

Industrial Maintenance

Status, Trends + Forecasts Report

2021



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ABOUT ADVANCED TECHNOLOGY SERVICES

Advanced Technology Services, Inc. (ATS) is a global solutions provider with over three decades of proven experience in technology-driven industrial maintenance and MRO asset management. Through a technically skilled workforce, standardized processes and Industry 4.0 technologies we deliver asset health and productivity to many of the world's leading process and discrete manufacturers. ATS has corporate offices throughout the U.S., Mexico and U.K. To learn more how we make factories run better, visit www.advancedtech.com.

EXECUTIVE SUMMARY

It is a pivotal moment for maintenance and reliability organizations in the manufacturing industry. Never has the value of their work been clearer or the available tools for maintenance optimization more attractive. Long considered a cost center, manufacturing executives are increasingly recognizing the profit potential of technology-driven maintenance strategies and willing to invest in related technologies with a proven ROI.

The relationship between IT/OT was rising well before COVID-19 existed, but the pandemic caused it to surge. Suddenly, in-person asset monitoring and maintenance became a health and liability risk and exacerbated pre-existing skills shortages. Awareness of vulnerabilities to unexpected downtime and asset failure became more acute.

Plant and operations management quickly realized that the need for organizational, technological, and culture change was urgent, not just to mitigate the pandemic but as an enduring best practice in agility. Those in the executive suite concurred.

To better understand the present state and quantify the trends, Plant Engineering and ATS partnered in early 2021 to examine current and planned maintenance practices and strategies, and the effects of maintenance technologies on productivity and profitability in manufacturing facilities.

The study explored the respondents' personal attitudes about maintenance and the people, process, and technology challenges associated with maintenance programs. It asked about the maintenance strategies and tools used in their facility and issues affecting productivity. It delved into plans to reduce unscheduled downtime and to deploy new or additional technologies in the plant.

Familiarity with the impacts of the industrial internet of things (IIoT) on plant maintenance operations were gauged, as were the anticipated benefits of machine health monitoring sensors. The study revealed the range of tools used to monitor and manage maintenance and the advantages being realized from their various strategies and tools. Respondents were also asked about their facility's current and future use of maintenance outsourcing.

IIoT-based technologies are prominent topics in this study because of their compelling ability to streamline or automate crucial tasks, and their capacity to help plants transition from costly reactive maintenance and routine preventive maintenance (PM) in favor of ROI-driven proactive strategies.

For instance, using sensors to monitor machine health and performance turns conventional predictive maintenance (PdM) into a real-time solution. Intelligent data analytics help to trigger prescriptive maintenance (RxM) alerts with recommended corrective actions; streamline root cause analysis (RCA); and enable systematic continuous improvement of maintenance operations. Providing remote access to asset performance and condition data enables oversight from anywhere at any time, saving time and money and increasing safety and responsiveness.

Integrating IIoT solutions with a robust computerized maintenance management system (CMMS) centralizes and standardizes the data and thus accelerates the time to value. With the integrated solution, maintenance teams can better track and trend asset degradation, predict and prevent downtime, boost asset reliability and availability, and improve productivity and plant performance.

Though enthusiasm about advanced maintenance technologies is rising, many plants lack the time and talent to implement and effectively utilize them. The long-standing shortage of skilled technical workers has many facilities operating with lean or understaffed teams. Consequently, the study confirmed, many are partnering with outsourcing service providers to fill talent gaps, whether for individual roles, selected maintenance programs, or entire maintenance operations. Outsourcing to expert service providers offers a means for these manufacturers to cost-effectively realize the benefits of world-class maintenance tools and practices.



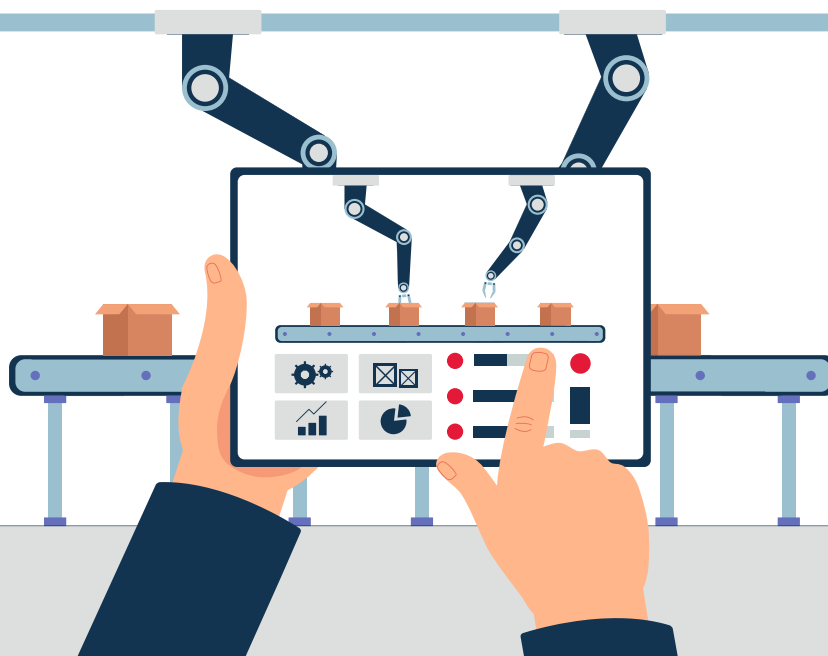
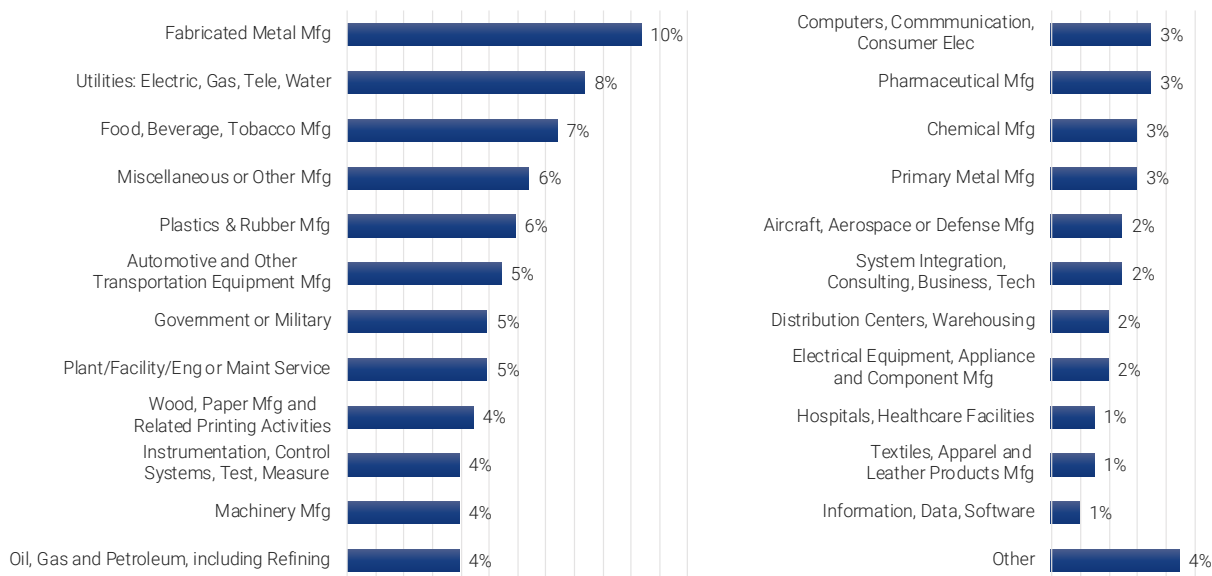
SURVEY METHODOLOGY

A sample of qualified subscribers of Plant Engineering magazine were invited by email to participate in the 2021 Industrial Maintenance study. Data was collected in January and February of 2021 from 203 respondents who are responsible for maintenance at all or part of their facilities.

Seventy-nine percent of the respondents have engineering, maintenance, or supervisory roles while 20% are in general

management. On average, they have 23 years of experience in the manufacturing industry, with 32% having 30 or more years. The average facility has 384 employees, and an average of 21% of a plant's operations team is part of its maintenance department. The primary businesses served are wide ranging, with the greatest presence in fabricated metal manufacturing, utilities, and food, beverage, and tobacco manufacturing.

PRIMARY BUSINESS SERVED

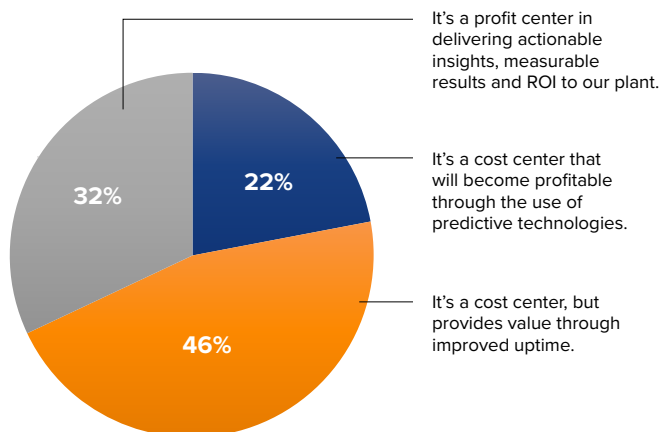


ATTITUDE TOWARDS MAINTENANCE

Attitudes toward maintenance are formed through personal experience and knowledge gained from training, professional development, and networking with peers. Individuals most familiar with advanced maintenance strategies generally recognize the bottom-line potential for maintenance being a profit center, rather than a reactionary cost center.

In this study, 32% of the respondents view maintenance as a profit center that delivers actionable insights, measurable results, and return on investment (ROI). These leaders in industry have a strong grasp of the value proposition for best-practice maintenance and reliability approaches. Another 22% consider maintenance a cost center that will become profitable through the use of predictive technologies. This awareness of the potential is key to driving maintenance practice improvements.

ATTITUDE TOWARD MAINTENANCE

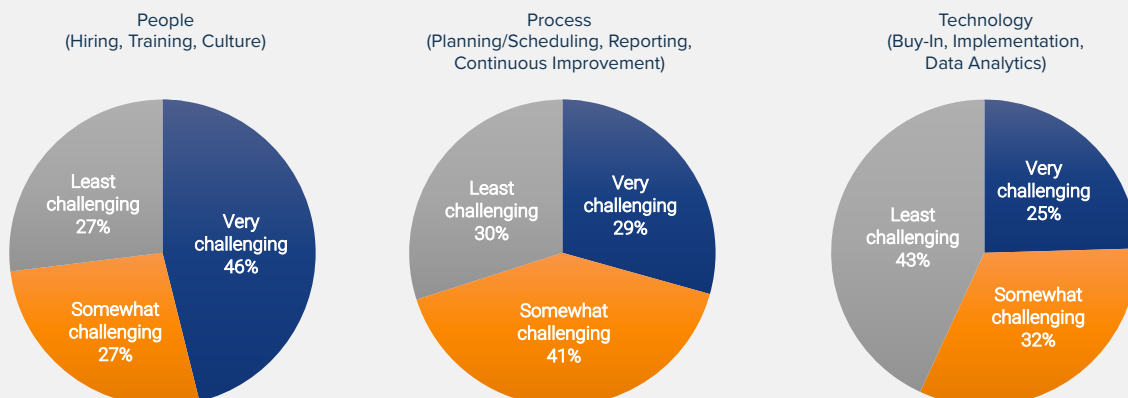


MAINTENANCE PROGRAM CHALLENGES

Effective maintenance programs require an optimal blend of people, processes, and technology. Unfortunately, each of these components has its own inherent complexities, and getting all three right is a true feat. The study found the people component to be the most troublesome, including hiring, training, and cultural fit. In fact, 46% consider it very challenging and another 27% find it somewhat challenging.

Processes such as planning, scheduling, reporting, and continuous improvement are considered very challenging by 29% of respondents and somewhat challenging by 41%. The greatest perceived strength is in the technology component; 43% consider it the least challenging aspect. Only 25% find technology buy-in, implementation, and analytics to be very challenging.

CHALLENGING ASPECTS OF PLANT MAINTENANCE PROGRAMS



CURRENT MAINTENANCE STRATEGIES AND TOOLS

Manufacturing plants often utilize more than one maintenance strategy, with heightened attention on the most critical assets and a more relaxed approach for the least critical. Half of the plants studied have implemented three or more maintenance strategies and tools to protect operations, personnel, and production.

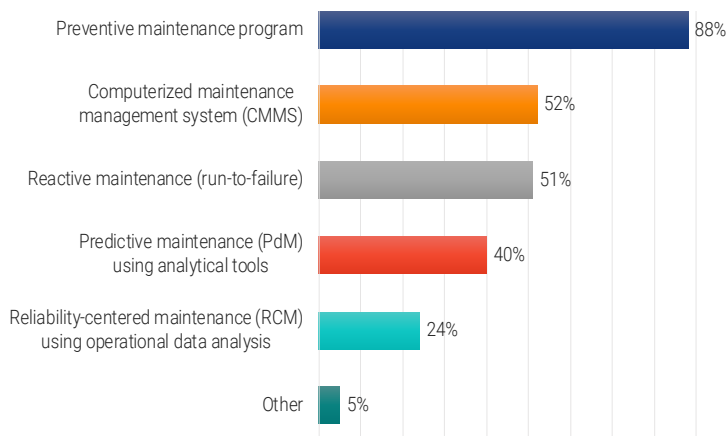
A significant majority of the plants, 88%, have a preventive maintenance (PM) program in place. PM includes routine tasks such as cleanings, oil changes, inspections, and replacing parts, scheduled on a time or usage interval. This classic maintenance approach helps to prevent unplanned downtime and equipment failures, although it introduces the potential for over-maintenance or under-maintenance of equipment.

A more timely, proactive approach is predictive maintenance (PdM), which uses analytical tools to predict the need for maintenance based on asset condition and performance data, so that corrective actions can be planned and scheduled in time to avoid failure. This strategy is used by 40% of respondents.

For the least critical equipment, running to failure (RTF) and then reactively maintaining or replacing it, is an option. Fifty-one percent of respondents apply this method to selected equipment.

Reliability centered maintenance (RCM) using operational data analysis is employed by 24%. This is a useful method of determining which maintenance strategy to apply based on an examination of the asset's function and its typical modes, causes, and consequences of failure.

PRESENT MAINTENANCE STRATEGIES AND TOOLS



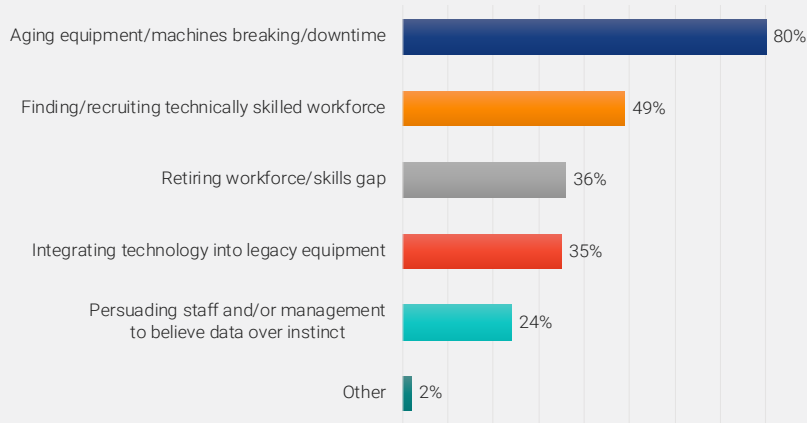
FACTORS AFFECTING PRODUCTIVITY

Productivity hits come from many directions. The largest factor is the combination of aging equipment, machines breaking down, and/or downtime, according to 80% of the respondents.

Talent availability is a considerable and persistent concern. Finding/recruiting a technically skilled workforce is an issue for almost half of the respondents. The retiring workforce and consequential in-house skills gaps are creating productivity challenges for 36%.

Integrating technology into legacy equipment is another time drain, with 35% considering it a factor. Getting management and/or staff to believe the data, as opposed to their own instinct, is detrimental to productivity, says 24% of the respondents.

WHAT AFFECTS PLANT PRODUCTIVITY



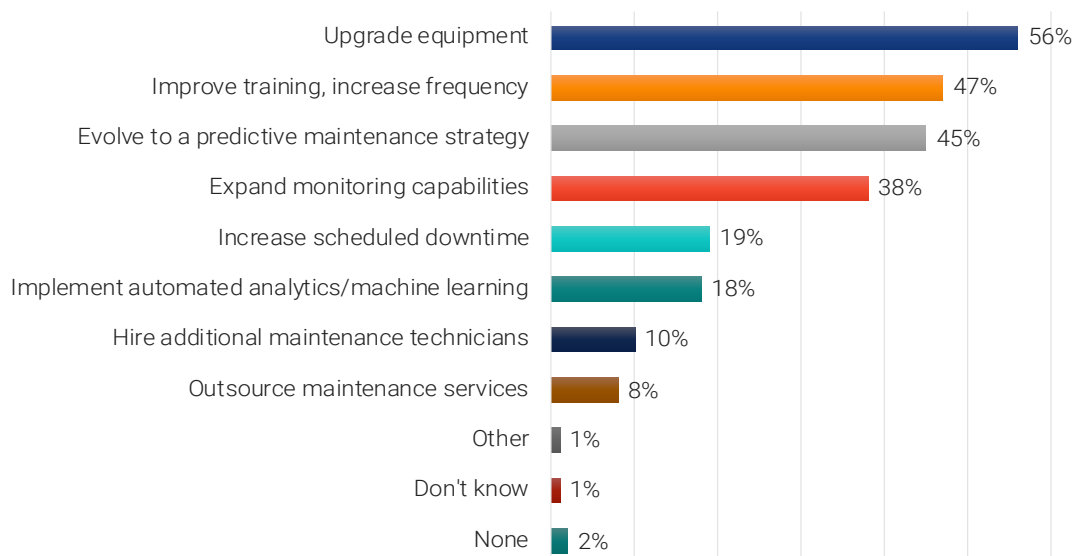
PLANS TO DECREASE DOWNTIME

Downtime in manufacturing due to equipment breakdowns or failure is extremely costly. In addition to the obvious maintenance or replacement costs, there are the costs of lost productivity and production, scrapped materials or products, reduced customer trust, and potential regulatory fines, healthcare costs, and legal ramifications should there be health, safety, or environmental consequences. The problem is exacerbated when the right parts or components are not readily on hand and sourcing lead times are long.

Plants strive to limit downtime by scheduling maintenance, upgrades, and replacements to occur within predetermined, planned outages. This is where advanced maintenance strategies, tools, and technical expertise really make a difference.

The study's respondents reveal a variety of plans being made to reduce unscheduled downtime at their plants. Fifty-six percent say the plants plan to upgrade their equipment; 47% plan to improve and/or increase the frequency of training; 45% intend to evolve to a PdM strategy; and 38% expect to increase their asset monitoring capabilities.

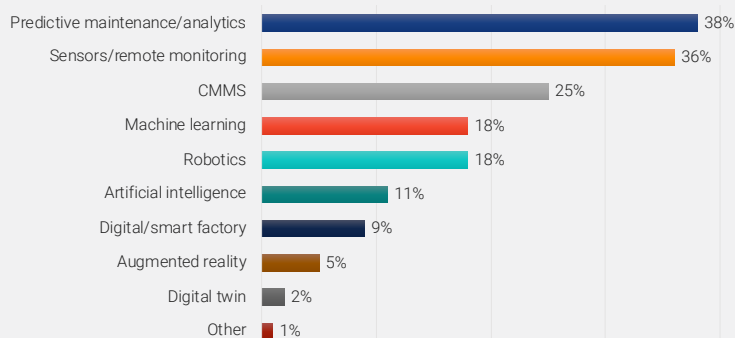
PLANS TO DECREASE UNSCHEDULED DOWNTIME



PLANS FOR TECHNOLOGY IMPLEMENTATION

Coinciding with plans to decrease downtime are new technology initiatives. New or expanded technology implementations are planned for 72% of respondents. For example, 38% expect to implement PdM/analytics technologies; 36% are targeting sensors/remote monitoring technologies; and 25% set their sights on computerized maintenance management systems (CMMS).

NEW OR INCREASED TECHNOLOGY IMPLEMENTATION PLANS

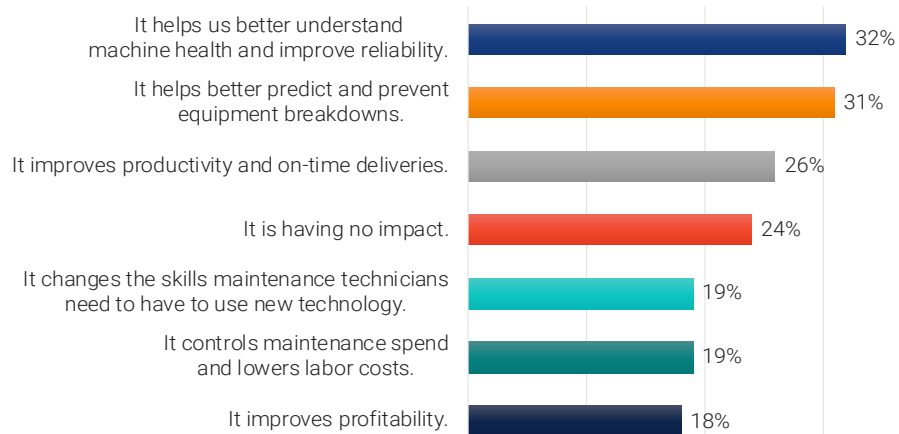


IMPACT OF IIOT ON MAINTENANCE

IIoT technologies are increasingly recognized as providing opportunities to increase machine reliability and uptime. Thirty-two percent of the respondents believe IIoT-related technology helps to understand machine health and improve reliability. Thirty-one percent say it helps in predicting and preventing equipment breakdowns.

For 26%, IIoT technologies are credited for helping plant maintenance operations with improving productivity and on-time deliveries; 19% say it controls maintenance spend and lowers maintenance costs; and 18% observe it boosts profitability. Noted by 19% is the change in skills that maintenance technicians need to use new technology; this can be an issue when the appropriate in-house knowledge or training is not readily available.

IMPACT OF IIOT-RELATED TECHNOLOGY ON MAINTENANCE OPERATIONS

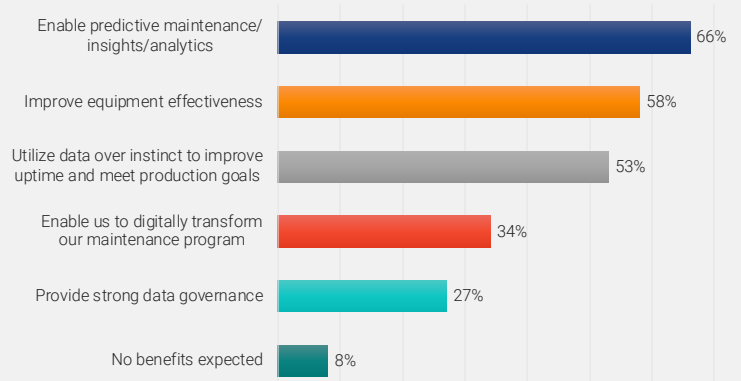


ANTICIPATED BENEFITS OF SENSORS

The respondents were asked to anticipate what benefits would arise from adding machine health monitoring sensors to production equipment. The range and implied value of foreseen advantages is notable.

Sixty-six percent expect that it will enable PdM, insights, and analytics. For 58%, improving equipment effectiveness is anticipated, and 53% believe using data instead of instinct will help to improve uptime and meet production goals. Additionally, 34% foresee enabling digital transformation of the maintenance program and 27% see strong data governance as a benefit of machine-monitoring sensors.

BENEFITS EXPECTED FROM ADDED SENSORS

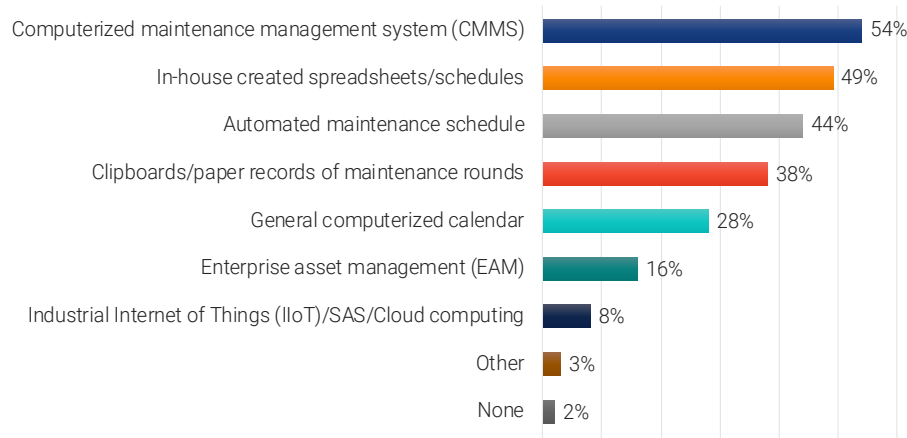


MONITORING & MANAGING MAINTENANCE

Multiple diverse solutions are used to monitor and manage maintenance, the study found. Computerized solutions include CMMS, automated maintenance schedules, computerized calendars, enterprise asset management (EAM) systems, and IIoT-enabled solutions. Manual approaches including internally developed spreadsheets and the use of paper and clipboards for maintenance rounds.

Of all the technologies mentioned for monitoring and managing maintenance, the most used is CMMS at 54%. CMMS and EAM solutions provide a means to centralize and standardize maintenance activity and keep historical records. Asset and work management, planning and scheduling, inventory management, cost tracking, audit and compliance record keeping, and analytics and reporting are among their many crucial capabilities.

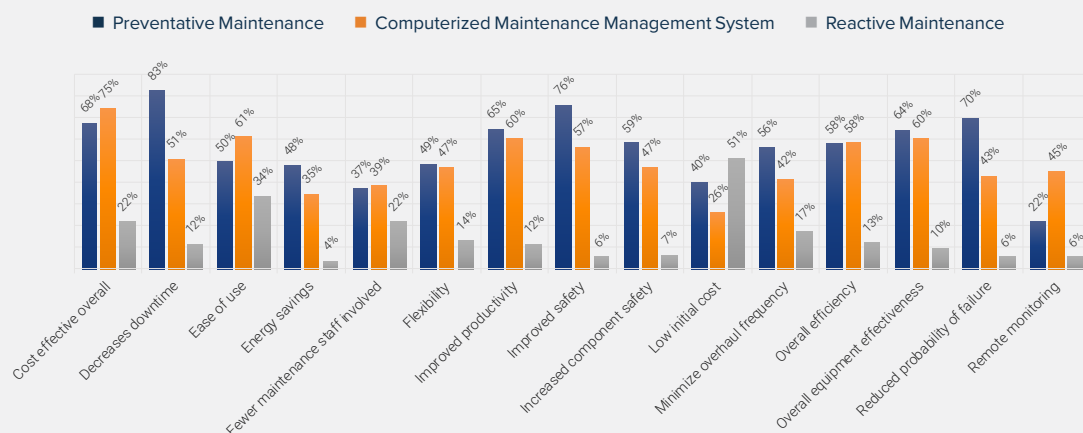
MONITORING & MANAGING MAINTENANCE TECHNOLOGIES



CMMS ADVANTAGES

Switching from disparate silos of information to a complete, integrated, enterprise-wide CMMS/EAM solution improves the visibility and effectiveness of maintenance programs. Examples of CMMS benefits being realized by the respondents who use it include overall cost effectiveness (75%), ease of use (61%), improved productivity (60%), overall efficiency (58%), improved safety (57%), remote monitoring (45%), and more.

ADVANTAGES TO MAINTENANCE STRATEGIES

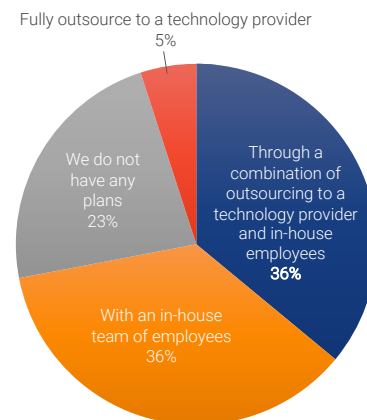


COLLECTING, ANALYZING, & ACTING ON MACHINE DATA

Capturing machine health data using IIoT-based sensors is far more efficient than collecting it manually during inspections or maintenance rounds. Plans to collect, analyze, and act on machine data in the next 1-3 years vary.

A full 36% expect the machine data roles will be performed using a combination of outsourcing to a technology provider and a team of in-house employees. Full outsourcing to a technology provider is expected for 5%, and 36% anticipate using only in-house teams. Less than a quarter of the respondents observe that there are no current plans to advance their machine data capabilities.

COLLECTING, ANALYZING AND ACTING PLANS ON MACHINE DATA IN THE NEXT 1 TO 3 YEARS



OUTSOURCING MAINTENANCE OPERATIONS

The desire to outsource maintenance roles such as machine data support is accelerating in the manufacturing industry. The difficulty of finding, training, and retaining qualified talent internally is contributing to the trend.

The study found that 88% of plants outsource some or all of their maintenance operations for any number of reasons. Insufficient internal capabilities are most often noted. For example, 40% report a lack of skills among current staff; 39%

note a lack of time and manpower to dedicate to maintenance; 32% say too many specialized skills are required; 31% observe that skilled individuals are hard to find; and 24% indicate their budget is insufficient to hire or retain skilled individuals.

Furthermore, 29% wish to lower overall costs through outsourcing, reflecting the cost-effective nature of using expert outsourcing service providers and focusing attention instead on core competencies.

FACTORS FOR OUTSOURCING MAINTENANCE OPERATIONS



WE MAKE FACTORIES RUN BETTER

“It is encouraging to see how manufacturers are planning to improve their maintenance processes and ownership. Whether upgrading equipment, increasing training, and/or implementing advance technologies and proactive maintenance strategies, these steps are sure to increase reliability, productivity, and bottom-line profitability. As it is common for manufacturers to not consider maintenance, let alone advanced maintenance, a core competency, it makes sense that 88% of facilities surveyed outsource some or all of their maintenance operation.

At ATS, our central mission is to provide technology-driven industrial maintenance and MRO asset management solutions to help manufacturers leverage best-in-class tools for improving maintenance, through a skilled technical workforce, safety excellence, best-in-class processes, reliability engineering and advanced technologies, including - machine health monitoring sensors, intelligent data analytics, and modern CMMS solutions. Doing so allows them to avoid the challenges and costs associated with finding and staffing highly skilled reliability experts in-house and instead focus on growing their business.”

Jeff Owens, CEO

Advanced Technology Services, Inc.

For information about how your plant operations can be improved now and long-term, go to www.advancedtech.com or call 855-834-7604.



