By Joel Levitt CMRP, CMPP, CRL

JDL@Maintrainer.com WWW.MaintenanceTraining.com

Summary
Effective maintenance management involves three critical steps. First, establish a robust filing system to organize asset data. Second, a detailed physical survey will be conducted to assess maintenance exposures. Third, work orders and inspection tickets should be integrated to build a comprehensive database for informed decision-making. While computers aid complex environments, smaller facilities may benefit from manual systems. Efficient workflows, including backlog and pending work management, enhance responsiveness and accountability. Preventive maintenance minimizes emergencies and customer complaints, while root-cause analysis ensures long-term solutions. Proactive systems foster operational efficiency and prevent maintenance failures, highlighting the importance of structured processes and diligent record-keeping.

Buildings and Facilities -Steps to Set up a Maintenance System

There are three steps to the process of running a maintenance department.

• The first step is to set up your filing systems so you will have a place to put the stuff that's created.

• The second step is to do a physical survey and analyze each part of your property, property, or equipment type for its maintenance exposures.

• The third step is to start incorporating your work orders and inspection tickets to build a comprehensive group of information – a "database" – which will provide you with convenient access to information about all your assets. You will have a file folder for each asset in your database (no computer needed for this database!).

Simple concept
Whenever you get a work order against that asset, you stick it into the file folder – that's what a database is. Whether the file folder is in your hands or a computer is irrelevant as long as it's where you can get to it quickly.

If you have a larger environment, you will be forced to use a computer because it would be the only way to keep all the records of labor hours as they are received. Given calculators and enough time, the computer has no capabilities beyond those that people can do manually.

However, if you have 1,000 assets, you won't have enough people to track all the work orders coming in and recap them to the correct places. If you have a small environment, it might be better not to use a computer. Computers in facilities are overkill in most situations. The situations where computers are needed are:

• Where there are multi-shifts and people are working around the clock; or

• There are multiple buildings where you physically can't see everybody or

 • People are spread over two or more sites or circumstances.

In these environments, a computer makes sense. If you have only one building, even a rather large one, a computer can help with management aspects. Many building services departments have gotten buried by what the computer makes them do, and they don't have time to do their jobs.

Example of a circumstance in which a computer can be helpful:
One maintenance administrator was in charge of 13 nursing homes, and the local site managers put all their work orders in from their sites. The maintenance administrator was then able to look at each of the 13 sites, make comparisons, and then make some conclusions about how good or bad they were or if they were over or under-crewed. The computer made a lot of sense in that situation, even though each site was not big enough to justify it. Due to the regulatory requirements of nursing homes, a CMMS would be helpful in quickly establishing that mandated maintenance is being done.

Set Up a manual system
Set up a loose-leaf binder or file folder for every property. If you have relatively small buildings, set them up with the following ten categories:
1. Grounds/Paving/Driveway/Garage
2. Exterior/Roof
3. Heat /Hot Water/Plumbing
4. Kitchen (Food Service)/Restrooms
5. Basement/Structure
6. Electric
7. Interior
8. Inspections/Log Sheets
9. Meter Readings
10. Other If your buildings are more extensive, you must set them up by assets.

Setting up the file folders is easy. Look at your site and decide how to set it up – whether by assets or systems. Setup by systems for smaller buildings where there is less activity. Setup by assets if the building or buildings are too large and there is too much activity to manage by systems.

You can determine all necessary information if you have maintained the filing system. If you have the wrong information or no information in the file, there will be no advantage when, maybe five years from now, there is a problem.

 Conduct a Survey
The purpose of the survey is to create a picture of the property in a specific time frame -- a concise picture of every asset, including grounds and lawns -- cataloged and broken down by assets so you can see if something has changed in the future.

What to look for in the survey
Survey information should cover the entire property for maintenance and liability exposure and should include:

• Access items, such as doors, windows, hatches

• ADA requirements (disabled/alternatively-abled access)

• Compressors and process equipment

• Computer rooms

• Control systems (such as thermostats)

• Elevators

• Electrical items (central)

• Exterior finishes, Exterior Accessories

• Generators, pumps

• Grounds

• HVAC components (heating, ventilation, air conditioning, exhaust systems)

• Interior finish

• Kitchen Equipment

• Laundry Equipment

• Lighting

• Pavement, sidewalks, parking areas

• Production equipment

• Plumbing items (central)

• Restrooms

• Roofing

• Safety/security systems: Fire alarm, fire extinguisher, smoke detectors, security systems

• Street (how close do the busses, heavy traffic, big trucks, and trains go to the foundation of your building)

• Physical structure of building

• Swimming pools

• Tanks (both underground and above ground), piping systems

• Trash compactors, trash handling systems

Inspectors should have the following tools for the initial survey:

• Binoculars (for visual inspection of soffits, gutters, etc.)

• Magnifying glass to examine paints, surfaces, sub-strata

• Folding knife

• Phone or Digital camera for recording problems or locations

• Step ladder, extension ladder

• Measuring tape

• Outlet tester (3-prong with an adapter to check ground and polarity)

• Hand tools

• Good flashlight

Items to collect or generate in a survey are:

1. Plans or surveys of each plot (with the building and lot size), aerial photographs, any sets of blueprints, sketches (plan views) showing where utilities enter the property, and locations of all shutoffs.

2. Ground-level photos of the street views in both directions, where appropriate;

3. A filled-out Building History Form for each building

4. A filled-out Asset Information Sheet for every significant asset (including equipment like heaters -- make, model, serial number), wall, floor, ceiling finish and materials, and manuals for equipment (they can be three-hole punched and added to the correct sections of the property book); extensive facilities could file books in their technical library, and

5. Maintenance Write-ups for all deficiencies would be placed into an "In-Box" on the appropriate person's desk.

6. Along with the Asset Information Sheets, record the condition of each asset, if it's possible to determine that information from a physical survey.

For example, it may be possible to tell reasonably accurately how long some roofs will last by simply going up and checking things out. On other roofs, you may not be able to see the problems.

Condition and possible degradation of many other assets – cooling towers, for example -- are easily gauged visually. If you're skilled in such evaluations, approximate how much you will need to spend on each unit in the next few years. Of course, this would be an educated guess.

Get those manuals!
When you take over the care and maintenance of an existing building, one of the things you need to do is get all the owner's manuals. However, it is unlikely you will get them

all. The first place to try is the OEM's website. Typically, you can download a manual with the model number. If that doesn't work, some websites provide O&M manuals at a nominal charge. They may not be available anywhere, but it would be to your benefit to attempt.

Note Any Special Conditions

Are there any special conditions that would affect the preventive maintenance (PM) system? One famous situation occurred in Philadelphia at the Bellevue-Stratford Hotel, where an outbreak of Legionnaire's disease resulted from an air intake near the cooling tower. Pigeon droppings had accumulated in the water and caused specific bacteria to be sucked into the intakes.

This unique situation was where the intakes were pulling in the air that was not clean. If you encounter such unique problems, you will schedule a rebuild, which they did. Before something like that occurs, you could schedule more frequent and intensive preventive maintenance. For an older building, much of the information is not always available. If the work has been done in the past 20 years, you should be able to find out about it.

Survey Forms on which to write up deficiencies

Decide at some point how detailed you will go in separating and keeping track of your assets. Decide which assets to group and which to track, and divide them by logical categories. Be wary of keeping track of assets by location. It is not practical because things get moved around.

Be cautious when setting up your asset information. For example, doors that are all the same can be classified as one aggregate under the category of "Doors." This organization would allow for comparison to other kinds of doors for performance and wear. Tracking by type is certainly a possibility you might want to explore. Asset Detail Sheet Let's say there is a boiler system in the basement, and the boiler has some components that need to be tracked separately – the fuel pump, the nozzles or injection system, and the circulating pump on a hot water system.

The Asset Detail Sheet

provides a place to capture all the detailed information about the equipment. When it goes down, you'll know exactly where to find what you need to buy to replace parts rather than sending someone out to crawl through the mechanical area to find the serial numbers. All this can be recorded ahead of time. This level of detail may take a couple of months or more, depending on the size of the facility, but it will be worth the effort and time spent on productivity.

MECHANICAL ASSET INFORMATION SHEET	ASSET NUMBER:		DEPARTMENT:

ASSET DESCRIPTION:	DATE OF SURVEY:

LOCATION OF ASSET:	MANAGER RESPONSIBLE FOR ASSET:

MANUFACTURER:	S/N:

SPECS/ELECTRICAL CHARACTERISTICS:

LOCATION OF: MANUAL
            BILL OF MATERIAL
            DRAWINGS
	LOCK-OUT INSTRUCTIONS
	ATTACHED ☐

CONNECTION TO WHICH ASSET DIAGRAM:

CONDITION OF ASSET: WORK TO BE DONE:	ESTIMATE

PROBABILITY —OF—REPLACEMENT

IMMEDIATE	6 MO	1 YR	2 YR	3-5 YR	5-10 YR	WHEN

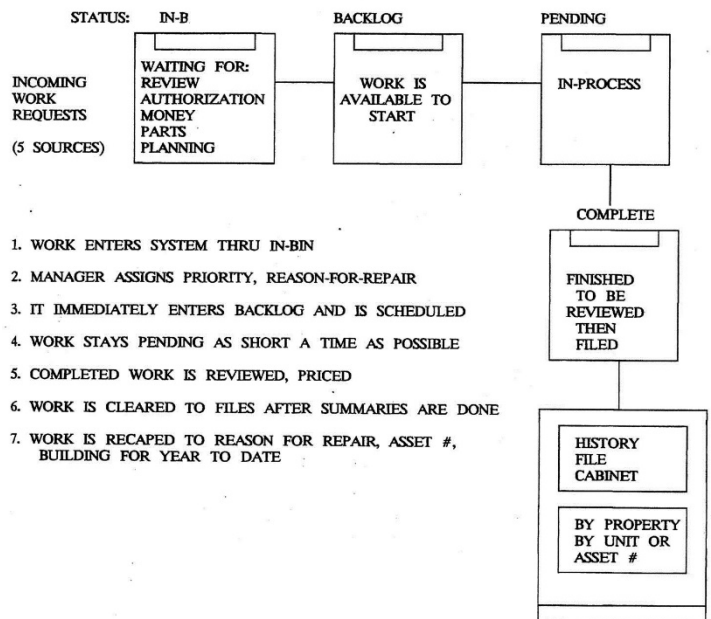**NOTES TO PM SYSTEM, SPECIAL TASKS:**

	SURVEYER:

Example doors:

For example, keep track of the doors to decide if that kind of door should be used again for a particular application.

- Is there another kind of door that would have been better?
- What's good about it? Is it easy to service, is it reliable, is it inexpensive, or does it have a low life-cycle cost?
- What exactly is advantageous about that door?
- How long does it take to fix when it breaks?
- What are the breakdown modes?
- Are there any breakdowns that you can engineer yourself out of? Maybe a screw that pulls out can be prevented by simply installing a plate with the initial installation of the door, thereby making it a non-issue.

Capture the basic information; make sure it's available when you need to make decisions.

The Clipboard Control System shows the steps your work orders need to take.

CLIPBOARD CONTROL SYSTEM

STATUS:	IN-B	BACKLOG	PENDING
INCOMING WORK REQUESTS (5 SOURCES)	WAITING FOR: REVIEW AUTHORIZATION MONEY PARTS PLANNING	WORK IS AVAILABLE TO START	IN-PROCESS

COMPLETE

1. WORK ENTERS SYSTEM THRU IN-BIN
2. MANAGER ASSIGNS PRIORITY, REASON-FOR-REPAIR
3. IT IMMEDIATELY ENTERS BACKLOG AND IS SCHEDULED
4. WORK STAYS PENDING AS SHORT A TIME AS POSSIBLE
5. COMPLETED WORK IS REVIEWED, PRICED
6. WORK IS CLEARED TO FILES AFTER SUMMARIES ARE DONE
7. WORK IS RECAPED TO REASON FOR REPAIR, ASSET #, BUILDING FOR YEAR TO DATE

FINISHED TO BE REVIEWED THEN FILED

HISTORY FILE CABINET

BY PROPERTY BY UNIT OR ASSET #

Step 1: In-Box When the work comes in, it will go into an In-Box or a file folder on the person's desk, which will determine if the work is authorized and is under the jurisdiction of the department requesting it. The work order may need special handling. Is there money available in the budget to do this job? Are the parts available, or do they need to be ordered? Is there planning that needs to be done?

Step 2: Backlog Once you've checked it out, the work order goes
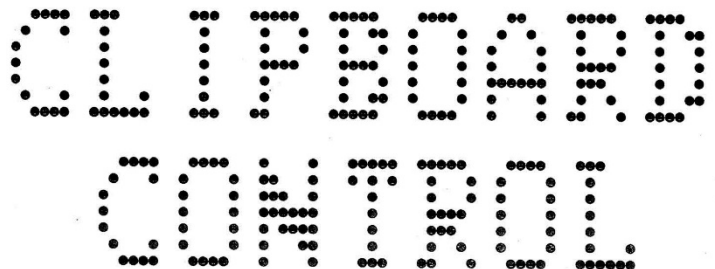
into the Backlog. The backlog is divided into work waiting for something (parts, contractor labor, engineering, money, etc.) and work available to start (Ready Backlog). Ready Backlog is the most critical type of work to track and manage.

If the backlog falls too low, people sit around and stretch out other jobs because they're afraid there could be a layoff. Employees get overwhelmed if the backlog gets too long and the customers wait. The longer customers wait, the higher they prioritize the things they've requested. This priority escalation causes the priority system to get muddied because people request simple things as high priorities.

For example, one particular steel mill had a 96-week active backlog. Even if no work orders came in, they would have had about two years of work on the books. How can you run an operation with two years' worth of work in the books? What if you're a production supervisor in a steel mill and need to get some hand railings around a machine? How do you get it done?

First, you could call it a "safety hazard" because the backlog on safety hazards is only about 16 weeks. Or maybe you would block the way of any maintenance personnel as they walk through the area. Or, perhaps you would have one of your guys go into the welding shop and make the railings. You might even set up your maintenance department and say, "Forget them; I'll do my work." Maybe you could get plant management to authorize a contractor to do the work on-site.

There are many ways to get things done, but that's the worst scenario. Another confounding impact is people will submit multiple requests for the same work because nobody remembers what they requested six months ago. When the issue comes up again, another work order is put in. You won't even know what jobs in the backlog are still valid. Ideally, there should be no less than a one-week backlog per tradesperson and no more than three weeks. This gives one to three weeks of backlog per person. If it goes beyond that, there will be problems servicing the customers. If it goes much shorter than that, there will be employees who will walk out because they don't have enough materials to do the job.

Step 3: Pending As soon as the work is issued to someone, the work goes from backlog into a state called Pending. Pending means the work order has been issued to a mechanic, and it's in the process; though the mechanic might not have physically started the work, it will be started within a short period. Once it's begun, pending work will need to be finished soon.

Pending work gets a lot of departments into trouble because they jump from job to job, and nothing ever gets finished. That's always a symptom of a poorly organized effort. It means that there is a "knee-jerk" type of maintenance manager who jumps whenever someone makes a request.

More appropriately, the maintenance manager will do whatever is necessary for public relations but won't interrupt the current work unless it's imperative. That way, the

pending work will stay relatively low. When the pending work is completed, it must be reviewed and filed back into the system. In smaller organizations, this can all be organized on four clipboards (therefore, the name Clipboard Control System).

Once the file system has been built and the survey completed, you must begin collecting work orders and inspection tickets and filing them by asset, either on a computer or manually. Every time someone works on an asset, that information must be entered into the filing system. Then, you can look back and see all the required information for future construction.

Maintenance Cycle
The Maintenance Cycle includes five categories of incoming work.

Category One The first category is the work initiated by the tenant, the user, or the customer. The customer calls you and tells you there's a problem. Maybe water is gushing out of a pipe, the room is too hot or cold, or too much air is coming out. This is customer work. It could be a real emergency or an actual life-and-death situation. Or it could be routine and minor. Interestingly, the company will judge you by your services to the customers more than anything else, not even by how good you are at running your maintenance department. So, it behooves you to have good customer inquiry response systems, even when the "emergency" is not essential.

Category Two The second category is work initiated by the PM system. This category should become the most significant part of your work, and customer complaints should drop as the backlog goes down. After six months to a year, there should be far fewer customer complaints as the system becomes more effective. Category Three 7 The third category is routine work. That's work that you do of a known quantity and duration. For example, suppose you have a manufacturing operation that shuts down each weekend. In that case, you might need to assign a maintenance mechanic for two hours every Monday morning to start the line up, or to start the boiler or an air conditioning system. You would need somebody qualified to help start regularly, which is routine work for which two hours are allocated every Monday morning. Another example of a routine job would be policing an apartment complex or dorm. You might need to assign someone to go around on Monday mornings to pick up the broken glass and beer bottles from parties.

Category Four The fourth category is Corrective Maintenance (CM) initiated by the PM write-up. Corrective maintenance is your best kind of work as far as efficiency goes. It can be planned and scheduled, giving you some time. It can be viewed and reviewed leisurely because you detected it rather than the customer.

Category Five The fifth category is work initiated from management decisions. That would be remodeling, redecorating, rehabbing, security changes, energy efficiency changes, change of office use, etc.

Types of Work There are four different kinds of work:
1) Short repairs. These are repairs that can be done in under an hour.
2) Long repairs. These are jobs that require planning, tools, materials, and scheduling.
3) Deferred maintenance. This is stuff you "throw on the back burner" and hope it doesn't "start a fire."
4) Jobs for outside contractors. These are contracted out because of the size, skills, cost, situation, time of year, etc.

Outcome

The outcome is an essential component of any PM system. This thought process is an analysis of the root cause of the problem. The maintenance staff has a lot of experience that can be utilized to figure out the root cause of the problem and what they can do to change the engineering, economics, or something that can help the company or organization.

Experimentation helps find better products or processes. This is where world-class operations analyze why things happen so they can be fixed permanently. A world-class maintenance operation doesn't wait for the same problem to happen again. Do you know the difference between a maintenance worker who is a parts-changer and one who looks at the issue to solve it?

Many people are qualified to change a valve or a pump, but not many are competent to look at the dynamics of the operation and analyze why the problem is happening in the first place. You may not know you have crew members who can do the analysis. They will need to be motivated. It would be best if you asked people on the maintenance crew why things happen. Be sure they know this is not done to "point a finger" and that your purpose is to analyze why the problem occurred, what part failed, why it failed, what was wrong with it, if there was a problem with materials, or how it was mounted.

Most maintenance departments will say they haven't the time to ask those questions; their schedule is too tight. Yet, huge amounts of money are available to be recaptured if you get in the habit of asking "why." This is a dilemma. There is no time to ask the questions, but if the questions are asked, you can save much more than just time.

The technicians best ask the questions; they are the most available to do it. Supervisors are "up to their asses in alligators." Most managers don't even know what their families look like after a while. If you add in a little bit of time to each job, that will allow a technician time to analyze.

The activity would not be noticed so much as it would be if the supervisor or manager took the time. Everybody is "under the gun," but taking the time to analyze is far better than fixing the same problem repeatedly.

In addition, it is worth your while to take the time to praise an employee who has worked especially hard at getting a problem resolved. Also, employees should be commended if

a unit has not broken down in the first place. Their hard work and success should not go unnoticed by management, even when praised for not having problems.

Showing a positive attitude most of the time and being negative only occasionally will surely get more attention than the other way around. What you reward is what you get. So, make sure you are rewarding the right thing.

Failure of a management system
An Example of Maintenance Failure: A housing authority administers funds sent out by the Department of Housing and Urban Development (HUD). Throughout the United States, housing authorities administer the money given to them by HUD for Section 8 and other programs for subsidized housing.

Every year, HUD requires a housing quality assurance inspection of every unit. This inspection is required of private developers, public developers, housing authorities, and redevelopment authorities; everybody has the same standard. It's a written standard; you can read it and see what you have to supply.

An article in The Philadelphia Inquirer, Wednesday, May 27, 1992, described exactly what can happen when standards are not followed when there is no work order system with job tracking.

At the Philadelphia Housing Authority in 1992, HUD inspected 87 residences and found that 86 failed the housing quality standard. This condition was to the point where a household of five was sleeping in one bedroom because two of the bedrooms were uninhabitable because the ceiling fell. The audit blamed "tenant abuse" – the housing authority said that the tenants had abused the property, and that was why the ceiling collapsed.

The auditors tracked 26 repair requests filed in November of the previous year, and all 45 work orders were outstanding 45 days later – not one had been done. It took 49 days to repair a bathroom sink pipe, 33 days to repair a kitchen exhaust fan switch, and five days to replace a toilet seat.

What kind of work order control system would allow a situation like that? This was not a situation of scarcity. They had the money to do the job. If you had as many people as they had to do the amount of work that they had to do, you would have had no problem doing it. There was a maintenance crew of about 700 to 800 people.

This lack of response was a control problem. People were sent out with the wrong instructions, to go to the wrong unit, with the wrong materials and tools. How much time can you waste that way?

It could take three days to replace a toilet seat, and you need to check all the units to find out which one has a broken toilet seat when you've been sent to the wrong unit.

One high-rise spent three years without hot water. It would be difficult to spend three years without hot water if you have a work order tracking system and accountability.

What went wrong? There was a full complement of maintenance workers there. The site was only 20 years old. With a work order tracking system and accountability, many of these problems would be eliminated. Three hours and 45 minutes should be sufficient to replace a toilet seat. Sadly, nobody had ever asked, "Why did it take so long?" You need to know how much time each repair should normally take; then, you should question if you are outside the deviation limit for that repair.

When you find an unacceptable deviation, you can go into the work order system and find answers. What if a toilet seat usually takes three hours, and you are taking far longer? Maybe there's one central location where you get your toilet seats. Still, because of politics, that location is in a councilmanic district, which is nowhere near the projects that need the toilet seats, necessitating a time-consuming trip for each toilet seat request.

Maybe someone with political influence wanted the warehouse to be located where they could distribute patronage jobs. Whatever the story is, some questions need to be asked.

Maintenance Atrocities Scrapbook
Here's a recommendation: try keeping a scrapbook of Maintenance Atrocities. Whenever a story comes up in a newspaper about a catastrophe due to maintenance or a case where something was not being tracked correctly, put it into a scrapbook. People learn from stories. If you have copies of a couple of relevant catastrophe articles that you can send with your request for PM funds, you may find that people will not understand your numbers but will understand the articles.

The importance of preventive maintenance will get through to them, and how that would have saved the properties in the articles. You could even include your notes on how PM would have avoided that catastrophe. Managers, bureaucrats, and accounting people want to prevent catastrophes, not only because they're a liability but because of public relations.

Some people couldn't care less about maintenance, but when they hear that a kid got hurt in a town 400 miles away in this same situation – you might be able to get dollars to do an inspection program to ensure it doesn't happen in your place.

Your scrapbook doesn't need to be complicated; you can rip out relevant articles and put them in a book. If it became the newspapers and had to do with maintenance, it would be a catastrophe. If the machine had run typically, it would never have entered the newspapers. You'll be surprised how much people pay attention to those stories.

Crazy, Fun Books teaching maintenance fundamentals

From the series: "Elements of Great Maintenance Management"

You can tell from the covers these books are different than everything else you've seen.
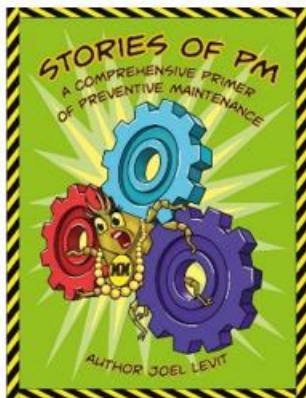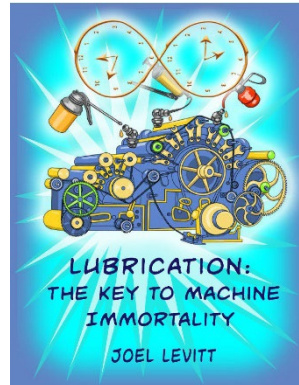

Preventive Maintenance
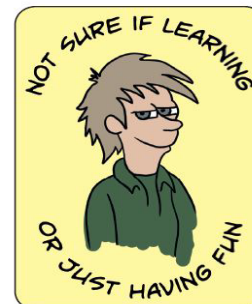

Defect Elimination

Reliability and fundamentals

Maintenance quality

Maintenance Planning

Lubrication

We know:

- o Old-school books and manuals don't cut it.
- o Boring texts don't cut it.
- o Humans learn best with stories.
- o New students want **entertrainment!** (I made this word up from Enterainment + Training)

   Introducing a new training series. A tool to teach maintenance fundamentals called "Elements of Great Maintenance Management."

Quest for Defect Elimination (ISBN 979-8627700458) is a full-color graphic novel that provides the basics of defect elimination and shows the quest to achieve fewer defects. To view on Amazon: http://www.amazon.com/dp/B086XG33D9/ref=nosim?tag=Maintenance08-20

Battle for Reliability, Fundamentals Win the Day (ISBN: 9798598795286) teaches the critical need to focus on maintenance fundamentals to avoid breakdowns. To view on Amazon: https://www.amazon.com/dp/B0B917XPKK/ref=nosim?tag=maintenance08-20

Stories of PM, A Comprehensive Primer of Preventive Maintenance (IBSN: 979-8496071154)
PM is the primary way to ensure the reliability of machines, buildings, or other physical assets. **To view on Amazon:**
https://www.amazon.com/dp/B09K1TTGD5/ref=nosim?tag=maintenance08-20

Quality is Not an Accident, The Challenge of Managing Maintenance Quality
(ISBN: 9798842723751) Quality of work depends on everything going right.
https://www.amazon.com/dp/B0B7QGX4TL/ref=nosim?tag=maintenance08-20

LUBRICATION: The Key to Machine Immortality (ISBN: 9798387529566)
Getting our people to take lubrication seriously is the simplest and most effective way to ensure the smooth running of your equipment. **To view on Amazon:** https://www.amazon.com/dp/B0BZ27N6CW/ref=nosim?tag=maintenance08-20/

Maintenance Planning Cuts Waste and Frustration ISBN: 979-8333645401
Maintenance Planning and subsequent scheduling are potent tools to cut waste and maintenance worker frustration. The challenge is that workers, operations, and even maintenance leadership don't always understand planning and, as a result, don't actively support it.

To view on Amazon:
https://www.amazon.com/dp/B0D9VQB4P5/ref=nosim?tag=maintenance08-20

SPRINGFIELD RESOURCES
maintenance management training and consulting

Joel Levitt, President JDL@Maintrainer.com
Springfield Resources 267-254-0061
WWW.MaintenanceTraining.com

LASER-FOCUSED TRAINING

These titles are also available for short webinars and on-site presentations.