

Autonomous Maintenance: A Case Study on Step – 0 to 3 Implementation at Detergent Packing Machine in FMCG industry

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Abstract: Businesses in the Fast-Moving Consumer Goods (FMCG) sector always work to improve the efficiency of their manufacturing processes in order to keep a competitive edge in the fast-paced and cutthroat business. With a focus on the detergent packing machine at an FMCG manufacturing plant, this case study explores the application of autonomous maintenance (AM), a key component of the Total Productive Maintenance (TPM) philosophy. Finding and removing losses from the manufacturing process, especially those involving equipment and plant, is the main goal of AM. The four main phases of the step-by-step process described in the AM technique are Step0, Step1, Step2, and Step3, each of which aims to restore the fundamental machine conditions. The AM process's cornerstone, Step 0, emphasizes the necessity of a change in the maintenance staff's perspective. In this level, operators and maintenance teams would discover the value of autonomous maintenance and be instilled with a sense of ownership and responsibility for the equipment. The emphasis switches to cleaning and inspection tasks in Step 1. The detergent packing machine is thoroughly cleaned and carefully inspected to look for any indications of wear and tear or possible problems. This stage lays the groundwork for future enhancements by attempting to create a baseline for the machine's current state. The second step is to establish performance and cleanliness standards for the machine. For regular cleaning and inspections, standardized protocols are created to provide uniformity and predictability in maintenance tasks. In order to improve operators' and maintenance personnel's abilities to recognize and handle possible problems, this stage also includes training courses for them. Step 3 focuses on maintaining the progress made in the preceding steps. It entails creating an organizational culture of proactive maintenance where the idea of continuous improvement permeates every aspect of the business. To make sure that the set standards are being followed and that any deviations are quickly corrected, audits and reviews are carried out on a regular basis. This case study demonstrates the effective use of autonomous maintenance at the detergent packing machine in the FMCG sector by carefully following these four guidelines. The outcomes include a significant reduction in costly breakdowns, improved machine reliability, and the cultivation of a culture of continuous improvement, contributing to the overall competitiveness of the company's products. The lessons learned from this case study can serve as valuable insights for other companies looking to embark on a similar journey of enhancing their manufacturing processes through Autonomous Maintenance.

Keywords: Fast-Moving Consumer Goods (FMCG); Autonomous Maintenance (AM); Manufacturing efficiency; Machine conditions restoration; Detergent packing machine.

1. Introduction

Changes in how employees see and use company-wide equipment can lead to improved corporate business results as well as a more enjoyable and productive work environment. Within every TPM programme, AM is one of the most fundamental building components. The official separation of operations and maintenance occurred after preventative maintenance was brought to Japan from America. Employees eventually lost the sense of personal responsibility that came with operating and maintaining their machinery. This propensity is countered by TPM's autonomous maintenance processes. In order to slow down forced degradation, manage contamination, and guard against equipment issues, operators engage in routine maintenance and improvement tasks. Usually carried out in stages, autonomous maintenance (AM) operations are only successful when the flow from one stage to the next is closely regulated. Perform audits following each stage in order to control this; the FM should complete the final audit and grant approval for the subsequent phase. Why is strict control so crucial? For instance, preliminary cleaning (Step-1) entails considerably greater than just sanitising and cleaning the surrounding surfaces and machinery. It will be impossible to eradicate and manage degradation if team efforts are not concentrated on recognizing and addressing issues discovered during cleaning. Likewise, weather conditions such as rain, snow, and salt spray may erode the foundations of the plant and damage its machinery, contingent upon its position. Products that disperse, leak, obstruct, and so on can also push equipment to deteriorate. Typical examples of these products are solids, gases, powders, liquids, and furthermore. The climate, the tools, or the nature of the product will all have an impact on how such degradation is handled. However, the programme will regress to step-1 or even

lower if step-2 of AM—action targeting pollution sources and inaccessible places—is not carried out correctly. Implementing autonomous maintenance successfully requires step-by-step auditing of team actions to maintain correct focus.

1.2 The Need for Autonomous Maintenance

In ancient times, factory workers had the responsibility of regularly inspecting and repairing machinery to ensure it continued functioning smoothly. Different companies had different rules, but most wanted operators to completely clean and fix equipment like pumps. Overall, plants did a lot of maintenance on their own. Improvements in computer technology are making it easier for machines to operate on their own without human help. A significant challenge is the extensive maintenance required to support all the sensors essential for automation. Furthermore, process industries must address challenges such as leaks, spills, and blockages. The people who know the workplace best (the operators) are the best ones to solve these problems, so there's a growing need for them to be able to do maintenance on their own. In today's environment, the production and maintenance departments frequently have hostile interactions. When machines break and work can't be done, the production department gets really upset. They say the people who fix the machines don't know what they're doing, and it takes a long time to get them working again. They also say the machines are too old and that's why they keep breaking. Then the people who take care of fixing things say they don't have time to do important daily inspections. Meanwhile, the maintenance department criticizes the production team: "We prepare the standards, but they don't do the checks", they don't know how to operate their equipment properly", or they don't lubricate their machines. The maintenance department excuses its own failings by claiming it has too many repairs and not enough people to do them. Finally, it plays its trump card: We want to do major over hauling, but we don't have the money for it. With these attitudes on both sides, there is no way the goal of good maintenance – detecting and dealing with equipment abnormalities promptly – can ever be achieved. The production department must abandon the "I make & you fix mind set". They have to assume ownership of their own equipment and take responsibility for preventing deterioration. Only then can the maintenance department properly carry out the specialized maintenance techniques that ensure effective maintenance. Both departments must clearly define and agree to their respective roles and remove any barriers through mutual understanding and support. They must integrate their efforts until they stand like the two sides of a coin. This is the only way to create a failure – free, trouble-free workplace.

1.3 The Goals of Autonomous Maintenance Study

The primary responsibility of the production department is to create high-quality products efficiently and cost-effectively. One of the most important things it does is find and fix problems with equipment quickly, which is the aim of good maintenance. AM encompasses all tasks carried out by the production team to maintain the plant's smooth and efficient operation for the planned production.

- ◆ Maintaining proper functioning and frequent inspections can help prevent equipment damage.
- ◆ Restore and properly maintain equipment to return it to optimal condition.
- ◆ Identify the fundamental requirements for maintaining equipment in good working order.
- ◆ Teach individuals how to think and operate differently by using the tools.

2. Research Methodology

Data collection: HUL-Chhindwara Detergent Factory
Methodology: Autonomous Maintenance
Statistical tool: WWBLA and PM analysis

2.1 Autonomous Maintenance Implementation Framework

AM is implemented in seven steps; one additional step is added to that i.e. step-0. Following are the steps of AM:

- **Step -0** Safety
- **Step -1** Initial cleaning
- **Step -2** Eliminate sources of contamination and inaccessible areas.

- **Step -3** Establish cleaning and checking standards (Preparation of the tentative standards)
- **Step -4** Equipment general inspection
- **Step- 5** General process inspection (Autonomous Inspection)
- **Step -6** Standardization
- **Step -7** Autonomous management (Practice full self-management)

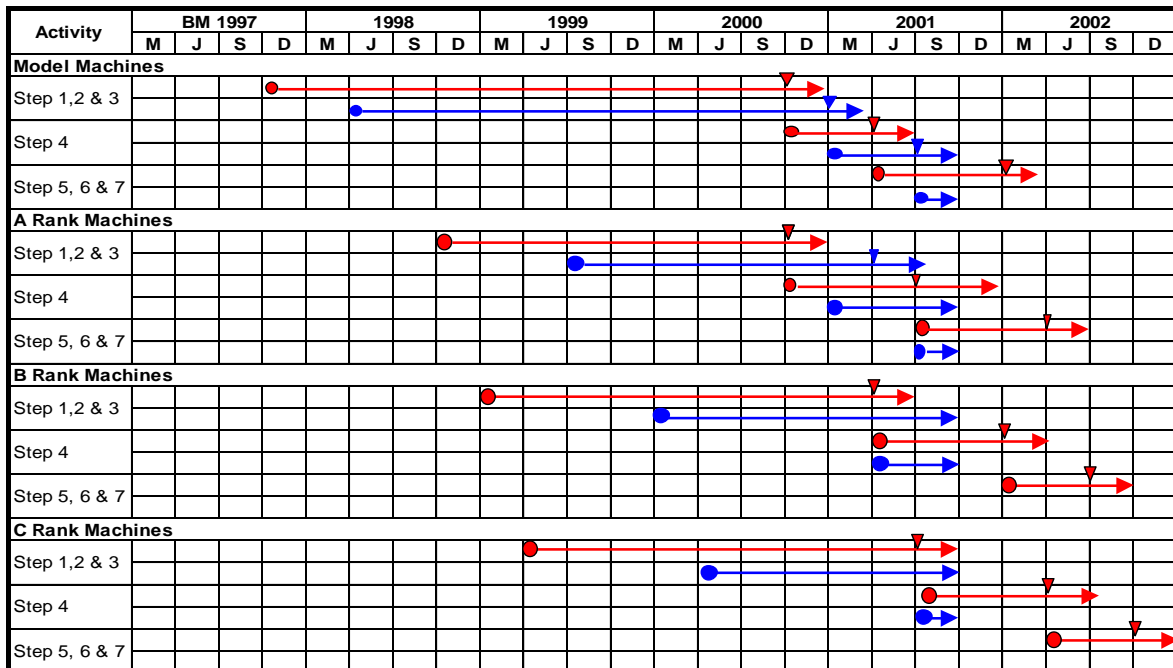
Step 1 to 3 is all about getting rid of things that make things break down faster, fixing things that are already broken, and keeping equipment in good shape. The aim of these steps is to make operators interested in their equipment and to change their self-image from just pushing buttons to being more skilled. In steps 4 and 5, the leaders of the team will show their team members how to check things carefully. The checking will go from just looking at the individual parts to looking at the entire process. The aim of these steps is to prevent mistakes and help operators better understand their equipment and process. Steps 6 and 7 are meant to make sure that maintenance is done well and to improve how things are done by making systems and methods standard and including other areas, like stores and distribution. The main goal of these steps is to create a strong organization and culture where every workplace can manage itself well.

2.1.1 Illustration of Autonomous Maintenance Target (AM)

Jishu Hozen Pillar Targets (Level 2)								
FM Projects		KPI	UOM	Targets				
Category	Ref No.			2001	2002	2003	2004	2005
P	C/BP1, C/PP1	Sustain Zero Breakdowns due to poor Jishu Hozen	Nos.	0	0	0	0	0
		Reduction in Jishu Hozen Time	Mins. / Shift	8	6	4	4	3

(Source HUL-Chhindwara Detergent Factory) Table:1(a)

Table 1 Illustration of Autonomous Maintenance Master Plan



(Source HUL-Chhindwara Detergent Factory) Table:1(b)

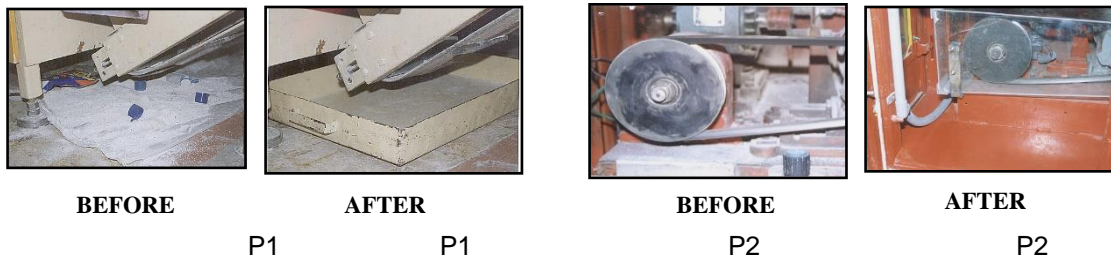
Master plan should be drawn up for a period of 3 Years for all the model machines, A rank equipment, B rank equipment and C rank equipment. Activity for next step must be started after completion of audit of previous step.

Master plan should be regularly reviewed and it should be strictly followed. Red line indicates the target and blue line indicates the status against the target.

3. Practical Implementation Framework

3.1 Step -0 Safety

Once it has been decided to start autonomous maintenance on any particular machine, the first thing is to ensure that the machine is safe enough to do initial cleaning. Stop the machine for few hours (say 4 hrs) and then the circle leader should brief about the step-0 activities to the circle members. In this step the abnormalities w.r.t safety must be identified like possibility of electric shocks (live wires, push buttons without caps, no protection cover over the junction box, panels), remaining air pressure in the line, possibility of dust getting into eyes, skin irritation because of detergent, any sharp edges, corners on the machine, slippery floors etc. List/tags should be prepared and all the unsafe conditions must be corrected immediately. In step-0 special attention needs to be given with respect to 1S and 2S. Identify why is forced deterioration caused, what losses will occur if forced deterioration takes place and check condition in which defects failures and minor stoppages occurs. The circle members should sit and understand the machine by drawing the sketch of the machine, they must think what evil will cause if stain, oil depletion or a loose bolt occurs. They should find out the easiest way of cleaning the machine and finding out abnormalities.



(Source HUL-Chhindwara Detergent Factory Powder Packing Machine) Picture:19.1.1

In the above picture, P1 (Before), lots of spoon and powder spillages are seen. These are the safety hazard, due to which a person can slip and fall. This situation has been corrected. In the P1 (After) picture, you can see a proper tray is provided and hence there is no spillage of powder and hence there is no hazard now and also the place is very clean. In the second set of picture P2 (Before) , the drive belt is not having safety guard, due to this injury can happen. This has been addressed by providing transparent safety guard. Refer P2(After) picture. The transparent guard also helps in visualizing the moment of the belt. The above are the examples of Step 0, which needs to seriously complied before starting the AM activity o the machine. If safety is not followed in true sense, then injury can happen and the TPM program cannot progress further as people would be scared to touch the machine.

3.2 Step -1 Initial Cleaning

Having completed the step -0 activities, now the machine is safe enough to carry out the initial cleaning activities. For this activity at least 8hrs shut down is required. The entire team (circles) will now work on that particular equipment to carry out the step-1 activities under the guidance of circle leader/facilitator who is an officer/manager. The objective of step 1 is to raise the reliability of equipment by carrying out the following activities:

- Eliminate dust, dirt and grime
- Expose all abnormalities
- Correct minor flaws and establish Basic condition of equipment

To carry out the above three activities, the circle members should be divided into another 3-4 groups (sub group) of two person each. Each sub group should be given responsibility to thoroughly clean the different sections of machine for example in case of Nichrome make FFS machine, one sub group should be deployed on cup filler/weigh feeder section, another sub group should take care of heater section (front section of m/c), third sub group should carry the initial cleaning activities on the inner portion (drive section) of machine and the fourth group should be deployed on the laminate feed section. In case of HSQ wrapping machine, one sub group can work on the tablet in feed section, second sub group should focus on wrapper feed section, third sub group should be deployed on the turret section and folding table section and the forth sub group should do the activities on the drive section (gear section). Before starting the activities, adequate cleaning tools like, brushes of different types, cotton pieces, trays, dust pans any customized tools should be made available. Lots of white tags and red tags should be made available to the group. Include one or two technicians (fitters & electricians) in the circle to correct the

abnormalities then and there if it is possible. You can also allocate engineering contract resource for carrying out modification jobs which calls for fabrication.

3.2.1 Tag (Japanese word Fuguai)

Tags are simple cards used to write the abnormality (flaws) which are detected on any equipment. It is a kind of highlighter to flag the problems. Tag indicates when the abnormality was found, who has detected it and the nature of problem. Normally the tag is tied on the equipment part/component itself which is having defect, one tag should be raised for each problem and the tag must be properly filled with the abnormality details. Generally it is found that the tags tied on the equipment gets soiled with the product getting manufactured or with oil & grease and they are not readable after some point of time, to avoid this problem some factories are using tag with carbon copy, the original copy is tied on the equipment and the carbon copy is given to TPM secretariat for filing and keeping record of the abnormalities. Another way to prevent the tags getting misplaced or soiled is to provide three small pockets on the machine itself, one pocket will be used for keeping the empty tags, rest two of the pockets can be used for keeping the unattended (open) and attended (closed) tags respectively. Here the logic is, after detecting the abnormality, if it can be attended by the operator he/she will rectify the problem and will put the tag in the closed tag pocket, if he/she can not attend the problem, then the tag will be put in the open tag pocket so that it can be attended by the technician (fitter/electrician). The closed tag will be collected by the secretariat person for keeping the record. During the initial cleaning activity, try to tie as much tag as possible on the equipment and make tag matrix after filling the tag classification sheet.

Illustration of Tag entry and Classification Table

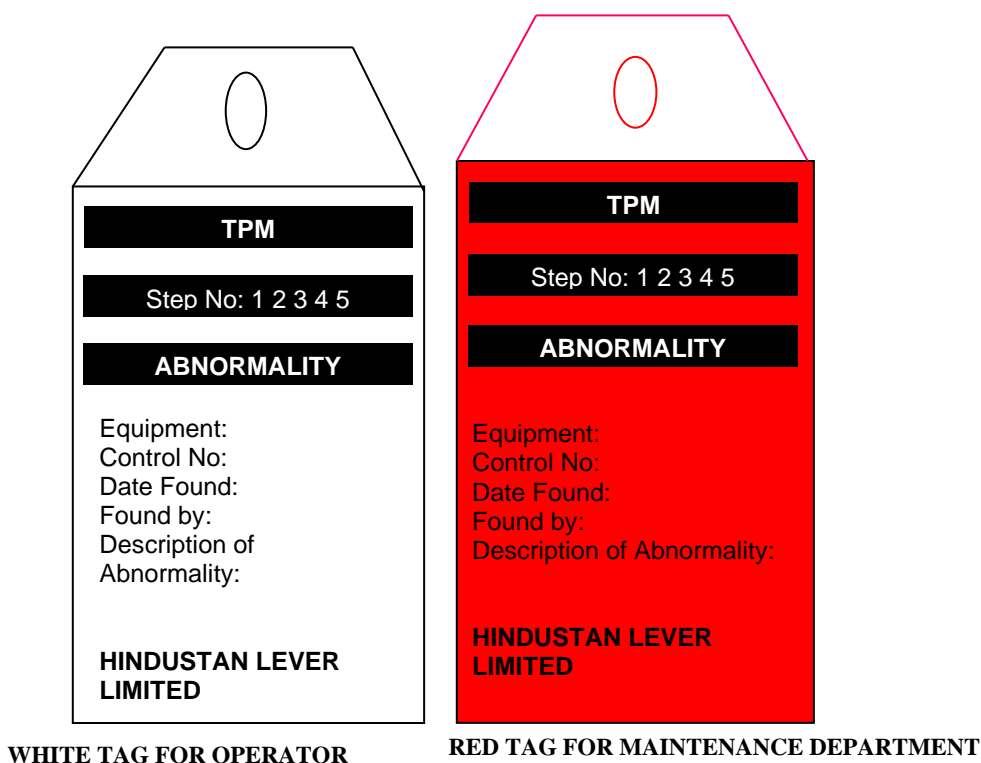
List of "Fuguai" in the Equipment										
			Equipment Name :			Unit Name :		No :		
No :	Date of Detection	Detect or	"Fuguai" Item	Why is it "Fuguai" (What will happen if it is left as it is ?)	Why did it become so ? (What is the cause)	Contents of Countermeasures	"EFU" Classification	Executor	Planned Date	Date of Completion

(Source JIPM-HUL TPM Instructor's Course – TPM Text Book) Table: 19.1.2.1(a)

J/H TAGS	ATTACHED	CLOSED
CLEANING	112	112
LUBRICATION	96	96
OTHERS	27	27
TOTAL	235	235

(Source HUL-Chhindwara Detergent Factory) Table:19.1.2.1(b)

Normally the tags are of two types, white tag and red tag. White tag are put for the kind of problem which operator can handle themselves, red tag jobs are carried out by the fitters/electricians of maintenance department.



(Source HUL-Chhindwara Detergent Factory) Picture:19.1.2.1

After putting the tags, all the tags needs to be segregated and classified under cleaning, lubrication, inspection and tightening. Tag classification sheet should be filled and an action plan must be drawn for attending the tags. Having studied about the tags, now we will ones again look into the initial cleaning process. Through cleaning forces the operators to touch every part of their equipment. This increases their interest in it and makes them resolve not to let it get dirty again. During initial cleaning as mentioned earlier abnormality should be tagged, abnormality is a deficiency, disorder, slight irregularity, defect, bug or flaw means any condition that could lead to other problem. Initial cleaning is a one time activity, therefore maximum number of tags must be attached. The tags apart from abnormalities should also be attached for things like hard to access area for cleaning, lubrication, inspection and tightening. Lack of facility to carry out cleaning, lubrication, inspection & tightening may lead to poor basic condition of machine.

3.2.2 Goals of Initial Cleaning

Activities	Hardware Goals	Human Goals	Roles of managers & Officers
Ensure that all areas of the equipment are free from dust and dirt. Expose issues like	Prevent things from deteriorating by removing the harmful dust and dirt that can damage them.	Get operator in touch with their equipment to make them more familiar with it, develop a sense of ownership & concern, and	Explain the meaning of contamination & accelerated deterioration (maintainability), that is explain the meaning of "optimal

minor errors, unclean spaces, inaccessible areas, and factors leading to quality concerns. Clear out items and equipment that are rarely used.	Enhance the efficiency of inspecting and repairing items by eliminating dust and dirt to boost the quality and speed of the process. Verify that the equipment is functioning properly and attend to any unnoticed malfunctions.	stimulate their curiosity about it. Enable group leaders to learn about leadership by implementing this step in small group. Enable people to recognise slight defects and other irregularities.	condition” Point out the most important parts to keep clean & explain the importance of basic equipment conditions (cleaning, lubricating & tightening) Explain the significance of inspection through cleaning.
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(Source JIPM-HUL TPM Instructor’s Course – TPM Text Book) Table: 19.1.2.2

During the initial cleaning process the officers, managers and fitters must explain, infect answer the following questions to the operators.

- ◆ What can go wrong of this part is dirty?
- ◆ What happens to this column or pipe when this part is rusty?
- ◆ How would the product be affected if this were blocked?
- ◆ This part keeps on getting dirty no matter how often I clean it. Where does the contamination come from?

3.2.3 Lubricate

Using oil or grease is very important for keeping machines working well. It works like blood in the machine. It is made to keep things working well by stopping them from getting worn out or damaged, keeping pneumatic tools accurate, and reducing rubbing. Machines are often not oiled properly by people, and the working environment may not always be suitable:

- People who do not understand the necessity and importance of lubrication make statement like this: “The oil in this machine hasn’t been replaced for five years, but it’s still going strong”.
- People who work with machines are not taught about how to use oil properly or how not using it correctly can cause problems..
- Far too many different types of lubricant are used and too many lubrication sites are inaccessible.
- There is too much reliance on mechanical greasers and other automatic lubricating devices.
- Lubricating standards are often nonexistent or hard to follow.

Such conditions expose equipment to accelerate deterioration. To begin counteracting this in step 1, perform the following activities as lubrication related abnormalities are exposed:

- Teach the importance of lubrication using OPL sheets.
- Lubricate immediately whenever you find that equipment is inadequately lubricated or not lubricated at all.
- Replace all contaminated lubricants.
- Clean and repair all dirty or damaged lubricant inlets and level gauges.
- Check to see whether all automatic lubricating devices are operating correctly.
- Clean and lubricate all revolving parts, sliding parts, drive chains, and other moving parts.
- Clean and repairs all manual lubricating equipment and lubricant containers.

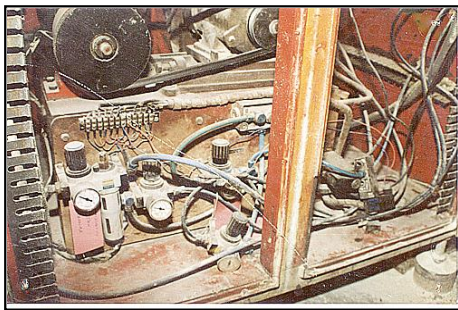
3.2.4 Tighten

Connectors (bolts, screws, and nuts) of various kinds are used in all equipment to secure distinct mechanical parts. If these screws are tightly secured, the equipment works as intended. A single loose bolt is all it takes to set off a series of wear and vibration events. The machine begins to shake and rattle as it vibrates a little bit. This causes other bolts to come free, vibration to feed on vibration, little cracks to enlarge into gaping splits, parts to break or become damaged, and eventually there is a complete meltdown. While the step-1 activities are being carried out take the action listed below as the deficiencies and abnormalities that relates to nuts and bolts. They are extremely important in establishing basic equipment conditions and stamping out potential trouble sources.

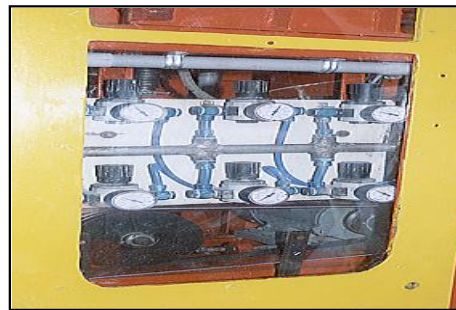
- ◆ Securely tighten loose nuts or bolts.
- ◆ Replace missing nuts or bolts.
- ◆ Replace cross-threaded nuts or bolts that are too long.
- ◆ Replace damaged or severely worn nuts and bolts.
- ◆ Use locking devices on important nuts that persistently work loose.

3.2.5 Illustration of work carried out on the machines based on the AM Step -1 method at HUL Chhindwara Detergent Factory

There are number of examples where AM Step -1 have been done successfully and the old machine has become like new machine. Most of abnormalities have been identified and have been eliminated. In below, Picture No. 1(Before) you can see inside the machine, the wirings are not proper, the pneumatic instruments and tubing are not properly dressed and fitted. These are abnormalities which can lead to breakdown of the machine and also the repairing time would be high. Hence the machine would stop and Unit will lose the production output. During Step 1 initial cleaning these kind of problems are identified, they are noted on Tag and after that during maintenance day the jobs gets done. Picture 2 is the result of the job which is done to correct the abnormalities. Now you can see the air tubing's are fitted properly, electric cables are dressed properly. The measuring instruments are fitted properly and transparent cover is provided so that the operator can see the instruments, gauges when the machine is in operation. This is the example of Powder Packing Machine used for packing Rin Powder.



BEFORE P - 1



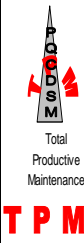






























AFTER P - 2

(Source HUL-Chhindwara Detergent Factory) Picture: P – 1, 2

3.2.6 Step-1 Cleaning Standard Check List

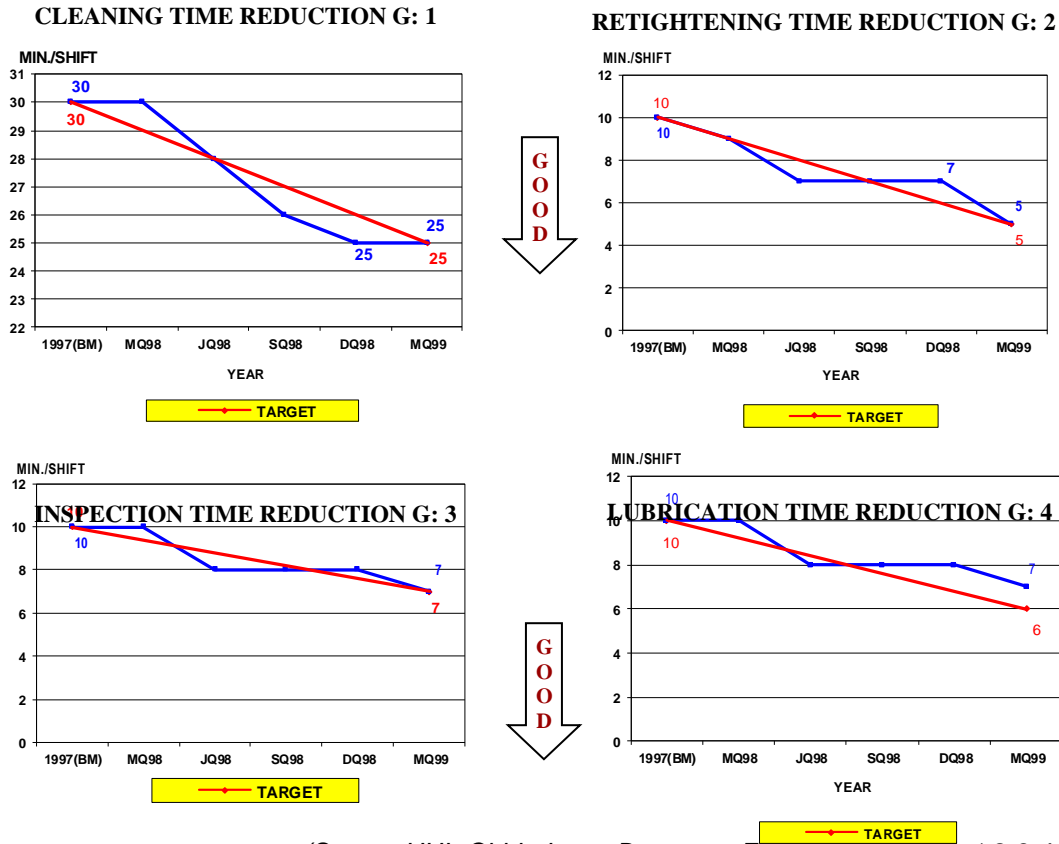
Once the step-1 activities are through a cleaning standard should be prepared involving operators and fitters. This tentative – tentative check list must religiously followed to maintain the step-1 level. This check sheet is called tentative - tentative check list because it is going to be revised in step-3.

(Source HUL-Chhindwara Detergent Factory) Table:19.1.2.6)

	AUTONOMOUS MAINTENANCE STANDARD - CLEANING					Group :	Panther	Prepared :				
	Location :	Packing Hall	Equipment :		Flex		Leader :	Mr.Binay Sharma	Revised :			
			Standard	Method	Tool	Action if Required	Time (Min)	Interval				
								Shift	Daily	Weekly	Monthly	Quarterly
HORIZONTAL SEALER	Sealing Surface	No lamination, No shampoo	 		Clean	2 minutes	✓					
	Batch cutter blade	No Lamination, no shampoo,	 		Clean	2 minutes	✓					
	Roller.	No Dust , No Dirt.			Clean	2 Minute	✓					
VERTICAL SEALER	Sealing jaws	No laminate, No shampoo,	 		Clean	1 minutes	✓					
FILLING NOZZLES	Flexible Hose	No shampoo	 		Clean	2 minutes	✓					
MAIN DRIVE	Motor	No dust,	 		Clean	2 minutes	✓					
	Clutch break assembly	No dust,	 	 	Clean	2 minutes	✓					
	Colleting drive	No shampoo,	 		Clean	3 Minutes		✓				
	Dancing roller	No Dust	 		Clean	2 Minutes	✓					
	Inside area	No Dust	 		Clean							

3.2.7 Step-1 Outcome

Once Step-1 is implemented thoroughly, the cleaning, lubrication, inspection and retightening time reduces from the benchmark figure as shown in the graphs. The Red line is the target line decided by the team on a particular machine and the Blue line is the actual line which represents the performance after carrying out the AM Step -1 Activities, that is initial cleaning and rectifying the problems, identified in the form of Tags. The below trend graphs are from a soap packing machine. It is clearly visible that the cleaning time of the machine has been reduced; now the machine need not have to be stopped for more time to do cleaning. This increases the run time of the machine and hence the production out with better quality. Likewise the retightening time, Inspection time and lubrication time reduced. All these time saving results in more production output. The “X” axis represents the period i.e. month and “Y” axis represents Minutes/Shift.

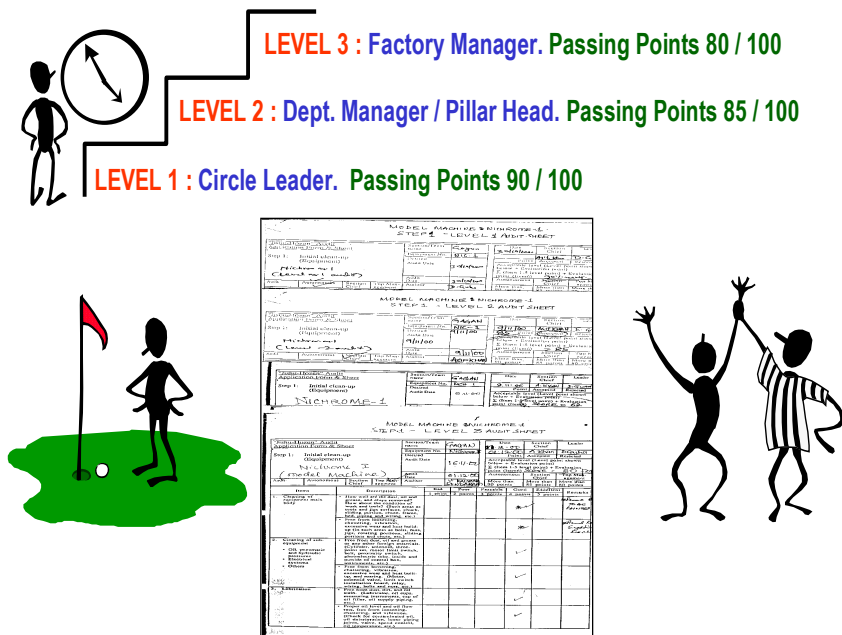


(Source HUL-Chhindwara Detergent Factory) Graph: G: 1,2,3,4

Apart from the above shown benefits, there are other intangible benefit which has resulted in after carrying out Step -1 activities. Most importantly the equipment will look like the way it has come from the original equipment manufacturer. Clean work place. Safe work place. Good housekeeping. Easy accessibility. Reduced down time.

3.2.8 Step- 1 Audit

The single most important factor in the success of an autonomous maintenance program is conducting a careful audit on completion of each step to confirm the results achieved and point the direction for further improvement work. The audit provides guidance where needed and gives people a sense of achievement. While the step – by – step approach makes the program easier for teams to understand as they progress through it, the audit serve as milestone on the journey and help to consolidate the gains made at each step. Audits are carried out for each step of autonomous maintenance; each audit will have three levels of audit. The first level of audit which is also called as self audit should be done by the circle (small group) who has worked on that equipment, the second level of audit will be carried out by the departmental head and the final audit will be done by the unit head. For each level of audit there are certain percentage which needs to be scored by the circle then only the next level of audit happens, level-1 more than 90%, level-2 more than 85%, level-3 more than 80%.



(Source HUL-Chhindwara Detergent Factory) Picture: 19.1.2.8

Self –assessment (by small group) audits promote effective monitoring and evaluation of progress, section level (by departmental manager) audits keep activities bubbling by providing guidance and assistance, top management (by unit head) audits foster motivation through recognition. One points to be remember here, each and every equipment must go through the audit procedure, there should not be common audit for the entire cascade, reason being, each and every equipment will have its own set of abnormality, own set of problems. If an cascade is having three packing machine of same type, all the three machines must be audited individually. All the audits sheets introduced by JIPM for all the steps are given at the end of this chapter.

3.3 Step -2 Countermeasures against the Sources of Contamination and Hard to Access Area

During the first stage, operators make use of their hands and senses for cleaning and identifying problems. Following that, they engage their minds to brainstorm improved approaches for accelerating and streamlining the tasks of cleaning, lubricating, inspecting, and tightening. The initial challenge of cleaning something prompts people to make an effort to keep it clean to save time in the future. This makes them want to do things better. They come up with ways to stop leaks and keep dust, dirt, and other things from making things dirty. They use covers, shields, and other methods to do this. In simple terms, the goal of step-2 is to make it easier to clean, lubricate, check and tighten equipment to keep it in good condition. Nobody wants to clean the equipment all the time. So, the goal is to avoid cleaning and focus on inspecting and fixing problems right away. There are several variables in our industry (HPC & Foods) that can cause our machinery to not function properly. These factors could harm the quality of our products. For example:

- Soap chips, powder, LLPO, cut wrappers/stiffeners, oils, vapour etc make initial cleaning difficult in the equipment.
- Contamination by dust, dirt, chips, spills, oil and grease hampers checking of bolts, nuts, oil level gauges, and so on.
- Powder contamination causes accelerated deterioration, such as excessive wear of V –belts and drive chains.
- Dust, powder contamination causes malfunctioning of limit switches, photo switches, and other sensors.
- Leaking liquids and vapours cause process units, stands, and other structures to corrode.
- Infiltration of control panels by powder dust makes control unreliable.

Although the harmful effects of contamination are known, but very little is done about it in many workplaces for a number of reasons. For example, people rarely think about dust proofing when designing and ordering equipment such as vibrators, conveyors, and so on. Many believe it is impossible to prevent all dust and vapour from escaping, so they simply shrug their shoulders and do nothing about it. Others assume improvement cost too much of money and therefore cannot be done. To maintain equipment in healthy condition with zero quality defect product it is very important to control leaks, spillages, scattered powders, soap chips, vapours and corrosive liquids. The following are key points for remedying contamination sources:

- Accurately ascertain the nature of the contamination and how and where it is generated.
- Gather quantitative data on the volume of leaks, spills, and other contamination.
- Encourage operators to trace contamination back to its original source.
- Localise the contamination first, then persistently reduce it through a succession of improvements. This produces the best results because one shot improvement is not possible.
- Carry out focused improvements by project teams that include managers and technical staff. The project team approach is essential when dealing with major contamination sources that operators cannot handle through autonomous maintenance.

Even when you establish basic equipment condition and achieve optimal condition, you may be taking too much time and effort to maintain them, and some of the work may still be dangerous. In such cases checking and lubricating probably will not continue for long. Optimal condition are not truly achieved until cleaning, checking, and lubricating have become so easy that anyone can do them quickly, correctly, and safely. This involves the following improvement activities:

Reduce cleaning time: Prepare and test at a glance cleaning charts, reduce contamination sources, make hard to clean places more accessible, and devise more efficient cleaning tools.

Reduce checking time: Prepare illustrated checking charts, inspect nuts, bolts, V belts, chains, couplings, and so in to confirm whether operators can perform checks within the allotted times, devise improved inspection tools, install quick –release covers, improve the positioning and orientation of attachments, create extra space, provide staging for operators to stand on while they check hard to reach places, and so on.

Identify hard to lubricate places: Use illustrated lubrication charts to check devices such as oil-level gauges, FRLs and replenish or change lubricants. Reposition oil level gauges, FRLs, lubricant inlets, and so on for ease of access.

3.3.1 Goals of Step-2

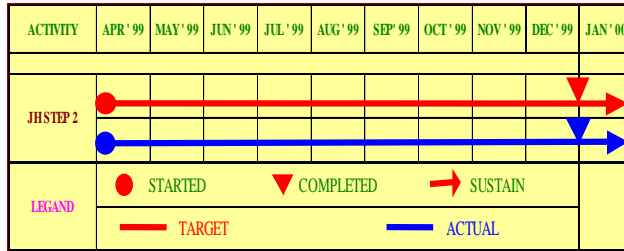
Activities	Hardware Goals	Human Goals	Roles of managers & Officers
Reduce the time spent on cleaning by eliminating dust-collecting objects, controlling their dispersion, and simplifying the cleaning, and maintenance, and use of items.	Improve how well the equipment works by stopping dust and dirt from getting stuck on it and keeping them away from where they come from. Enhance the maintenance of items by thoroughly cleaning, inspecting, and applying oil to prolong their lifespan. Create equipment that does not require manual work.	Teach the philosophy and practice of equipment improvement, starting with small-scale, easily accomplished projects. Germinate the seeds of improvement ideas through small-group activities. Allow individuals to experience the thrill and joy of improving in a particular area.	Encourage improvement ideas and give practical hints, i.e. give technical guidance and support. Teach problem solving techniques such as why-why analysis. Ensure that other departments respond promptly to work requests. Give guidance on the use of match mark and visual controls.

(Source JIPM-HUL TPM Instructor's Course – TPM Text Book) Table: 19.1.3.1(a)

In line with the above steps and goal, prepare a master plan to carry out the job and classify the target into category as shown below. The master plan is made along with small groups (circles) who are area owner of that machine. The master plan specifies the target date about the completion of the activity. The Step 2 tagging should be done in line with the target date given in the master plan. the classification of Tags is done based on Cleaning abnormalities, Lubrication abnormalities, Tightening abnormalities and Inspection issues, where the machine parts cannot be inspected, it is difficult to see those parts. Once the classification is done as per the table shown below, the tags are given to respective technician to attend the job and management provides the resources to complete

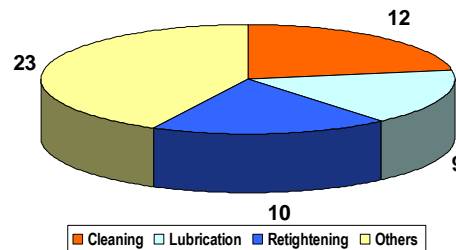
the job. Once the tags are attended the machine is free from hard to access area and no contamination happens inside the machine which deteriorates the machine parts leading to breakdowns and also affects the quality of product.

MASTER PLAN



TAG STATUS (STEP - 2)

J/H TAGS	ATTACHED	CLOSED
CLEANING	12	12
LUBRICATION	09	08
RETIGHTENING	10	10
OTHERS	23	21
TOTAL	54	54

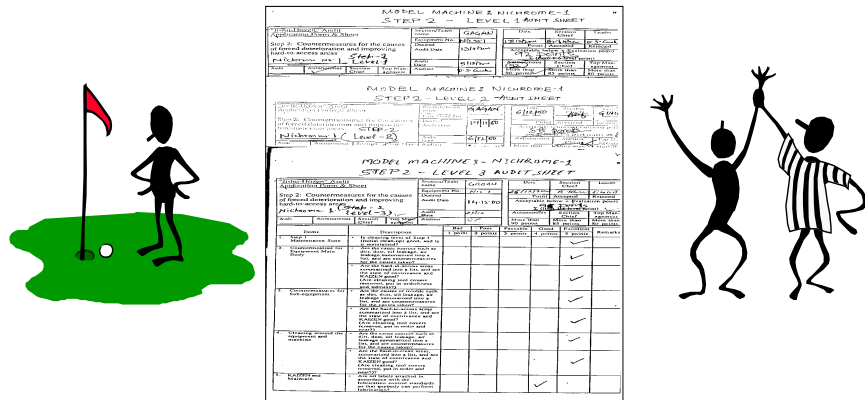
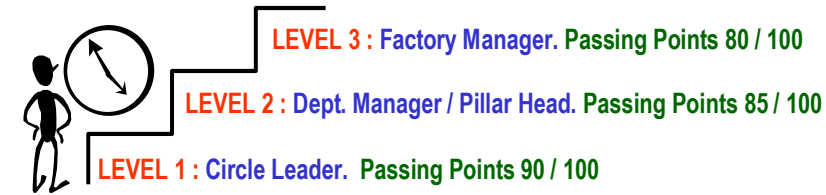


(Source HUL-Chhindwara Detergent Factory) Table: 19.1.3.1(b)

3.3.2 Step- 2 Audit

After carryout all the activities, the circle needs to carry out the level-1 audit, on scoring 90%, they need to request departmental head for carryout the level-2 audit, once level-2 audit is cleared after scoring 85% marks, the circle needs to request unit head to do the final audit (level-3). Unit head will give clearance for carrying out the step-3 activities.

AUDIT SHEET FOR STEP 2



(Source HUL-Chhindwara Detergent Factory) Picture: 19.1.3.3

3.4 Step -3 Establish Cleaning and Checking Standards (Preparation of the tentative standards)

The core activity of this step is to prepare tentative standards to maintain the basic condition of equipment. Standards bring in discipline and commitment to any activity, through standards step-1 and 2 gains shall be sustained. In this step, operator teams must standardize cleaning and inspection procedures and take responsibility for maintaining their own equipment. Generally, it is found that the standards are not followed religiously. People from maintenance department frequently complain that they furnish the production department with standards but the operators don't follow them. Managers always says that operators neglect to perform checks no matter how often they are reminded to do so. Typical reason for not filling the check sheets form operator's point of view are given below:

- We have been given standards (check sheet) but we don't know why we have to do this activity.
- We don't really understand what we have to check and why we have to check.
- If we try to perform checks according to the checklist, it takes too much time and the progress is not visible.
- The checks are hard to do because there are so many high, cramped or dark places.

If the standards are made without involving operating team, then it is never going to follow. "We set standards, you obey them" style of management, is not going to penetrate into operators mind, hence they are not going to maintain the check sheet.

Self-set standards are always obeyed

- During step-1 of JH, operators are involved in cleaning their equipment, correcting minor flaws, and establishing and maintaining basic equipment conditions. During Step-2, they reduce the time required for these tasks by controlling sources of contamination and making cleaning, inspection, and lubrication sites more accessible. As a result, operators are well aware of the necessity and importance of keeping their equipment in its new, greatly improved state.
- During step -3, with proper guidance in preparing standards and establishing checkpoints, operating team will have the motivation, ability, and opportunity to formulate realistic standards for preventing deterioration during their daily checking.

3.4.1 Goals of Step-3

Activities	Hardware Goals	Human Goals	Roles of managers & Officers
------------	----------------	-------------	------------------------------

<p>Create workplace requirements which would need the least amount of time and effort to maintain sanitation, lubricating, and tightening levels. Increase the effectiveness of job inspections by implementing visual controls.</p>	<p>Continue to uphold the three fundamental requirements for equipment maintenance and degradation prevention (CLIT) Verify accuracy utilising visible oversight, such as machinery nameplates and gauges with the right operating range shown.</p>	<p>Make sure operators understand the significance of standards and adhere to them. Enlighten individuals about their respective duties so they may understand the value of collaboration.</p>	<p>Give hints on writing and presenting CLIT standards Explain the ways in which visual controls might make checking easier and offer helpful suggestions.</p>
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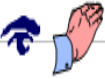


















(Source JIPM-HUL TPM Instructor’s Course – TPM Text Book) Table: 19.1.4.1

3.4.2 Key Points in Preparing Standards

Standards allow operators to begin performing checks easily correctly, and without omissions. Standards, therefore, must answer the Five Ws & One H i.e. Where? What? When? Why? Who? and How? and incorporate the following points.

- ✓ **Inspection items:** To decide what needs to be cleaned, inspected, and lubricated in order to keep the equipment in basic operating condition, the entire crew should get together. Officers ought to draw attention to any repetitions or omissions.
- ✓ **Key points:** Everybody must talk about what could happen if a specific part gets loose, infected, or not lubricated enough. This is to help you comprehend and keep in mind the damage that can occur if the fundamental or ideal conditions of the equipment are not met. It's crucial that officials offer direction and counsel on these matters and furthermore.
- ✓ **Method:** Choose the easiest and most suitable way to verify. Provide unambiguous visual controls so that anyone may accurately and consistently complete the checks.
- ✓ **Tools:** Select and properly mark the cleaning, lubrication, and inspection tools that will be used.
- ✓ **Times:** Establish the time and frequency of each check. Reduce its duration by engaging in enhancement initiatives.
- ✓ **Responsibility:** Assign a someone to oversee each activity to make sure it is completed, and make sure everyone understands their responsibilities to improve the sense of equipment ownership..
- ✓ **Language:** Try to make the checklist in the regional language which can be easily understood by everyone.

Sample Step -3 Check Sheet

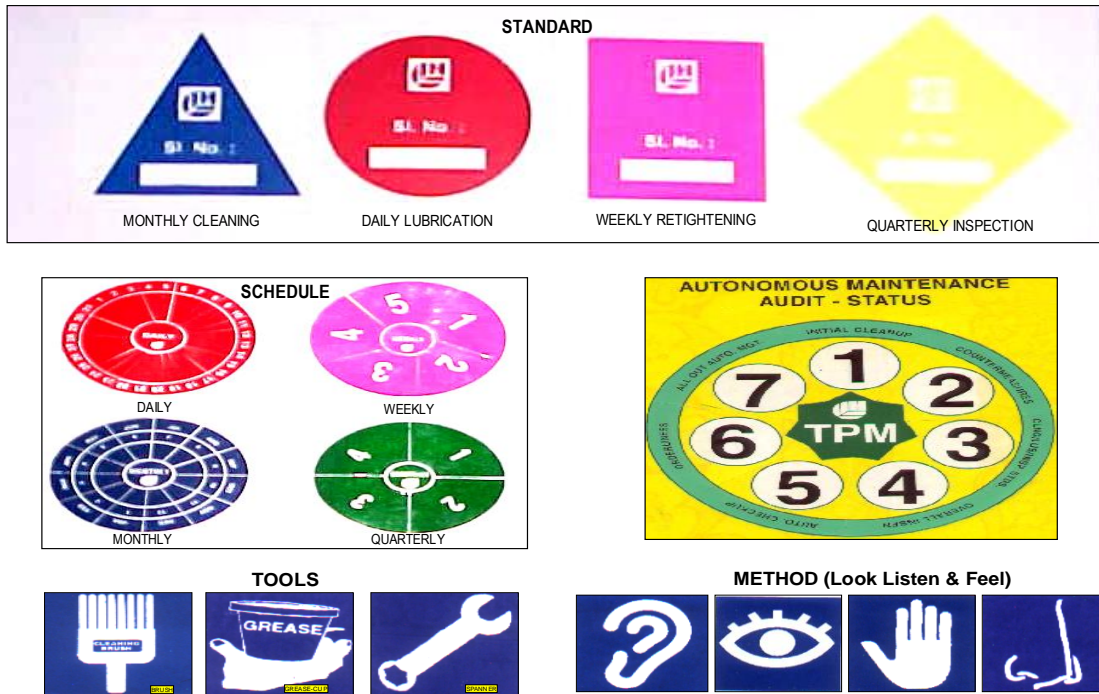
JISHU HOZEN STANDARD											
Cleaning, Oiling and Tightenin	Section	RM STORES	Line	TANK FARM	Circle Name	Ankur	Section Manager	Officer	Operator	PREPARED BY	
	Equipment No.	Lab Pump -1	Equipment Name	Centifugal Pump	Date Prepared	19.3.2005	G.Kannan	P.K.Bakiwal	R.YADAV	R.YADAV & D. GUHA	
No.	ITEM	STANDARD	METHOD	TOOLS	CLEANING HOURS		PERIOD				INCHARGE
					Now	After	SHIFT	DAY	WEEK	MONTH	
					13/09/2000 Minutes	30/12/2000 Minutes					
1	Body of the Pump	No dust, dirt, leak		Cotton Waste Brush	5	3					R. YADAV
2	Body of the Pump	No abnormal noise no vibration		screw driver	1	0					R. YADAV
3	Stuffing Box	MATERIAL drops 20 - 25 per minute		Spanner	0.5	0					R. YADAV
4	Electric Motor	No dust , dirt		Cotton Waste Brush	2	1					R. YADAV
5	Electric Motor	No abnormal noise no vibration		screw driver	1	0					R. YADAV
6	Coupling Spider	No cuts / Damages		Spanner	0.5	0					R. YADAV
7	Foundation of Motor	Full Tight		Spanner	1	0					R. YADAV
8	Foundation of Pump	Full Tight		Spanner	1	0					R. YADAV
9	Foundation of Pump	MATERIAL / Dust Accumulation		Cotton Waste Brush	3	1					R. YADAV
10	Lubrication of Pump	Up to Level Marking		Oil Can / Grees gun	3	0					
TOTAL TIME					18	5					

(Source HUL-Chhindwara Detergent Factory) Table: 19.1.4.2(b)

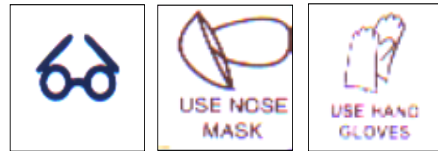
3.4.3 Visual Controls (VCS)

In step -3 lots of visual controls must be introduced on the equipment and surrounding area, infect visual control is the key to consistent performance of cleaning, checking, lubricating and tightening task to make them easy to perform correctly by any one. Visual controls helps in uncovering the hidden defects and flags of the abnormality, they are also easy means of understanding the equipment function and helps in smooth operation of the equipment. VCS should be directly pasted on the parts/components of the equipment and clearly indicate operating conditions, rotating directions and other information.

Some Visual Controls Stickers



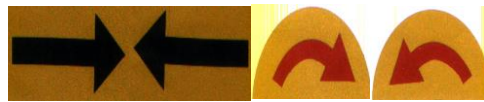
PERSONAL PROTECTIVE EQUIPMENTS



ELECTRICAL SAFETY SIGNALS



DIRECTION ARROWS



OTHER SAFETY SIGNALS

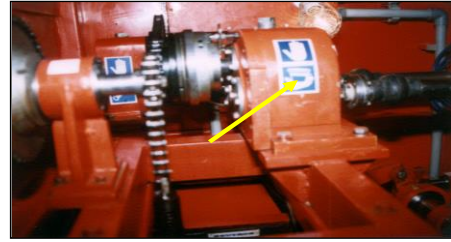


OTHER



(Source HUL-Chhindwara Detergent Factory) Picture: 19.1.4.3(a)

Examples of Visual Control Stickers Pasted on the Machine parts



VISUAL CONTROL STICKER PASTED ON MACHINE PARTS

(Source HUL-Chhindwara Detergent Factory) Picture: 19.1.4.3(b)

Examples of Visual Control Stickers Pasted on the Guages



GAUGE MARKING

(Source HUL-Chhindwara Detergent Factory) Picture: 19.1.4.3(c)

Explanation of Picture a, b, c: The stickers are used on the machine for ease of identification of the activity which needs to be carried out. It also gives the direction of motion / movement of the parts. The sticker also represents the caution signs for the operator to get alert. In the above picture, the stickers are pasted on the machine parts and also on the gauges. For example, the sign of hand means, check the vibration of the machine part by touching with hand, feel the vibration, if it is high mark as alert in the check sheet. The symbol of grease cup indicates that this part has to be lubricated by grease and the frequency is mentioned in the check list. The visual control stickers are so use full that even an illiterate person can understand the meaning and can perform the required operation / activities. On the gauges the target limit is marked by using the visual control means (Refer Picture19.1.4.3(c)), with

this kind of making the operator know the operating limit of the compressed air used, pressure of the lubrication oil etc...Visual control system is very important step in Step -3 of autonomous maintenance.

Finally the Shop Floor: Neat and clean everything is marked



(Source HUL-Chhindwara Detergent Factory) Picture: 19.1.4.3(d)

Step- 3 Audit

AUDIT SHEET : STEP - 3



LEVEL 3 : Factory Manager. Passing Points 80 / 100

LEVEL 2 : Dept. Manager / Pillar Head. Passing Points 85 / 100

LEVEL 1 : Circle Leader. Passing Points 90 / 100



Sl. No.	Item	Standard	Actual	Remarks
1	Preparation and maintenance of the shop floor	100%	100%	
2	Preparation and maintenance of the shop floor	100%	100%	
3	Preparation and maintenance of the shop floor	100%	100%	
4	Preparation and maintenance of the shop floor	100%	100%	
5	Preparation and maintenance of the shop floor	100%	100%	
6	Preparation and maintenance of the shop floor	100%	100%	
7	Preparation and maintenance of the shop floor	100%	100%	
8	Preparation and maintenance of the shop floor	100%	100%	
9	Preparation and maintenance of the shop floor	100%	100%	
10	Preparation and maintenance of the shop floor	100%	100%	
11	Preparation and maintenance of the shop floor	100%	100%	
12	Preparation and maintenance of the shop floor	100%	100%	
13	Preparation and maintenance of the shop floor	100%	100%	
14	Preparation and maintenance of the shop floor	100%	100%	
15	Preparation and maintenance of the shop floor	100%	100%	
16	Preparation and maintenance of the shop floor	100%	100%	
17	Preparation and maintenance of the shop floor	100%	100%	
18	Preparation and maintenance of the shop floor	100%	100%	
19	Preparation and maintenance of the shop floor	100%	100%	
20	Preparation and maintenance of the shop floor	100%	100%	
21	Preparation and maintenance of the shop floor	100%	100%	
22	Preparation and maintenance of the shop floor	100%	100%	
23	Preparation and maintenance of the shop floor	100%	100%	
24	Preparation and maintenance of the shop floor	100%	100%	
25	Preparation and maintenance of the shop floor	100%	100%	
26	Preparation and maintenance of the shop floor	100%	100%	
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29	Preparation and maintenance of the shop floor	100%	100%	
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32	Preparation and maintenance of the shop floor	100%	100%	
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45	Preparation and maintenance of the shop floor	100%	100%	
46	Preparation and maintenance of the shop floor	100%	100%	
47	Preparation and maintenance of the shop floor	100%	100%	
48	Preparation and maintenance of the shop floor	100%	100%	
49	Preparation and maintenance of the shop floor	100%	100%	
50	Preparation and maintenance of the shop floor	100%	100%	



(Source HUL-Chhindwara Detergent Factory) Picture: 19.1.4.4

The system of audit at the end of every Step remains the same. The passing score is also same.

4. Expose All Abnormalities

An abnormality as explained earlier is a flaw, any condition that could lead to other problems. Abnormalities have been classified into seven types which are listed in the table given below. During initial cleaning the seven types of abnormalities should be kept in mind and then accordingly tagging must be done.

List of 7 Types of Abnormalities

S.No	Abnormality	Examples
1	Minor Flaws	
a	Contamination	Dust, dirt, powder, oil, grease, rust, paint
b	Damage	Cracking, crushing, deformation, chipping, bending

c	Play	Shaking, falling out, tilting, eccentricity, wear, distortion, corrosion
d	Slackness	Belts, chains
e	Abnormal phenomena	Unusual noise, overheating, vibration, strange smells, discoloration, incorrect pressure
f	Adhesion	Blocking, hardening, accumulation of debris, peeling, malfunction
2	Unfulfilled basic condition	
a	Lubrication	Insufficient, dirty, unidentified, unsuitable, or leaking lubricant
b	Lubricant supply	Dirty, damaged, or deformed lubricant inlets, faulty lubricant pipes
c	Oil level gauges	Dirty, damaged, leaking, no indication of correct level
d	Tightening	Nuts and bolts, slackness, missing, cross-threaded, too long, crushed, corroded, washer unsuitable, wing nuts on backward
3	Inaccessible places	
a	Cleaning	Machine construction, covers, layout, foothold, space
b	Checking	Covers, construction, layout, instrument position and orientation, operating-range display
c	Lubricating	Position of lubricant inlet, construction, height, footholds, lubricant outlet, space
d	Tightening	Covers, construction, layout, size, footholds, space
e	Operation	Machine layout, position of valves, switches, and levers, footholds
f	Adjustment	Position of pressure gauges, thermometers, flowmeters, moisture gauges, vacuum gauges , etc
4	Contamination sources	
a	Product	Leaks, spills, spurts, scatter, overflow
b	Raw materials	Leaks, spills, spurts, scatter, overflow
c	Lubricants	Leaking, spills, seeping lubricating oils, hydraulic fluids, fuel oil, etc
d	Gases	Leaking compressed air, gases, steam, vapours, exhaust fumes, etc
e	Liquids	Leaking, spills and spurting cold water, hot water, half-finished products, cooling water, waste water , etc.
f	Scrap	Flashes, cutting, packaging materials, and nonconforming product
g	Other	Contaminations brought in by people, forklift trucks, etc.
5	Quality defects	
a	Foreign matter	Inclusion, infiltration, and entrainment of rust, chips, wire scraps, insects, etc.
b	Shock	Drooping, jolting, collision, vibration
c	Moisture	Too much, too little, infiltration, defective elimination
d	Grain size	Abnormalities in screens, centrifugal separators, compressed air separators etc.
e	Concentration	Inadequate warming, heating, compounding, mixing, evaporation, stirring, etc.
f	Viscosity	Inadequate warming, heating, compounding, mixing, evaporation, stirring, etc.
6	Unnecessary and non-urgent items	
a	Machinery	Pumps, fans, compressors, columns, tanks, etc.
b	Piping equipment	Pipes, hoses, ducts, valves, dampers, etc.
c	Measuring instruments	Temperatures, pressure gauges, vacuum gauges, ammeters, etc
d	Electrical equipment	Wiring, piping, power leads, switches, plugs, etc.
e	Jigs and tools	General tools, cutting tools, jigs, molds, dies, frames, etc.
f	Spare parts	Standby equipment, spares, permanent stocks, auxiliary materials, etc.
g	Makeshift repairs	Tape, string, wire, metal plates, etc.
7	Unsafe places	
a	Floors	Unevenness, ramps, projections, cracking, peeling, were (steel deckplate)
b	Steps	Too steep, irregular, peeling anti-slip covering, corrosion, missing handrails
c	Lights	Dim , out of position, dirty or broken covers, not properly explosion-proofed
d	Rotating machinery	Displaced, fallen off or broken covers, no safety or emergency stop devices
e	Lifting gears	Wires, hooks, brakes, and other parts of cranes and hoists
f	Other	Special substances, solvents, toxic gases, insulating materials, danger signs, protective clothing, etc

(Source TPM in Process Industry) Table: 19.1.2.3(a)

After identifying the abnormalities, it is essential to raise the reliability of equipment by establishing basic conditions, correcting minor flaws such as damage, excessive play, deformation, and wear as soon as you detect them. When serious damage is discovered, such as severely cracked or broken parts that can only be fixed by a specialist or the manufacturer, ask the maintenance department to deal with it right away. Up till now we have seen the one element of basic condition, i.e. cleaning, now we learn about the importance of lubrication and tightening.

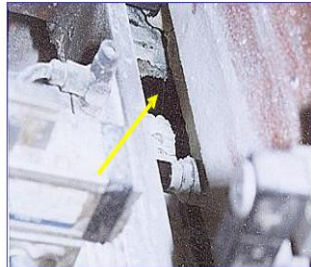
5. Interpretation and Analysis

5.1 Illustration of work carried out on the machines based on the AM Step -2 method at HUL Chhindwara Detergent Factory Section (A)

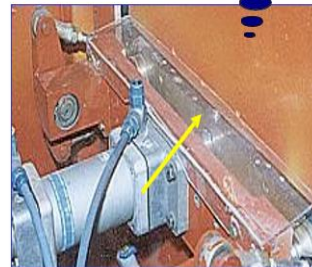
(Countermeasure Against The Sources Of Contamination)

Plugged the gaps, there by arrested the entrance of powder inside the machine, saved the cleaning.

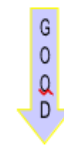
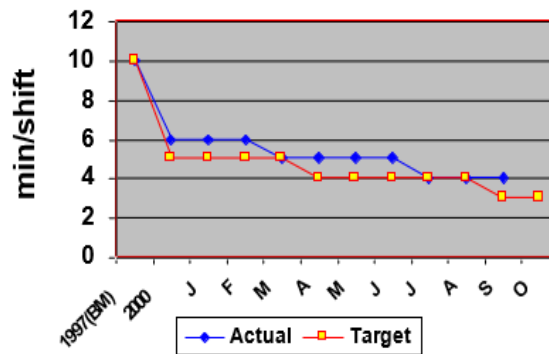
Eliminated Source of Contamination



BEFORE



AFTER



(Source HUL-Chhindwara Detergent Factory) Picture: 19.1.3.2(a)

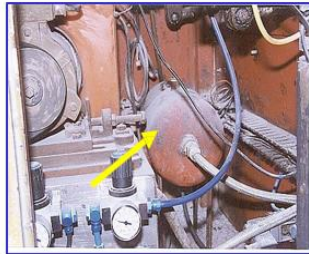
Explanation of Section A: In the above, before picture there is a gap in the Powder Packing Machine. From this gap the detergent powder use to enter inside the machine and use to deposit on the various parts of the machine, hence making the machine dirty as well as due to detergent powder wear and tear rate increase, resulting into forced deterioration. This problem is sorted out by providing one transparent sheet at the gap so that no detergent powder is entered inside the machine. This is seen in the After Picture. The below trend graphs represents the cleaning time reduction close to 4 Min/Shift Operation. Hence fulfilling the needs to countermeasures against the sources of contamination.

5.2 Chhindwara Detergent Factory Section (B)

(Countermeasure Against Hard to Access Area for Cleaning)

Removed Air tank from the inner portion of M/c to outside the M/c bed so that M/c bed can be cleaned easily.

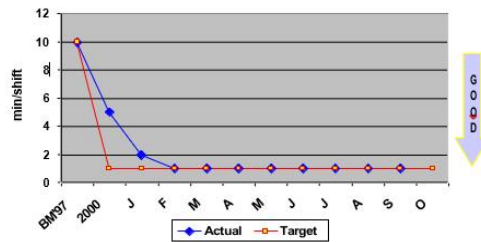
Eliminated Hard to Clean Areas



BEFORE



AFTER

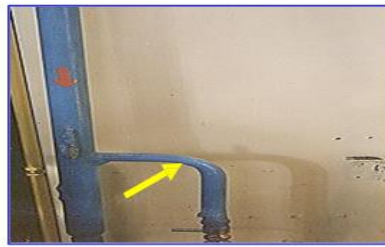


Explanation of Section B: Section B represents the before and after picture of the same detergent powder packing machine. This time the problem was hard to access area. In the before picture it is clearly visible that a big air tank is fitted inside the machine. This air tank is used to supply the air for movement of the machine parts to function. This is an important static part of the machine. However this air tank was not allowing the operator to see the other parts of the machine and also the cleaning was very difficult. A simple Kaizen (improvement) was done; this air tank was fitted outside the machine. It was fitted on the body of the machine, thereby in the after picture it is very clear that the machine inside section is very easy to approach for cleaning and inspection. This job has resulted in elimination of hard to access area for cleaning, and hence the breakdown got reduced and the life of the machine increased. The graph in the section B represents the cleaning time reduction.

5.3 Chhindwara Detergent Factory Section (C)

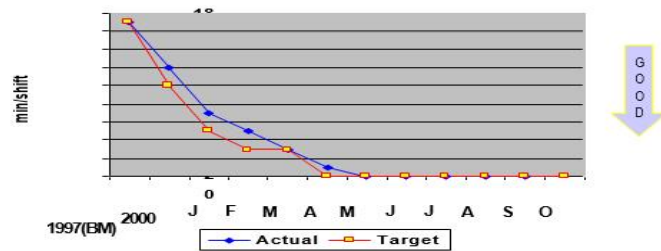
Hard to access area for lubricating the Solenoid valves converted into auto lubrication by providing FRL unit.

Eliminated Hard to



BEFORE

AFTER



(Source HUL-Chhindwara Detergent Factory) Picture: 19.1.3.2(c)

Explanation of Section C: Section C represents the before and after picture of the same detergent powder packing machine. This time the problem was hard to access area for lubrication. It was difficult to carry out the lubrication of various component of the machine, since the component / parts were not easily approachable. As it is evident that lubrications very essential for the machine parts to perform better and it reduces the wear & tear of the machine and hence the breakdown. In the before picture there is no lubrication system provided. The lubrication of the parts are done manually through oil can with great difficulty and the machine also have to be stopped. To overcome this problem, online lubrication was installed on the detergent packing machine. This is called on line lubricator. The oil is supplied to the machine parts through the air tubes and hence this job satisfies the requirement to elimination of hard to access area for lubrication. The below graph in section C represents the reduction in time due to lubrication, and hence the machine run time goes up.

5.4 Chhindwara Detergent Factory Section (D)



(Source HUL-Chhindwara Detergent Factory) Picture: 19.1.3.2(d)

Explanation of Section D: Section D represents the before and after picture of the same detergent powder packing machine. It is evident from the above picture. The machine was like a black box. Nothing can be seen inside. The movement of the parts cannot be seen. This was because the cover of the machine was made out of metal sheet. This problem got resolved by providing transparent door, see the after picture. Now the inner section of the machine can be seen all time without opening the doors of the machine. Hence the inspection time got reduced substantially, which is represented by the below graph. This improvement activity fulfilled the requirement of elimination of hard to access area for inspection. This was very important job, since without proper inspection of the machine, the operator cannot access the working condition of the machine and he cannot predict the breakdown and cannot take the preventive action.

6. Conclusion

An effective method for raising production efficiency was the application of autonomous maintenance (AM) at the detergent packing machine in the fast-moving consumer goods (FMCG) sector. The case study showed that by methodically adhering to the four essential AM stages (stages 0 through 3), expensive failures were reduced, machine dependability was increased, and a proactive maintenance culture was established. In Step 0, the maintenance personnel underwent a viewpoint change that sparked a sense of accountability and ownership. In order to achieve consistent development, later phases concentrated on comprehensive cleaning, standardized procedures, and ongoing improvement. The findings demonstrate the importance of autonomous maintenance in creating a competitive advantage through reduced procedures and can be a useful reference for other FMCG companies looking to enhance their production operations in an equivalent manner.

Appendix

List of Abbreviation/Symbols

HUL	Hindustan Unilever Limited
TPM	Total Productive Maintenance
OEE	Overall Equipment Efficiency
PM	Preventive Maintenance
CM	Corrective Maintenance
MP	Maintenance Prevention
KK	Kobetsu Kaizen (Japanese word), English word: Focused Improvement
AM	Autonomous Maintenance (English word), Japanese word: Jishu Hozen
PM	Planned Maintenance

IFC	Initial Flow Control or Early Management
QM	Quality Maintenance
E&T	Education & Training
OTPM	Office TPM
SHE	Safety – Health – Environment
P	Productivity
Q	Quality
C	Cost
D	Delivery
S	Safety
M	Morale
FM	Factory Manager
JH	Jishu Hozen (Autonomous Maintenance)
OPL	One Point Lesson
Kaizen	Continuous Improvement
WIGs	Widely Important Goals
RS	Retail Stockiest
WWBLA	Why why because logical analysis
PM	Phenomenal Mechanism
JIPM	Japanese Institute of Plant Maintenance
1S	Sorting Out,
2S	Place for everything & everything in its place
FFS	Form – Fill – Seal Machine
HSQ	Hard Soap Wrapping Machine
HPC	Home and Personnel Care
LLPO	Light liquid paraffin oil
VCS	Visual Control System
CLIT	Cleaning – Lubrication – Inspection & Tightening
TTC	Technical Training Centre
PPA	Process Point Analysis
Q	Quality Component
PP	Processing Point
QC	Quality Control
QA	Quality Assurance
HH	Quality Maintenance
ECRS	Eliminate – Combine- Reorganize- Simplify
CBM	Condition Based Maintenance
MQ	March Quarter
JQ	June Quarter
SQ	September Quarter
DQ	December Quarter
dB	Decibel. Unit used for measuring the noise level. 80dB is good acceptable noise level. Above 120dB is extremely high, which can damage the human ear.
DFA	Distilled fatty acid plant. Fatty acid used for manufacturing soap
VDL	Vaisity Detergent Limited. A subsidiary Unit of TATA, merged with HUL

References

1. Unilever website. www.unilever.com
2. HUL website. www.hul.co.in
3. Inside Unilever portal, the internal website of the company.
4. HUL company financial balance sheet
5. HUL, TPM training modules by corporate TPM
6. HUL, 5S training module by corporate TPM
7. JIPM – HUL, TPM 12 step implementation guide.
8. Training module on TPM by Suzuki San
9. HUL, TPM awareness program. 3 days module
10. HUL, TPM training module on Autonomous Maintenance
11. Training module on Autonomous Maintenance – Jishu Hozen by Suzuki San
12. JIPM Planned Maintenance by Kinjiro Nakano San
13. JIPM-HUL TPM Instructor's Course – TPM Text Book
14. JIPM – HUL TPM Instructor's Course – Concept of Kaizen & Kobetsu Kaizen
15. JIPM – HUL TPM Instructor's Course – The 5S Improvement Handbook
16. JIPM – JMAM. TPM-01-1, Basic Concept of TPM
17. JIPM – JMAM. TPM-02-1, Planning & Management of Maintenance
18. JIPM – JMAM. TPM-01-1, Basic Concept of TPM
19. JIPM – JMAM. LPM-01-1, Introduction to TPM Activity

20. JIPM –JMAM. LPM-02-1, Self Initiated Maintenance
21. JIPM –JMAM. LPM-03-1, Individual Improvements
22. TPM Activity Report to JIPM by Chhindwara Factory Ch.1 Out Line of Company & Plant
23. TPM Activity Report to JIPM by Chhindwara Factory Ch.2 TPM Policies & Objectives
24. TPM Activity Report to JIPM by Chhindwara Factory Ch.3 TPM Organisation
25. TPM Activity Report to JIPM by Chhindwara Factory Ch.12 TPM Effects / Evaluation
26. TPM Activity Report to JIPM by Chhindwara Factory Ch.5, 5a,5b,5c JishuHozen Activities (Autonomous Maintenance)
27. TPM Activity Report to JIPM by Rungkut Plant
28. TPM Activity Report to JIPM by HUL Sumerpur Factory
29. TPM Activity Report to JIPM by HUL Orai Factory
30. TPM Activity Report to JIPM by HUL Hosur Factory Level 1
31. TPM Activity Report to JIPM by HUL Pune Tea Exports Level 1
32. TPM for Workshop Leaders, KunioShirose
33. TPM Encyclopedia, Edited by JIPM
34. TPM in Process Industry, Edited by Tokutaro Suzuki.
35. Practical TPM, James A Leflar

DOI: <https://doi.org/10.15379/ijmst.v9i2.3578>

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