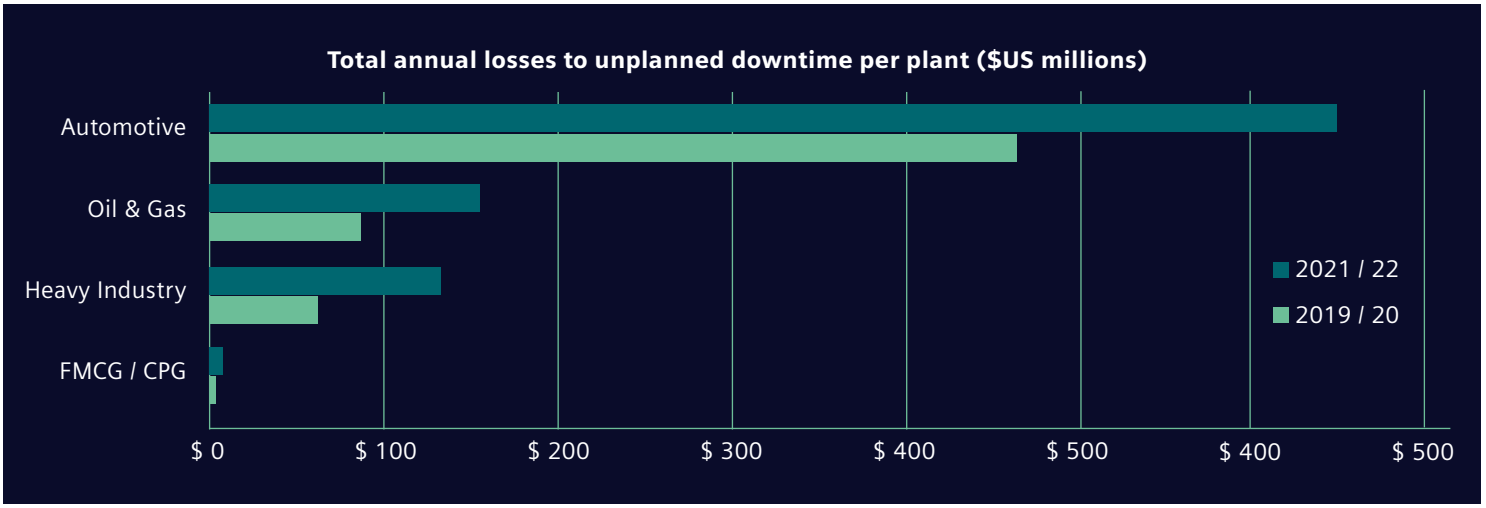
With hourly costs of downtime up so sharply, total losses suffered by manufacturers have also risen very steeply in two years.

The total losses suffered by manufacturers were already vast two years ago, and these costs are spiraling.

The average annual cost of unplanned downtime to each plant operated by a Fortune Global 500 firm is $129m a year – up 65% on two years ago.

At large automotive plants, average yearly losses to unplanned downtime now top $600m. And in this sector, losses could have been worse. Big automotive manufacturers have limited them by reducing the amount of lost production time by 45% in the last two years, more than any other sector (see next section). This is partly a reflection of lines not running at full capacity because of the global microchip shortage. It also reflects Predictive Maintenance strategies becoming more mainstream in the sector: adoption of predictive maintenance (Predictive Maintenance) has grown, with the number of manufacturers with Predictive Maintenance teams increasing from 11% to 38% in the last two years.

In Heavy Industry costs of unplanned downtime per plant have more than doubled in two years, to $128m a year. In Oil & Gas, they have risen 76% to $149m. A key factor in these rises is that sectors producing these goods sit early in the supply chain – they produce steel, aluminium and other metals for a huge variety of purposes, pulp for paper, and oil for all sorts of uses, including plastics. This can mean they face the stiffest penalties for failure to deliver on time: every subsequent user of the raw material faces their own penalties for missing deadlines set by customers, and these penalties tend to be passed down the supply chain, leading to the severest penalties for those near the start. In short, the costs of failure in stressed supply chains flow downwards to those nearest the start.



A second factor in the rising cost of downtime to producers in both Heavy Industry and Oil and Gas are price rises. For instance, in the period covered (2021–22) the oil price peaked at 300% higher than in the period covered by the last report (2019–20). This helps explain why producers in this sector now lose an average of $149 million a year for each facility they run. And this spike in the total cost of downtime has come despite businesses in this sector cutting the number of failures by 25% and the total amount of downtime by 16%. Digitization and Predictive Maintenance are playing a crucial role in limiting losses here.

The total cost of downtime in FMCG has also grown, but less sharply than in any other sector. Here the average facility run by a Fortune Global 500 firm is losing just under $10m a year to downtime, up 36% in two years.

Across the Fortune Global 500, firms are now losing an estimated $1.5tn each year to unplanned downtime – a rise of 70%. Unplanned downtime losses equate to 11% of these firms' annual revenues (up from 8% two years ago). The loss of trust and contractual penalties that come from being the point of failure in a stressed supply chain are getting ever-more problematic for manufacturers.

The Figures

$129 million

annual cost to a typical large plant through unplanned downtime (up 65% in two years)

$1.5 trillion

annual downtime losses for Fortune Global 500 firms

70% rise

in losses for Fortune Global 500 firms compared totwo years ago

11% of annual revenues

amount lost to unplanned downtime over the Fortune Global 500 companies

Fewer downtime incidents but longer recovery times

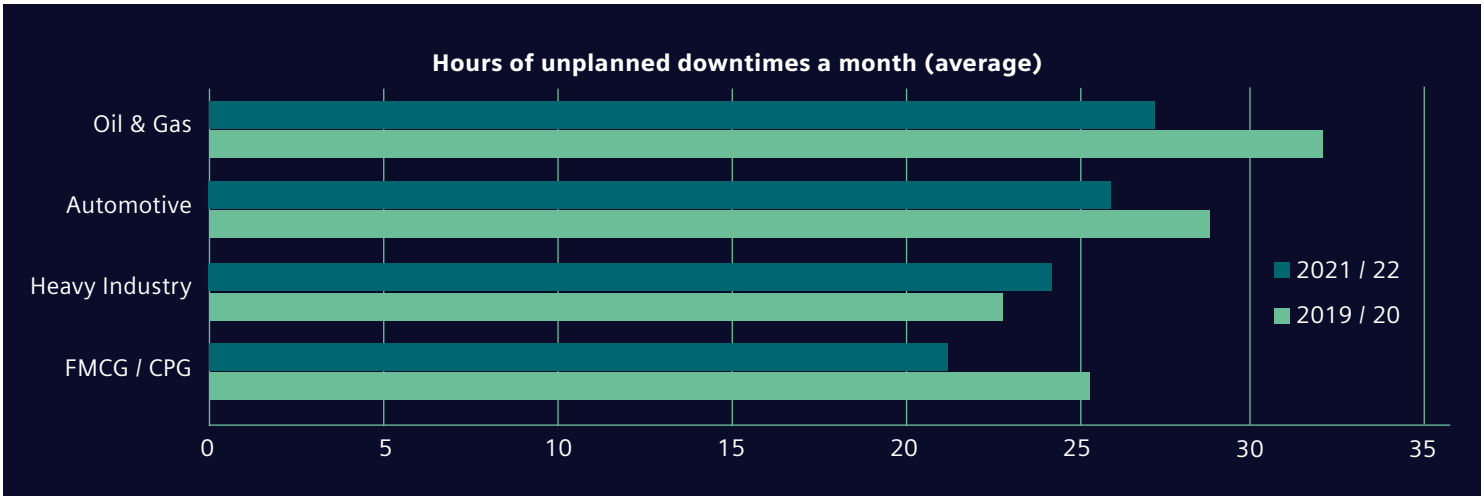
The total losses incurred by manufacturers across all sectors would have been far worse, but with the help of Predictive Maintenance strategies and Industry 4.0 technology, they have in the past two years cut the amount of downtime they are facing.

Compared with two years ago, the number of unplanned downtime incidents is down. But the average plant is taking longer to get running again.

The average plant now has 20 unplanned monthly downtime incidents – six fewer incidents than two years ago. This is a key metric for business success. With the costs of downtime soaring, even with fewer incidents total costs of downtime are rising. It is very hard for manufacturers to reduce the cost of an hour's downtime. The only way for businesses to keep costs under control is to keep driving the number of incidents down. And only predictive maintenance strategies and the technology to implement them enable businesses to do this reliably.

Although there were fewer incidents, the production time lost to those incidents fell by just two hours, to 25 hours a month. The average facility still loses more than a full day's production to unplanned downtime every month.

Why might the number of incidents have fallen? Largely because digitization and predictive maintenance efforts are starting to have a significant impact. And in automotive, with lines working below capacity, engineers have had more chances to nip issues in the bud before they lead to unplanned downtime.



And why might those incidents be taking longer to recover from? Two key factors are at play here. Global supply-chain issues mean emergency replacement components have become harder to source in the past two years. And as part of the so-called great resignation, many experienced engineers have left the industry, creating a skills and knowledge gap. Inevitably, these factors affect recovery times.

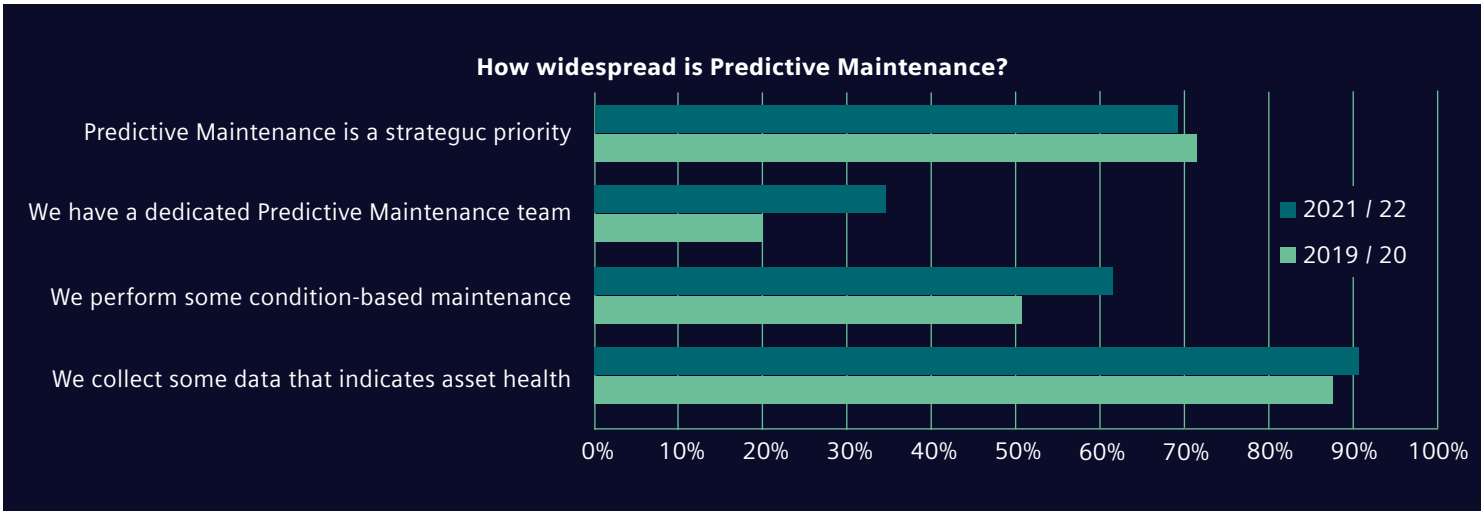
20 downtime incidents a month

per facility on average
(down six on two years ago)

25 hours

lost per plant each month
(down by an hour compared to two years ago)

Appetite for Predictive Maintenance



Seven out of 10 businesses surveyed see Predictive Maintenance as a strategic priority. Two-thirds of firms are now doing some form of condition-based maintenance. And a third now have their own dedicated Predictive Maintenance team.

These figures paint a clear picture. In 2022, Predictive Maintenance is not a future or niche technology. It is well-established and well-proven.

Our data may slightly inflate the prevalence of the technology, because it is drawn from large multinational firms that engage with Senseye Predictive Maintenance, and who are therefore likely to have some interest in Predictive Maintenance.

However, it is now so clear that companies save money with these technologies that Predictive Maintenance has moved from nice-to-have to must-have.

For instance, in our survey, the Overall Operating Efficiency shown by firms where Predictive Maintenance is a strategic priority was almost double (60) than that offered by firms where it was not (29).

Predictive Maintenance is also about predicting upcoming machinery issues to avoid failures. That means lower costs in the spares that have to be held, which is especially important given the current uncertainty in supply.

It enables prognostics – particularly, the ability to predict Remaining Useful Life. And it is getting less and less expensive. On average, Senseye Predictive Maintenance customers who deploy the technology for Predictive Maintenance at scale recoup their Predictive Maintenance investment costs in three to six months.

It is, therefore, no surprise that Predictive Maintenance is now a mainstream technology for large multinational manufacturers and industrial companies, as this survey shows.

Seven out of ten

businesses see Predictive Maintenance as a strategic priority

One in three

businesses have their own dedicated Predictive Maintenance team

Two out of three

firms are now doing some form of condition based maintenance

Are firms collecting the kind of data that makes **Predictive Maintenance possible?**

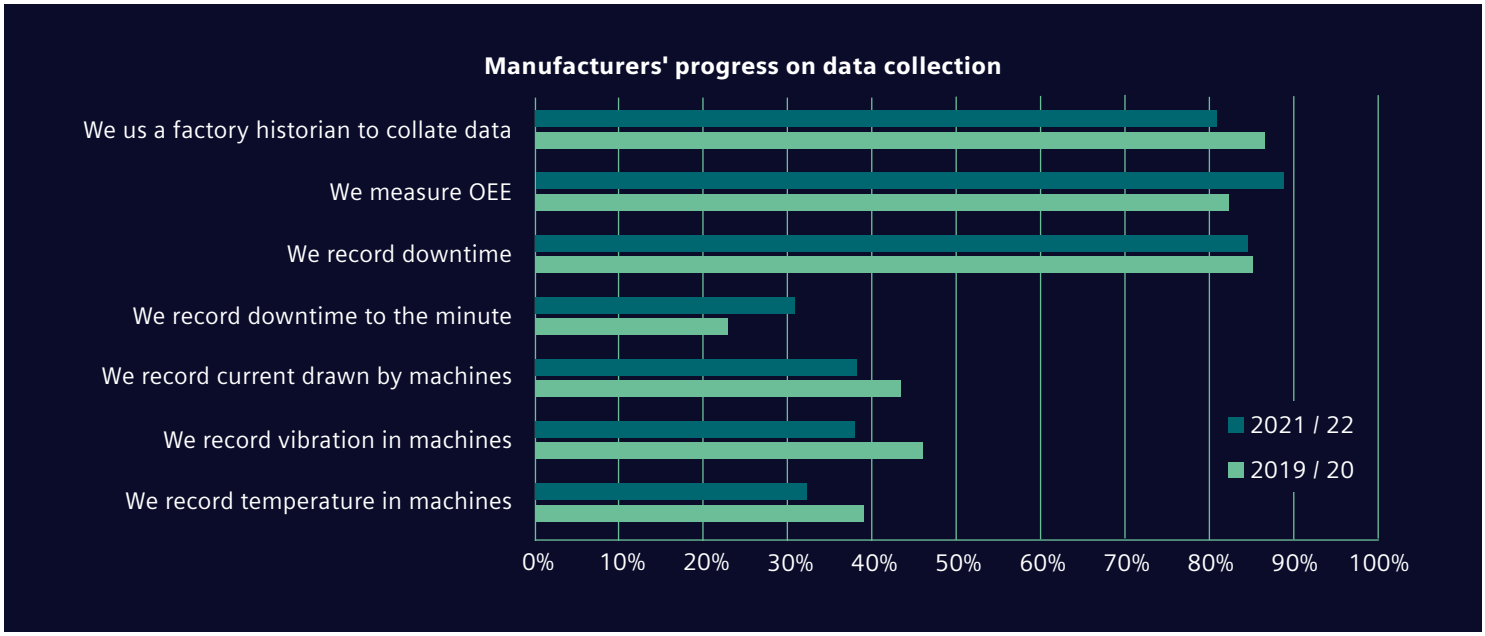
More than three-quarters of businesses collect some basic data from their machines. They measure OEE, record downtime, and use a factory historian. This is now mainstream practice.

However, the data collected via a factory historian is not always as helpful as businesses imagine, and increasingly this is seen as legacy technology. A richer and more useful data set is needed to get the benefits of a Predictive Maintenance strategy and less unplanned downtime.

The businesses reaping the greatest rewards are those who have gone beyond using factory historians to implement IoT platforms that let them integrate and use data from multiple sources. These include maintenance records (CMMS), operational systems, Manufacturing Execution Systems, service data and human insights.

The leading businesses in the field are integrating information from many more sources to create the most powerful machine learning and AI predictions about the health of their equipment.

The key is finding the data points that have the most predictive power and then monitoring them. In Senseye Predictive Maintenance's experience the smartest factories are now adopting a "small data" model; they identify and monitor the most important data points amongst the swathes of data that turns out to be irrelevant.



With the focus very firmly on value over volume, this approach involves setting out precisely the types of data needed to ascertain and analyze a particular pattern or outcome.

Furthermore, data doesn't necessarily need to be collected in real-time, but at preset intervals pertinent to the function of the machine. For some this could be hourly, for others daily, but by switching off the constant data flow, data volumes are substantially reduced.

It is much more effective to focus on what is relevant, in a pragmatic way, with a steer from those who know the equipment best. Otherwise, insight can be drowned out by the sheer noise of a huge volume of data.

Businesses measure:

- **OEE**
- **Downtime**
- **Factory Historian**

Over three quarters

of businesses collect some basic data from their machines.

Improving productivity with **Predictive Maintenance**

Senseye Predictive Maintenance Asset Intelligence automates the analysis of machine health, enabling Predictive Maintenance. It can be introduced cost-effectively and at scale across large manufacturing and industrial organizations.

It uses artificial intelligence to analyze data about all aspects of machine health, such as current drawn down by machines and vibration. That allows Senseye Predictive Maintenance to give you early warning of deterioration in performance and reliability. With that information, engineers can direct their attention where needed to prevent failure.

Predictive Maintenance means firms can service machines before they break down, not after. And it eliminates the need for exhaustive, costly preventative maintenance schedules.

By bringing in Predictive Maintenance, Senseye Predictive Maintenance's clients have shown the following:

- An 85% improvement in downtime forecasting accuracy
- A 50% reduction in unplanned machine downtime
- A 55% increase in maintenance staff productivity
- A 40% reduction in maintenance costs

These gains mean large manufacturers have recouped the cost of their investment within three months.

What could manufacturers be saving **with Predictive Maintenance?**

Extrapolating from these figures, Senseye Predictive Maintenance estimates that the use of AI-driven machinehealth monitoring across the Fortune Global 500 could:

- Save 1.6 million hours of downtime annually
- Realize a 6% productivity boost worth $734 billion
- Achieve a 40% reduction in maintenance costs worth $236 billion and deliver a 4% boost to the bottom line[1]
- Recoup 171,000 lost hours and deliver a 12% boost in productivity worth up to $354 billion a year for automotive manufacturers in the Fortune Global 500
- Save Fortune Global 500 FMCG manufacturers 607,000 production hours a year, and deliver a 2% productivity boost worth $23.5 billion
- Save Fortune Global 500 organizations in Heavy Industry over 740,000 lost hours a year, and provide a $323 billion annual productivity boost
- Save Fortune Global 500 Oil & Gas producers 72,000 hours a year in their refineries alone, and deliver a $33 billion productivity boost

These figures are enormous. But AI-driven machine-health monitoring delivers more. It improves things for people, production and the planet. Fixing before failure reduces the need for replacement parts by up to 40%, which cuts wastage and carbon usage. Condition monitoring also reduces energy usage. And Predictive Maintenance strategies allow organizations to cope better with the post-Covid retirement of many experienced engineers, by focussing engineers' time where it is most needed.

Methodology

The results in this report come from an ongoing survey by Senseye Predictive Maintenance, asking large manufacturing and industrial businesses about unplanned downtime, data collection, condition-based maintenance and Predictive Maintenance.

The results used here cover the period from January 2021 to August 2022. They are based on 56 completed online interviews with maintenance, engineering and IT professionals at large industrial organizations in the following sectors:

- Automotive
- FMCG (fast-moving consumer goods)
- Heavy Industry
- Oil & Gas.

These organizations were across the world.

Senseye Predictive Maintenance used extrapolation to estimate unplanned downtime in Fortune Global 500 companies. We extrapolated findings from our research using publicly available information on the number of plants operated by these organizations and the number of employees.

Data on Predictive Maintenance's benefits come from live deployments of Senseye Predictive Maintenance's software at large manufacturing and industrial organizations.

Footnotes:

[1] Previous research from Senseye Predictive Maintenance in the metals and mining sector show that large industrial organizations typically spend approximately 3% of annual turnover on maintenance. This estimate assumes that 3% figure is consistent across all sectors analyzed for this report.

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