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HOW TO WRITE AN EFFECTIVE, REPEATABLE MAINTENANCE PROCEDURE

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HOW TO WRITE AN EFFECTIVE, REPEATABLE MAINTENANCE PROCEDURE

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In this article Marty Tauber shares some tips on how to document maintenance procedures.

When maintenance procedures that have been customized for your processes and equipment are effectively documented, taught, reinforced, used, and updated, they help drive standard work, support the pillars of TPM, and foster true culture change. To Marty's advice we would add a few pointers from our own experience:

- Most adults are visual learners, so in addition to ensuring that procedures are clearly written, keep them as concise and visual as possible. Say it with pictures, drawings, and diagrams whenever possible, and consider using the “one-point lesson format” (see the examples we have included at the end of the article).
- In addition to involving your most qualified technicians in the documentation process, include a team of people that will actually be using the procedure. Including end users helps them take ownership and ensures better adherence.
- When it comes to actually performing maintenance procedures, we strongly advise that all necessary parts, tools, equipment, and permits be kitted in advance by planners, as Marty suggests, rather than by the mechanic performing the work. Planners should also preschedule any and all needed resources. Make it easy for the mechanics to get right to the job at hand and use their time effectively.

One thing to keep in mind: doing it perfectly the first time is not the point. But doing something lays the groundwork for learning and making things better. We encourage clients to engage process owners in the development of standard procedures that are simple and easy to follow, and then continually work to improve them.

Soon improvement starts to become part of daily work—and that's what's critical to a culture of TPM and operational excellence.

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With downsizing and the retirement of an experienced workforce, many companies will be affected by “Corporate Amnesia.”

Have you ever noticed that some mechanics can perform a maintenance procedure efficiently and effectively while others will completely skip over parts of tasks? Why is that, especially when they all have had the same training using the same material? The answer is “human nature.” When you send four mechanics to training, unfortunately all four do not process and retain the material in the same way. One may cue in on the torque specs, one on operational aspects, one on what tools he will have to purchase, and another on next weekend’s football game. Needless to say, back at work these four mechanics will apply four slightly different versions of the same maintenance procedure.

For just this reason, it is important to have an effective, repeatable, written maintenance procedure available to and reviewed with all mechanics that will be performing a particular task. Sounds simple enough, right? Then why is it that more maintenance shops are not striving to record and teach their procedures?

The old way of thinking is, “Well, we spent all that money sending them to school. They have already been taught, so they should know what they are doing.” But remember— it’s “human nature.” The old way of thinking will put you on a slow downward spiral to failure, as many companies are realizing today. With downsizing and the retirement of an aging, experienced workforce, many companies will be affected by “Corporate Amnesia”: All the technical expertise of the aging workforce will exit the company, leaving behind a void of important technical and mechanical knowledge that will be difficult if not impossible to fill.

THE TRAINER’S ROLE

More and more, companies are relying on outside trainers to educate their workforce.

This is a great concept that will work in some cases, but how many of your machines are “standard”? Most machinery is customized to a specific manufacturing process. The “standard” procedures taught will resemble the actual ones, but will also leave out important changes that reflect your customized work processes.

This is where an in-house company trainer can help. The ideal trainer will have been employed by your corporation for a number of years, know the machines, know how to work on them, and have some basic computer skills. Preferably the trainer will also have come from the maintenance ranks and be recognized as an effective worker.

An important duty of a company trainer is to record and write “Effective, Repeatable Maintenance Procedures.” Maintenance work procedures are the key to success in work execution. “Work execution is the function that involves how we perform Preventive Maintenance, Predictive Maintenance and Corrective Maintenance effectively.”¹

MAINTENANCE PROCEDURE BASICS

The first question to ask is, “What procedure should I document?”

Writing a concise and effective maintenance work procedure is not as simple as it sounds. There are many important details to consider: Are you sure that what you are writing is actually the correct procedure? Do you have all the torquing specs correct? Is your lubrication information correct and up to date? These are only a few of the questions that need to be asked.

But the first question to ask yourself is more basic: “What procedure should I document?” Any maintenance or production procedure that is repeatable and gets assigned on a regular basis, especially to several different people, is a good candidate. Check your weekly or monthly downtime sheets for signs of a possible problem area. Whenever a mechanical failure that resulted in downtime can be tied back to an improper or incomplete maintenance procedure, you have found your subject matter.



RESEARCHING THE PROCEDURE

Talk to the mechanics that do the work.

Once you have identified a procedure that should be written up, start by researching how it is performed.

- Ask the Maintenance Supervisor who is best qualified to perform the maintenance procedure you will be documenting. Supervisors are your best reference for mechanics' levels of expertise.
- Talk to the mechanics that do the work, asking them to go through the procedure with you, step by step. By drawing on their expertise and letting them know that you want to record it for others to follow, they will feel like an integral part of the process and will strive to give you all the information they can.
- You may need to do this with several mechanics to verify that the entire procedure has actually been covered and that no step has been left out. Start with the mechanic the Supervisor recommends and then a second. You may see discrepancies, which would indicate that the procedure is not being performed in the same manner. That, in turn, reinforces why the written procedure is so important.

WHAT TO INCLUDE

Any mechanic who follows your instructions should be able to perform the procedure as well as your best mechanic.

Write the procedure in a manner that would allow you to hand it to any mechanic, even one who is completely unfamiliar with it. Any mechanic who follows your step-by-step instructions should be able to perform the procedure as well as your best mechanic— maybe not as fast, but just as effectively.

Make it understandable to just about anyone, so that even an apprentice could perform it. If you follow the KISS (keep it simple, stupid) principle in the language you use, you should have no problem.

You will need to list the tools, consumable parts, spare parts, work permits, and any specialized equipment required to perform the task. In this way, when the mechanic gets into the thick of the work, they won't find that the one worn-out bearing is out of stock until tomorrow. The availability of all needed parts, tools, equipment, and permits should be verified by the mechanic before any work is started, or better yet by the planners before they assign the task.

- It is important to list any staff coordination requirements, such as having a plumber on site or a welder available to fabricate or weld a broken part.
- The steps should be in logical order, starting with a lockout/tagout (LOTO) procedure and de-energizing the equipment.
- Do not omit any step, no matter how insignificant you may think it is. The person who will be performing it may need that "insignificant" information. For example, "When installing the seal on the shaft, be certain that the flanged side of the seal is facing away from the bearing housing."
- Be detailed and concise in your description of the step being performed.
- A picture is worth a thousand words. Insert an image anytime a step is hard to visualize.
- Prevent misunderstandings by using circles and arrows to highlight the items you are describing.
- To conserve space, keep pictures small, but make them large enough to show the detail you are describing.
- The picture-cropping tool in your word-processing software program will help you eliminate unnecessary elements that might distract from the important material in the image.

Provide specifications that need to be reviewed, and highlight any dangers.

In your step-by-step explanation, provide specifications that need to be reviewed. For example, if you are referring to slide bars, provide the tolerances for a new slide bar and what is acceptable before a worn one must be replaced. A good rule to follow when a part is on the lower end of the tolerance range is to err on the side of replacing it. That way, you will eliminate any question about whether it will last until the next procedure, and prevent possible unplanned downtime

In any work procedure there are inherent dangers (pinch points, sharp edges, etc.) These should be written in RED so that they stand out.

You do not want to forget to warn someone about a sharp edge only to hear that they had to be rushed to the hospital for stitches. Explicit warnings and cautions are as important as detailed work instructions.

To cover circumstances that might arise during the work procedure, add a note in the appropriate section. Explain what might occur, what to look for, and how to correct it. For example, a belt tensioner may need to be adjusted or an automatic oiler on a drive chain checked for oil level and operation. Give specific details, such as amount of chain deflection, physical indicator marks, type of oil, or an amount consumed (or not consumed) that might indicate a problem.

FORMAT THE DOCUMENT

Get in the habit of formatting your work to look professional.

After writing the initial draft, take a look at the layout. Set up the written procedure in a format that not only looks professional, but reads professionally as well. Be sure to include a version number and date in the footer of the document. See the example that follows for ideas on formatting.

The procedures you create will be a direct reflection of you as a technical writer. If you get into the habit of formatting your work to look professional, producing an attractive and easy to follow Repeatable Maintenance Procedure will become second nature.

MAINTENANCE PROCEDURE

Topic of Maintenance Process **Video Available**

Times Roman 16 B Times Roman 16 RED Times Roman 20 BU

A brief description of the process you will be outlining or important notes. ← Times Roman 16 RED



Pictures: Cropped in Picture Tools, Text wrapping = TIGHT
Try to size all pictures the same

PAGE LAYOUT: **Margins – Narrow**
Page Borders – Box, 1/2 pt. Double Line

All text in Times Roman 14

1. Number or Bullet individual steps
 - Sub-Bullet important steps within individual steps that contained them.

Tools Required; Any and all tools required to perform task, including 2 way radios and additional help

Parts Required; Any and all parts including adhesives and Loctite needed to perform task

Footer; 8 pt. date created, version, e-file location, below box line

Date created Version e-file location

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VERIFY, VERIFY, VERIFY...

Never assume that you have the final say in the procedure protocol.

Once you have gathered the necessary information, researched the procedure, and written it up in a professional manner, the next step is to have it verified by supervisors and the mechanic to whom you were first referred. Never assume that you have the final say in the procedure protocol, just because you took good notes and did a lot of work. The mechanic could have inadvertently left out a small but important step; something may have been added to or deleted from the process since you observed it; or you simply might have missed something.

Always have the maintenance procedure proofread and checked by several people who know the proper method of performing the particular task.

Shift supervisors and mechanics that actually oversee or perform the procedure should verify the write-up for accuracy and have the final say in the content. As a trainer, never assume that you are the know-it-all in maintenance; this will tend to shorten your career as a trainer. Granted, you may have come up through the ranks and quite possibly you do know a lot, but when was the last time you personally performed a given procedure? Are you absolutely certain that nothing has changed in the meantime?

No one is infallible in a changing environment such as maintenance, with the advent of oil analysis, vibration analysis, and other technologies that can assist in ascertaining the condition of a piece of equipment.

ALWAYS have your work verified. Then and ONLY THEN should you distribute it to maintenance for use. If you follow this simple rule, you will be assured that what you write is accurate and genuinely reflects the step-by-step procedure required to perform the particular task.

Use a sign-off sheet for complex procedures.

Likewise, never be in a rush to write a procedure. Rushing only increases the odds that you will miss something, inadvertently cause increased downtime, and negate the purpose of writing the procedure in the first place. Once you write a bad procedure that leads to downtime or an adverse event, the credibility of any of your procedures is shot. Spend the time to research, organize, write, format, and verify each one properly. It's also a good idea to have a sign-off sheet for procedures (especially for complex ones), so that you have written documentation that the procedure was reviewed and validated.

STORING PROCEDURES AND TRACKING EFFECTIVENESS

Track the downtime

File approved maintenance procedures in an accessible location. Appropriate places to store finished procedures might include a common drive with a folder assigned exclusively for maintenance information concerning a particular piece of equipment, or a document management system (such as SharePoint)

Once you have completed and filed a procedure for use, you or the planners should measure its effectiveness by tracking how it affects downtime.

- Start by obtaining downtime reports from the Maintenance Planners for the relevant piece of equipment, and graphing the trend for the past four to six months.
- After six months, take another look at downtime and chart it against the original findings. Hopefully the net result will be a decrease in equipment downtime.

If the downtime in the following four to six months was generated not by work performed according to your procedure, but by another event or process, you have a topic for another maintenance procedure. If the procedure was written correctly and performed accurately, there should not be a recurrence of the initial downtime event that caused you to write the procedure. If it does recur, it is time to review why it failed:

- Was it due to a mechanical failure that should have been picked up during the procedure?
- What was the condition that permitted the event to occur?
- Was the procedure followed faithfully and effectively?
- If the procedure was followed, parts were available, and scheduling was correct, your procedure may need to be modified to address the cause of the subsequent downtime.
- Once you have determined how you want to modify the original procedure, merge the modification with the original. In the footer, be sure that you update the procedure version number (for example, version 1.0 changed to version 1.1 or 2.0) and the date.
- Of course, the new version should also be verified.

Be sure to update the version number.

Following the steps above will assure that you write accurate, up to date, and trustworthy Repeatable Maintenance Procedures that, when followed, will produce measurable positive results.

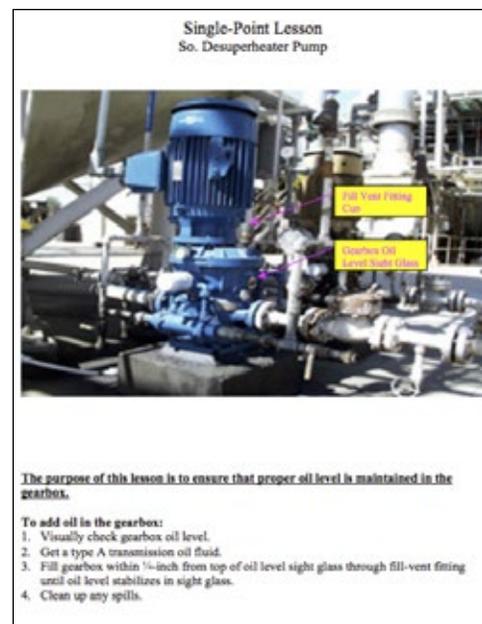
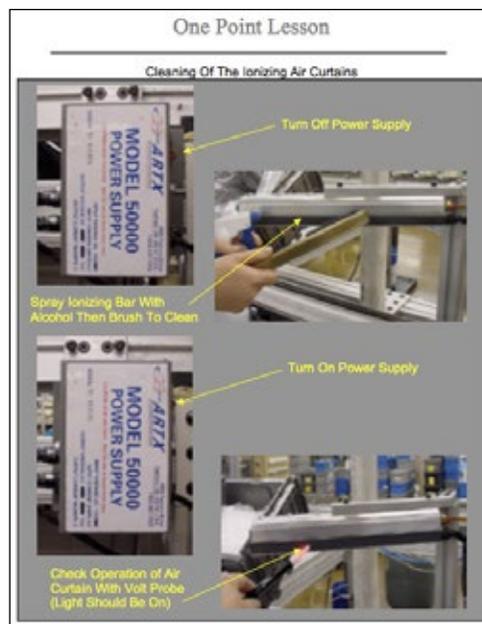
After all, this is what writing a Repeatable Maintenance Procedure is all about—standardizing a repeatable procedure so that it can be followed by any mechanic, with similar positive and effective results time after time.

i Tool Box Talks- "Effective Maintenance Work Procedures" by Ricky Smith, Principal Reliability Advisor with GP Allied.

Examples of One-Point Lessons

Following are examples of maintenance procedures documented as "one-point lessons."

Note that the visuals are the focal point, with minimal text used for explanation, and the subject matter is kept to one main point or task.





AEROSPACE AND ELECTRONICS / AT&T INC. / THE BOEING COMPANY / INTEL CORPORATION / JEPPESEN / LITTELFUSE, INC. / MEGGITT POLYMERS AND COMPOSITES / PRATT & WHITNEY / UNITED TECHNOLOGY CORPORATION / WEIR GROUP / **AUTOMOTIVE** / AUTOLIV INC. / CUMMINS CORPORATION / FORD MOTOR COMPANY / HONDA OF AMERICA / KAMTEC, INC. / LEAR CORPORATION / MIBA BEARINGS LLC / TENNECO, INC. / **BANKING/FINANCE, INSURANCE AND SERVICES** / ARVAL / BNP PARIBAS / COUNTRY FINANCIAL INSURANCE COMPANY / GOODYEAR/DUNLOP SERVICES / GRANGE INSURANCE / GROUPAMA / GROUPE CAISSE D'EPARGNE / KEYBANK / NATIONWIDE FINANCIAL SERVICES, INC. / SPB / **CAPITAL GOODS** / AEROQUIP CORP. / A.O. SMITH CORP. / BUSCH MANUFACTURING / CRANE CURRENCY / DEERE & COMPANY / EMERSON ELECTRIC CO. / JOHNSON CONTROLS / METTLER TOLEDO LLC / POCLAIN HYDRAULICS / SAUDER WOODWORKING COMPANY / SNAP-ON INC. / STANLEY BLACK & DECKER INC. / UNION TANK CAR COMPANY / **CHEMICALS** / AIR PRODUCTS AND CHEMICALS, INC. / ARKEMA / CECA / CYPLUS IDESA / KMG CHEMICALS, INC. / SOLVAY / **CONSUMER GOODS** / ACUSHNET COMPANY / ADIDAS GROUP / BERRY GLOBAL GROUP INC. / D&W FINE PAK / DURACELL INC. / GANNETT NJ MEDIA GROUP / HENKEL CORPORATION / KIMBERLY-CLARK CORPORATION / LEK INC. / MANA PRODUCTS / PING GOLF / PIRELLI COMPANY / PLASTIPAK HOLDINGS INC. / PROCTER & GAMBLE / QUAD/GRAPHICS, INC. / RECKITT BENCKISER GROUP / SHERWIN WILLIAMS / TEXOPS / UNILEVER / W.L. GORE / **ENGINEERING AND CONSTRUCTION** / AMERICAN WOODMARK CORP. / ATLAS ROOFING / BRAZEWAY, INC. / CERTAINTED CORPORATION / JACOBS ENGINEERING GROUP INC. / JELD-WEN, INC WINDOWS & DOORS / MI WINDOWS AND DOORS / OLDCASTLE BUILDINGENVELOPE / OWENS CORNING / **FOOD AND BEVERAGES** / ADVANCED PIERRE FOODS / ANHEUSER-BUSCH / CALIFORNIA NATURAL PRODUCTS / THE COCA COLA COMPANY / E. & J. GALLO WINERY / FLORDIA CRYSTALS CORPORATION / GENERAL MILLS, INC. / GLANBIA NUTRITIONALS / GROUPE AOSTE S.A. / THE HERSHEY COMPANY / INGREDION INC. / MARS PETCARE / MEAD JOHNSON COMPANY / MILLERCOORS / SCHWAN'S COMPANY / T. MARZETTI COMPANY / URSCHEL LABORATORIES COMPANY / WONDERFUL CITRUS / **HEALTHCARE SERVICES, EQUIPMENT AND PHARMACEUTICALS** / BOSTON SCIENTIFIC CORP. / BROOKDALE SENIOR LIVING / CEVA SANTE ANIMALE / ETHYPHARM / GENENTECH, INC. / HOPITAUX UNIVERSITAIRES DE GENEVE / IPSEN GROUP / LEICA BIOSYSTEMS COMPANY / MAYO CLINIC / MEDTRONIC / MERCK SANTE / MERIAL / OHIO COLLEGES OF MEDICINE / OSU WEXNER MEDICAL CENTER / PFIZER – FAREVA / VIRBAC / WOOSTER COMMUNITY HOSPITAL / **METALS AND MINING** / ALCOA CORPORATION / ALLEGHENY TECHNOLOGIES / BARRICK GOLD CORPORATION / GBC METALS, LLC / HIRSCHVOGEL INC. / IMERYS / KAISER ALUMINUM CORP. / SEARLES CORPORATION / **MUNICIPALITIES AND GOVERNMENT** / CITY OF ALEXANDRIA, VA / FEDERAL AVIATION ADMINISTRATION / NATIONAL SECURITY AGENCY / OHIO DEPARTMENT OF DEVELOPMENTAL DISABILITIES / ORANGE COUNTY SANITATION DISTRICT / UNITED STATES DEPARTMENT OF LABOR / UNITED STATES MINT / **OIL AND GAS** / BP AMOCO / EXXONMOBIL CORP. / MARATHON OIL CORP. / SUNCOR ENERGY / SUNOCO...



#4 White Paper Kaikaku Moving Beyond Kaizen

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