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There are different types of maintenance work, each designed for specific scenarios. Knowing the differences between maintenance types helps people determine which ones are the most suitable for their purposes.Routine MaintenanceRoutine maintenance, also referred to as preventive maintenance, is implemented on a fixed schedule and typically includes activities such as inspecting, cleaning, washing, replacing, and checking. It is typically performed in the downtime between shifts or on weekends to avoid affecting productivity goals.Planned MaintenanceWhere routine maintenance may happen on a daily, weekly, or monthly basis, planned maintenance may be scheduled once per year or as needed. This is because planned maintenance is more time-consuming, expensive, and thoroughoften requiring the services of a specialist.Corrective MaintenanceIf during your routine maintenance inspection of a car, you discover signs of severe wear and tear, you need to perform corrective maintenance. When computer or gauge readings for a machine show unusual, possibly hazardous anomalies, you need to perform corrective maintenance. Corrective maintenance pertains to the repairs and replacements necessary to get an asset back up and running at full power and in optimal condition.Predictive MaintenancePredictive maintenance focuses on techniques used to determine the appropriate schedule for planned and corrective maintenance. Its primary goal is to predict, through a variety of testing methods such as vibration analysis, when a machine will start experiencing severe wear and tear so corrective maintenance can be scheduled without affecting productivity goals.Benefits of MaintenanceIn general, businesses benefit from good maintenance practices. However, several factors need to be considered before you can determine if maintenance is helping your organization.Increase longevity of assets Having the patience and dedication to regularly inspect, clean, and care for an expensive asset helps operations maximize productivity and cut costs by preventing expensive repairs and replacements.Optimize asset performance A well-maintained asset operates at maximum capacity, positively affecting business ROI through efficiency and consistency.Avoid unscheduled downtimes Unexpected breakdowns can cause significant problems for any business. Diligent maintenance can help businesses avoid unexpected outages, ensuring operations run smoothly and without any hiccups.Minimize costs Most industrial machines used for business operations cost a small fortune, so it only makes sense to diligently maintain these assets to get the most out of them. Failure to implement good maintenance practices will lead to machine breakdowns, costing the business more money through avoidable repairs and replacements.Maintenance vs. RepairMaintenance and repair work have the same goal, which is to keep your business running efficiently as designed. Simply put, the goal of maintenance is to make repairs unnecessary.From the time a business acquires an asset, they should already have a maintenance plan ready for implementation. Routine maintenance techniques like cleaning and regular inspections are often done on a weekly, monthly, and sometimes even daily basis. Cleaning, monitoring, and inspecting can be done quickly and often at no cost while still contributing to an assets overall health and longevity.However, even with the best maintenance plan and personnel, the possibility of an unexpected machine breakdown can never be eliminated. When this happens, businesses need to rely on swift repairs to get their assets back up and running ASAP, before losses become insurmountable.Cultivate a culture of excellence with our digital solutions that enhance efficiency, agility, and continuous improvement across all operations.Maintenance Practices Across IndustriesGood maintenance programs benefit virtually all businesses across different industries; the only difference is how they apply maintenance techniques to achieve their business goals. Below is a list of how different industries apply maintenance practices to maximize their operations.AerospaceGood maintenance practices are crucial in the aerospace industry since malfunctions can result in high-fatality disasters. Aircraft maintenance is also legally mandated in Title 14 of the Code of Federal Regulations (14 CFR). The Federal Aviation Administration (FAA) mandates the following maintenance inspection activities: 100-hour inspection, annual inspection, and progressive inspection.Freight and LogisticsSometimes referred to as the transport industry, the freight and logistics industry is essential to the successful operation of many other industries since freight services are called upon to transport materials and tools needed for service and production. Some common maintenance practices in the freight and logistics industry are fleet maintenance and scheduled ship maintenance.Computers and ITWith our increasing reliance on computers for both work and our personal lives, it is naturally in everyones best interest to maintain them and ensure that they are operating at optimal levels. Common computer maintenance processes include server maintenance and IT risk assessments.AgricultureAgricultural activities rely heavily on equipment and industrial-grade chemicals to complete. Proper farm maintenance plays a crucial role in ensuring that workers are safe from work-related injuries and operations proceed without a hitch. Maintenance activities include equipment maintenance and facility maintenance.Real EstateCommercial, residential, and industrial buildings require regular maintenance to retain their structural integrity and functionality, avoiding deterioration and eventual collapse. Below are some common maintenance techniques practiced in the real estate industry. Food and BeverageThe maintenance of food processing machines, utensils, and facilities is the foundation upon which successful food companies and restaurants are built. Maintenance examples in this industry include kitchen maintenance and chiller maintenance.HospitalityTo achieve and maintain customer satisfaction and keep customers coming back, hotels and lodges need to keep their establishments in pristine condition through diligent and consistent maintenance practices. This can be done through regular hotel maintenance, as well as HVAC maintenance, among other things.ManufacturingCompanies in the manufacturing industry utilize heavy-duty machinery for mass production. To prevent machine breakdowns that disrupt operations, good machine maintenance protocols must be implementedmachine maintenance and factory maintenance are already a great start.RetailThere are multiple factors to be considered when coming up with a winning formula for a successful retail company. Selling high-quality products and having great customer service are some of the more obvious elements. Consistent implementation of good store maintenance practices, however, is just as important in making sure your business operates at full capacity.Maintenance Training: Your Key to Building a Culture of SafetyBreak free from the limits of traditional face-to-face training. Thanks to the advancement of mobile training apps, its now easier to create your maintenance training and make it available for your team anytime, anywhere, and on any device. Here, weve made a list of some maintenance training that is perfect for busy teams who need to stay on top of their safety game.Maintenance and reliability are essential to running a business in todays economy. With increasing global competition and tightened markets, its critical to deliver a high-quality product consistently. Its also essential to offer your customers the best possible serviceall while keeping costs down. If it sounds like a lot. Thats because it is.Managing a business in the manufacturing industry through an economic lens can sometimes feel like you're trying to squeeze blood from a turnip. But what if I said that you could increase output by up to 30% with advancements in maintenance strategies?Adopting a new-age maintenance strategy will give you more control over your production schedule. You'll be able to predict when repairs will be needed, making it easier to schedule around them. This is especially important if you have a tight deadline or need to meet specific standards (like ISO).A well-maintained machine produces better quality products with higher precision for a more extended time. This results in brand consistency, which means more satisfied customers.10 Reasons Why Maintenance And Reliability are Critical For SuccessMaintenance and reliability are two of the most critical factors in the manufacturing industry that can drive a business into success or failure. If you're not sure why this is the case, keep reading!The manufacturing process is complex and requires many different components to work together to produce something worthwhile. The more complex a machine is, the more likely it is that something will go wrong during the operation. This means that companies in this industry need to be prepared for any kind of situationand preparedness starts with maintenance and reliability.If your company wants to stay competitive, you must ensure your machines are always properly maintained. You also must ensure that every employee understands maintenance's importance for their job performance and safety. Everyone must be involved in this processfrom designers to assembly line workers.Lets dive into the top ten reasons why maintenance and reliability matter for your organization.1) Improve safety and reduce the risk of accidentsA well-maintained facility will help improve equipment reliability, reducing the risk of accidents and improving productivity.Therefore, proactive maintenance is an essential part of an ongoing program. It helps ensure that all equipment is working correctly and that safety systems are functioning as they should. For example, if a machine stops working unexpectedly or breaks down, the problem must be diagnosed immediately so the issue can be addressed before anyone gets hurt.In addition to helping prevent accidents, keeping your equipment and facilities in good shape can ensure that your business complies with safety regulations. Employers must apply industry-specific OSHA standards; otherwise, they jeopardize losing their business.2) Extend the lifespan of equipment and facilitiesWhen it comes to maintenance and reliability, businesses are in a tough spot. They need to ensure that their equipment and facilities are working at peak capacity, but they also need to minimize the time and money spent on repairs.Routine maintenance is the best way for a business to extend the lifespan of its equipment and facilities while reducing replacement costs and preventing premature wear and tear.Replacing equipment can be costly. It's not just the moneyyou also have to factor in the time and expense of finding new suppliers and getting set up with a new system.Plus, when you have older equipment or facilities that are falling apart, it can take longer for your workers to get their jobs done, which means lost productivity and higher costs for you.The good news is that there is a way to detect the reliability of machinery about its age and use. Identifying asset indicators before they degrade will give you time to budget repairs and replacements accordingly. This will also lead to more sound financial decisions when purchasing equipment in the future.3) Improve customer satisfaction and loyaltyCustomer satisfaction is critical to the success of your business. Customers expect consistent products, clean facilities, and reliable service. When you dont deliver on those expectations, your loyal relationships suffer.Bain & Company found that even a 5% increase in customer retention rates will increase profits by more than 25%. When buyers like your product, they will buy more. And tell their friends. This critique can go as far as the aesthetic of your facility because customers expect a reliable experience as much as a high-quality product. Investing in the maintenance and reliability of your business is the best way to stay competitive and grow.4) Prevent unexpected downtime and disruptions to business operationsWhile many companies believe that maintenance is just a cost of doing business, it doesn't have to be.Maintenance is a necessary expense, but the right approach can save you money in the long run.A proactive maintenance strategy will identify and address potential issues before they cause downtime. By scheduling routine maintenance on your equipment, you can be sure that it will continue to run reliably for years.5) Improved reliability can lead to increased productivity and efficiencyIt can be hard to get the job done if your equipment and facilities aren't reliable. Keeping productivity high is also challenging if you spend time fixing broken things or worrying about what might break next.That's why it's crucial to invest in a proper maintenance strategy.When you maintain your equipment and facilities, you'll reduce the likelihood that they will fail. When they fail, you'll find out quickly so you can take action before it affects anything elseand you'll have a much easier time getting them back up and running again.Not only that, but if your employees have confidence that their equipment will perform as expected when they use it, they'll be able to focus on completing their jobs. This will lead to increased productivity and higher-quality output.6) Identify and address potential problems that become costly issuesRoutine maintenance can help you identify potential issues before they become expensive problems, which means you can address them quickly and reduce costly equipment failure and downtime.When you identify problems early, you'll have more time to repair or replace parts before they become significant issues. This saves time, money, and resources that can be used for innovation and growth.7) Enhance the reputation and credibility of a businessIn manufacturing, reliability is more than just having a product that works as expectedit's also about being able to deliver your product on time and in good condition. If your facility is unreliable, shipping times will be delayed, and product quality will suffer.Clients and customers will only stay loyal to a brand that delivers consistency.So how do you create a reliable facility? You invest in maintenance. A well-maintained facility can enhance the reputation and credibility of a business by showing that it cares about its customers and clients enough to support this process.8) Improve energy and reduce utility costsMaintenance and reliability are essential in manufacturing because they help you improve energy efficiency, which will reduce utility costs.It's no secret that manufacturing facilities are giant energy hogs. The Department of Energy released metrics explaining that around 76% of all electricity use is within the business sector.The good news is that you can reduce your businesss energy usage by anywhere between 20%-35% with cost-effective technologies. Up-to-date equipment is designed to run more economically by reducing energy consumption.When your machines run efficiently, they're more likely to last longer and produce higher-quality output. And if you develop a comprehensive maintenance program for your factory, it may increase the overall efficiency of your facility without adding more equipment!9) Provide a better working environment for employeesEmployees are privy to safety standards, which makes reliable equipment a basic workplace expectation, primarily if they work in a high-risk environment where, in this case, if a piece of heavy machinery breaks down, it can cause injuries or even worse, fatalities.When workers feel unsafe, their performance will suffer. Production will decrease if they need more motivation from feeling uncared for or simply not having reliable equipment for each task.Workforce productivity and safety go hand in hand. When management prioritizes worker safety, employee trust and loyalty in the company will rise. This confidence in safety will yield a more cohesive work culture that breeds motivation and success.10) Demonstrate a commitment to sustainabilityAs mentioned above, the manufacturing industry is one of the largest consumers of energy in the US. And its time these businesses held themselves responsible.Not only are more consumers aligning their purchases with social advocacy in the form of business representation, but our administrations carbon reduction initiative offers various financial incentives. Your stance on protecting our ecosystem will affect your brand and your pocket.Preventive maintenance is a great way to promote environmental sustainability. One of the best ways to do this is to monitor energy use and opt for technology that will reduce energy dependency.For example, if you're looking to replace your old light bulbs with LEDs, it makes sense to do so in a way that reduces your carbon footprint and decreases waste by minimizing the number of bulbs you'll have to dispose of. One unavoidable aspect of running a business is dealing with regular maintenance of your assets, equipment and property. Unfortunately, your frequently used equipment will occasionally malfunction, fail or slow down over time due to natural wear and tear, but you can take steps to lengthen the lifespan of your business most essential assets, as youll soon find out.We highlight the seven different types of maintenance that youre most likely to face as a business owner or manager, namely proactive maintenance strategies and responsive maintenance strategies. Within these groupings, well cover seven specific types of maintenance, including preventive, planned, condition-based, predictive, reactive, emergency and corrective maintenance. Well talk more about what these different types of maintenance entail, what they cost and how theyll contribute to your business success in the long run.Proactive Maintenance StrategiesPreventive MaintenanceWhat Is It?Preventive maintenance is defined as taking precautionary steps or actions to prevent equipment failures before they actually occur. Preventive maintenance is typically time-based or usage-based and involves routine inspections, upgrades, proper lubrication (where applicable), adjustments and replacement of outdated equipment or parts.This type of maintenance program can be implemented in many areas of your business, and it includes any preventive action, such as changing water filters, regularly cleaning essential equipment (such as refrigerator condenser coils), inspecting business vehicles (i.e., delivery vans) and checking grout and caulking to protect a property against water damage.The preventive maintenance tasks you perform, of course, will be specific to your business and should always involve close inspection of your most critical assets or the most valuable equipment for daily operations.BenefitsA few benefits of a preventive maintenance approach include:Minimized downtime and business closures due to unexpected equipment failures: This will help you avoid financial loss and protect your bottom line.Increased life expectancy of essential equipment and assets: Inspecting, updating and caring for your business assets will result in less money spent on new equipment in the long run.Decreased energy consumption for your business assets: When equipment runs optimally, less energy is required, which means lower utility bills for your business.Cost of Implementation ($$)Some preventive maintenance processes require planning, which can either take time away from the day-to-day of your business or result in money spent on inspections and upgrades. For regular preventive maintenance actions, youll have an increase in labor costs in order to have onsite maintenance technicians who can perform such actions, rather than contracting a technician every now and then. This, of course, may depend on your business unique size, needs and budget.Example of Preventive MaintenanceAn unexpected refrigerator breakdown can leave a restaurant reeling, resulting in considerable food loss, closing for the rest of the day (or the time it takes to schedule and make repairs) and high repair costs. Performing regular inspections and cleaning of the condenser coils will help prevent such a costly incident from occurring and will mean less risk to your business in the long run.Planned MaintenanceWhat Is It?Planned maintenance covers any maintenance that is planned, scheduled and documented. It is specifically defined as preventive maintenance that is carried out according to a set preventive maintenance program.Basically, planned maintenance is implemented to reduce business downtime, which often stems from unforeseen equipment failures and can greatly impact a business bottom line. Should such a failure occur, any plan or strategy that would get the equipment in question up and running again would be a type of planned maintenance.Preventive maintenance is one type of planned maintenance and will account for and prevent machine breakdowns before they occur. There is also planned, unscheduled maintenance, which is the process of correcting or fixing a system that has already broken and anticipating such business hindrances ahead of time. For example, if you manage a fleet of cars, having spare parts on hand would make replacing, say, a broken battery quick and easy for a maintenance technician.BenefitsPlanned maintenance is relatively simple to implement, and its generally pretty cost-effective. Benefits include:Preparedness in the event of equipment failure or preventing such failure altogether: If possible, its always a good idea to be prepared with backup supplies or an action plan in the event of a breakdown. Preparing accordingly for these rare occurrences could save production time and money.Planned maintenance is often as simple as a regular, planned inspection or seasonal maintenance: Much like preventive maintenance, planned maintenance isnt particularly hard to pull off. Following manufacturer recommendations for equipment inspections or calling a technician to update essential systems as needed is often worth the short-term splurge.Significant cost savings in the long run: The cost of regular, routine maintenance activities and equipment upkeep often costs less in the long run than dealing with a major problem after it has occurred.Cost of Implementation ($$)The cost of carrying out a planned maintenance schedule isnt very high. Of course, this depends on the machine or equipment that needs inspection or servicing. Emptying grease traps in restaurants, for instance, is much less costly than some HVAC inspections are.Example of Planned MaintenanceIts generally recommended that a restaurant checks and empties its grease traps every one to three months, depending on the size and volume of business. Doing so prevents sewer lines from becoming clogged with waste.Condition-Based MaintenanceWhat Is It?Condition-based maintenance (CBM) is essentially an optimized version of preventive maintenance in that it involves performing maintenance based on equipment data instead of time- or usage-based metrics. By monitoring asset performance data, technicians can take quick action on a machine that is in the early stages of equipment failure or even identify maintenance needs before equipment fails.The following chart will help you better understand the process of condition-based maintenance in response to a machines decline:BenefitsWhile condition-based maintenance needs a lot of data to be gathered, there are definite benefits to this technology, including:Reduced number of total machine breakdowns: When its all said and done, condition-based maintenance may help you avoid a total machine failure, which can result in having to spend top dollar on a last-minute replacement.Equipment availability: If an essential piece of equipment were to suddenly go bust, this might result in losing a full day or more of production and sales while waiting to get it fixed or until you can purchase a replacement. Successful condition-based maintenance means that you will have managed to prevent your equipment from totally failing, enabling it to function until you can troubleshoot more thoroughly.Advance warning of breakdown: This probably goes without saying, but a warning that a machine or system needs attention is preferable to losing its functionality all at once. If such notifications are standard for your machine, you may even have enough time to call a mechanic, rather than attempting breakdown maintenance on your own.Cost of Implementation ($$$-$$$$)Condition-based maintenance can be a costly initial investment. If a machine doesnt already come equipped with the required technology, it can cost thousands to set it up, depending on the piece of equipment in question. Obviously, for machines that are less expensive than the installation process, its probably not a good idea to make the investment for that particular piece of machinery. However, if you do decide to install CBM technology, note that some companies have reported up to a 30 percent reduction in maintenance costs over time by taking this maintenance management step.Example of Condition-Based MaintenanceA sensor that measures vibrations of a rotating equipment can warn you when the moving piece starts to fall out of alignment and increase in vibration. This will cause the sensor to alert you when the vibration is out of the interval you set.Predictive MaintenanceWhat Is It?Predictive maintenance tracks the normal operation of a machine to detect possible defects before they pose a problem. Like condition-based maintenance, this maintenance approach uses condition-monitoring technology to measure the performance of equipment, typically by way of IoT (the Internet of Things).Considered an extension of CBM, predictive maintenance takes it a step further by using data for machine learning algorithms that help estimate an assets future condition. IoT sensors trigger maintenance work orders when a predictive model suggests that a failure may take place. This means that predictive maintenance will alert you to possible machine deficiencies without any prompting on your end.General examples of predictive maintenance include equipment observation, oil analysis and sensors for energy usage.BenefitsOne of the biggest reasons predictive maintenance is so valuable is because it allows for maintenance to be performed only when absolutely necessary that is, just before equipment failure is likely to occur. This means:Less money spent on preventive maintenance for a machine that doesnt need it: Predictive maintenance will enable you to save money until the very last minute, when maintenance or repairs are actually required but before any real system damage occurs (resulting in business shutdowns and mechanism breakdowns).Fewer production hours lost as a result of equipment failure:The accurate technology of predictive maintenance means that youll avoid total machine failure, which can be a hard hit to standard operations if the machine in question is integral to your business.A tenfold increase in ROI, and significant maintenance and downtime reductions: A report from the Department of Energy states that predictive maintenance contributes to a phenomenal tenfold increase in return on investment as well as a 70 to 75 percent decrease in equipment crashes and a 35 to 45 percent reduction in downtime. The stats dont lie!Cost of Implementation ($$$$)Unfortunately, one of the biggest and possibly only drawbacks of predictive maintenance is high upfront costs. Predictive maintenance requires a level of technology that standard preventive maintenance does not, which means you may need employees who can accurately interpret the condition-monitoring data. Or it might mean that youll need to consider hiring someone on a part-time basis, solely to read and relay this data. Thus, to determine whether predictive maintenance is right for your maintenance team, youll need to keep budgetary considerations in mind.Example of Predictive MaintenanceA food production plant may rely on predictive maintenance for its valuable industrial ovens, which may be running 24/7 to stay competitive. A sensor would be installed to the oven that would evaluate and produce data regarding temperature and vibration that would alert staff to make adjustments or tweaks to poor performing machines in real-time, reducing the need to shut down production completely.Responsive Maintenance StrategiesNow that weve covered some proactive maintenance strategies, were going to explore responsive maintenance, otherwise known as fire-fighting (responding to a system or machine breakdown once it has occurred).Reactive MaintenanceWhat Is It?Reactive maintenance is any response or reaction to fixing a failed machine that needs repairs. It focuses on restoring broken equipment to normal operating conditions, if at all possible. This process typically requires a mechanics services or manufacturer help to repair the broken machinery, which may be quite costly depending on the urgency and extent of the request.BenefitsReactive maintenance is far from ideal, but there are still a few benefits:Lower upfront costs (no investment): If youre not investing in any type of preventive maintenance and waiting for your equipment to fail before taking action, youll still be saving some money you would have spent on initial preventive maintenance costs.Less staff needed: If youre not using a preventive maintenance plan for your equipment, it generally requires less staff to oversee asset management than it would to consistently analyze and respond to machine warnings and malfunctions.No planning time required: When equipment fails, it fails, and mechanics and technicians usually respond fairly quickly all you have to do is wait for them to show up and fix it, no time required on your end.Cost of Implementation ($$-$$$$)Theres no one-size-fits-all for reactive maintenance. It all boils down to how much your specific machine will cost to fix. Some machines may cost a significant amount of money to restore (and in that case, you may want to simply consider new equipment), while others may only cost a few-hundred dollars. This is one reason why many businesses use some type of preventive maintenance strategy the worse the equipment damage, the greater the repair costs.Example of Reactive MaintenanceIf a restaurant refrigerator abruptly stops working, this can lead to food spoilage and may even cause the restaurant to shutdown for health reasons. A malfunctioning refrigerator could be detrimental to the restaurant as a whole, depending on how long the refrigerator is out of service.Emergency MaintenanceWhat Is It?Emergency maintenance is similar to reactive maintenance both processes require a last-minute response to the abrupt breakdown of equipment. However, emergency maintenance entails some kind of threat to health and safety (i.e., a sudden chemical spillage in a manufacturing plant may require total evacuation of the premises as well as alerting the appropriate authorities).BenefitsIn general, having to perform emergency maintenance is not a situation you want to find yourself in. The mess is typically not worth the money you may have saved on planning and prevention. That said, two advantages include:No initial cost involved:You cant always anticipate when or how a major threat to your business and staff may occur. Thus, aside from complying with standard health and safety requirements and taking normal precautions, investments dont negate the possibility of freak accidents from occurring.No planning required: Again, this probably isnt much of a benefit when you actually find yourself in a situation that poses a significant health risk to your business, staff and customers, but the upside is that planning time is minimal for these types of occurrences.Cost of Implementation ($$$$)Implementing emergency maintenance can be very expensive, interrupting not only the daily flow of your business and uptime of your equipment but also costing a significant amount of money to execute. Its not uncommon for emergency maintenance expenses to cost double the amount of a preventive maintenance strategy since the response is so urgent and the nature of the maintenance is often extensive.Example of Emergency MaintenanceA sewer back-up that floods a tenants apartment could easily cost the facility thousands of dollars in repairs and property damage and will most likely result in an evacuation from that apartment (and surrounding apartments).Corrective MaintenanceWhat Is It?Corrective maintenance is best described as any action that targets and fixes a system malfunction so that the equipment can be restored to proper working order. Unlike reactive maintenance, it is not a strategy; rather, it is an action that targets a specific piece of equipment. Additionally, the defect may be caught or noticed before it causes a significant problem or total equipment breakdown.BenefitsBenefits of corrective maintenance include:Reduced duration of planned and unplanned downtime:Corrective action is typically taken quickly, meaning that equipment downtime is (hopefully) brief.Reduced cost and time of running a reactive maintenance strategy: Having a reactive maintenance strategy requires planning, which often comes with associated costs and time spent on strategizing rather than production. Corrective action, alternatively, is a quick corrective response to an isolated piece of equipment.Reduced cost of maintenance operations and reduced emergency maintenance orders:Items that require corrective action can escalate to emergency maintenance, if left unchecked. Performing corrective maintenance usually reduces the chances of emergency situations from occurring.Cost of Implementation ($$-$$$$)Depending on the extent of repairs needed, corrective maintenance can be anywhere from moderately expensive to very expensive. If the repairs are easily fixable and isolated, your total cost might not be much more than the initial investments of implementing a proactive maintenance strategy.Example of Corrective MaintenanceIf frost or ice builds up in a walk-in freezer, this can escalate into a costly consequence for a restaurant. Ice accumulation can interfere with optimal refrigeration, causing compressors to use more energy and run less efficiently. If ice has already built up in a commercial freezer, it should be thawed either by turning the system off temporarily or by using a tool such as a hair dryer to expedite the process. This is one example of a totally cost-effective corrective maintenance action.Maintenance ApplicationsEach type of maintenance strategy has its benefits and drawbacks, and there is no one-size-fits-all when it comes to your business, but here are a few maintenance applications that are excellent candidates for a computerized maintenance management system (CMMS) software like Coast.Facility MaintenanceWhat Is It?Facility maintenance ensures that all areas, assets, and structures within or around a facility are operating as optimally as possible for maximum efficiency and safety. Preventive maintenance is commonly used to maintain a facilitys assets such as HVAC machines, and reactive maintenance is mainly used to keep the areas of a facility in good operating conditions such as painting of the walls.Property MaintenanceWhat Is It?Property maintenance is best defined as any preventive or corrective maintenance action taken to keep a property fully functional, and operating in its best condition. Reactive maintenance is commonly used to respond to a tenants request to repair items in their unit, and preventive maintenance is used to regularly inspect and replace filters in essential assets like an HVAC machine. Proactive maintenance is a preventive maintenance approach that operates to correct the root causes of error and to prevent breakdowns induced by the circumstances of the machinery. Proactive Maintenance, This type of treatment helps improve care through actions such as better design, workmanship, installation, scheduling, and maintenance procedures The characteristics of proactive maintenance include implementing an ongoing development process, using feedback and communication to ensure that the design/procedure changes made by the designer/management are effective, ensuring that no maintenance effects occur in the overall isolation, with the ultimate goal of optimizing and combining methods care with the technology in each application. These are duties carried out before a failure happens to avoid the object from entering a failed condition. These tasks further classified into, Scheduled restoration Scheduled discard On condition maintenance Remanufacturing or overhauling components at or before a particular age threshold, irrespective of their situation at the moment. The frequency of a scheduled stage of regeneration 8 is determined by the era at which the unit or part shows a fast rise in the likelihood of conditional error. Scheduled restoration tasks are possible if: There is an identifiable age at which the item shows a rapid increase in the conditional probability of failure Most of the items survive to that age Tasks carried out restore the original resistance to failure of the item Discarding an item, regardless of its condition at the time, at or before a specific life limit. Scheduled discard tasks are possible if; There is an identifiable age at which the item shows a rapid increase in the conditional probability of failure Most of the items survive to that age. Here the item is replaced with new one so that resistance to failure come to original condition. Activities are conducted to identify the errors that occur or are happening in the system. In order to prevent the consequences, action can be taken. 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Failure to implement good maintenance practices will lead to machine breakdowns, costing the business more money through avoidable repairs and replacements.Maintenance vs. RepairMaintenance and repair work have the same goal, which is to keep your business running efficiently as designed. Simply put, the goal of maintenance is to make repairs unnecessary.From the time a business acquires an asset, they should already have a maintenance plan ready for implementation. Routine maintenance techniques like cleaning and regular inspections are often done on a weekly, monthly, and sometimes even daily basis. Cleaning, monitoring, and inspecting can be done quickly and often at no cost while still contributing to an assets overall health and longevity.However, even with the best maintenance plan and personnel, the possibility of an unexpected machine breakdown can never be eliminated. When this happens, businesses need to rely on swift repairs to get their assets back up and running ASAP, before losses become insurmountable.Cultivate a culture of excellence with our digital solutions that enhance efficiency, agility, and continuous improvement across all operations.Maintenance Practices Across IndustriesGood maintenance programs benefit virtually all businesses across different industries; the only difference is how they apply maintenance techniques to achieve their business goals. Below is a list of how different industries apply maintenance practices to maximize their operations.AerospaceGood maintenance practices are crucial in the aerospace industry since malfunctions can result in high-fatality disasters. Aircraft maintenance is also legally mandated in Title 14 of the Code of Federal Regulations (14 CFR). The Federal Aviation Administration (FAA) mandates the following maintenance inspection activities: 100-hour inspection, annual inspection, and progressive inspection.Freight and LogisticsSometimes referred to as the transport industry, the freight and logistics industry is essential to the successful operation of many other industries since freight services are called upon to transport materials and tools needed for service and production. Some common maintenance practices in the freight and logistics industry are fleet maintenance and scheduled ship maintenance.Computers and ITWith our increasing reliance on computers for both work and our personal lives, it is naturally in everyones best interest to maintain them and ensure that they are operating at optimal levels. Common computer maintenance processes include server maintenance and IT risk assessments.AgricultureAgricultural activities rely heavily on equipment and industrial-grade chemicals to complete. Proper farm maintenance plays a crucial role in ensuring that workers are safe from work-related injuries and operations proceed without a hitch. Maintenance activities include equipment maintenance and facility maintenance.Real EstateCommercial, residential, and industrial buildings require regular maintenance to retain their structural integrity and functionality, avoiding deterioration and eventual collapse. Below are some common maintenance techniques practiced in the real estate industry. Food and BeverageThe maintenance of food processing machines, utensils, and facilities is the foundation upon which successful food companies and restaurants are built. Maintenance examples in this industry include kitchen maintenance and chiller maintenance.HospitalityTo achieve and maintain customer satisfaction and keep customers coming back, hotels and lodges need to keep their establishments in pristine condition through diligent and consistent maintenance practices. This can be done through regular hotel maintenance, as well as HVAC maintenance, among other things.ManufacturingCompanies in the manufacturing industry utilize heavy-duty machinery for mass production. To prevent machine breakdowns that disrupt operations, good machine maintenance protocols must be implementedmachine maintenance and factory maintenance are already a great start.RetailThere are multiple factors to be considered when coming up with a winning formula for a successful retail company. Selling high-quality products and having great customer service are some of the more obvious elements. Consistent implementation of good store maintenance practices, however, is just as important in making sure your business operates at full capacity.Maintenance Training: Your Key to Building a Culture of SafetyBreak free from the limits of traditional face-to-face training. Thanks to the advancement of mobile training apps, its now easier to create your maintenance training and make it available for your team anytime, anywhere, and on any device. Here, weve made a list of some maintenance training that is perfect for busy teams who need to stay on top of their safety game.,the free encyclopedia that anyone can edit.110,331 active editors 7,023,430 articles in EnglishGame Boy, platform of Donkey Kong LandDonkey Kong Land is a platform game developed by Rare and published by Nintendo for the Game Boy (pictured). Released on June26, 1995, it condenses the side-scrolling gameplay of Donkey Kong Country with a different level design and boss fights. The player controls Donkey Kong and Diddy Kong as they recover their stolen banana hoard from King K. Rool. Development began in 1994: Rare's Game Boy programmer, Paul Machacek, developed Land as an original game rather than a port of Country, believing that it would be a better use of resources. Land features pre-rendered graphics converted to sprites through a compression technique. Rare retooled Country's gameplay to account for the lower-quality display, and David Wise and Graeme Norgate converted the soundtrack to the Game Boy's sound chip. Critics praised it as successfully translating Country's gameplay, visuals, and music to the Game Boy. Land was rereleased for the Nintendo 3DS and the Nintendo Switch. (Fullarticle...)Recently featured: History of education in Wales (17011870)White dwarfBattle of GroixArchiveBy emailMore featured articlesAboutMendel Catholic High School... that Mendel Catholic High School (pictured) raised $15million through hosting weekly house dances from 1975?... that singer Karin Ann made headlines after performing live on Polish state television wrapped in a rainbow flag?... that voters approved a 600-percent increase in property taxes to fund programs at Valley Medical Center?... that the Diocese of Pore and Pula was nearly bankrupted over a dispute with the Italian Benedictines, a case that Draen Kutlea is credited with quietly resolving?... that the Dutch government considered converting the incomplete Java-class cruisers into English Channel ferries?... that Jack Reardon received a heart transplant while serving as the mayor of Kansas City?... that the symbol for equality in mathematics was not used for 61 years after its introduction, and was later popularized by Isaac Newton?... that stand-up comedian Dustin Nickerson has said that his children have veto power over any jokes he might tell about them?... that Saint-Sans's Phaton was described by a critic after its premiere as "the noise of a hack coming down from Montmartre"?ArchiveStart a new articleNominate an articleTrifid and Lagoon nebulaeThe Vera C. Rubin Observatory in Chile releases the first light images (example shown) from its new 8.4-meter (28ft) telescope.In basketball, the Oklahoma City Thunder defeat the Indiana Pacers to win the NBA Finals.An attack on a Greek Orthodox church in Damascus, Syria, kills at least 25 people.The United States conducts military strikes on three nuclear facilities in Iran.In rugby union, the Crusaders defeat the Chiefs to win the Super Rugby Pacific final.Ongoing: Gaza warIranIsrael warRussian invasion of UkrainetimelineSudanese civil wartimelineRecent deaths: Maria VoceWes HildrethLucien NedziAnne BurrellFrederick W. SmithRon TaylorNominate an articleJune 26Douglas Skymaster plane Amana1740 War of Jenkins' Ear: Spanish troops stormed the British-held strategically crucial position of Fort Mose in Spanish Florida.1945 At a conference in San Francisco, delegates from 50nations signed a charter establishing the United Nations.1950 A Douglas DC-4 Skymaster aircraft (pictured) crashed after departing from Perth, becoming the worst peacetime aviation accident in Australia's history.2010 A G20 summit, the largest and most expensive security operation in Canadian history, began in downtown Toronto.2015 The U.S. Supreme Court ruled in Obergefell v. Hodges that the right of same-sex couples to marry is guaranteed by the Fourteenth Amendment.Robert the Lotharingian (d.1095)George IV of the United Kingdom (d.1830)Walter C. Root (d.1925)Pavel Belyayev (b.1925)More anniversaries: June 25June 26June 27ArchiveBy emailList of days of the yearAboutAtacamite is a copper halide mineral: a copper(II) chloride hydroxide with the chemical formula $Cu_2Cl(OH)_3$. It was first described in 1802 by Dmitri Alekseyevich Golitsyn from deposits in Chile's Atacama Desert, after which it is named. Atacamite is a comparatively rare mineral, formed from primary copper minerals in the oxidation or weathering zone of arid climates. It has also been reported as a volcanic sublimate from fumarole deposits, as sulfide alteration products in black smokers. This photograph shows a specimen of atacamite, on a malachite matrix, from the Mount Gunson Mines in South Australia. The picture was focus-stacked from 42 separate images.Photograph credit: Ivar LeidusRecently featured: Turban Head eagleSpringbokGeraldine UlmarArchiveMore featured picturesCommunity portal The central hub for editors, with resources, links, tasks, and announcements.Village pump Forum for discussions about Wikipedia itself, including policies and technical issues.Site news Sources of news about Wikipedia and the broader Wikimedia movement.Teahouse Ask basic questions about using or editing Wikipedia.Help desk Ask questions about using or editing Wikipedia.Reference desk Ask research questions about encyclopedic topics.Content portals A unique way to navigate the encyclopedia.Wikipedia is written by volunteer editors and hosted by the Wikimedia Foundation, a non-profit organization that also hosts a range of other volunteer projects: CommonsFree media repository MediaWikiWiki software development Meta-WikiWikimedia project coordination WikibooksFree textbooks and manuals WikidataFree knowledge base WikinewsFree-content news WikiquoteCollection of quotations WikisourceFree-content library WikispeciesDirectory of species WikiversityFree learning tools WikivoyageFree travel guide WiktionaryDictionary and thesaurusThis Wikipedia is written in English. Many other Wikipedias are available; some of the largest are listed below. 1,000,000+ articles DeutschEspaolFranaisItalianoNederlandsPolskiPortugusSvenskaTing Vit 250,000+ articles Bahasa IndonesiaBahasa MelayuBn-lm-gCataletinaDanskEestiEsperantoEuskaraMagyarNorsk bokmlRomnSimple EnglishSloveninaSrpskiSrpskohrvatskiSuomiTrkeOzbekcha 50,000+ articles AsturianuAzrbaycancaBosanskiFryskGaeilgeGalegoHrvatskiKurdLatvieuLietuviNorsk nynorskShqipSlovenina Retrieved from " 2Calendar yearYearsMillennium2ndmillenniumCenturies17thcentury18thcentury 19thcenturyDecades1720s1730s1740s 1750s1760sYears1737173817391740 174117421743vteOctober 9: The Batavia Massacre by the Dutch East India Company of at least 5,000 Chinese Indonesians begins in what is now Jakarta.1740 by topicArts and scienceArchaeologyArchitectureArtLiteraturePoetryMusicScienceCountriesCanadaDenmarkFranceGreat BritainIrelandJapanNorwayRussiaScotlandSpainSwedenLists of leadersState leadersColonial governorsReligious leadersBirth and death categoriesBirthsDeathsEstablishments and disestablishments categoriesEstablishmentsDisestablishmentsWorks categoryWorksvte1740 in various calendarsGregorian calendar1740MDCCXLAb urbe condita2493Armenian calendar1189 Assyrian calendar6490Balinese saka calendar16611662Bengali calendar11461147Berber calendar2690British Regnal year13Geo.214Geo.2Buddhist calendar2284Burmese calendar1102Byzantine calendar72487249Chinese calendar (EarthGoat)4437 or 4230to (MetalMonkey)4438 or 4231Coptic calendar14561457Discordian calendar2906Ethiopian calendar17321733Hebrew calendar55005501Hindu calendars- Vikram Samvat17961797- Shaka Samvat16611662- Kali Yuga48404841Holocene calendar11740Igbo calendar740741Iranian calendar11181119Islamic calendar11521153Japanese calendarGenbun 5()Javanese calendar16641665Julian calendarGregorian minus 11 daysKorean calendar4073Minguo calendar172 before ROC172Nanakshahi calendar272Thai solar calendar22822283Tibetan calendar(female Earth-Goat)1866 or 1485 or 713to(male Iron-Monkey)1867 or 1486 or 714Wikimedia Commons has media related to 1740.1740 (MDCCXL) was a leap year starting on Friday of the Gregorian calendarand a leap year starting on Tuesday of the Julian calendar, the 1740th year of the Common Era (CE) and Anno Domini (AD) designations, the 740th year of the 2ndmillennium, the 40th year of the 18thcentury, and the 1st year of the 1740s decade. As of the start of 1740, the Gregorian calendar was 11 days ahead of the Julian calendar, which remained in localized use until 1923. Calendar year January 8 All 237 crewmen on the Dutch East India Company ship Rooswijk are drowned when the vessel strikes the shoals of Goodwin Sands, off of the coast of England, as it is beginning its second voyage to the Indies. The wreckage is discovered more than 250 years later, in 2004.[1]February 20 The North Carolina General Assembly incorporates the town of Newton as Wilmington, North Carolina, named for Spencer Compton, 1st Earl of Wilmington and patron of Royal Governor Gabriel Johnston.March 16 King Edward of the Miskito Indians signs a treaty making his kingdom, located on the coast of modern-day Nicaragua, a protectorate of Great Britain.[2]March 25 Construction begins on Bethesda Orphanage for boys near Savannah, Georgia, founded by George Whitefield.April 8 War of the Austrian Succession: The Royal Navy captures the Spanish ship of the line Princesa off Cape Finisterre and takes her into British service.May 31 Frederick II becomes King in Prussia upon the death of his father, Frederick William I.June 1 Plantation Act 1740 or Naturalization Act 1740 of the Parliament of Great Britain comes into effect providing for Protestant alien immigrants (including Huguenots, and also Jews) residing in the American colonies for 7 years to receive British nationality.June 16 Pour le Mrite first awarded in Prussia as a military honour.June 26 War of Jenkins' Ear: Siege of Fort Mose A Spanish column of 300 regular troops, free Black militia and Indian auxiliaries storms Britain's strategically crucial position of Fort Mose, Florida.July 7 Adam Smith sets out from Scotland to take up a scholarship at Balliol College, Oxford.[3]July 11 Pogrom: Jews are expelled from Little Russia.August 1 The song Rule, Britannia! is first performed at Cliveden, the country home of Frederick, Prince of Wales, in England.[4]August 17 Pope Benedict XIV succeeds Pope Clement XII, as the 247th pope.September 8 Hertford College, Oxford, England, is founded for the first time.[5]October 922 Batavia Massacre: Troops of the Dutch East India Company massacre 5,00010,000 Chinese Indonesians in Batavia.[6]October 20 Maria Theresa inherits the hereditary dominions of the Habsburg monarchy (Austria, Bohemia, Hungary and modern-day Belgium) under the terms of the Pragmatic Sanction of 1713 on the death of her father, Charles VI. Her succession to the Holy Roman Empire is contested widely because she is a woman, but she will reign for 40 years.November 6 Samuel Richardson's popular and influential epistolary novel, Pamela; or, Virtue Rewarded, is published anonymously in London.November 14 The University of Pennsylvania is officially established.December 16 Frederick II of Prussia invades the Habsburg possession of Silesia, starting the War of the Austrian Succession.Enfield, North Carolina, is founded.Spain begins construction on Fort Matanzas in the Matanzas Inlet, approximately 15 miles (24km) south of St. Augustine, Florida.The fairy-tale Beauty and the Beast by French novelist Gabrielle-Suzanne Barbot de Villeneuve was published.February 4 Carl Michael Bellman, Swedish poet, composer (d. 1795)February 15 Juan Andrs, Spanish Jesuit (d. 1817)February 16 Giambattista Bodoni, Italian publisher and engraver (d. 1813)February 17 John Sullivan, American General in the American Revolutionary War, delegate in the Continental Congress (d. 1795)March Johann van Beethoven, German musician, father of Ludwig van Beethoven (d. 1792)March 16 Johann Jacob Schweppe, German-born inventor, founder of the Schweppes Company (d. 1821)April 7 Haym Salomon, Polish-Jewish American financier of the American Revolution (d. 1785)April 14 Anna Strong, Patriot spy during the American Revolutionary War (d. 1812)May 7 Nikolai Arkharov, Russian police chief (d. 1814)Marquis de SadeJune 2 Marquis de Sade, French author, for whom sadism is named (d. 1814)June 24 Juan Ignacio Molina, Spanish-Chilean Jesuit priest, naturalist, historian, translator, geographer, botanist, ornithologist and linguist (d. 1829)June 27 James Woodforde, English clergyman and diarist (d. 1803)July 27 Jeanne Bar, French explorer (d. 1803)August 23 Emperor Ivan VI of Russia (d. 1764)August 26 Joseph-Michel Montgolfier, French inventor (d. 1810)September 12 Johann Heinrich Jung, German writer (d. 1817)September 23 Empress Go-Sakuramachi of Japan (d. 1813)September 25 Hercules Mulligan, tailor and spy during the American Revolutionary War (d. 1825)October 29 James Boswell, Scottish author (d. 1795)October 31 Philip James de Loutherbourg, English artist (d. 1812)December Elisabeth Olin, Swedish opera singer (d. 1828)Ali Pasha of Ioannina, Albanian ruler (d. 1822)Margaret Bingham, Countess of Lucan, born Margaret Smith, English portrait miniature painter and writer (d. 1814)[7]John Milton, American politician and officer of the Continental Army (d. 1817) (earliest estimated date of birth)Septimanie d'Egmont, French salonist (d. 1773)Pope Clement XIIFrederick William I, King in PrussiaSaint Theophilus of CorteCharles VI, Holy Roman EmperorAnna, Empress of RussiaJanuary Louise lisabeth de Joybert, politically active Canadian governors' wife (b. 1673)January 5 Antonio Lotti, Italian composer (b. 1667)January 17 Matthias Buchinger, German artist (b. 1674)January 20 Niccol Comneno Papadopoli, Italian jurist of religious law and historian (b. 1655)January 21 Nicholas Trott, colonial magistrate, South Carolina Chief Justice (b. 1663)January 27 Louis Henri, Duke of Bourbon, Prime Minister of France (b. 1692)January 29 Richard Lumley, 2nd Earl of Scarbrough (b. 1686)February 6 Pope Clement XII (b. 1652)[8]February 23 Massimiliano Soldani Benzi, Italian artist (b. 1656)February 29 Pietro Ottoboni, Italian cardinal (b. 1667)March 23 Olof Rudbeck the Younger, Swedish scientist and explorer (b. 1660)April 28 Bajirao I, Great Maratha warrior and Prime Minister of Marartha Empire (b.1700)April 23 Thomas Tickell, English writer (b. 1685)May 17 Jean Cavalier, French Protestant rebel leader (b. 1681)May 31 Frederick William I, King in Prussia (b. 1688)June 1 Samuel Werenfels, Swiss theologian (b. 1657)June 6 Alexander Spotswood, British governor of Virginia Colony (b. 1676)June 17Theophilus of Corte, Italian Roman Catholic priest, preacher and missionary, canonized (b. 1676)William Wyndham, English politician (b. 1687)June 18 Piers Butler, 3rd Viscount Galmoye, Anglo-Irish nobleman (b. 1652)July 2 Thomas Baker, English antiquarian (b. 1656)October 5 Johann Philipp Baratier, German scholar (b. 1721)October 11 Princess Magdalena Augusta of Anhalt-Zerbst, Duchess of Saxe-Gotha-Altenburg (b. 1679)October 20 Charles VI, Holy Roman Emperor (b. 1685)October 28 Anna, Empress of Russia (b. 1693)December 1 John Abernethy, Irish Protestant minister (b. 1680)December 20 Richard Boyle, 2nd Viscount Shannon, British military officer and statesman (b. 1675)December 30 John Senex, English geographer (b. ca. 1678)[9]^ Wendy van Duivenvoorde, Dutch East India Company Shipbuilding: The Archaeological Study of Batavia and Other Seventeenth-Century VOC Ships (Texas A&M University Press, 2015) p145^ "Mosquito Coast", in Historical Dictionary of the British Empire, ed. by Kenneth J. Panton (Rowman & Littlefield, 2015) p384^ "On this day in 1740..." Adam Smith Institute. July 7, 2010. Retrieved November 19, 2019.^ Williams, Hywel (2005). Cassell's Chronology of World History. London: Weidenfeld & Nicolson. p.308. ISBN0-304-35730-8.^ Hamilton, Sidney Graves (1903). Hertford College. University of Oxford college histories. London: Robinson.^ "Image: Bird's eye view of Batavia showing the massacre of the Chinese". Archived from the original on September 21, 2009. Retrieved November 12, 2006.^ This article incorporates text from a publication now in the public domain:Stephen, Leslie, ed. (1886). "Bingham, Margaret". Dictionary of National Biography. Vol.5. London: Smith, Elder & Co. ^ "Clement XII | pope". Encyclopedia Britannica. Retrieved April 22, 2021.^ "The Historical Theater in the Year 400 AD, in Which Both Romans and Barbarians Resided Side by Side in the Eastern Part of the Roman Empire". World Digital Library. 1725. Retrieved July 27, 2013.Retrieved from " 3One hundred years, from 1601 to 1700Millennia2ndmillenniumCenturies16thcentury17thcentury18thcenturyTimelines16thcentury17thcentury18thcenturyState leaders16thcentury17thcentury18thcenturyDecades1600s1610s1620s1630s1640s1650s1660s1670s1680s1690sCategories:Births Deaths Establishments DisestablishmentsvteThe 17th century lasted from January 1, 1601 (represented by the Roman numerals MDCI), to December 31, 1700 (MDCC).It falls into the early modern period of Europe and in that continent (whose impact on the world was increasing) was characterized by the Baroque cultural movement, the latter part of the Spanish Golden Age, the Dutch Golden Age,[1] the French Grand Sicle dominated by Louis XIV, the Scientific Revolution, the world's first public company and megacorporation known as the Dutch East India Company, and according to some historians, the General Crisis.From the mid-17th century, European politics were increasingly dominated by the Kingdom of France of Louis XIV, where royal power was solidified domestically in the civil war of the Fronde. The semi-feudal territorial French nobility was weakened and subjugated to the power of an absolute monarchy through the reinvention of the Palace of Versailles from a hunting lodge to a gilded prison, in which a greatly expanded royal court could be more easily kept under surveillance. With domestic peace assured, Louis XIV caused the borders of France to be expanded. It was during this century that the English monarch became increasingly involved in conflicts with the Parliament - this would culminate in the English civil war and an end to the dominance of the English monarchy.A scene on the ice, Dutch Republic, first half of the 17th centuryBy the end of the century, Europeans were masters of logarithms, electricity, the telescope and microscope, calculus, universal gravitation, Newton's Laws of Motion, air pressure, and calculating machines due to the work of the first scientists of the Scientific Revolution, including Galileo Galilei, Johannes Kepler, Ren Descartes, Pierre Fermat, Blaise Pascal, Robert Boyle, Christiaan Huygens, Antonie van Leeuwenhoek, Robert Hooke, Isaac Newton, and Gottfried Wilhelm Leibniz. It was also a period of development of culture in general (especially theater, music, visual arts and philosophy). Some of the greatest inventions took place in this century.It was during this period that the European colonization of the Americas began in earnest, including the exploitation of the silver deposits, which resulted in bouts of inflation as wealth was drawn into Europe.[2] Also during this period, there would be a more intense European presence in Southeast Asia and East Asia (such as the colonization of Taiwan). These foreign elements would contribute to a revolution in Ayutthaya. The Mataram Sultanate and the Aceh Sultanate would be the major powers of the region, especially during the first half of the century.[2]In the Islamic world, the gunpowder empires the Ottoman, Safavid, and Mughal grew in strength as well. The southern half of India would see the decline of the Deccan Sultanates and extinction of the Vijayanagara Empire. The Dutch would colonize Ceylon and endure hostilities with Kandy. The end of

the 17th century saw the first major surrender of Ottoman territory in Europe when the Treaty of Karlowitz ceded most of Hungary to the Habsburgs in 1699.In Japan, Tokugawa Ieyasu established the Tokugawa shogunate at the beginning of the century, beginning the Edo period; the isolationist Sakoku policy began in the 1630s and lasted until the 19th century. In China, the collapsing Ming dynasty was challenged by a series of conquests led by the Manchu warlord Nurhaci, which were consolidated by his son Hong Taiji and finally consummated by his grandson, the Shunzhi Emperor, founder of the Qing dynasty.[3] Qing China spent decades of this century with economic problems (results of civil wars between the Qing and former Ming dynasty loyalists), only recovering well at the end of the century.The greatest military conflicts of the century were the Thirty Years' War,[4] DutchPortuguese War,[5] the Great Turkish War, the Nine Years' War, MughalSafavid Wars, and the Qing annexation of the Ming.For a chronological guide, see Timeline of the 17th century.Main articles: 1600s, 1610s, 1620s, 1630s, and 1640sPersian Ambassador during his entry into Krakw for the wedding ceremonies of King Sigismund III of Poland in 1605.1601: 4th Spanish Armada; in the Battle of Kinsale, England defeats Irish and Spanish forces, driving the Gaelic aristocracy out of Ireland and destroying the Gaelic clan system.16011603: The Russian famine of 16011603 kills perhaps one-third of Russia.[6]1602: Matteo Ricci produces the Map of the Myriad Countries of the World (, Kny Wngu Qunt), a world map that will be used throughout East Asia for centuries.1602: The Dutch East India Company (VOC) is established by merging competing Dutch trading companies.[7] Its success contributes to the Dutch Golden Age.1603: Elizabeth I of England dies and is succeeded by her cousin King James VI of Scotland, uniting the crowns of Scotland and England.1603: Tokugawa Ieyasu takes the title of shgun, establishing the Tokugawa shogunate. This begins the Edo period, which will last until 1868.1603: In Nagasaki, the Portuguese Jesuit missionary Joo Rodrigues publishes Nippo Jisho, the first dictionary of Japanese to a European (Portuguese) language.1605: The King of Gowa, a Makassarese kingdom in South Sulawesi, converts to Islam.Tsar Michael I of Russia reigned 1613164516051627: The reign of Mughal emperor Jahangir after the death of emperor Akbar.1606: The Long Turkish War between the Ottoman Empire and Austria is ended with the Peace of ZsitvatorokAustria abandons Transylvania.1606: Treaty of Vienna ends an anti-Habsburg uprising in Royal Hungary.1606: Willem Janszoon captained the first recorded European landing on the Australian continent, sailing from Bantam, Java, in the Duyfken.1607: Flight of the Earls (the fleeing of most of the native Gaelic aristocracy) occurs from County Donegal in the west of Ulster in Ireland.1607: Iskandar Muda becomes the Sultan of Aceh for 30 years. He will launch a series of naval conquests that will transform Aceh into a great power in the western Malay Archipelago.1610: The PolishLithuanian Commonwealth army defeats combined RussianSwedish forces at the Battle of Klushino and conquers Moscow.1610: King Henry IV of France is assassinated by Franois Ravaillac.1611: The Pontifical and Royal University of Santo Tomas, the oldest existing university in Asia, is established by the Dominican Order in Manila[8]1611: The first publication of the King James Bible.1612: The first Cotswold Olympic Games, an annual public celebration of games and sports begins in the Cotswolds, England.1613: The Time of Troubles in Russia ends with the establishment of the House of Romanov, which rules until 1917.16131617: PolishLithuanian Commonwealth is invaded by the Tatars dozens of times.[9]James I of England and VI of Scotland ruled in the first quarter of the 17th century1613: The Dutch East India Company is forced to evacuate Gresik due to the Mataram siege in neighboring Surabaya. The dutch negotiates with Mataram and is allowed to set up a trading post in Jepara.16141615: The Siege of Osaka (last major threat to Tokugawa shogunate) ends.1616: The last remaining Moriscos (Moors who had nominally converted to Christianity) in Spain are expelled.1616: English poet and playwright William Shakespeare dies.1618: The Defenestration of Prague.1618: The Bohemian Revolt precipitates the Thirty Years' War, which devastates Europe in the years 161848.1618: The Manchus start invading China. Their conquest eventually topples the Ming dynasty.1619: European slaving reaches America when the first Africans are brought to the present-day United States.1619: The Dutch East India Company storm Jayakarta and withstand a months-long siege by the combined English, Bantenese and Jayakartan forces. They are relieved by Jan Pieterszoon Coen and a fleet of ships from Ambon. The dutch destroys Jayakarta and builds its new headquarters, Batavia, on top of it.16201621: PolishOttoman War over Moldavia.1620: Bethlen Gabor allies with the Ottomans and an invasion of Moldavia takes place. The Polish suffer a disaster at Cecora on the River Prut.1620: The Mayflower sets sail from Plymouth, England to what became the Plymouth Colony in New England.The 1622 massacre was instrumental in causing English colonists to view all natives as enemies1621: The Battle of Chocim: Poles and Cossacks under Jan Karol Chodkiewicz defeat the Ottomans.1622: Jamestown massacre: Algonquian natives kill 347 English settlers outside Jamestown, Virginia (approximately one-third of the colony's population)[10][11] and burn the Henricus settlement.16241642: As chief minister, Cardinal Richelieu centralises power in France.1626: St. Peter's Basilica in the Vatican completed.1627: Aurochs go extinct.[12]16281629: Sultan Agung of Mataram launches a failed campaign to conquer Dutch Batavia.1629: Abbas I, the Safavids king, died.1629: Cardinal Richelieu allies with Swedish Protestant forces in the Thirty Years' War to counter Ferdinand II's expansion.1630: Birth of Shivaji at Shivneri fort, in present day Maharashtra, India, who later founded Maratha Empire in year 1674.[13]1631: Mount Vesuvius erupts.1632: Battle of Ltzen, death of king of Sweden Gustav II Adolf.Battle of Nrdlingen (1634). The Catholic Imperial army, bolstered by professional Habsburg Spanish troops won a great victory in the battle over the combined Protestant armies of Sweden and their German allies1632: Taj Mahal building work started in Agra, India.1633: Galileo Galilei arrives in Rome for his trial before the Inquisition.16331639: Japan transforms into "locked country".1634: Battle of Nrdlingen results in Catholic victory.1636: Harvard University is founded in Cambridge, Massachusetts.1637: Shimabara Rebellion of Japanese Christians, rnin and peasants against Edo.1637: The first opera house, Teatro San Cassiano, opens in Venice.1637: Qing dynasty attacked the Joseon dynasty.1639: Naval Battle of the Downs Republic of the United Provinces fleet decisively defeats a Spanish fleet in English waters.1639: Disagreements between the Farnese and Barberini Pope Urban VIII escalate into the Wars of Castro and last until 1649.16391651: Wars of the Three Kingdoms, civil wars throughout Scotland, Ireland, and England.16401668: The Portuguese Restoration War led to the end of the Iberian Union.The inauguration of the Royal Academy of Turku in 1640.1641: The Irish Rebellion, by Irish Catholics who wanted an end to discrimination, greater self-governance, and reverse ownership of the plantations of Ireland.1641: Ren Descartes publishes Meditationes de prima philosophia Meditations on First Philosophy.1642: Beginning of English Civil War, conflict will end in 1649 with the execution of King Charles I, the abolition of the monarchy and the establishment of the supremacy of Parliament over the king.1643: L'incoronazione di Poppea, Monterverdi1644: The Manchu conquer China ending the Ming dynasty. The subsequent Qing dynasty rules until 1912.16441674: The Mauritanian Thirty-Year War.16451669: Ottoman war with Venice. The Ottomans invade Crete and capture Canea.16471652: The Great Plague of Seville.1648: The Peace of Westphalia ends the Thirty Years' War and the Eighty Years' War and marks the ends of Spain and the Holy Roman Empire as major European powers.Map of Europe in 1648 at the end of the Thirty Years' War16481653: Fronde civil war in France.16481657: The Khmelnytsky Uprising a Cossack rebellion in Ukraine which turned into a Ukrainian war of liberation from Poland.16481667: The Deluge wars leave PolishLithuanian Commonwealth in ruins.16481669: The Ottomans capture Crete from the Venetians after the Siege of Candia.1649: King Charles I is executed for high treason, the first and only English king to be subjected to legal proceedings in a High Court of Justice and put to death.16491653: The Cromwellian conquest of Ireland.Main articles: 1650s, 1660s, 1670s, 1680s, 1690s, and 1700sThe Night Watch or The Militia Company of Captain Frans Banning Cocq, 1642. 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Approximately 2,000 people die and 2,300 are injured.16921694: Famine in France kills two million.[16]1693: College of William & Mary is founded in Williamsburg, Virginia, by a royal charter.1694: The Bank of England is established.1695: The Mughal Empire nearly bans the East India Company in response to pirate Henry Every's capture of the trading ship Ganj-i-Sawai.16961697: Famine in Finland wipes out almost one-third of the population.[17]16971699: Grand Embassy of Peter the Great to Western Europe.1699: Thomas Savery demonstrates his first steam engine to the Royal Society.Catholic general Albrecht von Wallenstein (15831634), supreme commander of the armies of the Imperial Army during the Thirty Years WarJan Pieterszoon Coen (15871629), the founder of Batavia, was an officer of the Dutch East India Company (VOC), holding two terms as its Governor-General of the Dutch East IndiesRen Descartes (15961650) with Queen Christina of Sweden (16261689)Cardinal Mazarin (16021661), who served as the chief minister to the kings of France Louis XIII and Louis XIVMughal Emperor Aurangzeb (16181707), who ruled over almost the entire Indian subcontinent for a period of 49 yearsChhatrapati Shivaji (16301680) founder of Maratha Empire is widely regarded as one of the greatest Hindu rulersKangxi Emperor (16611722) one of the most influential emperors of the Qing dynastyShgun Tokugawa Ieyasu was the founder of Japan's final shogunate, which lasted well into the 19th century See also: Timeline of historic inventions 17th centuryMajor changes in philosophy and science take place, often characterized as the Scientific Revolution.Banknotes reintroduced in Europe.Ice cream.Tea and coffee become popular in Europe.Central Banking in France and modern Finance by Scottish economist John Law.Minarets, Jam Mosque of Isfahan, Isfahan, Persia (Iran), are built.1604: Supernova SN 1604 is observed in the Milky Way.1605: Johannes Kepler starts investigating elliptical orbits of planets.1605: Johann Carolus of Germany publishes the 'Relation', the first newspaper.1608: Refracting telescopes first appear. Dutch spectacle-maker Hans Lippershey tries to obtain a patent on one, spreading word of the invention.1610: The Orion Nebula is identified by Nicolas-Claude Fabri de Peiresc of France.1610: Galileo Galilei and Simon Marius observe Jupiter's Galilean moons.1611: King James Bible or 'Authorized Version' first published.1612: The first flintlock musket likely created for Louis XIII of France by gunsmith Marin Bourgeois.1614: John Napier introduces the logarithm to simplify calculations.1616: Niccol Zucchi describes experiments with a bronze parabolic mirror trying to make a reflecting telescope.1620: Cornelis Drebbel, funded by James I of England, builds the first 'submarine' made of wood and greased leather.1623: The third English dictionary, English Dictionarie, is published by Henry Cockeram, listing difficult words with definitions.1628: William Harvey publishes and elucidates his earlier discovery of the circulatory system.1637: Dutch Bible published.1637: Teatro San Cassiano, the first public opera house, opened in Venice.1637: Pierre de Fermat formulates his so-called Last Theorem, unsolved until 1995.1637: Although Chinese naval mines were earlier described in the 14th century Huolongjing, the Tian Gong Kai Wu book of Ming dynasty scholar Song Yingxing describes naval mines wrapped in a lacquer bag and ignited by an ambusher pulling a rip cord on the nearby shore that triggers a steel-wheel flint mechanism.1642: Blaise Pascal invents the mechanical calculator called Pascal's calculator.1642: Mezzotint engraving introduces grey tones to printed images.1643: Evangelista Torricelli of Italy invents the mercury barometer.1645: Giacomo Torelli of Venice, Italy invents the first rotating stage.1651: Giovanni Riccioli renames the lunar maria.1656: Christiaan Huygens describes the true shape of the rings of Saturn.1657: Christiaan Huygens develops the first functional pendulum clock based on the learnings of Galileo Galilei.1659: Christiaan Huygens first to observe surface details of Mars.1662: Christopher Merret presents first paper on the production of sparkling wine.1663: James Gregory publishes designs for a reflecting telescope.1669: The first known operational reflecting telescope is built by Isaac Newton.1676: Antonie van Leeuwenhoek discovers Bacteria.1676: First measurement of the speed of light.1679: Binary system developed by Gottfried Wilhelm Leibniz.1684: Calculus independently developed by both Gottfried Wilhelm Leibniz and Sir Isaac Newton and used to formulate classical mechanics.^ "Exchange History NL 400 years: the story". 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ISBN0-7486-3887-3Detail of a 17th-century Tekke Turkmen carpetChang, Chun-shu, and Shelley Hsueh-lun Chang. Crisis and Transformation in Seventeenth-Century China (1998).Langer, William. An Encyclopedia of World History (5th ed. 1973); highly detailed outline of events online freeReid, A. J. S. Trade and State Power in 16th & 17th Century Southeast Asia (1977).Spence, J. D. The Death of Woman Wang: Rural Life in China in the 17th Century (1978).Clark, George. The Seventeenth Century (2nd ed. 1945).Hampshire, Stuart. The Age of Reason the 17th Century Philosophers, Selected, with Introduction and Interpretive Commentary (1961).Hugon, Ccile (1997) [1911]. "Social Conditions in 17th-Century France (1649-1652)". In Halsall, Paul (ed.). Social France in the XVII Century. London: Methuen. pp.171172, 189. ISBN9780548161944. Archived from the original on 23 August 2016. Retrieved 7 August 2021.Lewitter, Lucian Ryszard. "Poland, the Ukraine and Russia in the 17th Century." The Slavonic and East European Review (1948): 157171. in JSTOROgg, David. Europe in the Seventeenth Century (6th ed. 1965).Rowbotham, Sheila. Hidden from history: Rediscovering women in history from the 17th century to the present (1976).Trevor-Roper, Hugh R. "The general crisis of the 17th century." Past & Present 16 (1959): 3164. Preventive maintenance is an established operation performed on a plant or machine before a failure occurs in order to protect them and prevent or eliminate any degradation in their operating conditions. This is done by using measured trend parameters that allow a comparison of current parameters with historical data. From this comparison, qualified judgments can be made about the need for corrective action. It is good for those machines and facilities which their failure would cause serious production losses. Why preventive maintenance needed?The preventive maintenance program guarantees the continuity of the operation and reduces the danger of unplanned interruptions. The total cost of downtime and 24-hour emergency repairs can be amazing. Planned shutdowns occur during periods of inactivity or minimal use, and as a result, problems can be detected in the early stages and corrective actions taken before extensive damage occurs. The factors that affect the efficiency of this type of maintenance:The proper planning and scheduling of PM programme.The ability to properly apply the PM programme.The required staff qualifications and skills, which can be gained through training.The need for required number of personnel in the maintenance department to perform this type of maintenance.Advantages of preventive maintenance:It reduces unplanned and forced outages of the system to a large extent.Longtime major break down of the system is avoided.During preventive maintenance, the residual life of the equipment in the system can be estimated by non-destructive tests.It can be used to update modern facilities.It enables the system trouble-free, uninterrupted quality power supply to consumers.Allows adequate time to implement experts` advice and decision for improvement of the system. Maintenance is the routine and recurring process of keeping a particular machine or asset in its normal operating conditions.So that it can deliver the expected performance or service without any loss or damage. OrMaintenance is defined as All actions necessary for retaining an item, or restoring to it, a serviceable condition, include servicing, repair, modification, overhaul, inspection and condition verificationIncrease availability of a systemKeep systems equipment in working orderRead more :What is Maintenance Engineering | Career in Mechanical FieldPurpose of Maintenance Attempt to maximize performance of production equipment efficiently and regularlyPrevent breakdown or failuresMinimize production loss from failuresIncrease reliability of the operating systemsPrinciple Objectives in Maintenance To achieve product quality and customer satisfaction through adjusted and serviced equipmentMaximize useful life of equipmentKeep equipment safe and prevent safety hazardsMinimize frequency and severity of interruptionsMaximize production capacity through high utilization of facilityMaintenance Engineering objectives Maintenance Manager If you choose to take an entry-level position in order to become a facilities maintenance manager, you can expect to spend several years working maintenance positions as you learn the skills necessary to become a manager. Larger employers with greater maintenance needs generally look for a facilities maintenance manager who can perform these tasks when needed, but is more focused on managing an in-house staff responsible for the majority of the actual work.Maintenance Engineering Jobs Typically, maintenance engineers need to possess knowledge of the principles of building or mechanical engineering. Maintenance engineer jobs generally require the person to maintain the plant or manage a crew who maintains it.They also set schedules, hand out paychecks, assign job duties, and monitor daily progress. Most construction engineering jobs require at least a bachelors degree in civil engineering or project management.Problems in Maintenance Lack of management attention to maintenanceLittle participation by accounting in analyzing and reporting costsDifficulties in applying quantitative analysisDifficulties in obtaining time and cost estimates for maintenance worksDifficulties in measuring performanceProblems Exist Due To: Failure to develop written objectives and policyInadequate budgetary controlInadequate control procedures for work order, service requests etc.Infrequent use of standardsTo control maintenance workAbsence of cost reports to aid maintenance planning and control systemMaintenance Costs Cost to replace or repairLosses of outputDelayed shipmentScrap and rework link to Top Branches of Mechanical Engineering link to Shree Ram Ayodhya Murti, idol - Vector , WallartOver the years, maintenance has become one of the most important factors an organization or industry must accomplish. Learning and performing maintenance is a very broad topic all technological organizations must look into to keep the organization and equipment in good working condition.The technical meaning of maintenance involves functional checks, servicing, repairing, or replacing industrial items. This item might include devices, equipment, machinery, building infrastructure, etc.Well, in this reading, well explore what maintenance is in organizational exposition, its applications, types, advantages, disadvantages and examples.Lets begin!Learn aboutTotal Productive Maintenance (TPM)with this detailed guide!What is Maintenance?Maintenance in this scenario is referred to as Maintenance, repair, and overhaul (MRO), which is also referred to as Maintenance, repair, and operations. The implementation of this maintenance and MRO has begun to become standardized.The following stated below is the definition of maintenance assigned by the United States Department of Defense:They defined it as any activity, such as tests, measurements, replacements, adjustments, and repairs intended to retain or restore a functional unit in or to a specified state so it can perform its required functions.They also stated maintenance to be all action taken to retain material in a serviceable condition or to restore it to serviceability. It includes inspections, testing, servicing, classification as to serviceability, repair, rebuilding, and reclamation.Maintenance can also be defined as all supply and repair actions taken to keep a force in condition to carry out its mission.And finally, maintenance is a routine recurring work required to keep a facility (plant, building, structure, ground facility, utility system, and other real property) in such condition that it may be continuously used at its original or designed capacity and efficiency for its intended purpose.Applications In woodworking and metalworking organizations that utilize machine tools and other facilities for production, maintenance is strictly connected to the utilization stage of the product or technical system.This means the concept of maintainability must be included.In this case, maintainability is considered as the ability of an item, under stated conditions of use, to be retained in or restored to a state making it perform its required functions, using the set-down prescribed procedures and resources.All industries must implement the MRO standards to keep those things in perfect position.Apart from the metalworking and woodworking fields that see the implementation of maintenance as a key purpose, other areas such as the marine and air transportation, offshore structures, industrial plant, and facility management industries.They all depend on maintenance, repair, and overhaul (MRO).You should also learn aboutPlant Maintenance with this detailed guide!Types of Maintenance The following stated below represent the basic types of maintenance that fall under the MRO:Preventive MaintenanceCorrective MaintenancePredictive MaintenancePredetermined MaintenanceCondition-Based MaintenanceReactive MaintenancePreventive MaintenancePreventive maintenance is abbreviated as PM. It is a routine for repeated inspection with the goal of noticing minor problems and fixing them before the major ones develop. In this situation, the machine or equipment is in good condition; nothing breaks down.In short, preventive maintenance is a regular and periodic or time-based schedule. The main purpose of preventive maintenance is for the equipment to make it from one planned service to the next planned service. This helps to avoid failures caused by fatigue, neglect, or normal wear, which are preventable items.Planned maintenance and Condition Maintenance help to achieve this by replacing worn components before they actually fail. For instance, equipment maintenance may change based on its age, as frequent routine maintenance will be done as of when its new.A good example of preventive maintenance is the routine cleaning of an air conditioning system. This maintenance is expected to be on schedule and ensure it is free of grit and dirt inside the casing and ensure no blockage in the air intake.In this maintenance, there is no specific problem with the system, but if not maintained, accumulation of dirt could cause problems later in the future. So, this maintenance helps to prevent difficulties in the future, such as poor performance, increased energy usage or sudden breakdown.The major benefits of preventive maintenance include prevention of major repairs, avoiding sudden or emergency shutdown of the business, increasing the products lifecycle as wear and tear are reduced, and finally keeping energy costs low.Corrective MaintenanceThe corrective type of maintenance is carried out after the complete breakdown or malfunction of equipment. It is also known as unplanned corrective maintenance because the maintenance team must begin work as soon as the issue occurs.It tends to be expensive because there are multiple damages apart from the worn parts. Serious repair and replacement costs and loss of revenues due to downtime during overhaul can be meaningful. Corrective maintenance also includes the rebuilding and resurfacing of equipment and infrastructure damaged by erosion and corrosion.Some conventional processes like welding and metal flame spraying, as well as engineered solutions with thermoset polymeric material, will also be performed. The purpose of this type of maintenance is to get the system back to its normal working condition as soon as possible.This is because the breakdown could lead to a loss of money as the operation is shut down. A good example of corrective maintenance is repairing an air conditioning system that stops functioning or repairing it when it is not functioning at its maximum performance.An excellent benefits of corrective maintenance include low cost of monthly maintenance, focuses on the main issues, and a straightforward process of maintenanceLearn aboutCar Maintenance Tips with this detailed guide!Predictive MaintenancePredictive maintenance is more advanced in sensing and computing technology. It uses the maintenance strategy to monitor key parameters within a system or machine.It uses the data with the analyzed historical trends to continuously evaluate the systems health and also predict a breakdown before it happens. The predictive type of maintenance tends to be more efficient due to the fact that more up-to-date data is collected about the machine issues.Predictive maintenance is known as a data-driven approach to conducting maintenance tasks, utilizing data to identify when maintenance is needed and predict potential machine failures. Some good examples of predictive maintenance include alarms sounding when internal temperature moves outside safe parameters.Also, sensors in data centers server rooms alert when the internal temperature is too hot, engine sensors monitor misfires, and a refrigeration truck sensor monitors internal temperatures. These notifications do not necessarily indicate a complete failure of the system but they mean its approaching a range where catastrophic failure can occur.Predictive maintenance may require higher setup costs, but it can save money by improving product quality, reducing breakdowns, improving equipment performance, and increasing customer satisfaction.Additionally, automation can reduce maintenance labor, as automation can become part of the predictive process. Predictive maintenance offers numerous benefits, including improved equipment performance, customer satisfaction, and reduced maintenance labor costs.Predetermined MaintenancePredetermined maintenance is a planned action developed by the manufacturer of equipment, rather than scheduled maintenance.For example, machinery maintenance is scheduled at time intervals based on the manufacturers recommendations, such as oil changes every fourth month, transmission service at a certain number of hours of run time, Parts X, Y, and Z checking for wear after one year of use, and engine replacement after a certain number of years.This approach extends the life of assets and is generally cost-effective, as it allows for planning for the purchase of parts and maintenance tasks. Some good benefits of predetermined maintenance include being easier to schedule and manage, including labor, and being outlined by the manufacturer. It also allows for scheduling technicians rather than hiring maintenance personnel.You should also learn aboutMaintenance of Socket Sets and Wrenches with this detailed guide!Condition-Based MaintenanceCondition-based maintenance is a method of checking the range of normal operating conditions of machines. This method involves observing the engines performance and adjusting the maintenance accordingly.For instance, a check engine light in a car indicates an issue with the engines range, requiring scheduled maintenance. This process can also be applied to self-monitoring machines or those that require physical inspections.Additionally, a machines increased energy consumption, such as a shorter fuel tank or a sudden spike in electrical usage, can also make use of condition-based maintenance.In essence, condition-based maintenance is crucial for maintaining the functionality of machines. It shows a lower cost than complete failure of a machine due to scheduling anomalies when they begin.This approach reduces downtime and energy consumption and increases productivity by allowing equipment to run in peak performance for longer periods. As performance drops, there are fewer failures as maintenance occurs as the equipments performance declines.Reactive MaintenanceReactive maintenance, also known as Run-to-failure or urgent maintenance. It is a system that responds when a failure of machinery or systems occurs. It can be handled in-house by the manufacturer or through a combination of in-house maintenance and the manufacturers technicians.Examples of reactive maintenance include a car wash at a local gas station breaking and the maintenance team being notified. The costs of reactive maintenance can range from minor repairs to total machinery replacement, making it difficult to predict.Some benefits of reactive maintenance include fewer maintenance staff, fewer employees, and wages paid out regularly. Additionally, there are fewer costs to implementation, as no regular maintenance means no labor or part costs until failure occurs.Learn aboutfoundry maintenance and safety with this detailed guide!How to Choose the Right and Best Maintenance?To choose the best maintenance strategy, you have to consider the cost of equipment failure and the potential impact on customers. If the cost is higher than repair, a reactive maintenance approach may be suitable. Conversely, if the cost is higher, a proactive approach may be a better choice.Factors to consider include time for maintenance, production loss cost, and customer impact. Businesses may need multiple types of maintenance depending on their operations.Preventative maintenance protects customer satisfaction and reduces legal risks, while reactive maintenance may be more economical for equipment under warranty or nearing the end of its lifecycle. Consider choosing the right maintenance for your equipment.ConclusionMaintenance is the cornerstone of equipment reliability, safety, and longevity across all industriesautomotive, manufacturing, electrical, and beyond.Whether its preventive, predictive, or corrective, a well-structured maintenance plan helps avoid unexpected breakdowns, reduces costly repairs, and ensures systems run at peak efficiency. Ultimately, consistent maintenance protects your investment, improves performance, and promotes safety.Learn aboutthe maintenance of Blast Furnaces with this detailed guide!FAQs on MaintenanceWhat is maintenance?Maintenance refers to the routine tasks performed to keep machinery, equipment, or infrastructure in good working condition, prevent failures, and extend its service life.What are the main types of maintenance?Preventive Maintenance (PM): Regular, scheduled inspections and servicing.Corrective Maintenance: Repairs done after a fault or failure occurs.Predictive Maintenance (PdM): Uses data and sensors to predict issues before they happen.Condition-Based Maintenance (CBM): Triggered by real-time equipment conditions.Why is preventive maintenance important?It reduces downtime, minimizes repair costs, improves safety, and extends the life of equipment.What is the difference between preventive and predictive maintenance?Preventive is scheduled based on time or usage, while predictive relies on real-time data and condition monitoring to forecast maintenance needs.How often should maintenance be performed?Frequency depends on the equipment type, manufacturer recommendations, usage intensity, and operating environment.What tools are used in maintenance management?Tools include CMMS software (Computerized Maintenance Management System), inspection checklists, diagnostic equipment, and sensor-based monitoring systems.Can poor maintenance affect safety?Yes, neglecting maintenance can lead to equipment failures, accidents, and health hazards for operators or users.There are different types of maintenance work, each designed for specific scenarios. Knowing the differences between maintenance types helps people determine which ones are the most suitable for their purposes.Routine MaintenanceRoutine maintenance, also referred to as preventive maintenance, is implemented on a fixed schedule and typically includes activities such as inspecting, cleaning, washing, replacing, and checking. It is typically performed in the downtime between shifts or on weekends to avoid affecting productivity goals.Planned MaintenanceWhere routine maintenance may happen on a daily, weekly, or monthly basis, planned maintenance may be scheduled once per year or as needed. This is because planned maintenance is more time-consuming, expensive, and thoroughoften requiring the services of a specialist.Corrective MaintenanceIf during your routine maintenance inspection of a car, you discover signs of severe wear and tear, you need to perform corrective maintenance. When computer or gauge readings for a machine show unusual, possibly hazardous anomalies, you need to perform corrective maintenance. Corrective maintenance pertains to the repairs and replacements necessary to get an asset back up and running at full power and in optimal condition.Predictive MaintenancePredictive maintenance focuses on techniques used to determine the appropriate schedule for planned and corrective maintenance. Its primary goal is to predict, through a variety of testing methods such as vibration analysis, when a machine will start experiencing severe wear and tear so corrective maintenance can be scheduled without affecting productivity goals.Benefits of MaintenanceIn general, businesses benefit from good maintenance practices. However, several factors need to be considered before you can determine if maintenance is helping your organization.Increase longevity of assets Having the patience and dedication to regularly inspect, clean, and care for an expensive asset helps operations maximize productivity and cut costs by preventing expensive repairs and replacements.Optimize asset performance A well-maintained asset operates at maximum capacity, positively affecting business ROI through efficiency and consistency.Avoid unscheduled downtimes Unexpected breakdowns can cause significant problems for any business. Diligent maintenance can help businesses avoid unexpected outages, ensuring operations run smoothly and without any hiccups.Minimize costs Most industrial machines used for business operations cost a small fortune, so it only makes sense to diligently maintain these assets to get the most out of them. Failure to implement good maintenance practices will lead to machine breakdowns, costing the business more money through avoidable repairs and replacements.Maintenance vs. RepairMaintenance and repair work have the same goal, which is to keep your business running efficiently as designed. Simply put, the goal of maintenance is to make repairs unnecessary.From the time a business acquires an asset, they should already have a maintenance plan ready for implementation. Routine maintenance techniques like cleaning and regular inspections are often done on a weekly, monthly, and sometimes even daily basis. Cleaning, monitoring, and inspecting can be done quickly and often at no cost while still contributing to an assets overall health and longevity.However, even with the best maintenance plan and personnel, the possibility of an unexpected machine breakdown can never be eliminated. When this happens, businesses need to rely on swift repairs to get their assets back up and running ASAP, before losses become insurmountable.Cultivate a culture of excellence with our digital solutions that enhance efficiency, agility, and continuous improvement across all operations.Maintenance Practices Across IndustriesGood maintenance programs benefit virtually all businesses across different industries; the only difference is how they apply maintenance techniques to achieve their business goals. Below is a list of how different industries apply maintenance practices to maximize their operations.AerospaceGood maintenance practices are crucial in the aerospace industry since malfunctions can result in high-fatality disasters. Aircraft maintenance is also legally mandated in Title 14 of the Code of Federal Regulations (14 CFR). The Federal Aviation Administration (FAA) mandates the following maintenance inspection activities: 100-hour inspection, annual inspection, and progressive inspection.Freight and LogisticsSometimes referred to as the transport industry, the freight and logistics industry is essential to the successful operation of many other industries since freight services are called upon to transport materials and tools needed for service and production. Some common maintenance practices in the freight and logistics industry are fleet maintenance and scheduled ship maintenance.Computers and ITWith our increasing reliance on computers for both work and our personal lives, it is naturally in everyones best interest to maintain them and ensure that they are operating at optimal levels. Common computer maintenance processes include server maintenance and IT risk assessments.AgricultureAgricultural activities rely heavily on equipment and industrial-grade chemicals to complete. Proper farm maintenance plays a crucial role in ensuring that workers are safe from work-related injuries and operations proceed without a hitch. Maintenance activities include equipment maintenance and facility maintenance.Real EstateCommercial, residential, and industrial buildings require regular maintenance to retain their structural integrity and functionality, avoiding deterioration and eventual collapse. Below are some common maintenance techniques practiced in the real estate industry. Food and BeverageThe maintenance of food processing machines, utensils, and facilities is the foundation upon which successful food companies and restaurants are built. Maintenance examples in this industry include kitchen maintenance and chiller maintenance.HospitalityTo achieve and maintain customer satisfaction and keep customers coming back, hotels and lodges need to keep their establishments in pristine condition through diligent and consistent maintenance practices. This can be done through regular hotel maintenance, as well as HVAC maintenance, among other things.ManufacturingCompanies in the manufacturing industry utilize heavy-duty machinery for mass production. To prevent machine breakdowns that disrupt operations, good machine maintenance protocols must be implementedmachine maintenance and factory maintenance are already a great start.RetailThere are multiple factors to be considered when coming up with a winning formula for a successful retail company. Selling high-quality products and having great customer service are some of the more obvious elements. Consistent implementation of good store maintenance practices, however, is just as important in making sure your business operates at full capacity.Maintenance Training: Your Key to Building a Culture of SafetyBreak free from the limits of traditional face-to-face training. Thanks to the advancement of mobile training apps, its now easier to create your maintenance training and make it available for your team anytime, anywhere, and on any device. Here, weve made a list of some maintenance training that is perfect for busy teams who need to stay on top of their safety game.Todays plants and facilities often have critical machines that bear the brunt of production activity while other equipment sits idle or is hardly used. Yet, the lightly used machinery is still scheduled for routine/calendar-based maintenance no matter how much or how little it operates.A research study found that up to 30% of maintenance activities are wasted because theyre scheduled too frequently. But theres also a flip side, which is when equipment doesnt receive enough maintenance.Over-maintained assets Preventive maintenance intervals are too frequent or not effective. The consequence is wasted labor and parts resulting in unnecessary expenses.Under-maintained assets Preventive maintenance interval frequencies are too low and dont enable failure detection or prevent equipment breakdowns. The result is unplanned production shutdowns and decreased output. Safety also becomes a risk factor.What is usage-based maintenance?Usage-based preventive maintenance, sometimes called planned maintenance, avoids over-maintenance of lesser-used assets. When applied to specific equipment, the maintenance strategy will decrease costs and increase maintenance of hard-working machinery, better-ensuring reliability. The difference lies in the scheduling of PM activities.The approach enables maintenance professionals to adjust and optimize PM scheduling to fit actual equipment usage instead of basing maintenance on broad OEM calendar-based recommendations.Benefits of usage-based maintenance:Weeds out unnecessary preventive maintenance activity, reducing overall operational expensesIncreases preventive maintenance of hard-working critical assets, ensuring peak performance and healthEnables better maintenance planning, e.g., repair time, and integration into the scheduling processSignificantly reduces unnecessary spare parts expenditures and labor costsOptimizes maintenance resources, freeing up team members to work on other important projectsAutomated notification reminders enable maintenance managers to plan for upcoming preventive maintenance and technicians to prepare for servicing equipmentA typical way to explain the strategy is to consider the recommended oil changes for your car. If you follow them, the auto manufacturer might suggest changing it every three months or every 5,000 miles, whichever comes first. However, you wouldnt change your oil based on a calendar date if you didnt use your car because you were sent overseas for three months on a job.Calendar-based/time-based maintenance Triggers PMs based on calendar dates and times: weeks, months, quarters. No matter what, equipment is slated for maintenance based on the absolute time elapsed since the last activity, even if the equipment isnt used. For example, a commercial fleet may change the oil in each vehicle on the first of every month, regardless of how many miles each vehicle has driven.Usage-based/meter-based maintenance Triggers PMs based on the actual equipment usage. Equipment is slated for maintenance after reaching a certain specific value unit, such as the number of miles driven or number of parts produced. A PM is automatically generated when a piece of equipment reaches a defined usage milestone. So instead of changing the oil for a whole fleet on the first of the month, a commercial fleet would track the miles driven and change the oil in each truck when it has driven 3,000 miles.What industries routinely adopt usage-based PM strategies?Many industries can benefit from usage-based maintenance, even though its often specific to certain equipment and particular needs. Here are four of the top sectors that leverage usage-based maintenance regularly.Industry case studies and examples:1. Fleet Management A leading construction company sought to improve its planning procedure and perform maintenance on more than 1,000 pieces of heavy equipment, including a fleet of over-the-road and off-road trucks. The organization and eMaint CMMS experts developed a system for importing usage data based on hours run, fuel usage, and mileage for specific equipment. PMs are triggered automatically based on predefined criteria alerting maintenance members that its time for service. (more)Oil & Gas A leading oil and natural gas producer in the United States and a subsidiary of one of the worlds largest oil and gas companies, apply meter-based PMs to track its compressors. eMaint automatically generates a work order when the machine hits 2000 hours. The CMMS also tracks critical spare parts needed for compressor repairs to ensure availability. (more) A work order is generated automatically at 2,000 hours.Work orders also show the parts needed to complete the task.2. Facilities An independent tools, products, and services provider helps its grocery store customers save money by applying meter-based PMs to critical store equipment, avoiding misspent labor and parts. (more)3. Manufacturing A tubing manufacturer imports meter reading measurements (temperature, pressure, fluid levels, suction) from critical equipment. The CMMS automatically triggers priority work orders and inspections when values fall outside predefined parameters.How do you import meter-based or usage-based data into the eMaint CMMS?If you decide to apply usage-based/meter-based strategies to your preventive maintenance program, youll need to consider how youll feed the data to the CMMS. The eMaint API facilitates back and forth communication between individual software systems. Integration must be designed and implemented to fit your companys unique requirements.Connect2Assets: The Fluke Reliability Connect2Asset software can automatically pull meter readings from PLC machines, building automation systems, building management systems, SCADA systems, GPS systems, and more. Then, it moves the data to eMaint. When predetermined thresholds levels are met, the CMMS automatically creates a work order.API Integration (Application Programming Interface): The eMaint Computerized Maintenance Management System API facilitates back and forth communication between individual software systems, which can be customized to fit an organizations unique requirements.eMaint MX Mobile software: The eMaint mobile software solution lets field technicians upload meter readings into the CMMS via their smartphone or tablet, whether theyre on-site or working remotely.Import from a spreadsheet: Data stored on a spreadsheet, such as meter readings, can be easily imported into eMaint and used to generate usage-based or meter-based preventive maintenance work orders automatically.There are different types of maintenance work, each designed for specific scenarios. Knowing the differences between maintenance types helps people determine which ones are the most suitable for their purposes.Routine MaintenanceRoutine maintenance, also referred to as preventive maintenance, is implemented on a fixed schedule and typically includes activities such as inspecting, cleaning, washing, replacing, and checking. It is typically performed in the downtime between shifts or on weekends to avoid affecting productivity goals.Planned MaintenanceWhere routine maintenance may happen on a daily, weekly, or monthly basis, planned maintenance may be scheduled once per year or as needed. This is because planned maintenance is more time-consuming, expensive, and thoroughoften requiring the services of a specialist.Corrective MaintenanceIf during your routine maintenance inspection of a car, you discover signs of severe wear and tear, you need to perform corrective maintenance. When computer or gauge readings for a machine show unusual, possibly hazardous anomalies, you need to perform corrective maintenance. Corrective maintenance pertains to the repairs and replacements necessary to get an asset back up and running at full power and in optimal condition.Predictive MaintenancePredictive maintenance focuses on techniques used to determine the appropriate schedule for planned and corrective maintenance. Its primary goal is to predict, through a variety of testing methods such as vibration analysis, when a machine will start experiencing severe wear and tear so corrective maintenance can be scheduled without affecting productivity goals.Benefits of MaintenanceIn general, businesses benefit from good maintenance practices. However, several factors need to be considered before you can determine if maintenance is helping your organization.Increase longevity of assets Having the patience and dedication to regularly inspect, clean, and care for an expensive asset helps operations maximize productivity and cut costs by preventing expensive repairs and replacements.Optimize asset performance A well-maintained asset operates at maximum capacity, positively affecting business ROI through efficiency and consistency.Avoid unscheduled downtimes Unexpected breakdowns can cause significant problems for any business. Diligent maintenance can help businesses avoid unexpected outages, ensuring operations run smoothly and without any hiccups.Minimize costs Most industrial machines used for business operations cost a small fortune, so it only makes sense to diligently maintain these assets to get the most out of them. Failure to implement good maintenance practices will lead to machine breakdowns, costing the business more money through avoidable repairs and replacements.Maintenance vs. RepairMaintenance and repair work have the same goal, which is to keep your business running efficiently as designed. Simply put, the goal of maintenance is to make repairs unnecessary.From the time a business acquires an asset, they should already have a maintenance plan ready for implementation. Routine maintenance techniques like cleaning and regular inspections are often done on a weekly, monthly, and sometimes even daily basis. Cleaning, monitoring, and inspecting can be done quickly and often at no cost while still contributing to an assets overall health and longevity.However, even with the best maintenance plan and personnel, the possibility of an unexpected machine breakdown can never be eliminated. When this happens, businesses need to rely on swift repairs to get their assets back up and running ASAP, before losses become insurmountable.Cultivate a culture of excellence with our digital solutions that enhance efficiency, agility, and continuous improvement across all operations.Maintenance Practices Across IndustriesGood maintenance programs benefit virtually all businesses across different industries; the only difference is how they apply maintenance techniques to achieve their business goals. Below is a list of how different industries apply maintenance practices to maximize their operations.AerospaceGood maintenance practices are crucial in the aerospace industry since malfunctions can result in high-fatality disasters. Aircraft maintenance is also legally mandated in Title 14 of the Code of Federal Regulations (14 CFR). The Federal Aviation Administration (FAA) mandates the following maintenance inspection activities: 100-hour inspection, annual inspection, and progressive inspection.Freight and LogisticsSometimes referred to as the transport industry, the freight and logistics industry is essential to the successful operation of many other industries since freight services are called upon to transport materials and tools needed for service and production. Some common maintenance practices in the freight and logistics industry are fleet maintenance and scheduled ship maintenance.Computers and ITWith our increasing reliance on computers for both work and our personal lives, it is naturally in everyones best interest to maintain them and ensure that they are operating at optimal levels. Common computer maintenance processes include server maintenance and IT risk assessments.AgricultureAgricultural activities rely heavily on equipment and industrial-grade chemicals to complete. Proper farm maintenance plays a crucial role in ensuring that workers are safe from work-related injuries and operations proceed without a hitch. Maintenance activities include equipment maintenance and facility maintenance.Real EstateCommercial, residential, and industrial buildings require regular maintenance to retain their structural integrity and functionality, avoiding deterioration and eventual collapse. Below are some common maintenance techniques practiced in the real estate industry. Food and BeverageThe maintenance of food processing machines, utensils, and facilities is the foundation upon which successful food companies and restaurants are built. Maintenance examples in this industry include kitchen maintenance and chiller maintenance.HospitalityTo achieve and maintain customer satisfaction and keep customers coming back, hotels and lodges need to keep their establishments in pristine condition through diligent and consistent maintenance practices. This can be done through regular hotel maintenance, as well as HVAC maintenance, among other things.ManufacturingCompanies in the manufacturing industry utilize heavy-duty machinery for mass production. To prevent machine breakdowns that disrupt operations, good machine maintenance protocols must be implementedmachine maintenance and factory maintenance are already a great start.RetailThere are multiple factors to be considered when coming up with a winning formula for a successful retail company. Selling high-quality products and having great customer service are some of the more obvious elements. Consistent implementation of good store maintenance practices, however, is just as important in making sure your business operates at full capacity.Maintenance Training: Your Key to Building a Culture of SafetyBreak free from the limits of traditional face-to-face training. Thanks to the advancement of mobile training apps, its now easier to create your maintenance training and make it available for your team anytime, anywhere, and on any device. Here, weve made a list of some maintenance training that is perfect for busy teams who need to stay on top of their safety game. Reliability Centered Maintenance (RCM) is a process used to determine what must be done to ensure that a physical asset can continue to fulfil the expected function in the context of its current operation. RCM is the maintenance approach that combines the practices and strategies of preventive maintenance (pm) and corrective maintenance (cm) to maximize the lifetime and function of assets/systems/ equipment with minimal costs (minimum cost) There are four major components in reliability centered maintenance (RCM) described in the figure below, namely reactive maintenance, preventive maintenance, predictive testing and inspection, and proactive maintenance. Preventive maintenance can be interpreted as a maintenance action to maintain the system/sub-assembly in order to continue to operate according to its function by preparing a systematic inspection, detection and correction of small damage to prevent the occurrence of greater damage. Reactive Maintenance This type of treatment is also known as a breakdown, justifying if there is damage, run-to-failure or repair maintenance. When reactive maintenance is rarely applied, the turnover rate is high, maintenance work is rarely done, the high percentage of unplanned maintenance activities is common. PTI can be used to create a schedule from time-based maintenance because the results are guaranteed by the condition of the monitored equipment. PTI data taken periodically can be used to determine equipment condition trends, data comparisons between equipment, statistical analysis processes, etc. Proactive Maintenance This type of treatment helps improve care through actions such as better design, workmanship, installation, scheduling and maintenance procedures. The characteristics of proactive maintenance include implementing an ongoing development process, using feedback and communication to ensure that the design/procedure changes made by the designer/management are effective, ensuring that no maintenance effects occur in the overall isolation   Maintenance involves regular inspections and repairs to keep equipment running smoothly and safely. This guide will explain why maintenance matters, explore different types of maintenance, and offer strategies for effective maintenance routines. Table of Contents Maintenance involves regular inspections, repairs, and upkeep of systems and machinery to prevent unexpected breakdowns and ensure safety and efficiency. The main types of maintenance practices include routine, preventive, corrective, and predictive maintenance, each with specific purposes and benefits. Effective maintenance strategies, industry-specific practices, and appropriate training and tools are crucial in overcoming challenges like downtime, managing maintenance costs, and retaining skilled workers. Maintenance is the process through which the good working condition of buildings, machinery, and systems is upheld via regular inspections, repairs, and upkeep. The primary objective of maintenance is to render repairs redundant by keeping equipment in optimal condition, which prevents unexpected breakdowns and guarantees safety. This involves a variety of activities, including: Functional checks Servicing Repairing Replacing necessary devices, equipment, and infrastructure. The scope of maintenance is vast and includes both tangible and intangible elements. It encompasses: Routine inspections Cleaning Monitoring Adjusting machinery to keep it functioning properly Maintenance activities are essential to retain or restore an item to a state where it can perform its required functions, using prescribed procedures and resources. Over time, maintenance terminology has become standardized, including terms like maintenance, repair, and overhaul (MRO). Maintainability, a crucial aspect to include during the utilization stage of a product or system, is intimately linked to maintenance. This is pivotal for the product or systems long-term functionality and efficiency. The Department of Defense defines maintenance as actions taken to retain or restore material to a serviceable condition. This definition highlights the importance of maintaining equipment not only for operational efficiency but also for safety and reliability. Types of Maintenance Different types of maintenance practices help organizations manage assets efficiently and prevent unexpected breakdowns. These practices can be broadly categorized into four main types: Routine Maintenance Preventive Maintenance Corrective Maintenance Predictive Maintenance Each type has its own specific purposes and benefits, tailored to meet different operational needs. Routine Maintenance Routine maintenance entails regular activities like inspecting, cleaning, and replacing parts to avert equipment failure. Implemented on a fixed schedule, routine maintenance includes tasks like lubricating, minor adjustments, and cleaning, ensuring machinery operates smoothly. These activities are essential for maintaining equipment in good working condition and preventing minor issues from escalating into major problems. Routine maintenance ensures that facilities can be continuously used at their designed capacity. Common activities include regular cleaning, monitoring, and inspecting. By performing these tasks, maintenance crews can detect and address potential issues early, reducing the risk of unexpected breakdowns and extending the lifespan of equipment. Preventive Maintenance Preventive maintenance involves carrying out scheduled tasks designed to preempt problems through routine checks and servicing. This approach helps prevent minor issues from escalating into major problems by conducting regular inspections and maintenance. Preventive maintenance is performed while equipment is still operational to avoid unexpected breakdowns. A preventive maintenance schedule helps organize and prioritize maintenance tasks, ensuring equipment operates efficiently and safely. This proactive approach can extend the lifespan of assets, reduce maintenance costs, and minimize unplanned downtime. By keeping up with preventive maintenance, facilities can run more efficiently and maintain a higher level of productivity. Corrective Maintenance Corrective maintenance refers to the process of executing maintenance tasks on equipment following a breakdown or malfunction. This type of maintenance is activated when equipment performance drops or fails, with the primary purpose of restoring the equipment to its optimal functioning condition as quickly as possible. While corrective maintenance is essential for addressing unforeseen issues, it often leads to significant costs due to downtime and the resources required for repairs. Advanced troubleshooting techniques are crucial in corrective maintenance to diagnose equipment issues efficiently, minimizing downtime and ensuring effective repairs. Despite its reactive nature, corrective maintenance is a necessary component of a comprehensive maintenance strategy, ensuring that equipment can be swiftly returned to operational status after a failure. Predictive Maintenance Predictive maintenance employs data and condition monitoring to anticipate the optimal time for maintenance, thereby avoiding unexpected failures and minimizing downtime. The primary goal is to: Predict when a machine will start experiencing severe wear and tear Allow for convenient scheduling of corrective maintenance Transform unplanned downtime into planned downtime by using predictive analysis tools to anticipate equipment failures. Predictive maintenance relies on data to identify when equipment parameters deviate from norms, indicating potential failures. Techniques such as vibration analysis, infrared thermography, and ultrasonic analysis are used to monitor equipment condition in real-time. By employing predictive maintenance, organizations

can optimize equipment performance, reduce maintenance costs, and enhance overall reliability. Benefits of Proper Maintenance Appropriate maintenance considerably lowers the risk of equipment breakdowns, thus preserving productivity and reputation. Equipment that undergoes regular maintenance runs more efficiently, which is measured by key performance indicators like Overall Equipment Effectiveness (OEE). Tracking asset life effectively can also extend its lifespan and reduce maintenance costs. Maintaining equipment promotes health and safety within facilities by ensuring clean air from HVAC systems through regular filter and coil cleaning. Additionally, effective maintenance can boost customer satisfaction by ensuring the consistent quality of products and creating a reliable brand image. The benefits of proper maintenance extend beyond operational efficiency, impacting safety, costs, and customer trust. Maintenance Strategies An effective maintenance strategy involves combining different approaches tailored to the specific needs of the industry. Standard Maintenance Procedures (SMPs) standardize both regular and unplanned critical tasks to ensure consistent task quality. Researchers and organizers play a crucial role in preparing and managing maintenance activities to improve equipment performance. Planned Maintenance Planned maintenance revolves around the use of a schedule for carrying out maintenance tasks, which guarantees equipment reliability and curtails unexpected breakdowns. Maintenance planning is essential for these activities, which often include: Inspections Cleaning Lubrication Parts replacement These tasks are performed according to a predetermined schedule. A maintenance plan helps in scheduling tasks, controlling machine stops, and ensuring equipment operates at an acceptable level. By implementing planned maintenance, organizations can: Minimize unexpected downtime Extend the lifespan of their assets Ensure that equipment is always in optimal working condition Reduce the need for emergency repairs and the associated costs. Condition-Based Maintenance Condition-based maintenance (CBM) leverages real-time monitoring and scheduled inspections to evaluate equipment condition, carrying out maintenance only as necessary. This approach prioritizes and optimizes maintenance resources using real-time data, avoiding unnecessary resource waste due to a preset schedule. Techniques such as: Vibration analysis Infrared thermography Ultrasonic analysis Oil analysis Electrical analysis Pressure analysis are employed to monitor equipment condition. CBM aims to minimize downtime and reduce maintenance costs by performing maintenance tasks based on the actual condition of equipment rather than a fixed schedule. Forecasting and sourcing parts can be challenging, especially with diverse equipment brands, but the benefits of targeted maintenance outweigh these difficulties. Continuous Improvement in Maintenance Continuous improvement in maintenance requires frequent evaluation and enhancement of maintenance processes, aiming for increased efficiency and effectiveness. Total Productive Maintenance (TPM) engages the entire workforce in maintenance activities, fostering a culture of continuous improvement. This approach not only improves equipment reliability but also empowers employees to take ownership of maintenance tasks. By adopting a continuous improvement mindset, organizations can: Identify and eliminate inefficiencies in their maintenance processes Regularly update maintenance strategies Incorporate feedback from maintenance crews Ensure that the maintenance program evolves with changing needs and technological advancements. Industry-Specific Maintenance Practices Different industries require specific maintenance practices to ensure optimal performance and safety. Marine and air transportation, offshore structures, and industrial plant and facility management are some of the sectors that depend heavily on maintenance, repair, and overhaul (MRO). Each industry has unique requirements and challenges that necessitate tailored maintenance approaches. Aerospace Maintenance In the aerospace industry, robust maintenance practices are pivotal to prevent high-fatality disasters and guarantee safety. The Federal Aviation Administration (FAA) mandates several maintenance inspections. These include the 100-hour inspection, annual inspection, and progressive inspection. These strict regulations ensure that all aircraft are maintained to the highest safety standards. Manufacturing Maintenance In the manufacturing industry, effective machine maintenance is crucial in preventing breakdowns and ensuring smooth operations. Condition-Based Maintenance (CBM) is a crucial tool for running a plant or factory optimally, leading to lower production costs and reduced use of resources. By employing CBM, manufacturers can ensure that machinery operates efficiently and reliably. IT and Computer Maintenance Key maintenance activities for IT systems encompass server maintenance and IT risk assessments. Regular maintenance ensures that IT infrastructure operates smoothly, reducing the risk of system failures and data loss. By performing routine checks and updates, IT professionals can maintain the integrity and performance of their systems. Check out 10 Essential Computer Maintenance Tips. Appropriate training and specialized tools are indispensable for maintenance personnel to keep abreast of rapidly advancing technology and industry standards. Training helps maintenance staff effectively operate, maintain, and repair new and technologically advanced equipment. This ensures that maintenance crews can perform their tasks efficiently and safely. Maintenance Training Programs Regular training helps maintenance personnel keep pace with technological advancements. Technical training programs cover various systems, including: Electrical Mechanical Hydraulics Pneumatics Control systems On-the-job training allows maintenance personnel to gain practical skills directly applicable to their work environment. Maintenance personnel often use specialized tools and equipment for diagnosing and repairing faults. These tools include testing and inspection devices for regular equipment checks, ensuring that all systems are functioning properly. Having the right tools is essential for effective and efficient maintenance operations. Common Challenges in Maintenance Typical challenges in maintenance include: Finding and retaining skilled workers Reducing downtime Managing costs Implementing condition-based maintenance These challenges can significantly impact the effectiveness of poor maintenance programs and the overall performance of equipment and systems. Downtime denotes a period when a system is not operational. Unplanned downtime, caused by unforeseen circumstances like unexpected equipment breakdowns, can lead to major profit losses, especially in the industrial and IT sectors. Developing emergency maintenance procedures and investing in fault-tolerant equipment can help reduce downtime and maintain productivity. Managing Maintenance Costs Without a regular maintenance program, catastrophic failures can result in higher corrective maintenance costs. High setup costs for predictive maintenance are offset by long-term savings from improved equipment performance and reduced failures. Tracking the economic life of assets helps in reducing long-term maintenance costs and optimizing resource allocation. In summary, effective maintenance practices are essential for ensuring the reliability, safety, and efficiency of equipment and systems across various industries. By understanding and implementing different types of maintenance, such as routine, preventive, corrective, and predictive maintenance, organizations can significantly reduce the risk of unexpected breakdowns and extend the lifespan of their assets. Maintenance strategies that include planned maintenance, condition-based maintenance, and continuous improvement can further enhance the effectiveness of maintenance programs. Proper training and the use of specialized tools are also crucial for maintaining equipment and ensuring that maintenance personnel are equipped to handle advanced technologies. By addressing common challenges such as downtime and maintenance costs, organizations can optimize their maintenance operations and achieve long-term success. What is the primary goal of maintenance? The primary goal of maintenance is to ensure that buildings, machinery, and systems are kept in good working condition through regular inspections, repairs, and upkeep to prevent unexpected breakdowns and ensure safety. What are the different types of maintenance? The different types of maintenance are Routine Maintenance, Preventive Maintenance, Corrective Maintenance, and Predictive Maintenance. Each type serves specific purposes and benefits tailored to different operational needs. How does preventive maintenance benefit organizations? Preventive maintenance benefits organizations by preventing minor issues from becoming major problems through regular inspections and maintenance. This approach extends the lifespan of assets, reduces maintenance costs, and minimizes unplanned downtime. What challenges are commonly faced in maintenance? In maintenance, common challenges include finding and retaining qualified workers, minimizing downtime, managing costs, and implementing condition-based maintenance. Why is training important for maintenance personnel? Training is important for maintenance personnel to stay updated with rapidly advancing technology and industry standards, ensuring they can effectively operate, maintain, and repair new and technologically advanced equipment. This helps in maintaining efficiency and safety in the workplace. Maintenance, a fundamental concept in various sectors, plays a pivotal role in ensuring the smooth operation and longevity of devices, equipment, machinery, and building infrastructure across industrial, business, and residential installations. The technical meaning of maintenance contains all range of activities, including functional checks, servicing, repairs, and replacements. Over time, these processes have changed to include a variety of economical techniques for maintaining equipment functionality, whether proactive or reactive to failures.Maintenance functions are broadly categorized into maintenance, repair, and overhaul (MRO), with standardized terminology gradually becoming the norm. The United States Department of Defense provides comprehensive definitions, encompassing activities such as tests, measurements, replacements, adjustments, and repairs. Beyond simple repairs, maintenance also involves keeping materials functional or in a state that is appropriate for use. In terms of military applications, it includes supply and repair operations to keep forces in a condition that allows them to complete their objective. The foundation of facility management is routine maintenance, which ensures that utilities, plants, buildings, and other facilities are always used to their full potential and efficiency. The concept of maintainability becomes essential when it comes to the stage of product or technological system utilization, which has an unbreakable connection to maintenance. The ability of an item to be maintained or restored to a state where it can carry out its necessary functions, using recommended processes and resources, under given conditions is known as Maintainability. Maintenance, in a wider sense, is the work that is done to keep machines in the same shape and condition as when they were first introduced. It is an active way to keep the machine in good shape throughout its entire life. Comprehending maintenance, with its multiple implications and uses, is crucial for industries trying to improve equipment reliability, reduce downtime, and ensure effective operations. Building construction and maintenance, covering service facilities (water, gas, steam, heating, ventilating, A.C.). Specialized tasks like painting, plumbing, carpentry work, and fire-fighting equipment maintenance.Maintenance of machines, transport vehicles, material handling equipment, steam generators, boilers, compressors, and furnaces. Inclusion of lubrication practices as an integral part of mechanical maintenance.Management of electrical equipment such as generators, transformers, switch gears, motors, telephone systems, and lighting. Inclusion of broader aspects like electrical installations, fans, meters, gauges, instruments, control panels, and battery charging.Definition and importance of maintaining components within a computer system. Discussion on the critical nature of information system maintenance in the digital age.Reactive maintenance is a maintenance strategy in which no preventive measures are done to keep equipment operating as intended by its design. It is sometimes referred to as the Run it, till it breaks or Run to fail mode. Under this model, equipment is only given attention and effort when it begins to show indications of failure, so that all maintenance seems to be unplanned.The replacement of a light bulb. Repairing a broken HVAC equipment rather than maintaining it. Repairing an HVAC unit once data from the unit shows that it is not performing effectively.Reactive maintenance is often perceived as a cost-effective option in the short term. By addressing issues only when they arise, there is a reduction in upfront maintenance expenses. As maintenance activities are initiated in response to equipment failures, fewer staff members may be required for ongoing monitoring and routine check-ups.Increased Downtime Costs: Unexpected equipment failures result in financial losses and interruptions to business, which lower production levels. Higher Labor Costs, Especially with Overtime: Overtime is frequently needed for urgent repairs, leading to tight labor budgets and may have an adverse effect on employee wellbeing. Elevated Repair or Replacement Expenses: Equipment replacement or repair expenses can increase due to more extensive damage caused by delayed responses to problems. Potential Secondary Damage: Reactive techniques may increase overall repair costs by unintentionally damaging other machinery or processes. Inefficient Staff Resource Utilization: Reactive strategies frequently result in the less-than-ideal utilization of staff resources since workers are assigned in a reactive rather than a proactive manner, which lowers overall productivity.Ignored routine inspections and basic maintenance can lead to reactive breakdowns by allowing minor problems to get worse.One factor that may cause breakdowns is a maintenance crew members lack of experience. Reactive conditions can result in more significant damage if faults are not immediately addressed.Equipment stress and failure can arise from deviating from specified operating standards. Reactive reactions are frequently the result of procedures not being followed precisely as instructed.Failure to monitor and address gradual deterioration is a common cause of breakdowns in reactive maintenance. Regular inspections are crucial to prevent unchecked wear and tear.Breakdowns can be traced back to inherent design weaknesses in equipment. Reactive approaches may highlight issues that could have been addressed during the design phase to enhance durability and reliability. After unexpected equipment failures, reactive maintenance is performed. The terms emergency maintenance and breakdown maintenance sometimes overlap, and various organizations may classify them differently. However, lets examine these two main types: Emergency Maintenance: What are the objectives of emergency maintenance? Emergency maintenance is a reactive approach that is initiated in reaction to unplanned failures in equipment or systems. This method addresses immediate issues even though it is expensiveusually three to five times more than preventive maintenance. Prioritizing requests for corrective maintenance work becomes crucial in order to ensure appropriate scheduling and planning. The challenges that come with emergency maintenance include extended equipment outages, more impact on output, and higher risks to safety because of hurriedly performed corrective actions. To minimize the overall impact on operations, organizations must carefully prioritize work requests, postponing non-urgent jobs to enable enough time for proper planning and scheduling. In the overall structure of equipment management, proper planning and priority are essential components in reducing the drawbacks of emergency maintenance and converting it into a more managed and effective procedure. What is a Run to Failure Maintenance Strategy? Breakdown or Run-to-Failure Maintenance (RTF) The objective of a run-to-failure, or corrective maintenance, technique is to repair an item only after it has failed.Deliberate or unplanned, corrective maintenance is the response to malfunctions that may have been avoided with preventative maintenance. This method works under the assumption that the failure is acceptable, wont significantly affect the environment or safety, and cant be prevented economically or technically. This approach works especially well in situations where there are not many consequences from failure and no immediate need for immediate repairs, such as in general area lighting or smart process instrumentation without trip functionality. This strategy works well in scenarios where personnel and material costs are not crucial factors and equipment outages have little effect on output. When selecting Corrective Maintenance as a strategy, however, it is critical to ensure that the failure modes under consideration do not have the potential to escalate into Emergency Maintenance. Selecting a run-to-failure strategy for machinery that needs to be restored right away following failure would lead to a reactive maintenance setting. It is more costly, inefficient, and unsafe to operate in this reactive environment. Though a run-to-failure plan may be a good one, its important to make wise choices. Avoiding the traps of a reactive maintenance environment requires careful assessment of the possible outcomes and influence on overall operational efficiency. What is the planned maintenance system? Planned Maintenance The objective of planned maintenance is to minimize downtime and lower total maintenance costs while optimizing the performance of industrial machinery. The objective of planned maintenance is to maximize efficiency while requiring the least amount of maintenance possible. This method uses a methodical approach in which every worker participates to improve output quality, increase uptime, and lower maintenance costs by continuously optimizing equipment functioning. It includes putting predictive and preventative planned maintenance strategies into action, which improves the general dependability and efficiency of industrial machinery. The major goal is to create a proactive system that takes care of possible problems before they become more serious, guaranteeing smooth operations and economical maintenance procedures. What is meaning preventive maintenance? Preventive Maintenance The definition of preventive maintenance is actions carried out according to a time- or machine-run schedule that identify, stop, or mitigate a systems or components degradation in order to maintain or increase its useful life by limiting degradation to an acceptable level. What is the main objective of preventive maintenance? The Essence of Preventive Maintenance: Preventive maintenance is the foundation of scheduled maintenance, focusing early component identification, replacement, and repair to prevent failures. This strategy significantly decreases the possibility of large repairs and improves the productivity and reliability of industrial machinery by taking proactive measures to fix minor problems. Planned maintenance aims for optimal equipment efficiency with a minimal impact on operations. Techniques for Preventive Maintenance: Periodic Reviews: Regular assessments of equipment performance and condition. Routine Lubrication: Ensuring proper lubrication to reduce friction and wear. Calibrations: Adjusting equipment to maintain accuracy and optimal functionality. Inspections: Visual and data-driven inspections to identify potential issues. Automation with CMMS Software: Preventive maintenance tasks are made easier with the incorporation of a Computerized Maintenance Management System (CMMS) software. By planning and monitoring maintenance tasks, this automated technique increases productivity and ensures that procedures and inspections are carried out on time. Costs of Preventative Maintenance Preventive Maintenance involves higher labor costs for scheduled equipment inspections. However, these expenses are justified by the prevention of major repairs and the reduction in energy consumption from machines operating at peak efficiency. Outsourcing preventive maintenance services offers a cost-effective solution, providing specialized expertise without extensive in-house resources. Despite the initial labor expenses, the long-term benefits, such as avoiding major repairs and energy savings, make Preventive Maintenance a financially sound strategy. Outsourcing further optimizes costs, ensuring a balanced approach to maintenance practices and budget considerations. Example of Preventive Maintenance in Action: Example: Conveyor Belt Maintenance In a manufacturing setting, conveyor belt systems play a critical role in the efficient movement of materials throughout the production process. To ensure uninterrupted operation and prevent unexpected breakdowns, a proactive preventive maintenance approach is employed. What is preventive maintenance system examples? Preventive Maintenance Activities: Regular Inspections: Scheduled inspections of conveyor belts are conducted at predetermined intervals. Belt Tension Checks: Ensuring the proper tension of the conveyor belt to prevent slippage or excessive wear. Cleaning and Lubrication: Removal of debris and application of appropriate lubricants to reduce friction and wear. Replacement of Worn Components: Timely replacement of worn-out or damaged components such as rollers, bearings and splices. Benefits of Preventive Maintenance Cost Savings: Prevents major repairs, saving on extensive repair or replacement costs. Operational Continuity: Minimizes downtime by preventing unexpected breakdowns. Extended Lifecycle: Increases the lifespan of equipment, reducing the need for frequent replacements. Optimized Performance: Ensures efficient operation and peak performance of equipment. Energy Cost Savings: Well-maintained equipment operates more efficiently, lowering energy costs. Safety and Compliance: Mitigates safety risks, ensures compliance with regulations, and avoids legal issues. Enhanced Reliability: Reduces downtime, ensuring consistent production schedules. Asset Management: Optimizes inventory and ensures availability of spare parts for timely repairs. Improved Output Quality: Maintains consistent and high-quality output to meet customer expectations. Positive Reputation: Enhances the companys reputation for reliability and professionalism in the industry What is predictive maintenance with example? Understanding Predictive Maintenance Utilizing measurements to identify early indicators of system degradation, predictive maintenance changes traditional methods of care and makes it possible to remove or manage causing stressors before major deterioration takes place. Predictive maintenance is a data-driven, advanced technique that improves overall operating efficiency. In contrast with time-based preventive maintenance, predictive maintenance is based on the machines actual state. Predictive Maintenance Definition: Measuring the beginning of system degradation and the present and future functional capability of components are essential elements of predictive maintenance. It deviates from preventive maintenance in that it uses real-time data instead of predetermined schedules. Data-Driven Approach: Predictive maintenance makes use of data from the equipment to map out possible machine breakdowns and identify maintenance needs in a timely manner. Examples of Predictive Maintenance in Action: Temperature Alarms: As seen in data center server rooms, these alerts sound when machine temperatures depart from safe ranges, preventing hazardous overheating. Monitoring Engine Misfires: Engine sensors keep a watch out for misfires, sending out alerts for prompt maintenance and ensuring maximum engine performance. Refrigeration Truck Sensors: To protect sensitive products, refrigeration trucks have internal temperature sensors that warn drivers when temperatures drop below permissible ranges. Benefits of Predictive Maintenance: Enhanced Product Quality: By resolving any problems before they affect production, predictive maintenance improves the quality of the finished product. Decreased Catastrophic Failures: Prompt action reduces the possibility of catastrophic events, ensuring ongoing operational dependability. Enhanced Equipment Performance: Proactive maintenance based on real-time data is the key to achieving optimal equipment performance. Improved Customer Satisfaction: By ensuring dependable and constant delivery of goods or services, predictive maintenance helps to increase customer satisfaction. While there may be higher setup costs for predictive infrastructure, the long-term benefits include: Cost Savings: Predictive maintenance saves money by preventing major repairs and reducing energy consumption. Labor Reduction: Automation integrated into the predictive process can lead to a reduction in maintenance labor. Click here to know more about Difference between Predictive Maintenance and Preventive Maintenance What is reliability-centered maintenance? Reliability-Centered Maintenance (RCM) Determining the maintenance needs of physical assets within their operational environment is the primary objective of the whole procedure known as reliability-centered maintenance, or RCM. RCM recognizes variations in equipment design, operation, and susceptibility to various degradation reasons in comparison with traditional maintenance schedules. This strategy organizes maintenance programs by prioritizing and maximizing the use of limited human and financial resources. Reliability-Centered Maintenance (Proactive): Basic Philosophy: RCM (Proactive) utilizes predictive and preventive maintenance techniques, incorporating root cause failure analysis to detect and pinpoint precise problems. This approach employs advanced installation and repair techniques, including potential equipment redesign or modification to proactively avoid or eliminate issues. Advantages: Efficiency: Can be the most efficient maintenance program. Cost Reduction: Lowers costs by eliminating unnecessary maintenance or overhauls. Minimized Overhauls: Reduces the frequency of overhauls. Prevents Sudden Failures: Lowers the probability of sudden equipment failures. Focus on Critical Components: Allows for the focused maintenance of critical components. Increased Reliability: Enhances component reliability. Root Cause Analysis: Incorporates root cause analysis for continuous improvement. Disadvantages: Startup Costs: May have significant startup costs, including training and equipment. Visibility of Savings: Potential savings might not be immediately evident to management. Basic Steps: Initiating Reliability-Centered Maintenance Master Equipment List: Develop a list identifying all equipment in the facility. Prioritization: Prioritize components based on importance or criticality. Grouping: Assign components into logical groupings. Maintenance Activities: Determine maintenance activities using technical manuals, machinery history, root cause analysis, and engineering assessment. Assess Maintenance Staff: Consider the number of employees in maintenance. Operations Personnel Tasks: Identify tasks that may be performed by operations maintenance personnel. Failure Mode Analysis: Analyze equipment failure modes and their impacts. Mitigation Strategies: Identify effective maintenance tasks or mitigation strategies. What is statistical based predictive maintenance? Statistical-Based Predictive Maintenance Statistical-based predictive maintenance involves leveraging statistical models and data analysis to predict when equipment maintenance is needed. This method relies on historical data, patterns, and trends to forecast potential failures. By employing statistical algorithms, organizations can identify anomalies and deviations from expected equipment behavior. This approach is particularly effective for detecting gradual degradation or wear-and-tear that might not be apparent through routine inspections. Statistical models can analyze large datasets, making it a powerful tool for predicting maintenance needs based on the equipments statistical behavior over time. What are condition-based maintenance approaches? Condition-Based Predictive Maintenance: Condition-based predictive maintenance, on the other hand, relies on real-time data collected directly from the equipment during its operation. This approach involves using various sensors and monitoring devices to continuously assess the condition of the equipment. By measuring factors such as vibration, temperature, pressure, and other relevant parameters, organizations can gain insights into the actual operating condition of the equipment. This real-time data allows for more accurate and timely predictions of potential issues, enabling proactive maintenance before a failure occurs. Condition-based predictive maintenance is especially valuable for equipment with dynamic operating conditions, as it provides a more immediate and precise understanding of the equipments health. Comparing Statistical-Based vs. Condition-Based Predictive Maintenance FeatureStatistical-Based Predictive MaintenanceCondition-Based Predictive MaintenanceData UtilizationMakes use of statistical models and historical data.Depends on data that is obtained in real time directly from the equipment.Timing of PredictionsEstimates maintenance requirements by using historical trends and patterns.Provides real-time information by forecasting maintenance requirements while the machinery is in use.Detection FocusEffective for detecting gradual degradation and long-term trends.Particularly valuable for immediate insights into dynamic operating conditions.Data SourcesAnalyzes large datasets and historical records.Utilizes sensors and monitoring devices to assess current equipment conditions. Maintenance Types Comparison: Planned vs. Unplanned Strategies This extended table provides a more detailed overview, including task type, objective, and interval, for Planned Maintenance (with subtypes) and Unplanned (Reactive) Maintenance (with subtypes). FeaturePlanned MaintenancePreventive MaintenancePredictive MaintenanceRCM (Reliability-Centered Maintenance)Unplanned (Reactive) MaintenanceEmergency MaintenanceBreakdown MaintenanceTask TypeProactive and planned tasks based on schedules and insights.Scheduled preventive tasks addressing known issues or wear-and-tear.Predictive tasks based on real-time data and insights.Varied tasks based on equipment importance, degradation, and risk.Reactive tasks initiated by failure occurrences.Immediate response tasks to critical failures.Task initiated post-failure for repairs.ObjectiveProactively ensure equipment reliability and prevent failures.Prevent potential issues and extend equipment lifespan.Predict and prevent failures based on data insights.Optimize maintenance for equipment criticality and degradation mechanisms.Reactively address immediate safety or operational concerns.Urgently respond to safety-critical failures to mitigate risks.Address failures to restore normal operations.IntervalRegularly scheduled intervals based on equipment needs and historical data.Fixed intervals determined by manufacturer guidelines or past performance.Dynamic intervals based on real-time equipment condition and predictive analysis.Variable intervals based on equipment criticality, degradation, and risk.No predefined interval, response is triggered by failure occurrences.Immediate response triggered by safety-critical failure occurrences.Immediate response post-failure for repairs.Focus on Equipment ImportancePrioritizes critical equipment based on its importance to processes.Critical components are identified and scheduled for preventive tasks.Prioritizes equipment based on predictive insights and criticality.Recognizes varying importance of equipment and optimizes resources.Reactively addresses failures as they occur, regardless of criticality.Immediate attention to failures impacting safety or critical processes.Reactive response to failures regardless of criticality.Resource OptimizationPrioritizes and optimizes both financial and personnel resources.Efficiently allocates resources for scheduled preventive tasks.Optimizes resources based on real-time insights and equipment importance.Balances limited resources for optimal maintenance outcomes.Reactive response might result in inefficiencies and increased costs.Utilizes resources urgently to address safety-critical failures.Resource allocation after the failure has occurred.AdvantagesImproved efficiency, reduced costs, and enhanced equipment reliability.Regular upkeep prevents major failures, reducing overall maintenance costs.Timely maintenance based on real-time insights, enhancing reliability.Efficient maintenance program, reducing unnecessary tasks.Immediate response to critical failures, minimizing operational impact.Urgent response to safety-critical failures, ensuring safety.Addressing failures post-occurrence for continued operations.DisadvantagesInitial setup costs may be significant. Savings potential may not be immediately evident.Regular scheduled tasks may lead to some unnecessary maintenance.Requires investments in technology and training. Savings potential might not be immediately visible.Initial setup costs might be high, and potential savings may not be immediately visible.Reactive nature may result in higher costs, inefficiencies, and safety risks.Reactive approach may lead to higher operational costs. Choosing the Right Maintenance Strategy: A Comprehensive Guide Choosing the right maintenance strategy involves a careful evaluation of various factors and considerations. Here are some steps and considerations to guide you in selecting the most appropriate strategy: Risk Assessment: Evaluate the potential risks associated with equipment failure. Consider the consequences in terms of safety, production loss, and financial impact. Cost Analysis: Compare the cost of potential equipment failure with the cost of implementing different maintenance strategies. Assess the expenses related to reactive repairs, downtime, and lost production. Proactive vs. Reactive: If the cost of failure is greater than the cost of repairs, a reactive maintenance strategy may be suitable. If the cost of failure is higher, a proactive maintenance strategy may be more beneficial. Impact on Production: Analyze the time it takes for maintenance to occur under different strategies. Consider the impact of maintenance on production schedules and overall efficiency. Customer Impact: Assess whether customers will be impacted by equipment failures. Consider the potential damage to the businesss reputation and customer satisfaction. Combination of Strategies: Recognize that different equipment or systems may require different maintenance approaches. Implement a combination of strategies based on the nature and criticality of assets.Consider the lifecycle stage of the equipment. Proactive maintenance may be beneficial for critical assets, while reactive maintenance could be economical for equipment near the end of its lifecycle. Utilize Maintenance Management Software: Implement maintenance management software, such as CMMS (SAP), to automate tasks, streamline processes, and maintain an overview of maintenance activities. Utilize technology to carry out maintenance tasks more effectively and economically. Legal and Compliance Risks: Consider legal and compliance risks associated with equipment failure. Proactive maintenance can help in meeting regulatory requirements and reducing legal risks. Continuous Improvement: Regularly review and assess the effectiveness of the chosen maintenance strategy. Adopt a culture of constant improvement and modify your plans in response to changing equipment requirements and business needs. Key Benefits of Maintenance Maintenance is critical to helping businesses operate smoothly and cost-effectively. Companies can save money and avoid delays by maintaining their equipment, machinery, and facilities. However, the benefits of maintenance are contingent on how well it is planned and done. Lets look at why maintenance is important and how it might benefit your organization. Extend the Life of AssetsRegular maintenance, such as inspections, cleaning, and servicing, helps expensive equipment last longer. This not only saves money by delaying replacements, but also ensures that operations function smoothly. Boost PerformanceMaintaining assets ensures optimal performance and consistent results. This increases efficiency and production, ultimately leading to a higher return on investment (ROI). Prevent Unexpected DowntimeBreakdowns can halt operations, resulting in delays and financial losses. Proactive maintenance helps to avoid these delays and ensures that everything goes as planned. Save Money in the Long RunIndustrial machinery and equipment represent considerable investments. Regular maintenance reduces the chance of costly repairs or replacements, allowing organizations to get the most out of their assets. Maintenance vs. Repairs While both maintenance and repairs aim to keep operations running smoothly, their approaches differ. AspectMaintenanceRepairsDefinitionProactive actions taken to keep equipment in good working condition.Reactive actions taken to fix equipment after a failure or breakdown.GoalPrevent issues and extend the lifespan of assets.Restore functionality after a problem occurs.ApproachPlanned and scheduled activities.Unplanned and urgent responses to failures.FrequencyRegular (daily, weekly, monthly, or as per a schedule).Occasional, only when a breakdown happens.CostLow to moderate (preventive tasks are often inexpensive).High (due to urgency, parts replacement, and potential downtime).ExamplesCleaning, lubrication, inspections, part replacements, and system monitoring.Fixing a broken part, repairing a malfunction, or replacing damaged components.Impact on OperationsMinimizes disruptions by preventing failures.Causes downtime until the issue is resolved.Resource RequirementRequires dedicated personnel and a structured plan.Requires skilled technicians and immediate availability of parts/tools.Risk of DowntimeLow (planned maintenance can be scheduled during non-peak hours).High (unexpected breakdowns can halt operations).Long-Term BenefitsExtends equipment life, improves efficiency, and reduces overall costs.Restores functionality but doesnt prevent future issues.Examples in PracticeWeekly cleaning of machinery.- Monthly inspection of HVAC systems. Fixing a conveyor belt that has snapped.- Repairing a leaking pipe.Tools/Software UsedCMMS (Computerized Maintenance Management Systems) for scheduling and tracking.Emergency repair tools and diagnostic equipment.DependencyRelies on a proactive mindset and adherence to schedules.Relies on quick response times and availability of repair resources. ISO Maintenance Standards for Enhanced Asset Management The International Organization for Standardization (ISO) provides various maintenance standards that organizations can utilize to create best practices and ensure effective asset management. Here are some important ISO standards for maintenance: ISO 55000 Series Asset Management: Assists organizations of all sizes and industries in improving how they manage and maintain their assets. ISO 14224 Collection of Reliability and Maintenance Data: Aims to standardize how industries such as petroleum collect data on equipment reliability and maintenance. ISO 9001 Quality Management Systems: A general quality management standard that contains standards for effective maintenance processes that maintain the quality of products and services. ISO 18436 Series Condition Monitoring of Machines: Provides guidelines for monitoring machine conditions, including principles, personnel qualifications, and training. These standards help firms improve maintenance processes, improve asset performance, and meet industry standards for improved business outcomes. Click here to know more about different Instrumentation maintenance procedure Do you have any friends, clients, or coworkers who would benefit from this Types of maintenance knowledge? Please share information about this article. Maintenance refers to the procedures used to keep equipment, machinery, or facilities in good operating order. Its all about being proactive identifying and addressing possible concerns before they become huge problems. What Does Maintenance Involve? Inspecting, cleaning, repairing, and replacing parts are all examples of maintenance operations. These responsibilities ensure that systems and equipment are operating optimally and safely. What Are the Types of Maintenance? There are several types of maintenance, each serving a specific purpose: Preventive Maintenance: Regular checks to prevent issues. Corrective Maintenance: Fixing problems after they occur. Predictive Maintenance: Using data to predict and address potential failures. Condition-Based Maintenance: Monitoring equipment condition to determine when maintenance is needed. How Do You Create a Maintenance Plan? To develop an effective maintenance plan: List all equipment and machinery. Prioritize them according to importance. Determine maintenance schedules for each group. For precise needs, refer to the manufacturers guidelines. Assign duties and verify that the plan is implemented consistently. Whats the Difference Between PM and CM? PM (Preventive Maintenance): Scheduled tasks to prevent equipment failure. CM (Corrective Maintenance): Repairs done after a breakdown occurs. What is PMO in Maintenance? PMO (Planned Maintenance Optimization) is an approach for improving current maintenance procedures by studying previous failures and fine-tuning preventative maintenance routines. What is PM in TPM? PM (Planned Maintenance) is an aspect of Total Productive Maintenance (TPM) that focuses on scheduling and carrying out maintenance chores to enhance equipment efficiency and lifespan. What is the maintenance concept? The maintenance concept should include a concise summary of the system/equipment under developments maintenance considerations, restrictions, and operational support plans as determined from the Concept of Operations (CONOPS). There are different types of maintenance work, each designed for specific scenarios. Knowing the differences between maintenance types helps people determine which ones are the most suitable for their purposes.Routine MaintenanceRoutine maintenance, also referred to as preventive maintenance, is implemented on a fixed schedule and typically includes activities such as inspecting, cleaning, washing, replacing, and checking. It is typically performed in the downtime between shifts or on weekends to avoid affecting productivity goals.Planned MaintenanceWhere routine maintenance may happen on a daily, weekly, or monthly basis, planned maintenance may be scheduled once per year or as needed. This is because planned maintenance is more time-consuming, expensive, and thoroughoften requiring the services of a specialist.Corrective MaintenanceIf during your routine maintenance inspection of a car, you discover signs of severe wear and tear, you need to perform corrective maintenance. When computer or gauge readings for a machine show unusual, possibly hazardous anomalies, you need to perform corrective maintenance. Corrective maintenance pertains to the repairs and replacements necessary to get an asset back up and running at full power and in optimal condition.Predictive MaintenancePredictive maintenance focuses on techniques used to determine the appropriate schedule for planned and corrective maintenance. Its primary goal is to predict, through a variety of testing methods such as vibration analysis, when a machine will start experiencing severe wear and tear so corrective maintenance can be scheduled without affecting productivity goals.Benefits of MaintenanceIn general, businesses benefit from good maintenance practices. However, several factors need to be considered before you can determine if maintenance is helping your organization.Increase longevity of assets Having the patience and dedication to regularly inspect, clean, and care for an expensive asset helps operations maximize productivity and cut costs by preventing expensive repairs and replacements.Optimize asset performance A well-maintained asset operates at maximum capacity, positively affecting business ROI through efficiency and consistency.Avoid unscheduled downtimes Unexpected breakdowns can cause significant problems for any business. Diligent maintenance can help businesses avoid unexpected outages, ensuring operations run smoothly and without any hiccups.Minimize costs Most industrial machines used for business operations cost a small fortune, so it only makes sense to diligently maintain these assets to get the most out of them. Failure to implement good maintenance practices will lead to machine breakdowns, costing the business more money through avoidable repairs and replacements.Maintenance vs. RepairMaintenance and repair work have the same goal, which is to keep your business running efficiently as designed. Simply put, the goal of maintenance is to make repairs unnecessary.From the time a business acquires an asset, they should already have a maintenance plan ready for implementation. Routine maintenance techniques like cleaning and regular inspections are often done on a weekly, monthly, and sometimes even daily basis. Cleaning, monitoring, and inspecting can be done quickly and often at no cost while still contributing to an assets overall health and longevity.However, even with the best maintenance plan and personnel, the possibility of an unexpected machine breakdown can never be eliminated. When this happens, businesses need to rely on swift repairs to get their assets back up and running ASAP, before losses become insurmountable.Cultivate a culture of excellence with our digital solutions that enhance efficiency, agility, and continuous improvement across all operations.Maintenance Practices Across IndustriesGood maintenance programs benefit virtually all businesses across different industries; the only difference is how they apply maintenance techniques to achieve their business goals. Below is a list of how different industries apply maintenance practices to maximize their operations.AerospaceGood maintenance practices are crucial in the aerospace industry since malfunctions can result in high-fatality disasters. Aircraft maintenance is also legally mandated in Title 14 of the Code of Federal Regulations (14 CFR). The Federal Aviation Administration (FAA) mandates the following maintenance inspection activities: 100-hour inspection, annual inspection, and progressive inspection.Freight and LogisticsSometimes referred to as the transport industry, the freight and logistics industry is essential to the successful operation of many other industries since freight services are called upon to transport materials and tools needed for service and production. Some common maintenance practices in the freight and logistics industry are fleet maintenance and scheduled ship maintenance.Computers and ITWith our increasing reliance on computers for both work and our personal lives, it is naturally in everyones best interest to maintain them and ensure that they are operating at optimal levels. Common computer maintenance processes include server maintenance and IT risk assessments.AgricultureAgricultural activities rely heavily on equipment and industrial-grade chemicals to complete. Proper farm maintenance plays a crucial role in ensuring that workers are safe from work-related injuries and operations proceed without a hitch. Maintenance activities include equipment maintenance and facility maintenance.Real EstateCommercial, residential, and industrial buildings require regular maintenance to retain their structural integrity and functionality, avoiding deterioration and eventual collapse. Below are some common maintenance techniques practiced in the real estate industry. Food and BeverageThe maintenance of food processing machines, utensils, and facilities is the foundation upon which successful food companies and restaurants are built. Maintenance examples in this industry include kitchen maintenance and chiller maintenance.HospitalityTo achieve and maintain customer satisfaction and keep customers coming back, hotels and lodges need to keep their establishments in pristine condition through diligent and consistent maintenance practices. This can be done through regular hotel maintenance, as well as HVAC maintenance, among other things.ManufacturingCompanies in the manufacturing industry utilize heavy-duty machinery for mass production. To prevent machine breakdowns that disrupt operations, good machine maintenance protocols must be implementedmachine maintenance and factory maintenance are already a great start.RetailThere are multiple factors to be considered when coming up with a winning formula for a successful retail company. Selling high-quality products and having great customer service are some of the more obvious elements. Consistent implementation of good store maintenance practices, however, is just as important in making sure your business operates at full capacity.Maintenance Training: Your Key to Building a Culture of SafetyBreak free from the limits of traditional face-to-face training. Thanks to the advancement of mobile training apps, its now easier to create your maintenance training and make it available for your team anytime, anywhere, and on any device. Here, weve made a list of some maintenance training that is perfect for busy teams who need to stay on top of their safety game.In this post, I will be diving into the topic of maintenancean essential aspect of ensuring that equipment, systems, or services function at their best. Ill start by explaining what maintenance is, followed by the meaning and definition of maintenance, so you have a clear understanding of its importance.We will also clarify a common confusion: maintenance vs. maintainance, discussing which one is correct and why. Ill cover the different types of maintenance and their unique characteristics, so you can see how each type serves a specific purpose. Plus, Ill provide some real-world examples of maintenance to make it all more relatable.Youll also learn about the term under maintenance and what it really means when a service is temporarily unavailable. Ill explain the role of routine maintenance and why its crucial for smooth operations. Lastly, Ill share the 7 amazing benefits of maintenance, showing how it can improve reliability, reduce costs, and extend the lifespan of assets.What is Maintenance?Maintenance is the routine process of inspecting, servicing, and repairing equipment or systems to ensure they function properly and safely. It includes tasks like cleaning, lubrication, replacing worn parts, and fixing issues to prevent breakdowns. There are various types of maintenancepreventive, corrective, and predictiveeach aimed at improving reliability and extending the life of assets. Whether in industries, homes, or vehicles, regular maintenance helps reduce unexpected failures, lowers long-term costs, and ensures smooth, uninterrupted operations.Maintenance MeaningIn the context of engineering and facility management, maintenance refers to the regular care, inspection, repair, and upkeep of equipment, machinery, and systems to ensure they operate efficiently and safely. Proper maintenance extends the lifespan of assets, reduces the risk of breakdowns, and helps avoid costly repairs. Maintenance activities can range from routine inspections to major repairs and are essential in industries like manufacturing, construction, and transportation.Maintenance DefinitionMaintenance is defined as the activities undertaken to keep equipment and systems in optimal working condition, including repairs, replacements, adjustments, and servicing. It is a proactive approach aimed at preserving the functionality and reliability of assets, minimizing downtime, and maximizing efficiency. Maintenance can be classified into several types, including preventive, predictive, corrective, and condition-based maintenance.Maintenance SpellingThe correct spelling of the word is maintenance. It refers to the process of keeping something in good working order through regular checks, repairs, and updates to ensure its proper functioning over time.Maintenance or Maintainance Which is Correct?The correct spelling is maintenance, not maintainance. Many people mistakenly spell it as maintainance because of the verb maintain, but the noun form drops the ai and becomes maintenance. This word refers to the act of keeping something in good condition through regular servicing or care. Using the correct spelling is important for professional writing, especially in technical, industrial, and mechanical contexts.Types of Maintenance and Their CharacteristicsType of MaintenanceDescriptionExamplePreventive MaintenanceRoutine actions taken to prevent equipment failureRegularly lubricating machinery to avoid wear and tearPredictive MaintenanceUsing data to predict when equipment needs maintenanceMonitoring vibration in rotating equipment to detect signs of wear before failureCorrective MaintenanceRepairs made after equipment malfunctionsFixing a machine that has stopped working due to a motor issueCondition-Based MaintenanceMaintenance based on the actual condition of equipmentInspecting and repairing only when needed, like replacing air filters when airflow is reduced1. Preventive Maintenance:Preventive maintenance involves regularly scheduled inspections and servicing to prevent equipment failures before they happen. It includes tasks like cleaning, lubrication, adjustments, and part replacements to ensure machinery runs smoothly and avoids unexpected breakdowns.2. Corrective Maintenance:Corrective maintenance is performed after a problem or failure is detected. It focuses on repairing or replacing faulty components to restore equipment to its normal operating condition. This type of maintenance is essential for addressing unexpected issues promptly.3. Predictive Maintenance:Predictive maintenance uses data, sensors, and monitoring tools to predict equipment failures before they occur. By analyzing performance patterns, this approach helps schedule maintenance only when necessary, reducing unplanned downtime and minimizing maintenance costs while improving reliability.4. Routine Maintenance:Routine maintenance includes simple, frequent tasks such as cleaning, checking fluid levels, tightening loose parts, or visual inspections. These actions help maintain daily functionality, ensure safety, and extend equipment life with minimal effort and cost involved.Examples of MaintenanceMaintenance is the process of keeping systems, machinery, and infrastructure in optimal condition through various methods, ensuring longevity, safety, and efficiency. It plays a vital role in preventing breakdowns and improving operational performance. Here are several examples of maintenance across different contexts:1. Preventive MaintenancePreventive maintenance involves scheduled checks and services to prevent equipment from failing. For example, a factory conducts regular inspections and lubricates machinery every month to avoid wear and tear, ensuring smooth operations and reducing the likelihood of sudden breakdowns.2. Corrective MaintenanceCorrective maintenance is performed when equipment breaks down. For instance, if a conveyor belt stops working due to a malfunction, technicians repair the faulty component to restore the system to proper working condition, minimizing downtime.3. Predictive MaintenancePredictive maintenance uses data to forecast when maintenance will be needed. An example is installing sensors on factory equipment to monitor vibrations and temperature. Based on this data, maintenance is scheduled before a problem occurs, avoiding unexpected downtime.4. Routine MaintenanceRoutine maintenance includes regular tasks performed to keep equipment functioning. An example is a car owner who changes the oil and filters every 5,000 miles, preventing engine issues and ensuring the vehicle runs efficiently for a long time.5. Emergency MaintenanceEmergency maintenance is required to address urgent issues. For example, if a buildings water pipe bursts, immediate repairs are necessary to prevent flooding and damage, ensuring the water supply is restored quickly.6. Structural MaintenanceStructural maintenance involves the upkeep of buildings and infrastructure. An example is regularly inspecting and repairing a roof to prevent leaks, ensuring the structure remains intact and safe for occupancy over time.7. IT System MaintenanceIn IT, maintenance ensures software and hardware systems remain secure and perform well. A company might regularly update its software and install security patches to protect against cyber threats and ensure smooth functionality.Under Maintenance:Under maintenance refers to a status indicating that a system, website, or service is temporarily unavailable due to scheduled or unscheduled repairs, updates, or improvements. During this time, essential work is being carried out to ensure the system operates more efficiently or securely. Users may experience downtime or limited access to features, and the service is typically restored once the necessary changes are completed. This status is commonly displayed to inform users of the ongoing work and to manage expectations.Routine Maintenance:Routine maintenance refers to regular, scheduled tasks performed to keep equipment, systems, or services in optimal working condition. It involves preventive actions such as software updates, hardware checks, and system optimizations to prevent unexpected failures, enhance performance, and extend the lifespan of the asset. Routine maintenance is typically planned in advance and can include tasks like cleaning, inspections, and replacing worn-out parts. Its purpose is to minimize downtime and ensure continued smooth operation, making it a proactive approach to system management.What Is Load? Types, Meaning, Testing, and Load Factor7 Amazing Benefits of Maintenance1. Improves Equipment ReliabilityRegular maintenance ensures machines function smoothly, reducing unexpected breakdowns. This enhances the reliability of your equipment, keeping operations steady and avoiding costly disruptions. Reliable equipment increases overall productivity and minimizes downtime.2. Increases Lifespan of AssetsProper maintenance preserves the lifespan of equipment and machinery, protecting your investments. By addressing minor issues early, you can extend the useful life of assets, delaying expensive replacements and improving long-term cost-effectiveness.3. Reduces Operational CostsPreventive maintenance lowers the likelihood of costly repairs, unplanned downtime, and emergency fixes. By keeping equipment in top condition, you minimize unexpected costs, helping your business stay within budget and maximize profits.4. Enhances Safety StandardsMaintaining equipment ensures it operates safely, reducing the risk of accidents and injuries. Regular inspections and repairs help identify potential hazards, keeping workers safe and compliant with safety regulations to promote a secure work environment.5. Boosts Energy EfficiencyWell-maintained machines consume less energy by operating at optimal efficiency. Regular servicing, such as cleaning and lubrication, prevents energy wastage, reducing operational costs and lowering your carbon footprint while improving overall system performance.6. Improves ProductivityWith consistent maintenance, equipment runs at peak performance, minimizing breakdowns that disrupt workflows. This enhances productivity, ensuring smooth operations, timely deliveries, and meeting customer expectations, which ultimately drives business growth and success.7. Supports Compliance and Regulatory StandardsMaintenance helps companies meet legal and industry-specific regulations. Regular inspections ensure compliance with safety, environmental, and operational standards, preventing costly fines, and ensuring that all equipment and systems meet necessary guidelines.Video Guide: Importance of MaintenanceThis video explains what maintenance is, the different types, key benefits, and common mistakes people make. Watch to gain valuable insights for effective maintenance and avoid common errors.Conclusion:In conclusion, maintenance is a critical process that helps keep systems, equipment, and machinery running smoothly. Whether its routine checks or major repairs, maintenance plays a vital role in enhancing reliability, reducing costs, and improving overall performance. By understanding its types and benefits, you can make more informed decisions about the upkeep of your assets, ensuring they last longer and perform better.There are different types of maintenance work, each designed for specific scenarios. 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This can be done through regular hotel maintenance, as well as HVAC maintenance, among other things.ManufacturingCompanies in the manufacturing industry utilize heavy-duty machinery for mass production. To prevent machine breakdowns that disrupt operations, good machine maintenance protocols must be implementedmachine maintenance and factory maintenance are already a great start.RetailThere are multiple factors to be considered when coming up with a winning formula for a successful retail company. Selling high-quality products and having great customer service are some of the more obvious elements. Consistent implementation of good store maintenance practices, however, is just as important in making sure your business operates at full capacity.Maintenance Training: Your Key to Building a Culture of SafetyBreak free from the limits of traditional face-to-face training. Thanks to the advancement of mobile training apps, its now easier to create your maintenance training and make it available for your team anytime, anywhere, and on any device. Here, weve made a list of some maintenance training that is perfect for busy teams who need to stay on top of their safety game.Maintenance is the routine and recurring process of keeping a particular machine or asset in its normal operating conditions.So that it can deliver the expected performance or service without any loss or damage. OrMaintenance is defined as All actions necessary for retaining an item, or restoring to it, a serviceable condition, include servicing, repair, modification, overhaul, inspection and condition verificationIncrease availability of a systemKeep systems equipment in working orderRead more :What is Maintenance Engineering | Career in Mechanical FieldPurpose of Maintenance Attempt to maximize performance of production equipment efficiently and regularlyPrevent breakdown or failuresMinimize production loss from failuresIncrease reliability of the operating systemsPrinciple Objectives in Maintenance To achieve product quality and customer satisfaction through adjusted and serviced equipmentMaximize useful life of equipmentKeep equipment safe and prevent safety hazardsMinimize frequency and severity of interruptionsMaximize production capacity through high utilization of facilityMaintenance Engineering objectives Maintenance Manager If you choose to take an entry-level position in order to become a facilities maintenance manager, you can expect to spend several years working maintenance positions as you learn the skills necessary to become a manager. Larger employers with greater maintenance needs generally look for a facilities maintenance manager who can perform these tasks when needed, but is more focused on managing an in-house staff responsible for the majority of the actual work.Maintenance Engineering Jobs Typically, maintenance engineers need to possess knowledge of the principles of building or mechanical engineering. Maintenance engineer jobs generally require the person to maintain the plant or manage a crew who maintains it.They also set schedules, hand out paychecks, assign job duties, and monitor daily progress. Most construction engineering jobs require at least a bachelors degree in civil engineering or project management.Problems in Maintenance Lack of management attention to maintenanceLittle participation by accounting in analyzing and reporting costsDifficulties in applying quantitative analysisDifficulties in obtaining time and cost estimates for maintenance worksDifficulties in measuring performanceProblems Exist Due To: Failure to develop written objectives and policyInadequate budgetary controlInadequate control procedures for work order, service requests etc.Infrequent use of standardsTo control maintenance workAbsence of cost reports to aid maintenance planning and control systemMaintenance Costs Cost to replace or repairLosses of outputDelayed shipmentScrap and rework link to Top Branches of Mechanical Engineering link to Shree Ram Ayodhya Murti, idol - Vector , WallartThere are different types of maintenance work, each designed for specific scenarios. Knowing the differences between maintenance types helps people determine which ones are the most suitable for their purposes.Routine MaintenanceRoutine maintenance, also referred to as preventive maintenance, is implemented on a fixed schedule and typically includes activities such as inspecting, cleaning, washing, replacing, and checking. It is typically performed in the downtime between shifts or on weekends to avoid affecting productivity goals.Planned MaintenanceWhere routine maintenance may happen on a daily, weekly, or monthly basis, planned maintenance may be scheduled once per year or as needed. This is because planned maintenance is more time-consuming, expensive, and thoroughoften requiring the services of a specialist.Corrective MaintenanceIf during your routine maintenance inspection of a car, you discover signs of severe wear and tear, you need to perform corrective maintenance. When computer or gauge readings for a machine show unusual, possibly hazardous anomalies, you need to perform corrective maintenance. Corrective maintenance

pertains to the repairs and replacements necessary to get an asset back up and running at full power and in optimal condition.Predictive MaintenancePredictive maintenance focuses on techniques used to determine the appropriate schedule for planned and corrective maintenance. Its primary goal is to predict, through a variety of testing methods such as vibration analysis, when a machine will start experiencing severe wear and tear so corrective maintenance can be scheduled without affecting productivity goals.Benefits of MaintenanceIn general, businesses benefit from good maintenance practices. However, several factors need to be considered before you can determine if maintenance is helping your organization.Increase longevity of assets Having the patience and dedication to regularly inspect, clean, and care for an expensive asset helps operations maximize productivity and cut costs by preventing expensive repairs and replacements.Optimize asset performance A well-maintained asset operates at maximum capacity, positively affecting business ROI through efficiency and consistency.Avoid unscheduled downtimes Unexpected breakdowns can cause significant problems for any business. Diligent maintenance can help businesses avoid unexpected outages, ensuring operations run smoothly and without any hiccups.Minimize costs Most industrial machines used for business operations cost a small fortune, so it only makes sense to diligently maintain these assets to get the most out of them. Failure to implement good maintenance practices will lead to machine breakdowns, costing the business more money through avoidable repairs and replacements.Maintenance vs. RepairMaintenance and repair work have the same goal, which is to keep your business running efficiently as designed. Simply put, the goal of maintenance is to make repairs unnecessary.From the time a business acquires an asset, they should already have a maintenance plan ready for implementation. Routine maintenance techniques like cleaning and regular inspections are often done on a weekly, monthly, and sometimes even daily basis. Cleaning, monitoring, and inspecting can be done quickly and often at no cost while still contributing to an assets overall health and longevity.However, even with the best maintenance plan and personnel, the possibility of an unexpected machine breakdown can never be eliminated. When this happens, businesses need to rely on swift repairs to get their assets back up and running ASAP, before losses become insurmountable.Cultivate a culture of excellence with our digital solutions that enhance efficiency, agility, and continuous improvement across all operations.Maintenance Practices Across IndustriesGood maintenance programs benefit virtually all businesses across different industries; the only difference is how they apply maintenance techniques to achieve their business goals. Below is a list of how different industries apply maintenance practices to maximize their operations.AerospaceGood maintenance practices are crucial in the aerospace industry since malfunctions can result in high-fatality disasters. Aircraft maintenance is also legally mandated in Title 14 of the Code of Federal Regulations (14 CFR). 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Compressor is said to be maintained per 2000 hour with multiples in general are: Compressor preventive maintenance checklist: This activity is usually done to check compressor conditions such as checking the oil level.Checklist of running hour, temperature and pressure operating data.cleaning the outside of the compressor and checking for leaks This weekly activity is usually carried out for such minor treatments Cleaning filter water.Clean the engine from dirt or machined dustmake minor repairs such as oil leakage.Clean the fin cooler by spraying it. This treatment is done to replace the fast moving of the compressor as well as what minor repairs if there are abnormalities such as: Water filter replacementOil filter replacementOil change (when using mineral oil)Electricity casting.Minor repairs if indicated there are abnormalities that must be corrected.Cleaning engine parts that are dirty from oil and dust This activity is carried out to carry out further treatment after 200 hours by doing: Filter oil changewater filter replacementoil separator replacementcompressor oil replacement (both synthetic and mineral)General cleaning including cleaning coolerchecking the electrical systemminor improvements indicated earlier This activity is carried out as in the 4000 hour preventive maintenance activities such as: Filter oil change water filter replacementoil separator replacementcompressor oil replacement (both synthetic and mineral)General cleaning including cleaning coolerchecking the electrical systemminor improvement indicated earlier.Oil thermal valve replacementreplacement auto drain kitChecking with motor and screw vibrations using the SVM meter This activity is usually called a big service or overhaul with activities like: Perform replacement of all bearings on the engine. Overhaul kit replacementFilter oil changewater filter replacementoil separator replacementcompressor oil replacement (both synthetic and mineral)General cleaning including cleaning coolerchecking the electrical systempreviously indicated improvementsOil thermal valve replacementauto drain kit replacement There are different types of maintenance work, each designed for specific scenarios. Knowing the differences between maintenance types helps people determine which ones are the most suitable for their purposes.Routine MaintenanceRoutine maintenance, also referred to as preventive maintenance, is implemented on a fixed schedule and typically includes activities such as inspecting, cleaning, washing, replacing, and checking. 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What are the main purpose of database maintenance activities. Purpose of maintenance. What is the main purpose of computer maintenance. Main objective of maintenance. What is the main purpose of preventive maintenance. What is the purpose of preventive maintenance in electrical installation and maintenance. What is the main purpose of having a vehicle maintenance inspection.