Autonomous Maintenance

Training Pack

Aims & Objectives

Target Audience :

Autonomous Maintenance Champions, Production Teams.

Purpose of Module :

To equip attendees with the knowledge & understanding to participate in Autonomous Maintenance Activities, in order to deliver tangible and sustainable improvements in equipment reliability

Aims & Objectives :

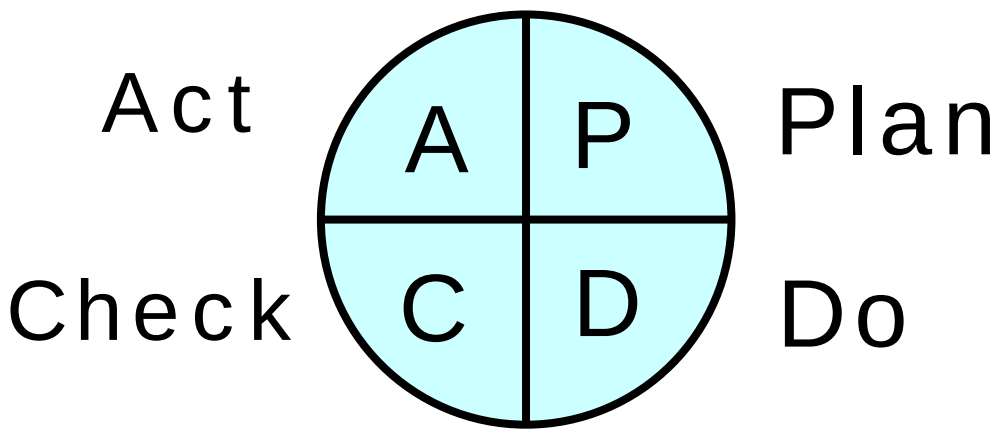
- Outline the Steps of AM
- Give Practical Guidance on AM roll out

What is Autonomous Maintenance?

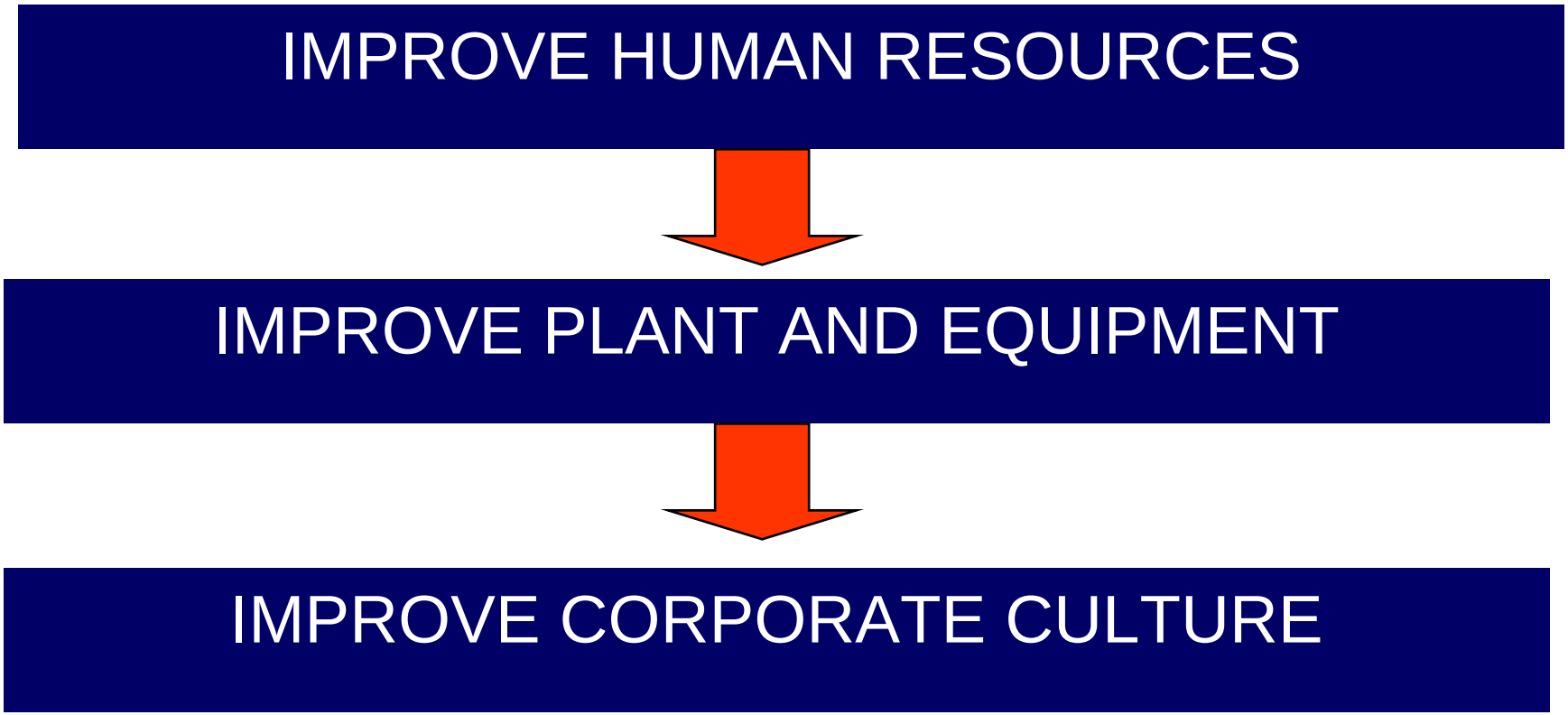
- An operator Skill development Programme
- An approach to allow problems to be identified and solved quickly
- An approach to stop accelerated deterioration of plant and equipment
- An approach to stop deterioration related failures
- An approach to stabilise equipment conditions (standards)
- An approach to develop training materials on how to run, operate & maintain equipment

What is Effective Maintenance?

- An Effective Maintenance system will support Autonomous Maintenance.
- Effective Maintenance should also involve all areas of the organisation.
- Information is key.
- Operator and Maintainer training
  - **Up-skill Maintenance to be trainers and equipment improvers**
  - **Up-skill Operators to be equipment maintainers (Autonomous Maintenance)**



How do we Implement Autonomous Maintenance?



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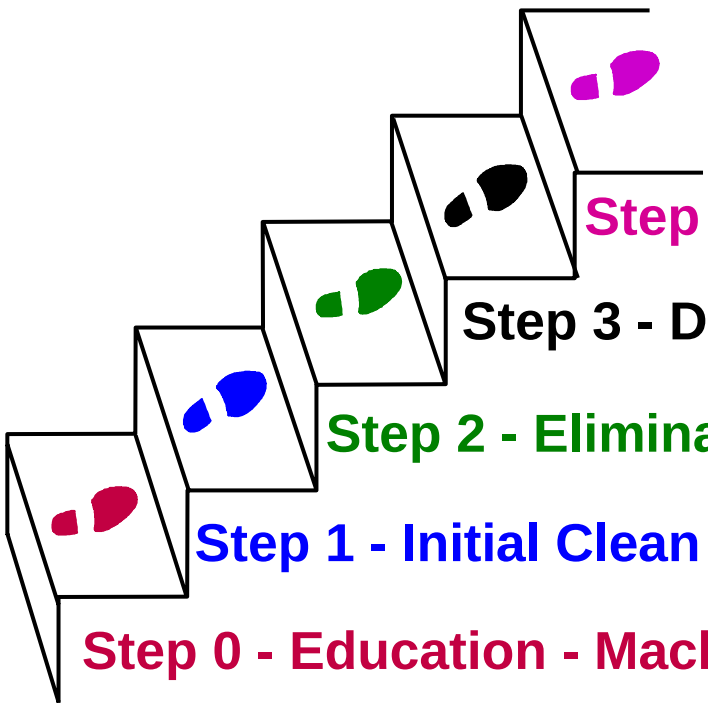


Step 4 - Finalise Standards & Train

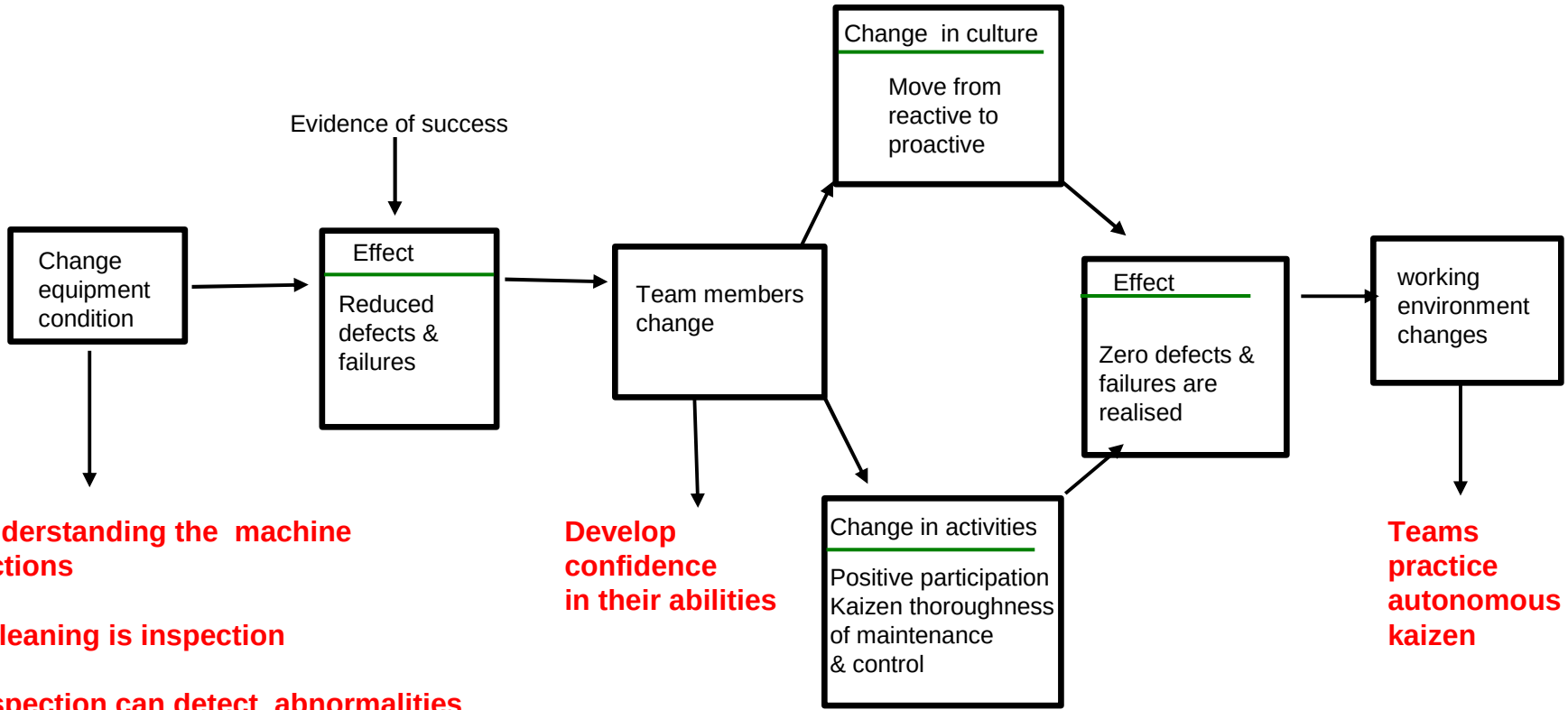
Step 3 - Develop ‘Provisional’ Standards

Step 2 - Eliminate Contamination & Inaccessible areas

Step 1 - Initial Clean & Inspect

Step 0 - Education - Machine Function

How does Autonomous Maintenance Work?



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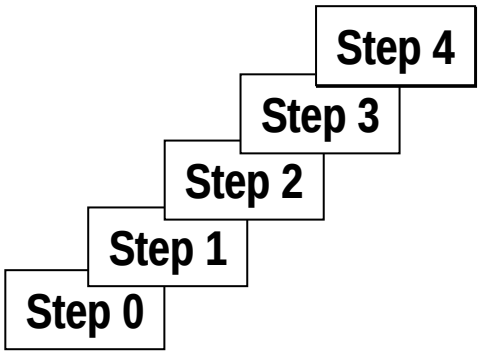
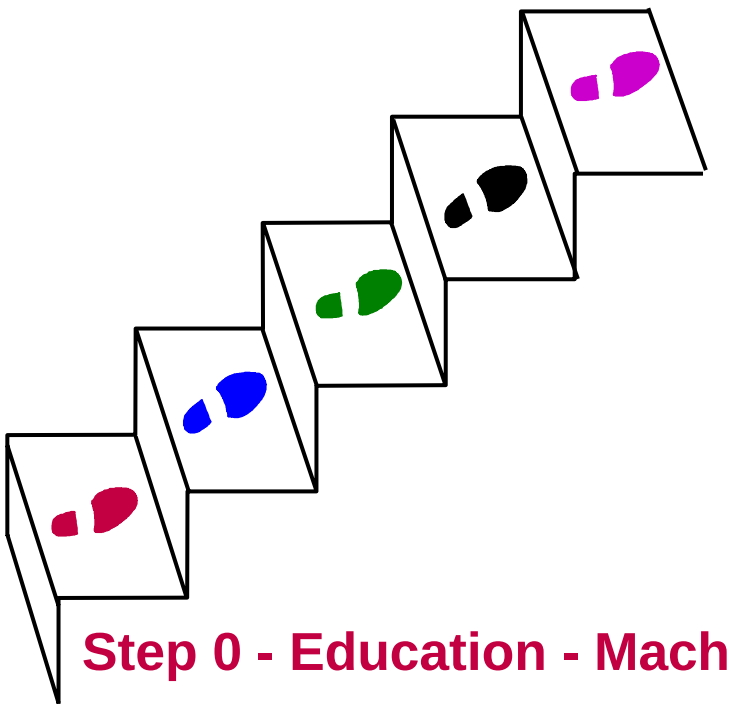


- **The way that the stages of autonomous maintenance are described as steps, promotes how autonomous maintenance works.**
- **To get from the bottom to the top it is easier to use evenly spaced comfortably sized steps.**
- **You must maintain each step as you progress, or the whole thing will crumble**

The 5 Steps of Autonomous Maintenance



Step 0 - Education - Machine Function

Step 0 - Education - Machine Function

Step 0 is about increasing our basic understanding of machine components and function.

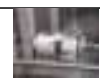
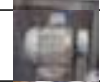
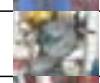
To help us with this we utilise the knowledge of engineers, and use machine components sheets to store this information.

Step 0 - Education - Machine Function

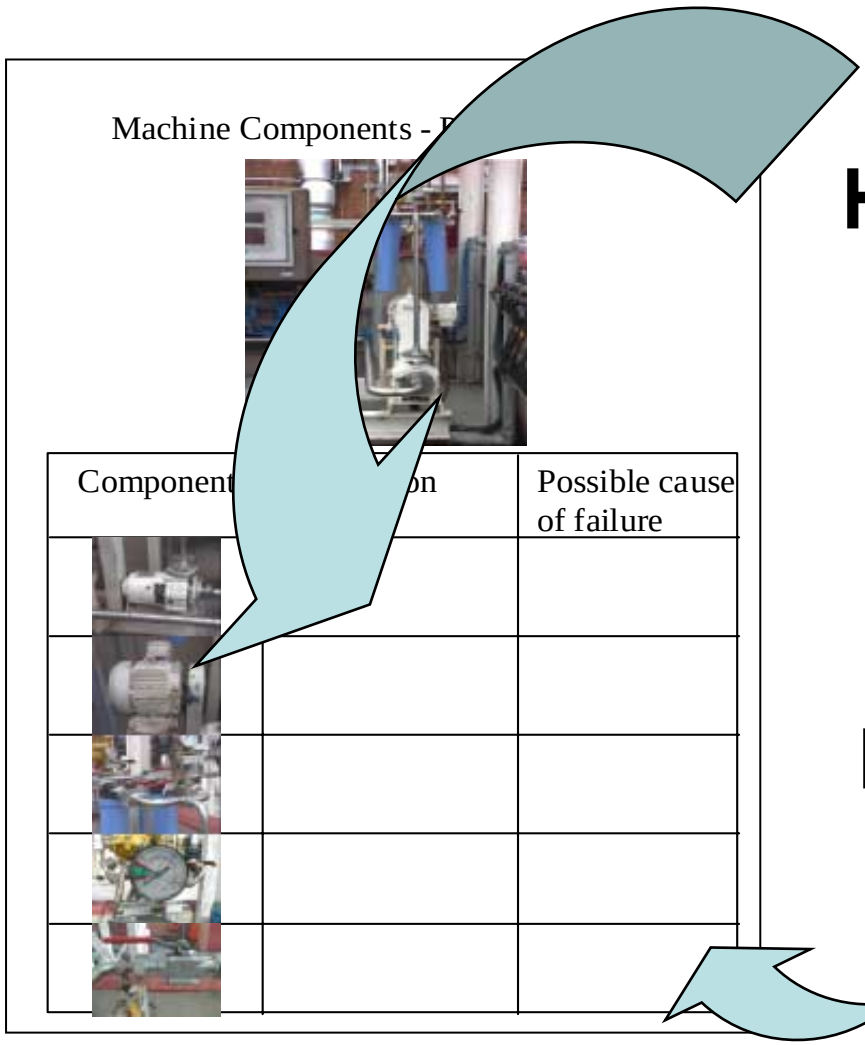
- Machine Component Sheets help us to understand how equipment works, and what can cause it to fail
- They also make a very effective training aid

Eg. Machine Components Sheet

Machine Components - Product Pumps

Components	Function	Possible cause of failure
		
		
		
		
		

Step 0 - Education - Machine Components Sheets



How Does It Work?

How Can it Fail?

Step 0 - Education - Machine Components Sheets

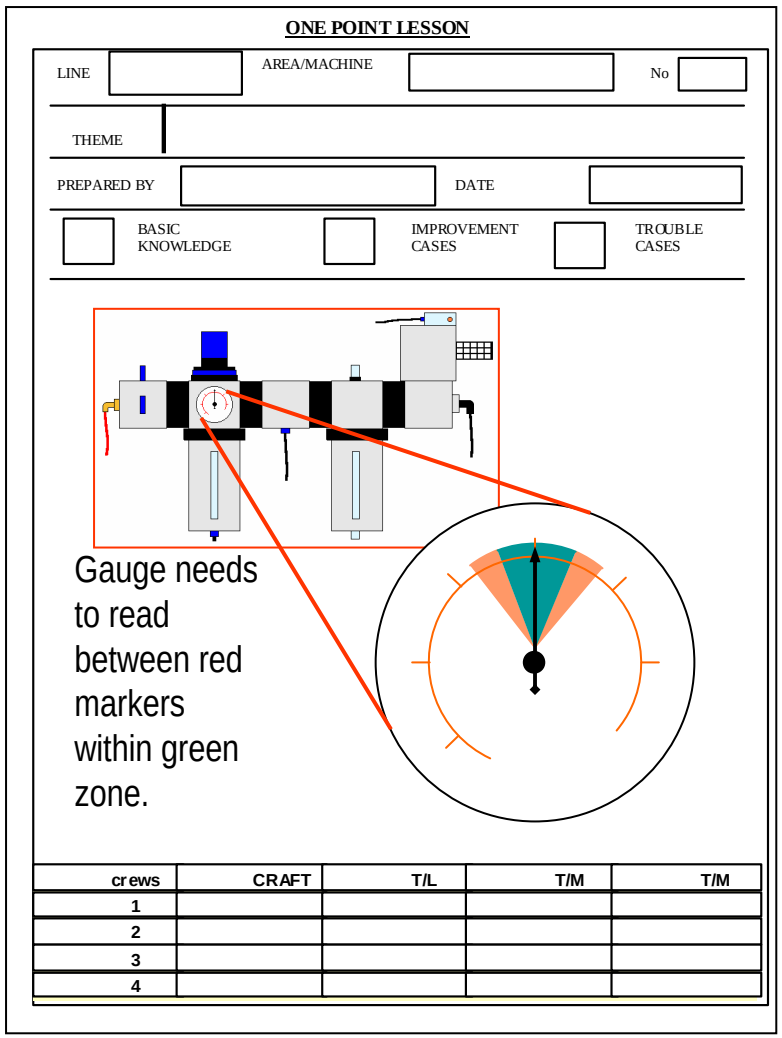
Machine Components - Product Pumps

Components	Function	Possible cause of failure
		
		
		
		
		

TIPS

- Should Initially be Hand drawn
- Should be completed at the machine in question
- Should be led by an experienced engineer

Step 0 - Education - One Point Lessons (OPL's)



ONE POINT LESSON

LINE | AREA/MACHINE | No

THEME

PREPARED BY | DATE

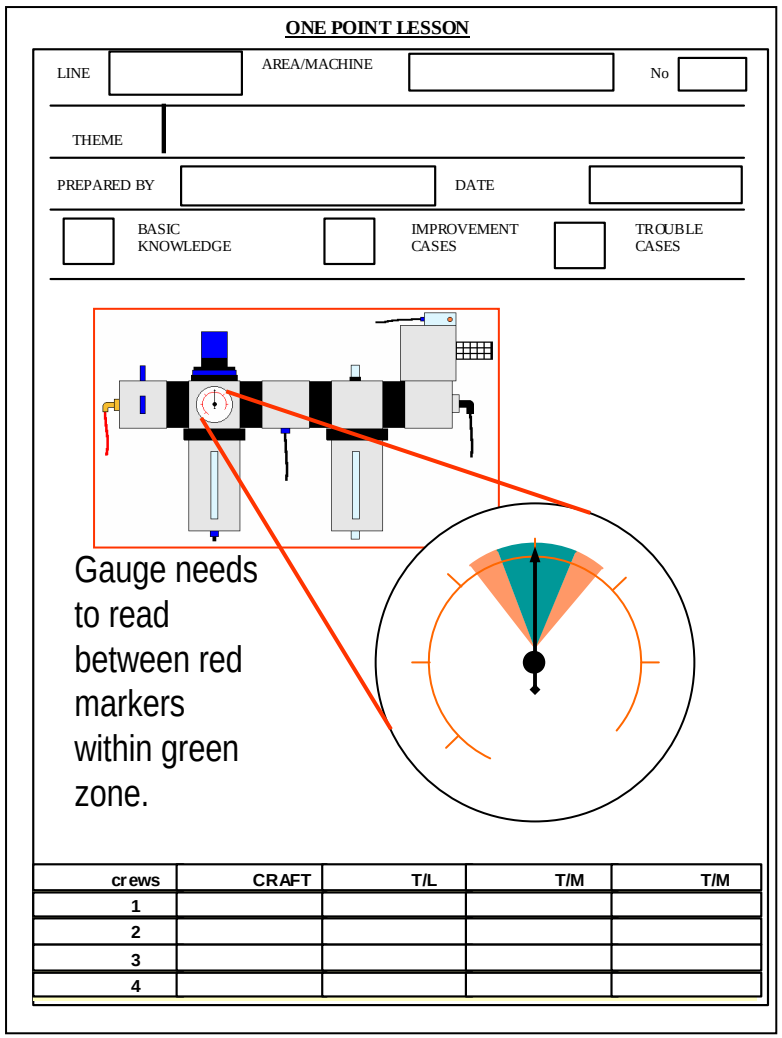
BASIC KNOWLEDGE | IMPROVEMENT CASES | TROUBLE CASES

Gauge needs to read between red markers within green zone.

crews	CRAFT	T/L	T/M	T/M
1				
2				
3				
4				

- **Tool to Communicate Improvements**
- **Tool to capture ideas**
- **Tool to share knowledge**
- **Tool for effective training**
- **Three types of OPL**
  - Basic Knowledge
  - Improvement Idea
  - Downtime Problem

Step 0 - Education - One Point Lessons (OPL's)



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1				
2				
3				
4				

TIPS

- Should Initially be Hand drawn
- Should be 80% Drawing 10% Words
- Should only take 5 mins to teach
- Adopt a company numbering system
- Should be verified by an engineer
- Use the bottom of the sheet as a training record

Step 0 - Education - Instructional Videos

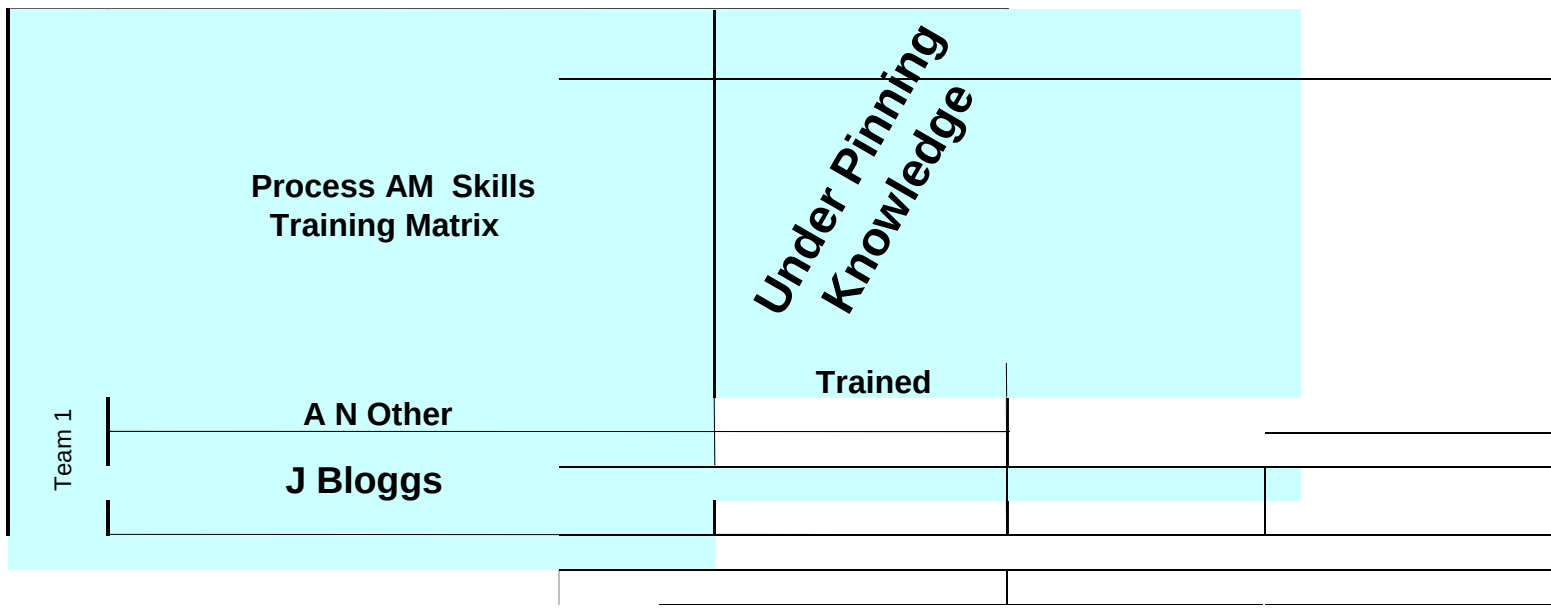
Guidelines

- **Keep it Simple**
- **Use Own Staff**
- **Humour**
- **Maximum 20 mins**
- **Plan the video**
- **Communicate intention to all staff**

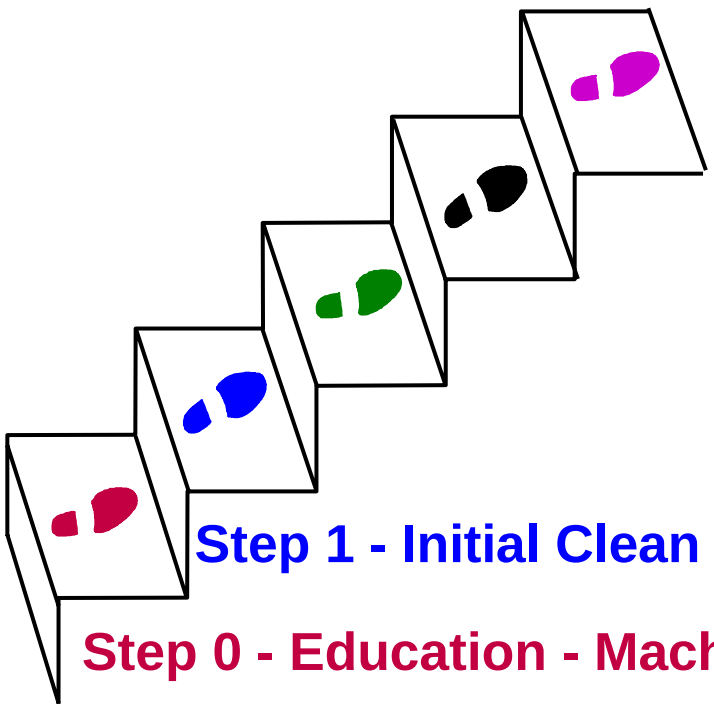
Step 0 - Education - Skills Audit

Guidelines

- **Based on detailed checklists that include**
  - Skills and Knowledge Required to complete Tasks
  - Notes on how to carry out assessments
  - Based on standard work instructions



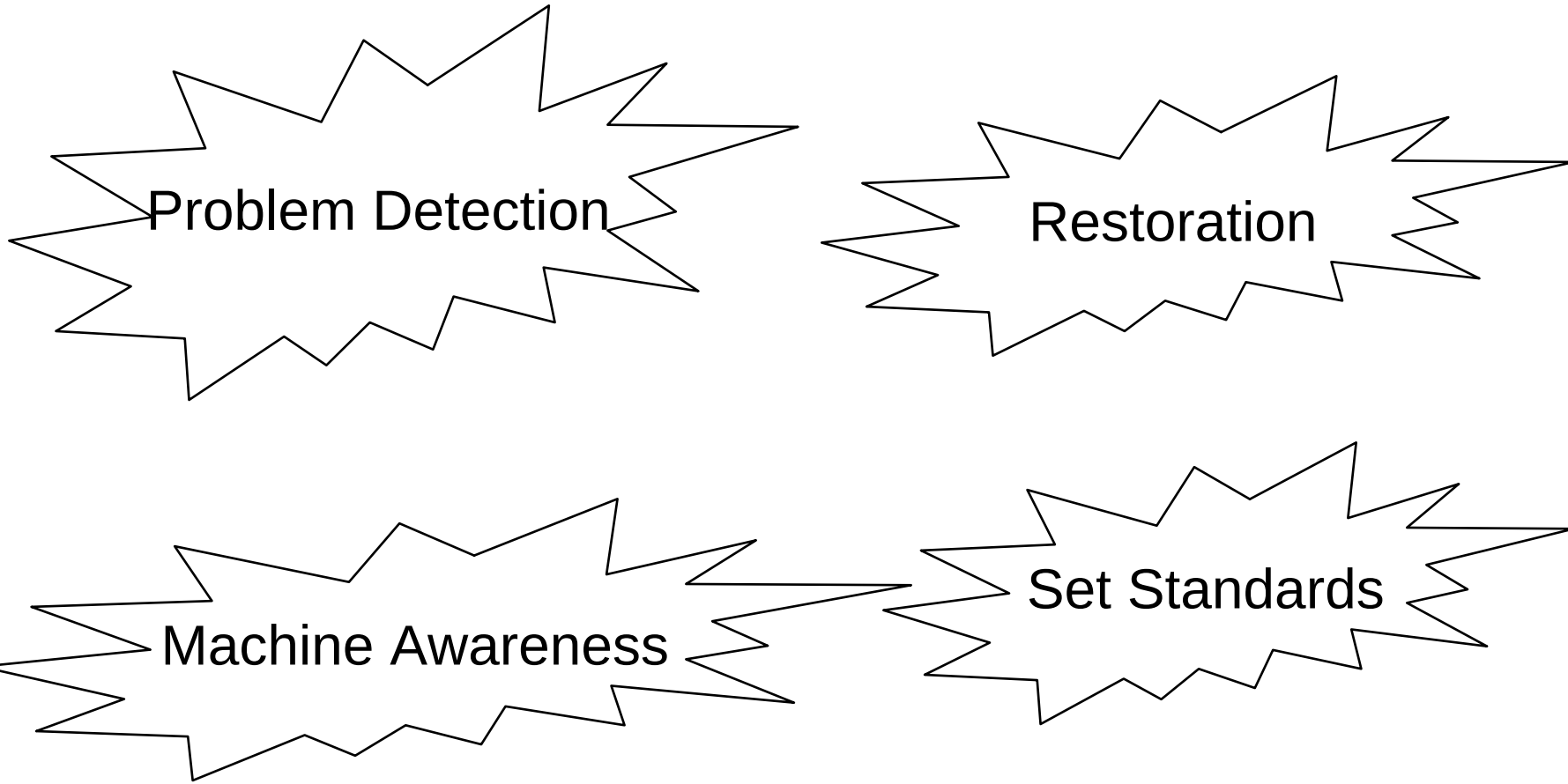
The 5 Steps of Autonomous Maintenance



Step 1 - Initial Clean & Inspect

Step 0 - Education - Machine Function

Step 1 - Initial Clean and Inspect



Cleaning IS Inspection!

Step 1 - Initial Clean and Inspect

Machine co

…..through cleaning you touch, through touching you find when you find, you fix !!

Clean & Inspection Fault Finding Sheet

Machine: M/c 1265	Date: 15/08	Completed by: J Brown

No	Location / Fault	Code class	Cause	Temp Perm	Countermeasure	Who	When
1	Pressure Gauge not within limit	H3	Poor labelling	T P	Ensure manual setting on label Write Setting on Setting sheet	Team Team	1/11 1/11
2	Measuring probe unprotected next to pallet	E9	Poor design	T P	Cover to be made Review machine specification	NCMT MR	Wk 26 Wk 26
3	Oil Leak next to twin pallet	L4	Poorly installed	T P	Fix leak Review installation procedure	Maint MR	Wk 25 Wk 27

Code	E	M	L	H	P	W
	Electrical	Mechanical	Lubrication	Hydraulic	Pneumatic	Water

Class	1	2	3	4	5	6	7	8	9
	Loose	Worn	Broken	Leaking	Missing	Dirty	Difficult to clean	Location / Routing	Poor design

Clean & Inspection Fault Finding Sheet

Machine:	Date	Completed by:

No	Location / Fault	Code class	Cause	Temp Perm	Countermeasure	Who	When

Code	E Electrical	M Mechanical	L Lubrication	H Hydraulic	P Pneumatic	W Water

Class	1 Loose	2 Worn	3 Broken	4 Leaking	5 Missing	6 Dirty	7 Difficult to clean	8 Location / Routing	9 Poor design

Clean & Inspection Concern/Fault Analysis Sheet

CONCERN / FAULT ANALYSIS

	E	M	L	H	W	P	TOTAL
1							
2							
3							
4							
5							
6							
7							
8							
9							
TOTAL							

CODE CLASS

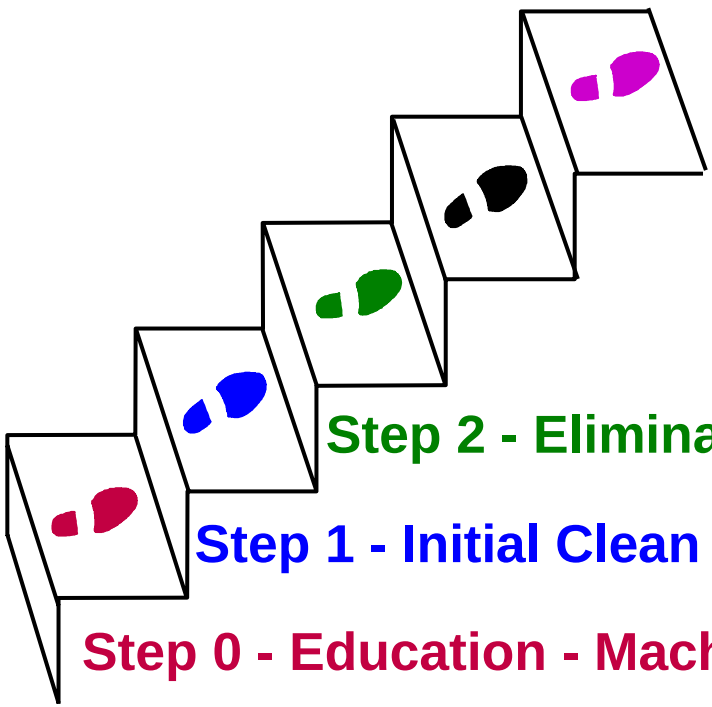
E = ELECTRICAL
M = MECHANICAL
L = LUBRICATION
H = HYDRAULIC
W = WATER
P = PNEUMATIC

1 = LOOSE
2 = WORN
3 = BROKEN
4 = LEAKING
5 = MISSING
6 = DIRTY
7 = DIFFICULT TO CLEAN
8 = LOCATION & / OR ROUTING

9 = POOR DESIGN

- Makes defects easier to detect.
- Better customer perception.
- Creates a better working environment.
- Aids efficiency and reduces accidents.
- Helps standardisation.

The 5 Steps to Autonomous Maintenance



Step 2 - Eliminate Contamination & Inaccessible areas

Step 1 - Initial Clean & Inspect

Step 0 - Education - Machine Function

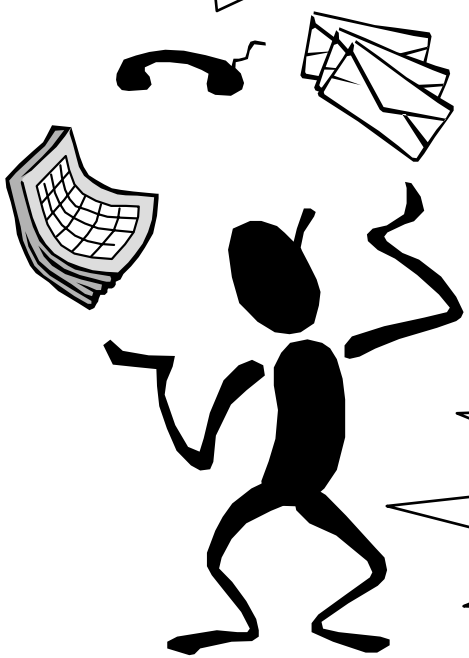
Step 2 - Eliminate Contamination and Inaccessible Areas

Quick Correction

Maintain Cleaning Standards

Reduces Inspection Time

Makes Maintenance Easier

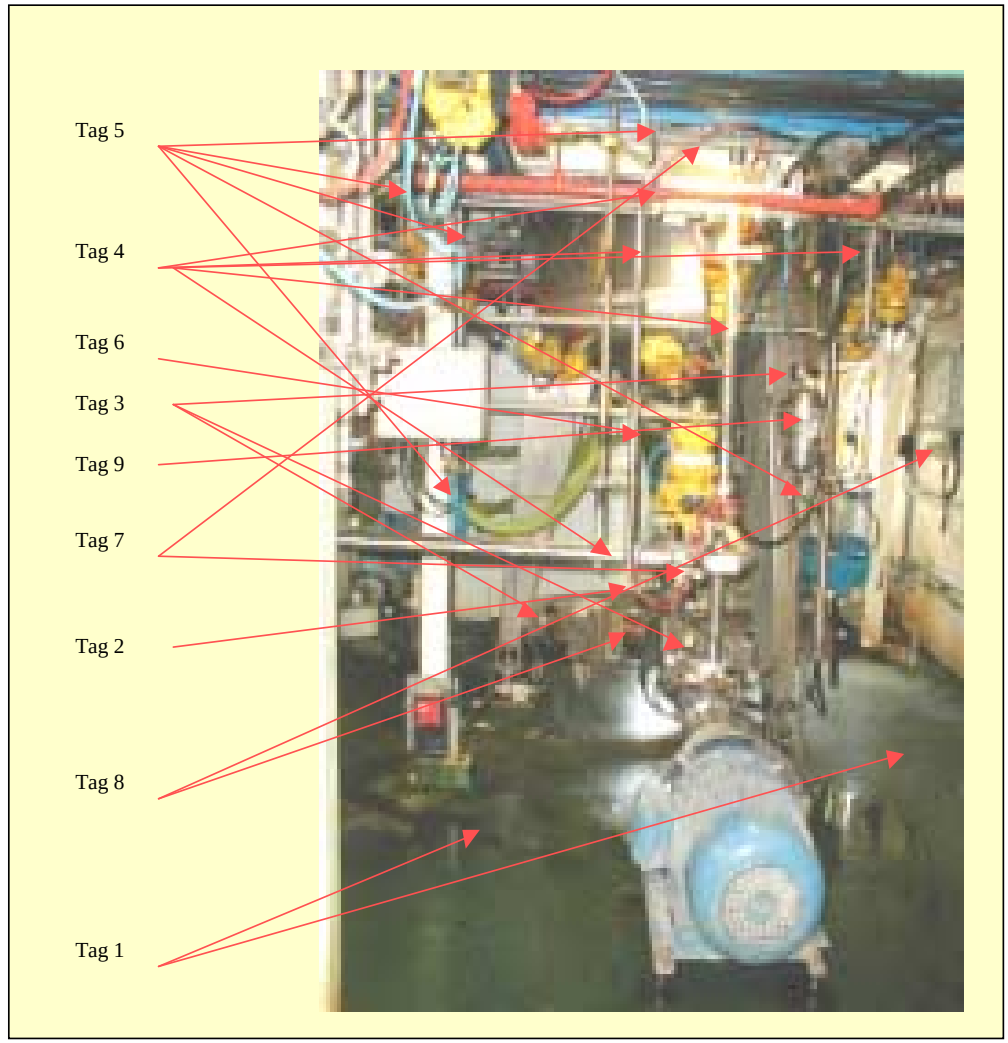


Planned Maintenance - Initial Equipment Survey

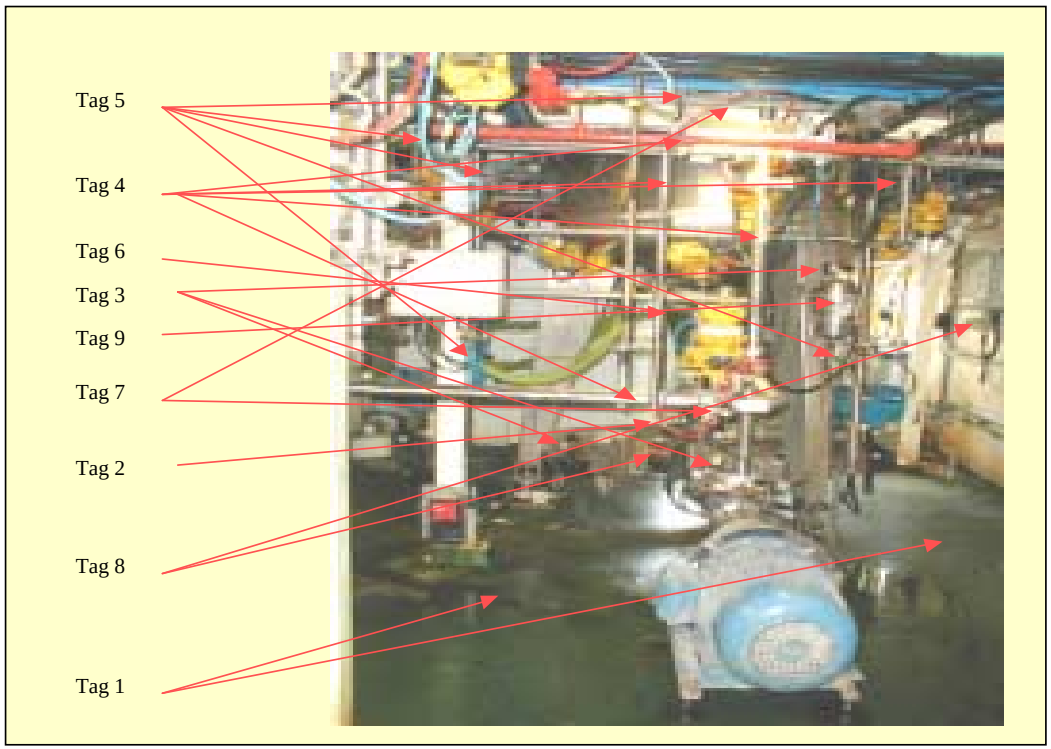
INITIAL EQUIPMENT SURVEY

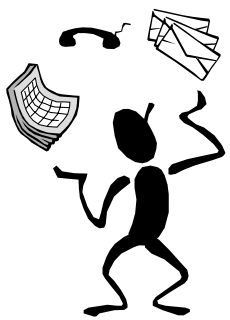
MACHINE MAPPING

- Group exercise.
- Lead by an experienced engineer/maintainer.
- Use in conjunction with “Tags”.



Step 2 - Eliminate Contamination - Machine Mapping

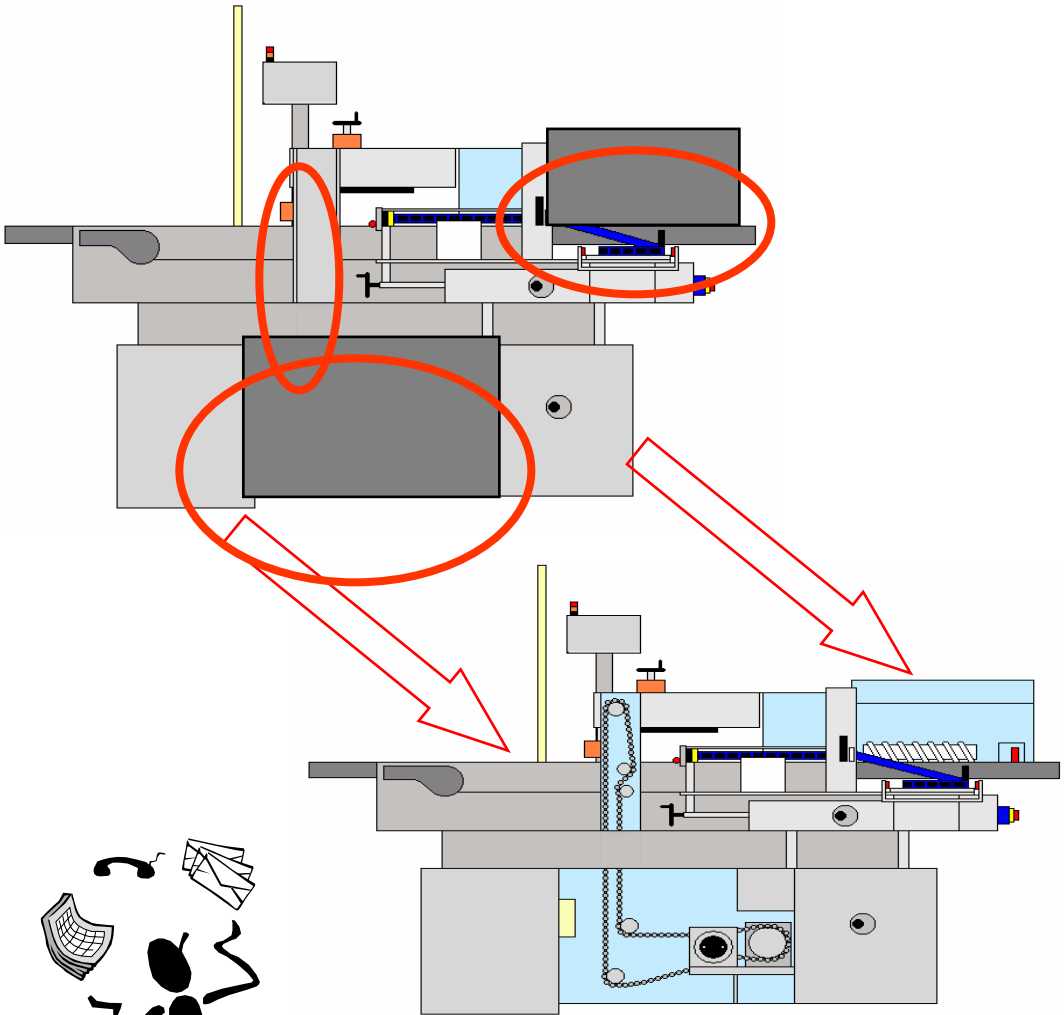




TIPS

- Group Exercise
- Identify Sources of contamination
- Identify inaccessible areas
- Should be led by an experienced engineer
- Can be used in conjunction with a red tag exercise

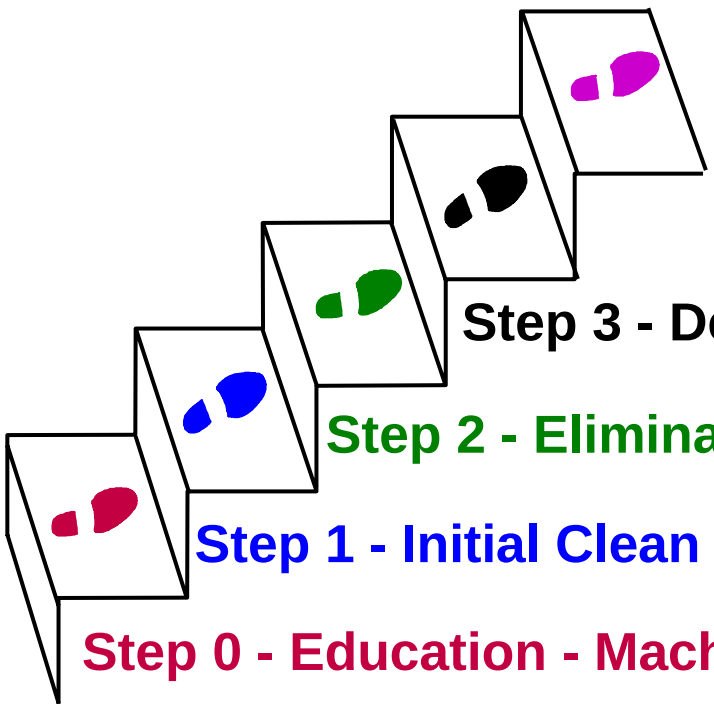
Step 2 - Eliminate Inaccessible Areas - Machine Mapping



TIPS

- Aim to reduce cleaning time
- Aim to reduce inspection time
- Make essential equipment access easier
- Simplify equipment operations

The 5 Steps to Autonomous Maintenance



Step 3 - Develop ‘Provisional’ Standards

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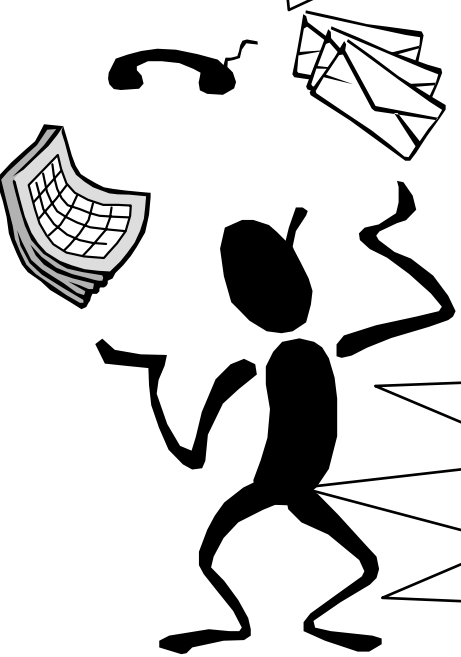
Step 3 - Develop Provisional Standards

Schedules

Cleaning Standards

Lubrication Standards

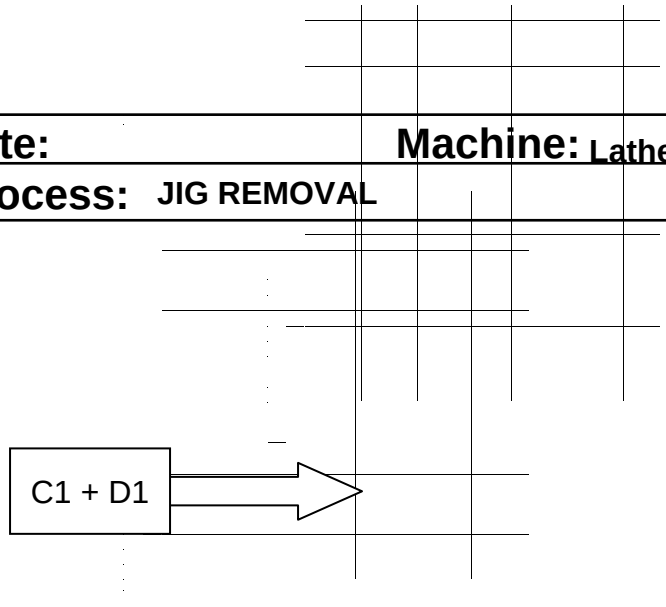


Inspection Standards

Step 3 - Develop Provisional Standards - Cleaning, Lubrication and Inspection

Date: **Machine:** Lathe

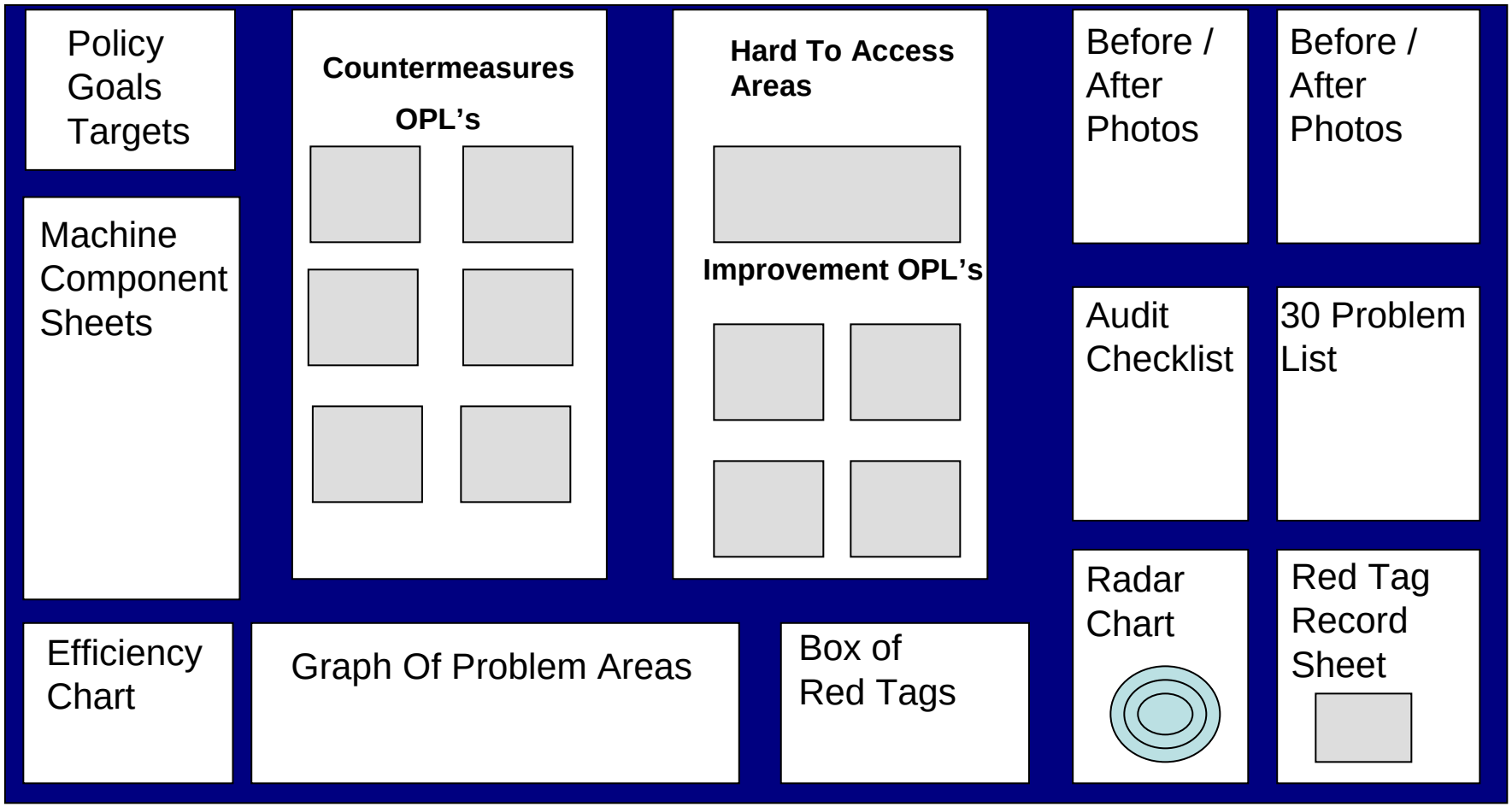
Process: JIG REMOVAL



Cleaning Items	
C	**Item to Clean**
1	LOCATING PINTLE
2	AREA AROUND SHAFT
3	SUPPORTING ACTUATOR SHAFT
4	GENERAL AREA

Lubrication & Inspection Items	
D	**Item**
1	LOCATING PINTLE - INSPECT FOR
	WEAR, LUBE WHERE NECESSARY
2	SUPPORTING ACTUATOR SHAFT -
	AS ABOVE
3	**REPORT ANY DAMAGE TO TEAM**
	LEADER

The TPM Board



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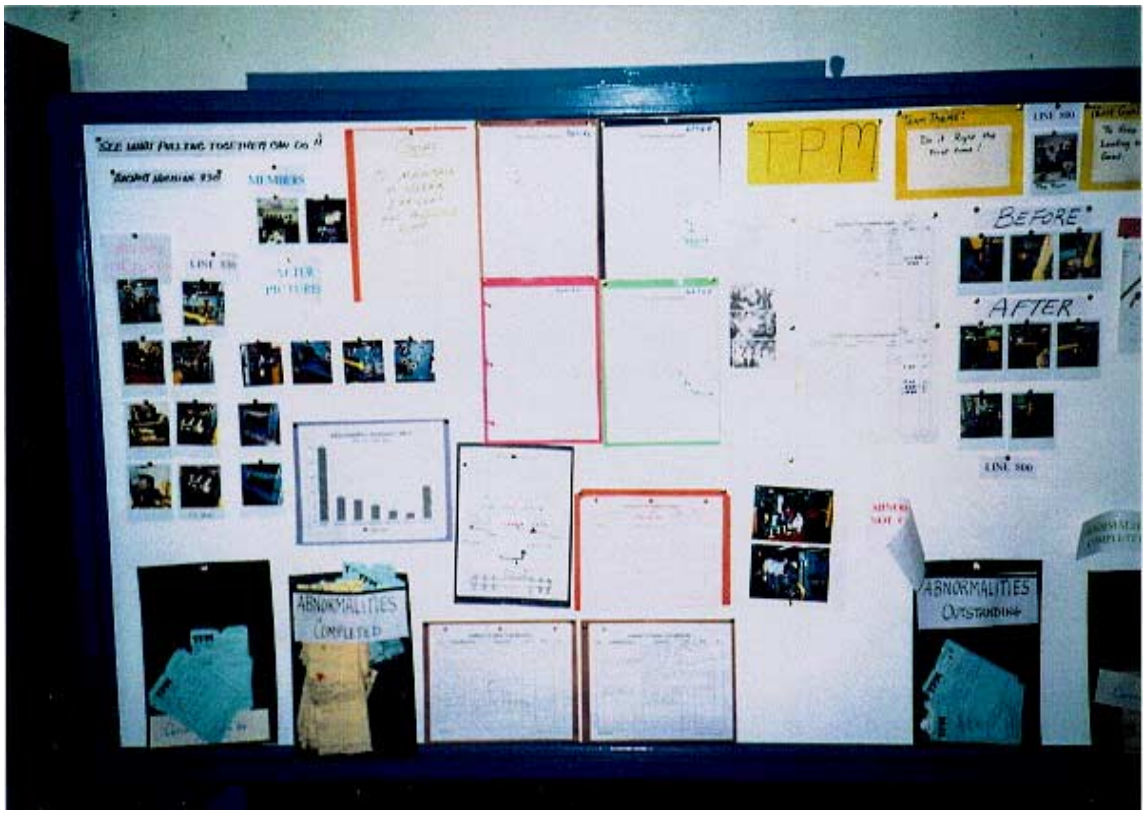
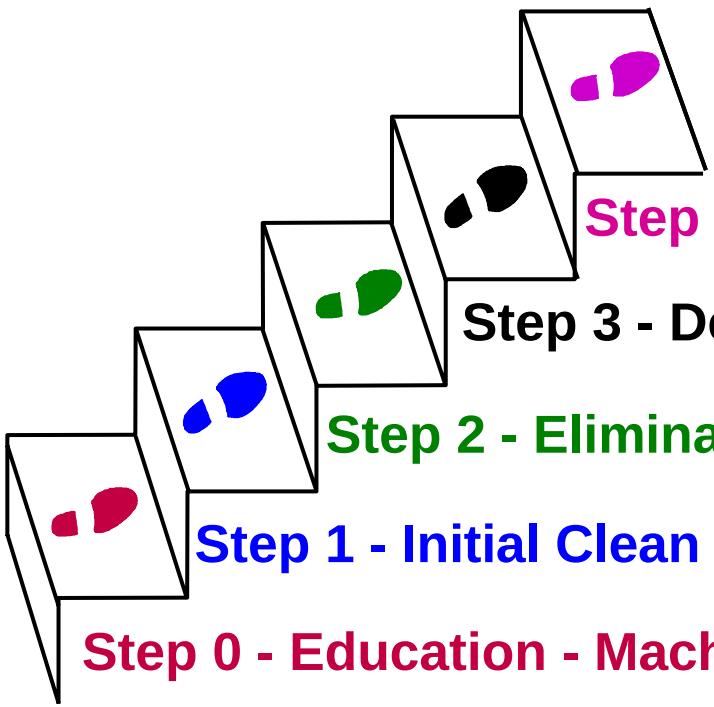


TIPS

- Display all work from steps 1 - 3
- Locate the board in the work area
- Present the board & improvements to senior managers
- Ensure that the board is up to date and owned
- Establish a standard that other boards can adopt

The 5 Steps to Autonomous Maintenance



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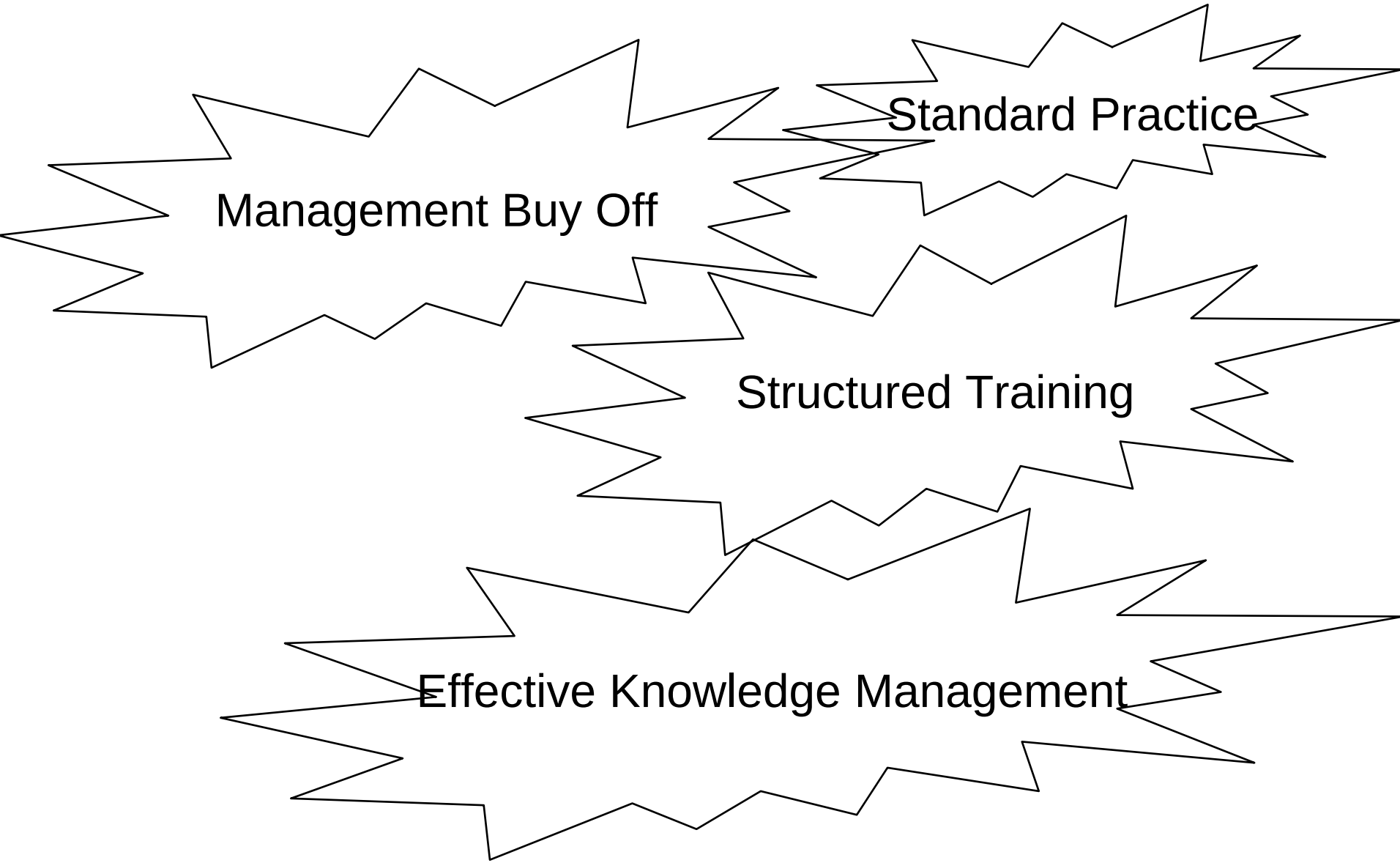
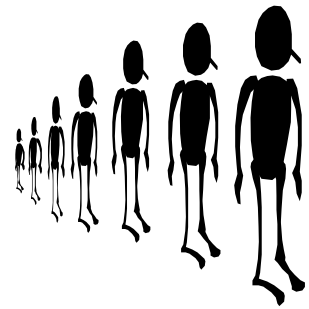
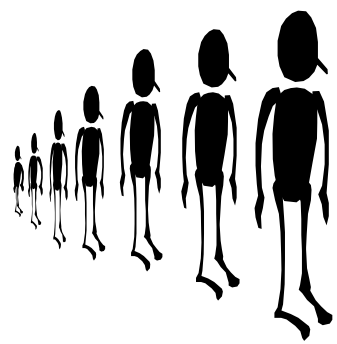


Step 4 - Finalise Standards and Train - Deployment

Trainers

Group leaders





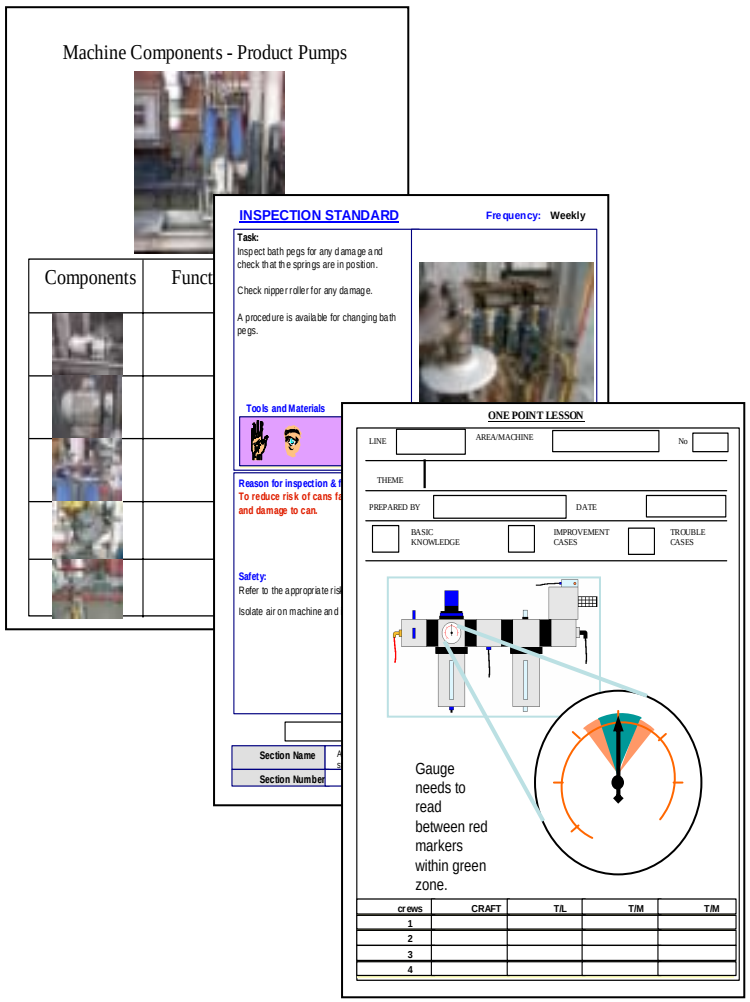
All the operators

Step 4 - Finalise Standards and Train - Training Contents

Training Should Include:-

- Parts names, structure and function of equipment
- Problems and their corrective actions
- Keypoints, methods, and criteria for inspection
- Inspection practice

Step 4 - Finalise Standards and Train - Training Contents



Training Should Include:-

- Component Sheets
- One Point Lessons
- Standards
- Work Instruction Sheets