SENSEYE PREDICTIVE MAINTENANCE

The True Cost of Downtime 2024

How much do leading manufacturers lose through inefficient maintenance?
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SIEMENS

Predictive Maintenance stops downtime costs crippling manufacturing

Unplanned downtime is now a cost that major manufacturers cannot afford.

In the Automotive sector, the cost of an idle production line at a big plant is now **$695 million** a year, 1.5 times higher than five years ago. In a Heavy Industry plant, it is **$59 million**, 1.6 times higher than in 2019.

So unplanned downtime now costs the world's 500 biggest companies **11%** of their revenues. That totals **$1.4 trillion** equivalent to the annual GDP of a major industrial nation like Spain.

These are the key findings of this report, a review of the true costs of downtime to manufacturers and industrial organizations over the past five years.

At the bottom end, the costs of a lost hour are now **$36,000** in Fast Moving Consumer Goods. At the top end, they are **$2.3 million** in the Automotive sector – or more than **$600** a second.

Faced with these kinds of costs, companies have been forced to try to cut downtime ruthlessly. Most have succeeded. Since 2019, almost every sector has cut the number of downtime hours suffered. Heavy Industry has slashed it to nearly a third of 2019 levels.

Only these efforts have stopped the overall costs of downtime from spiralling out of control.

Firms have brought in powerful new technology to minimize production hours lost. The Internet of Things has allowed them to collect data on the condition of their machines.

Predictive Maintenance (PdM) has allowed them to avoid machine failures on the one hand and the costs of over-maintenance on the other. Frequent scheduled maintenance keeps machines healthy, but it also has considerable costs in unnecessarily closed lines and the need to keep up stocks of expensive spares.

PdM has moved from a promising technology to an essential part of business.

This report asks three critical questions about the past five years in manufacturing and industry:

•   What is the true cost of downtime for large manufacturing and industrial businesses?

•   What savings could firms make by adopting technology enabling PdM?

•   How many firms have PdM teams in place, and how many are ready to do so?

We answer those questions using the results of surveys over five years. We hear from manufacturing and industrial organizations worldwide about the true impact of downtime.

Executive summary

- Unplanned downtime costs are generally much higher today than five years ago. In Automotive, every hour of downtime costs twice what it did in 2019. In Heavy Industry, it costs four times as much.

- The costs are highest of all in the Automotive sector. An hour's downtime in a large Automotive plant now costs **$2.3 million** an hour – or more than **$600** a second.

- In Oil and Gas, the cost of an hour's downtime fell dramatically in 2023, in line with a fall in oil prices. But 2022 saw record costs.

- In FMCG (Fast Moving Consumer Goods), the cost of an hour's downtime has remained relatively stable since 2019.

- Rising energy prices were the critical factor in the increasing cost of an hour's downtime over the past five years.

- Total losses to downtime are also rising but at a slower rate than per-hour costs. We estimate that the cost for an average large plant in the sectors we surveyed is now **$253 million** a year.

- We estimate that the world's 500 biggest companies lose almost **$1.4 trillion** annually through unplanned downtime, equivalent to **11%** of their revenues.

- The only factor that has prevented total losses from spiralling out of control has been a reduction in the number of hours lost to unplanned downtime. Plants now suffer an average of 25 downtime incidents a month per facility, down from 42 in 2019.

- An average large plant still loses 27 hours a month to unplanned downtime, down from 39 in 2019, but still more than a full day's production.

- A critical factor in this reduction has been Predictive Maintenance (PdM) going mainstream. Almost half of firms surveyed now have PdM teams, twice the proportion seen in 2019.

- Condition Monitoring and PdM applications have now become indispensable mainstream technologies. Nine out of ten respondents are doing some form of condition monitoring and almost half have dedicated PdM teams.

- Siemens estimates that full adoption of condition monitoring and PdM practices at Fortune Global 500 industrial organizations could:

  - Save them **2.1 million** hours of downtime annually

  - Save them **$388 billion** through a **5%** increase in productivity

  - Save them **$233 billion** through a **40%** reduction in maintenance costs

The true cost of an hour's downtime

In all of the sectors we surveyed, every hour of unplanned downtime costs more than ever before.

For each hour Automotive production lines fall silent or furnaces are on standby, money drains away frighteningly fast. To take the most extreme example, Automotive manufacturers now lose **$2.3 million** for each unproductive hour.

Is downtime getting more expensive?

In most sectors, yes. Our five-year comparison suggests that:

• In the Automotive industry, the cost per hour of downtime is 2x what it was in 2019

• In Heavy Industry, it is **4x higher**

• In Automotive, unplanned downtime now costs **$2.3 million an hour**.

• In FMCG, costs have stayed stable.

• In Oil & Gas, they were down sharply in 2023 as the oil price fell.

At the top end, huge sums are now lost to downtime, reflecting the hidden costs that hurt producers:

• Loss of revenue (the loss of goods that should have been produced for sale in that period)

• Cost of wages (paying staff who can't work)

• The cost of salaries for those rectifying the problem

• Cost of emergency replacement parts

• Penalties incurred, such as payments of contractual compensation.

Cutting downtime has, therefore, long ceased to be a nice-to-have. In today's manufacturing and industrial landscape, it is essential.

Why is an hour's downtime cost rising so much faster than inflation in key sectors?

In the Automotive and Heavy Industry sectors, the spike in the cost of downtime over the past five years has hugely outpaced inflation. For instance, US price inflation has totalled **19%** over the five years we studied (2019-23). By contrast, our figures suggest the cost of an hour's downtime has risen by **113%** in the Automotive sector. In Heavy Industry, that rises to **319%**.

### Heavy Industry: Cost of one hour unplanned plant downtime
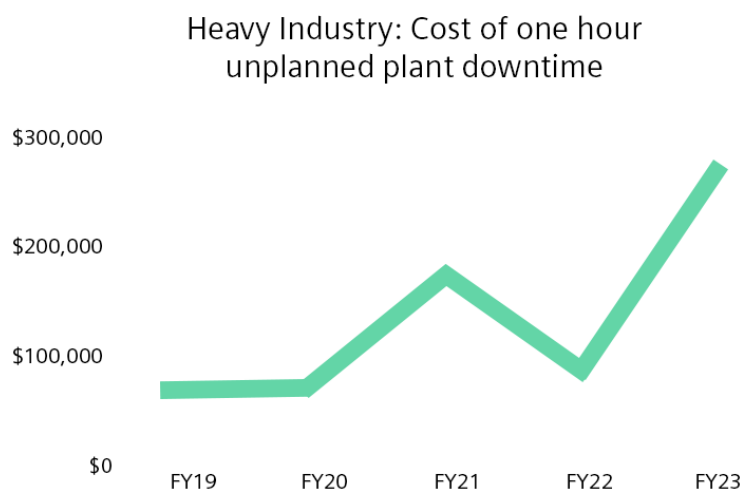
The first factor in the rising cost of downtime is the energy crisis, which began in the summer of 2021. Global energy prices rose sharply as economies came out of Covid lockdown. Reduced output from some energy producers led to further increases, as did the invasion of Ukraine in early 2022, which brought global uncertainty about energy supply and further price rises. Costs spiked in 2022, with oil prices almost three times higher than 2019.

Automotive: Cost of one hour unplanned plant downtime
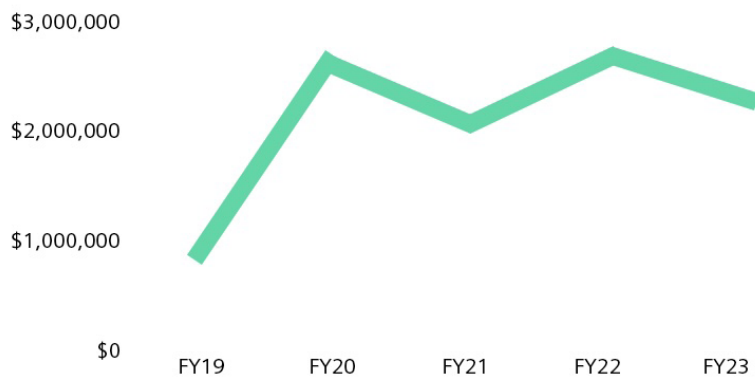
Automotive downtime has become increasingly expensive as the manufacturing processes and supply chains have become ever more complex and interdependent. Downtime in one part of the process can have knock-on effects across the assembly plant and even down the supply chain. This helps explain how, according to our figures, large Automotive manufacturers now lose $2.3 million for every hour of downtime.

## FMCG: Cost of one hour unplanned plant downtime
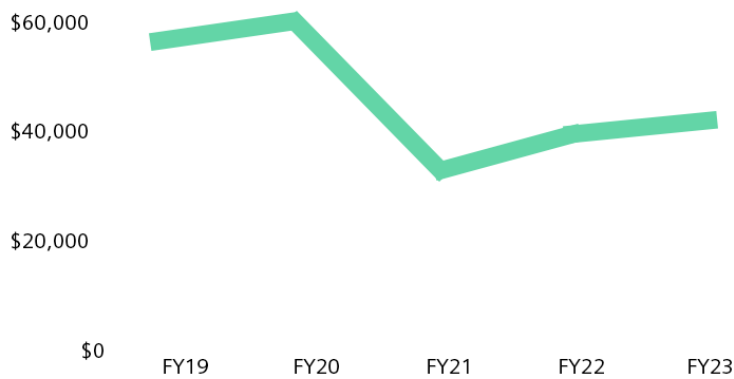
In Fast Moving Consumer Goods (FMCG), the cost of downtime fell during and after Covid lockdowns. It remains at a level below that of 2019. This may reflect changes in the penalty clauses manufacturers face for missing their production targets. In 2019, global demand was stagnant, leaving retailers in a strong position with manufacturers.

Retailers were able to name their terms, including penalty clauses. But the Covid boom in demand for FMCG – especially for electronics – turned the tables.

With retailers desperate to get products into delivery vans, they could not impose penalties on manufacturers for missed production targets. This may have allowed manufacturers to reduce the cost per hour of their downtime

Oil & Gas: Cost of one hour unplanned plant downtime
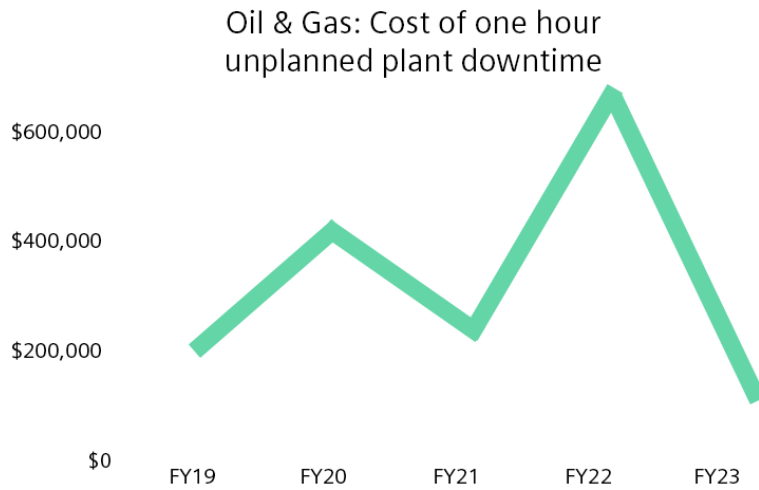
In Oil and Gas, the cost of an hour's downtime over the last five years follows a simple pattern. The higher the oil price at any given time, the higher the losses that stem from losing an hour's production. In 2023, the cost of an hour's lost production was broadly similar to that in 2019; unsurprisingly, the cost of oil was similar in both periods, at $60 - $80 a barrel. As the price spiked to nearly $120 a barrel in early 2022, so did the sector's downtime cost. Oil and Gas remains highly exposed to periods of very significant downtime costs when the oil price is high.

Cost of one hour unplanned plant downtime All Sectors Combined
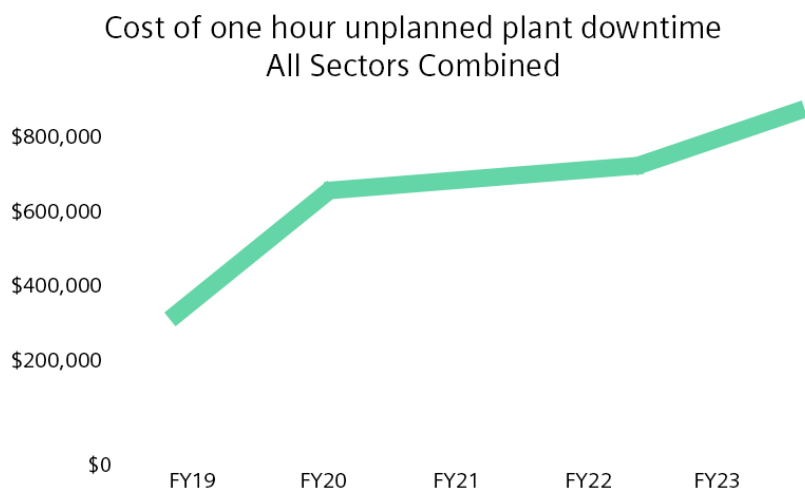
When we combine all the figures across sectors, they suggest that the cost of an hour's downtime has doubled over five years, driven mainly by the enormous costs now incurred by Heavy Industry.

Note: within each year's sample, the proportion of firms in each sector has been broadly similar, but has not remained exactly the same. This fluctuation means the combined results shown above are not directly comparable year-on-year and should be seen as indicative only

What about the cost for small and medium-sized manufacturers?

Our survey data comes mainly from large manufacturers and major heavy-industrial producers. However unplanned downtime poses significant challenges for SME manufacturers too. These include:

1. Cost. Downtime costs can be significant for SMEs, reaching $150,000 an hour at the top end. For smaller organizations, these can be unsustainable losses.

2. Loss of business. The health of many SMEs depends heavily on them supplying larger manufacturers. A metric many work to is OTIF – delivery On Time, In Full. Their customers monitor what proportion of orders are delivered on time and in full. Downtime is a severe challenge – if SMEs can't supply in time and in full, they are in danger of losing their status as a supplier. In some cases, this threatens their very existence.

3. Having to hold stock. If supplying an essential part is crucial to the SME hitting supplier KPIs, they may have to hold buffer stock to guard against being unable to supply in the event of downtime. This brings storage and management costs.

There is, therefore, a unique opportunity for SME manufacturers. As the cost of the technology needed to implement Industry 4.0 digitalization and Predictive Maintenance comes down, those on the cutting edge are using these technologies to eliminate these problems.

In doing so, they gain considerable competitive advantage by saving costs and becoming A-graded suppliers to major manufacturers.
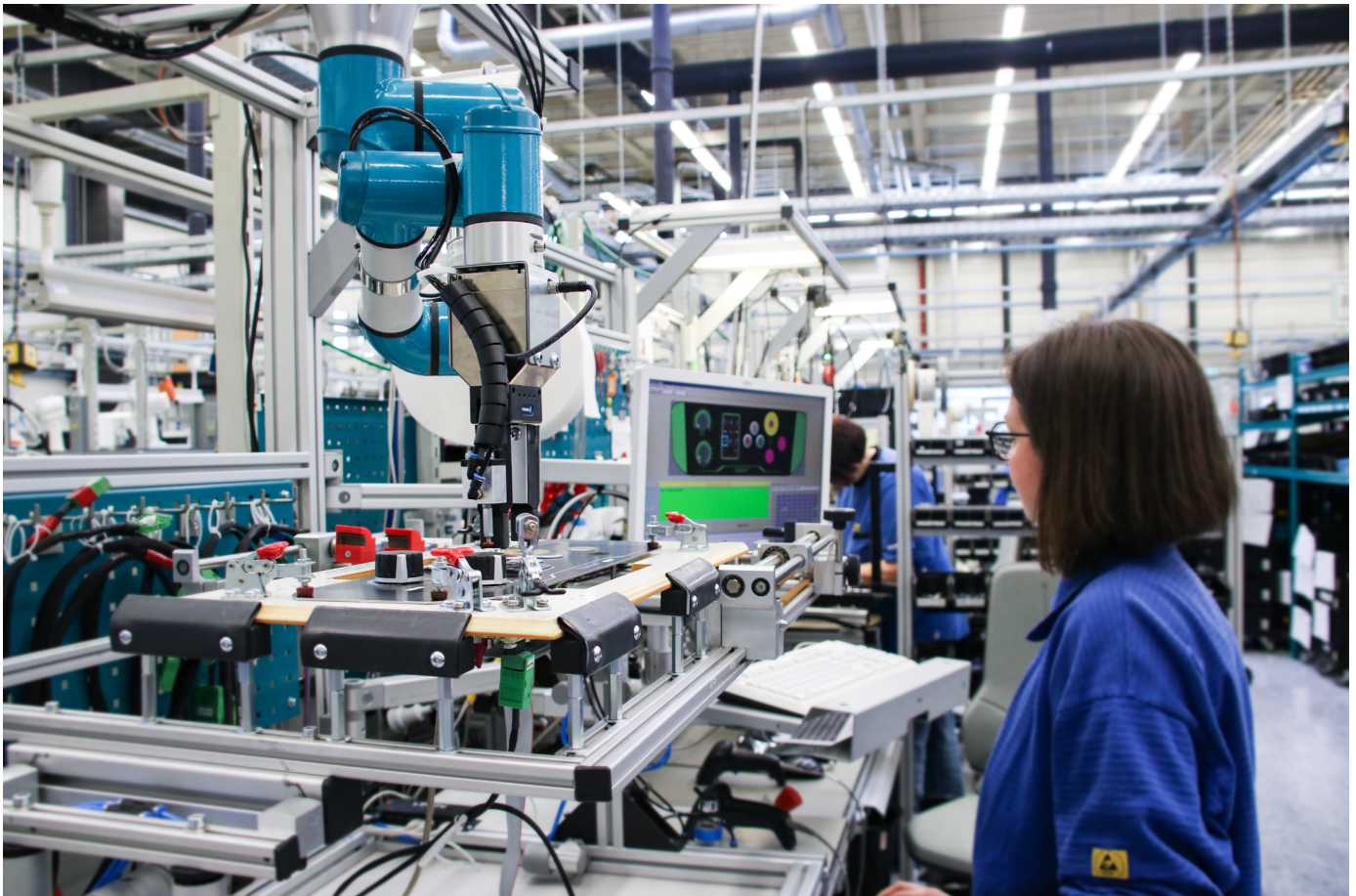
Total downtime losses held steady with Predictive Maintenance and Industry 4.0

Automotive: Total annual losses to unplanned downtime per plant
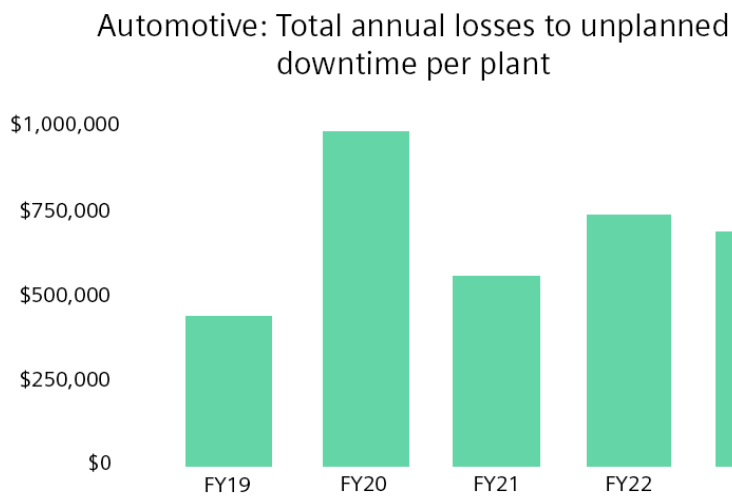
At some point in the past two years (2022 or 2023), almost every key sector we surveyed faced per-hour downtime costs at least three times higher than in 2019.

### FMCG: Total annual losses to unplanned downtime per plant
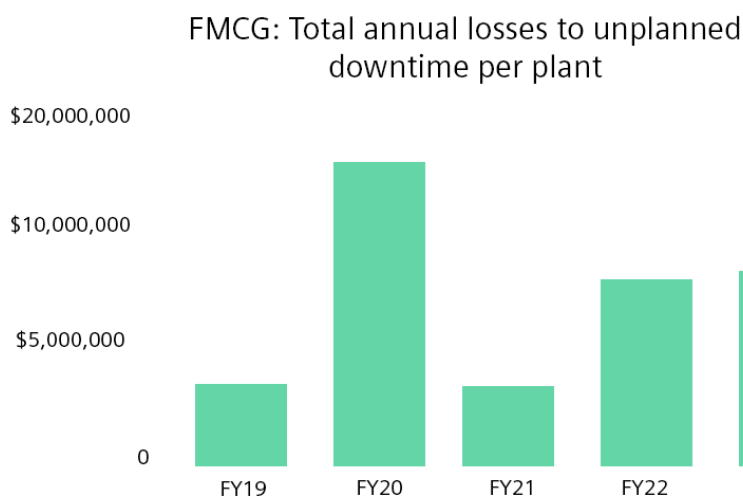
The exception is FMCG, which is explored later.

Does that mean overall costs of downtime have spiralled out of control too? The answer is no. The explanation lies in companies' successful efforts to minimize downtime.

- In all sectors, bar Oil & Gas, total costs per plant are at least 50% higher today than in 2019

- Oil & Gas costs per plant in 2023 are half what they were in 2019. But in 2022, they were three times as high due to much higher oil prices

- Global Fortune 500 businesses, the largest 500 companies in the world by revenue, still lose $1.4 trillion annually to unplanned downtime – equivalent to 11% of annual revenues or the GDP of Spain

- But these losses have fallen by 6% since 2022..

Heavy Industry: Total annual losses to unplanned downtime per plant
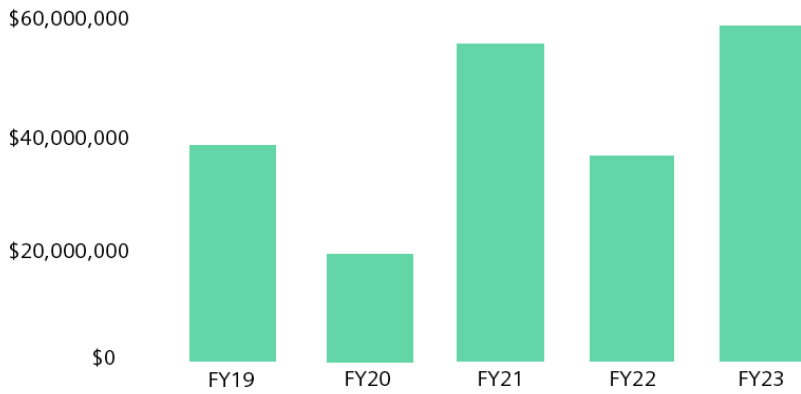
Total unplanned downtime costs have not spun out of control because manufacturers have reduced unplanned downtime. And, after a year of significant losses in Oil & Gas, a lower oil price has reduced the costs of unproductive time in that sector.

However, the sums lost are still vast. In Automotive, the annual cost of downtime in a large plant is approaching $750m a year – or more than $2m a day.

Oil & Gas: Total annual losses to unplanned downtime per plant
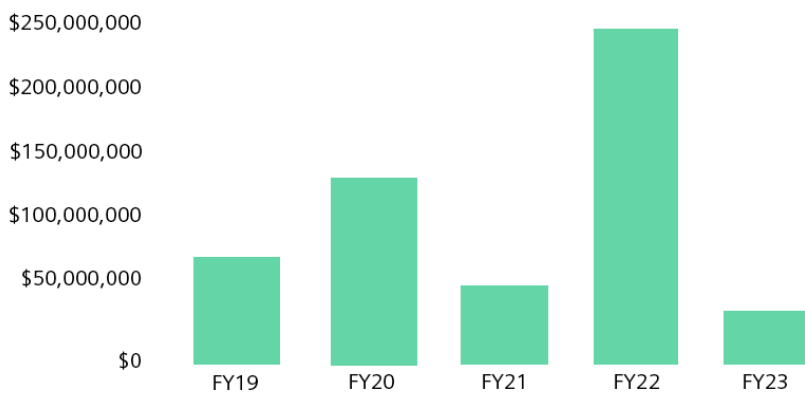
The overall costs of downtime are heaviest of all at large Automotive plants. This helps explain why this sector has been successful in holding the cost of downtime relatively steady, at around 50% higher than 2019 costs. Downtime is so costly that auto manufacturers have invested significant time and money in cutting it. They pre-manufacture components to exacting standards and have led the push towards digitization, Industry 4.0 and Predictive Maintenance. Why? Because they can't afford not to

As the supply chain gets stressed, manufacturers have problems with getting the supplies they need to produce their products. This has knock-on effects: if they miss their contractual obligations to buyers they are financially penalized. They have to add these costs to the penalties they impose on their suppliers for delivery failure. And so on, down the supply chain.

The net effect is that those at the bottom of the supply chain face the stiffest penalties for non-delivery, and this flow-down effect has hit Heavy Industry.

The most significant rise in overall downtime costs has been in the FMCG sector, where costs have doubled per plant since 2019 to just over $10 million annually. This may reflect the relatively low cost of an hour's downtime compared to other sectors. As such Industry 4.0 technology delivers a less compelling ROI. However, it still has important effects on the bottom line, improving the efficiency of engineers, reducing the need for planned maintenance, and making sudden failures much less likely. .

Plants face fewer downtime incidents and hours lost

The cost of every hour of downtime has spiked in key industries. But in every sector, total costs per plant have not risen as fast. How?

- The answer is that – with the help of Predictive Maintenance (PdM) – major manufacturers have slashed the unplanned downtime they have suffered over the last five years.

- They suffer 25 downtime incidents a month per facility on average, down from 42 in 2019

- They lose 27 hours per plant per month, down from 39 in 2019

- On average, each pant now loses 326 hours a year, down nearly a third on 2019

- Since 2019, only the FMCG sector has seen downtime hours increase

- In Automotive and Heavy Industry, hours lost to unplanned downtime have halved over the past five years

- But the average plant is taking longer to get running again

Hours of unplanned downtime per year
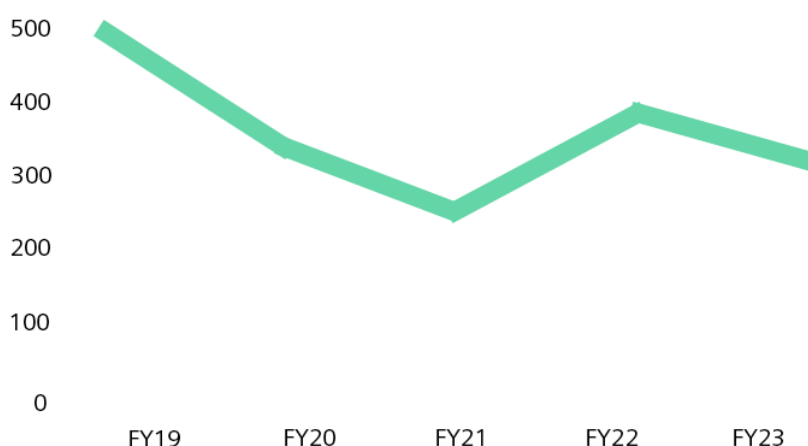
Why might the number of incidents and total time lost have fallen?

Compared with five years ago, the number of unplanned downtime incidents is dramatically down. The average plant now has 25 unplanned monthly downtime incidents, 41% fewer than five years ago. As PdM and Industry 4.0 technologies have gone mainstream, manufacturers have been able to predict mechanical failures and maintain machinery at the right time. These technologies have helped them push down the hours lost.

The exception here is in FMCG, where the average number of hours lost is similar today to 2019. This may reflect the fact that this sector needs to catch up on Industry 4.0 technology. With the cost per hour of downtime in FMCG less extreme than in Heavy Industry, PdM has been less of a business priority, and the sector has yet to achieve the reductions in downtime seen elsewhere.

**Why might downtime incidents be taking longer to recover from?**

Five years ago, it took an average of 49 minutes to get production back up and running following downtime. Now, it takes 81 minutes. This reflects several factors:

- Many businesses lost skilled maintenance labour during the so-called post-Covid 'great resignation', creating a skills and knowledge gap, which led to longer recovery times.

- Global supply-chain issues mean that emergency replacements are more challenging to source and take longer to arrive when components fail, leading to more extended periods of downtime.

- Industry 4.0 going mainstream means that data capture and failure-prediction techniques have solved many of the minor problems that once caused downtime. The things that cause downtime now are the more challenging problems that are harder to detect and take longer to fix.

Predictive Maintenance goes mainstream

How widespread is Predictive Maintenance?
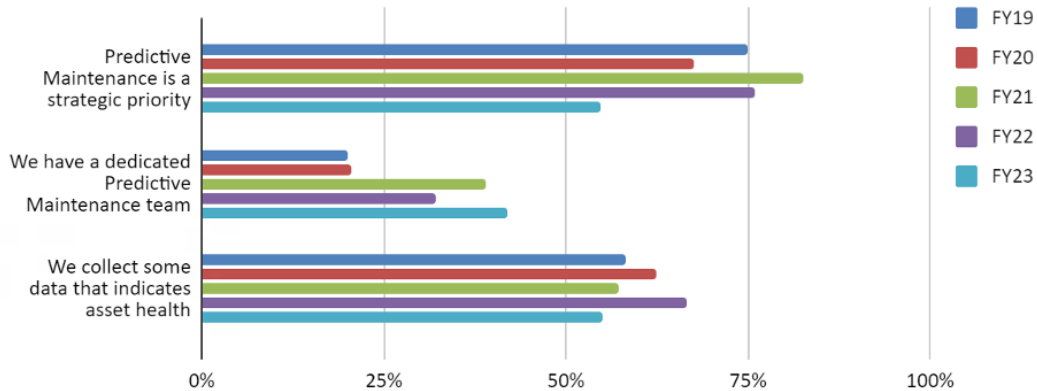
Predictive Maintenance (PdM) is now a routine part of business as usual at major manufacturers. Almost half now have a PdM team – double the proportion that had one five years ago.

Our detailed breakdown of what data firms capture shows that nine out of 10 manufacturers we surveyed collect at least some data that gives them a view of machine health. PdM is no longer just something frontrunners are trying out. It is a well-established and well-proven technology. Digitization strategies are now maturing.

This explains why the proportion of manufacturers saying PdM is a 'strategic priority' fell between 2019 and 2023: it is no longer a development priority but business as usual.

To control the costs of downtime, PdM has become a must-have. It prevents sudden and unexpected equipment failures that lead to lengthy downtime while avoiding the opposite danger of over-maintenance.

Costs are cut further by allowing manufacturers to reduce the spares they need to hold 'just in case'. It also allows them to calculate the likely Remaining Useful Life of machines, allowing industry to make full use of an asset lifespan without pushing machines so far that catastrophic and hugely costly failures become likely.

The pressure on supply chains in recent years has meant that unplanned downtime is a bigger and bigger headache. With the costs of PdM falling simultaneously, the technology has entered the mainstream, becoming a must-have for manufacturers.

Do manufacturers have the data for Predictive Maintenance?

Good data is the foundation for condition monitoring and Predictive Maintenance (PdM).

Nine in 10 major manufacturers (87%) now gather data that makes PdM possible, and half collect at least one of the key data points that boost PdM performance: current, vibration, and temperature.

Manufacturers' progress on data collection
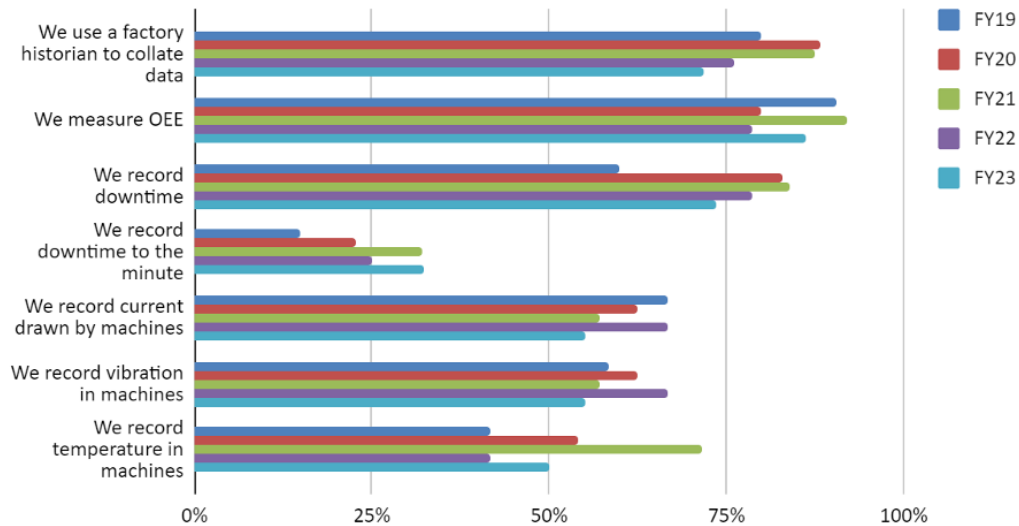
However, almost three-quarters are still using factory historians, only a slight fall from 2019. Historians are seen increasingly as legacy technology because they do not provide the rich data that powers the most effective PdM.

So, while PdM is increasingly widespread, not every business will feel the full power of the technology because they are not collecting the full range of data needed.

Powerful PdM needs data from a range of sources:

- Maintenance records

- Operational systems

- Manufacturing Execution Systems

- Service Data

- Human insights

Businesses use PdM technology to analyze all these data points. They then identify those with the most predictive power and focus on these. AI analysis finds those that offer nothing but irrelevant noise instead of a meaningful signal that allows accurate prediction of machine conditions. To help them do that, generative AI has been introduced to products like Senseye Predictive Maintenance. This helps customers bring out all the existing knowledge from their machines and systems. And it allows firms to make robust decisions about efficiency and maintenance via a user-friendly conversational interface.

Improving productivity with Predictive Maintenance

Senseye Predictive Maintenance automates the analysis of machine health, enabling Predictive Maintenance (PdM). 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, temperature and vibration. That allows Senseye Predictive Maintenance to warn you early about a deterioration in performance and reliability. With that information, engineers can direct their attention where needed to prevent failure.

PdM means firms can service machines before they break down, not after, eliminating the need for exhaustive, costly preventative maintenance schedules.

By bringing in PdM, 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, Siemens estimates that the use of AI-driven machine-health monitoring across the Fortune Global 500 industrial organisations could deliver:

- **2.1 million** hours of downtime saved annually

- **$388 billion** savings through a **5%** increase in productivity

- **$233 billion** in savings through a **40%** reduction in maintenance costs

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%**, reducing wastage and carbon usage. Condition monitoring also reduces energy usage, and PdM strategies allow organizations to cope better with the retirement of many experienced engineers by focusing time where it is most needed.
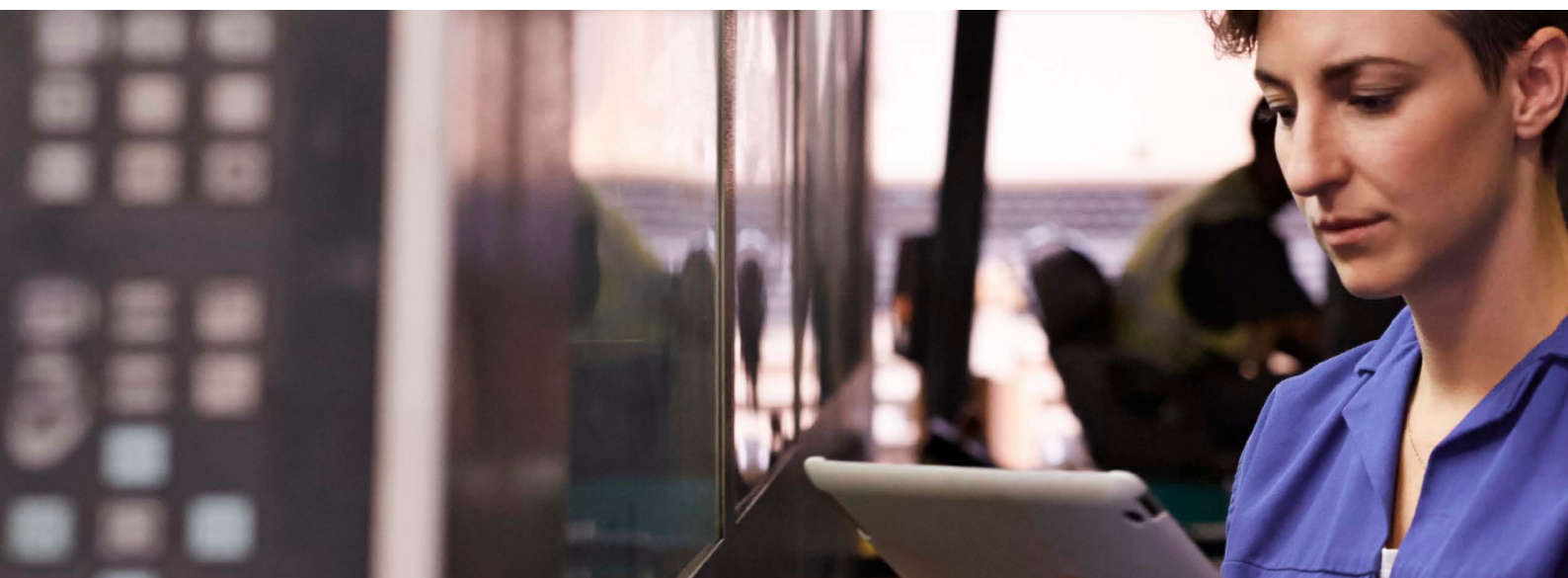
Methodology

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

The results used here cover the period from April 2019 to March 2023. They are based on 181 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 located across the world.

To estimate the impact of 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 benefits from live deployments of Senseye Predictive Maintenance's software at large manufacturing and industrial organizations.

Find out more: **siemens.com/senseye-predictive-maintenance**