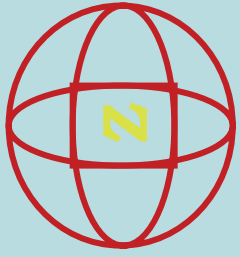


ZenPower International
Presentation.

TPM Implementation Blue-Print

www.tpmquality.com

By: Moses Tan (MSc, BIT), Principal TPM Consultant, ZenPower International



ZenPower International Introduction.

Who We Are:

ZenPower International was established in 1995 with its registered office in Singapore.

Our Vision.

To be the preferred regional provider of training, consultancy and sales services known for its integrity and excellence in business Quality, Reliability and Delivery.

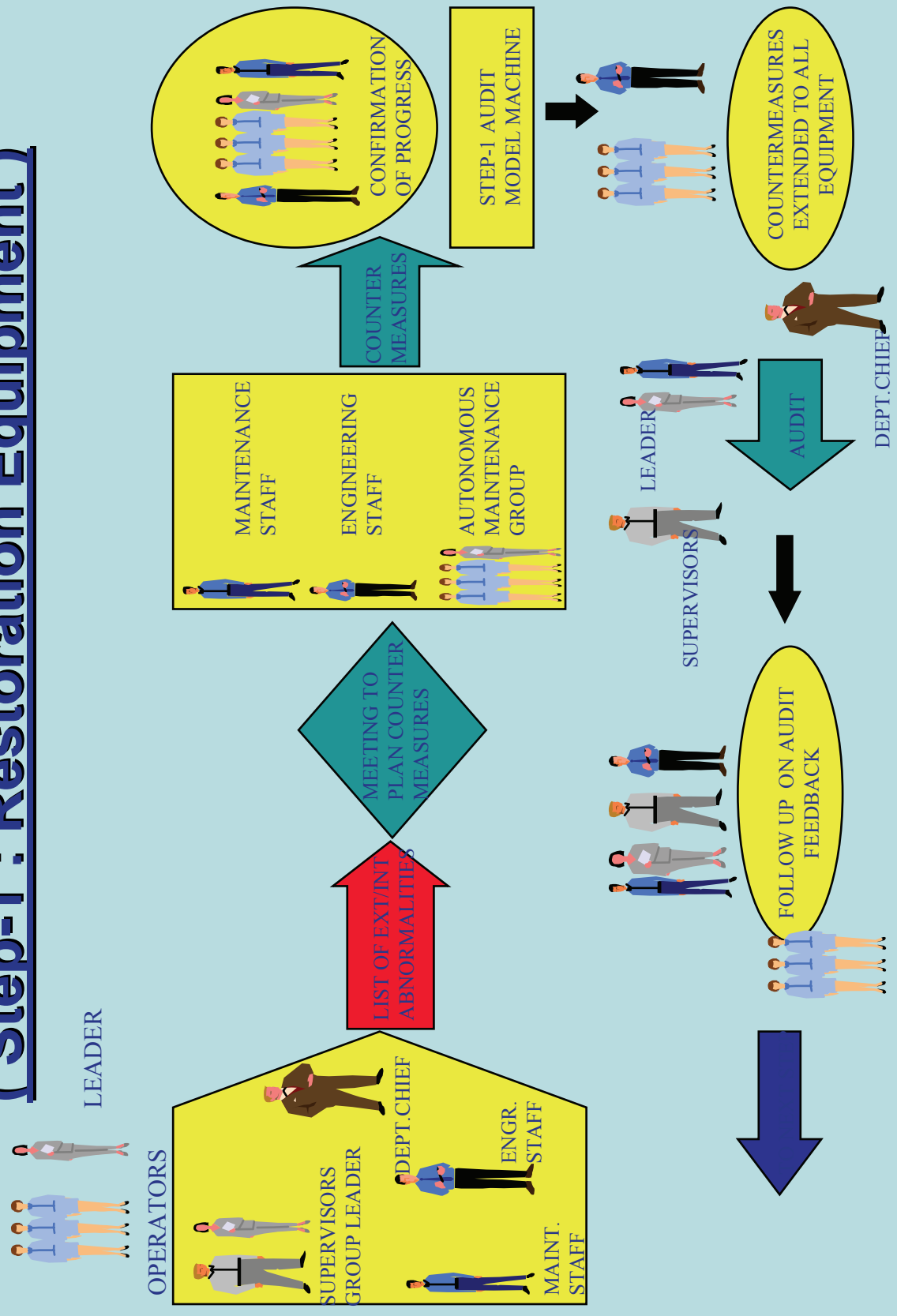
Focus:

**Understanding and Using
Autonomous Maintenance and
OEE concept for Continuous
Improvement in manufacturing**

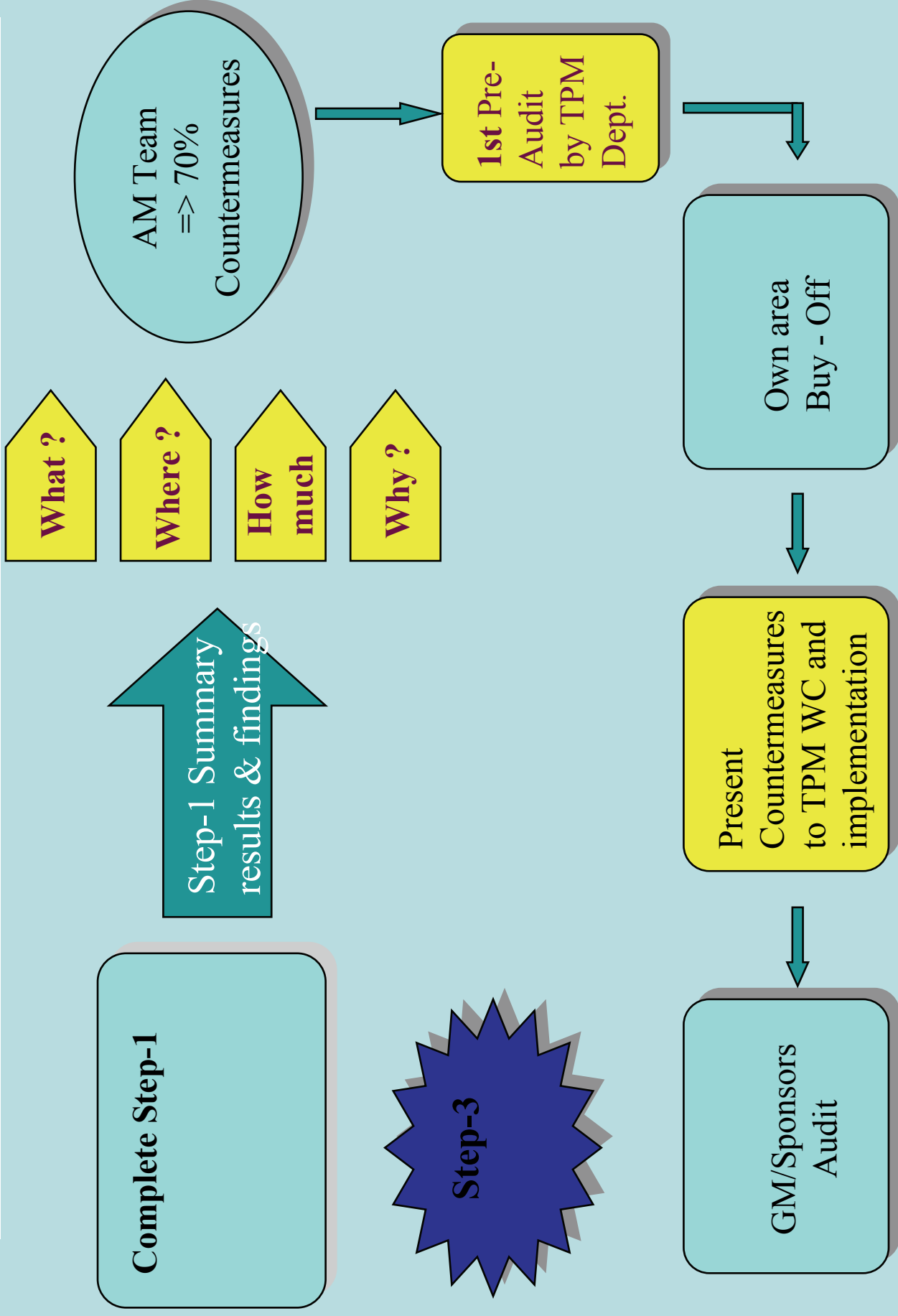
TPM-AM STANDARDS

Step #	Step Goal	Standards
Step 1	Restoration	=> 85% repair rate
Step 2	Eliminate Sources of Contamination	=> 70% successful effort
Step 3	Improve Equipment Accessibility	=> 70% successful effort
Step 4	Initial Maintenance Standards	> 50% sudden b/d reduction
Step 5	General Inspection Skills	> 90% sudden b/d reduction
Step 6	Autonomous Inspection	> 95% sudden b/d reduction
Step 7	Organise and manage workplace	TBD by management

Langkah-1 : Mengembalikan Peralatan Seperti Asal (Step-1 : Restoration Equipment)



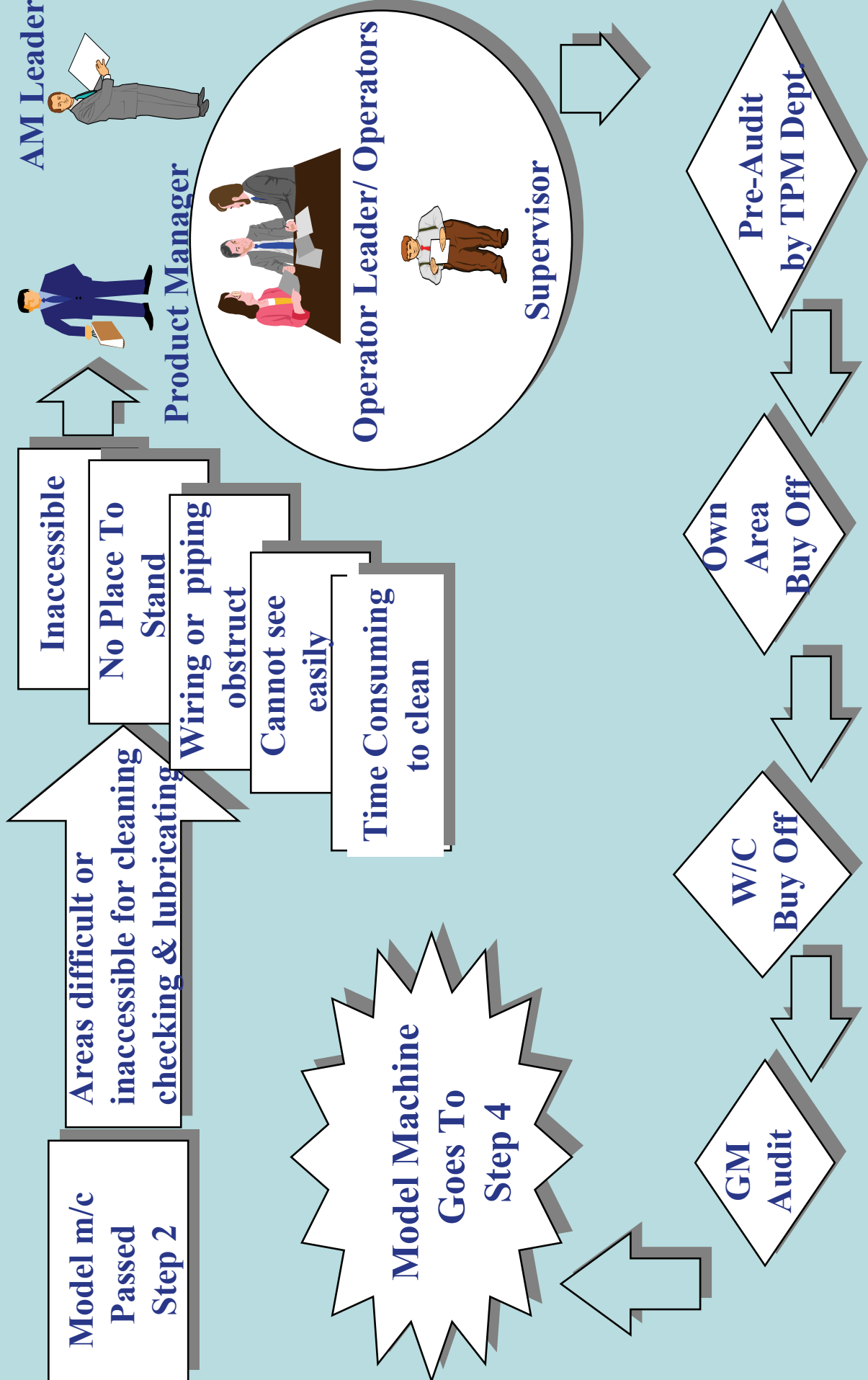
Langkah-2 : Menghapuskan Punca-Punca Kekotoran (Step-2 : Eliminate Contamination & Stains on Area & Parts)



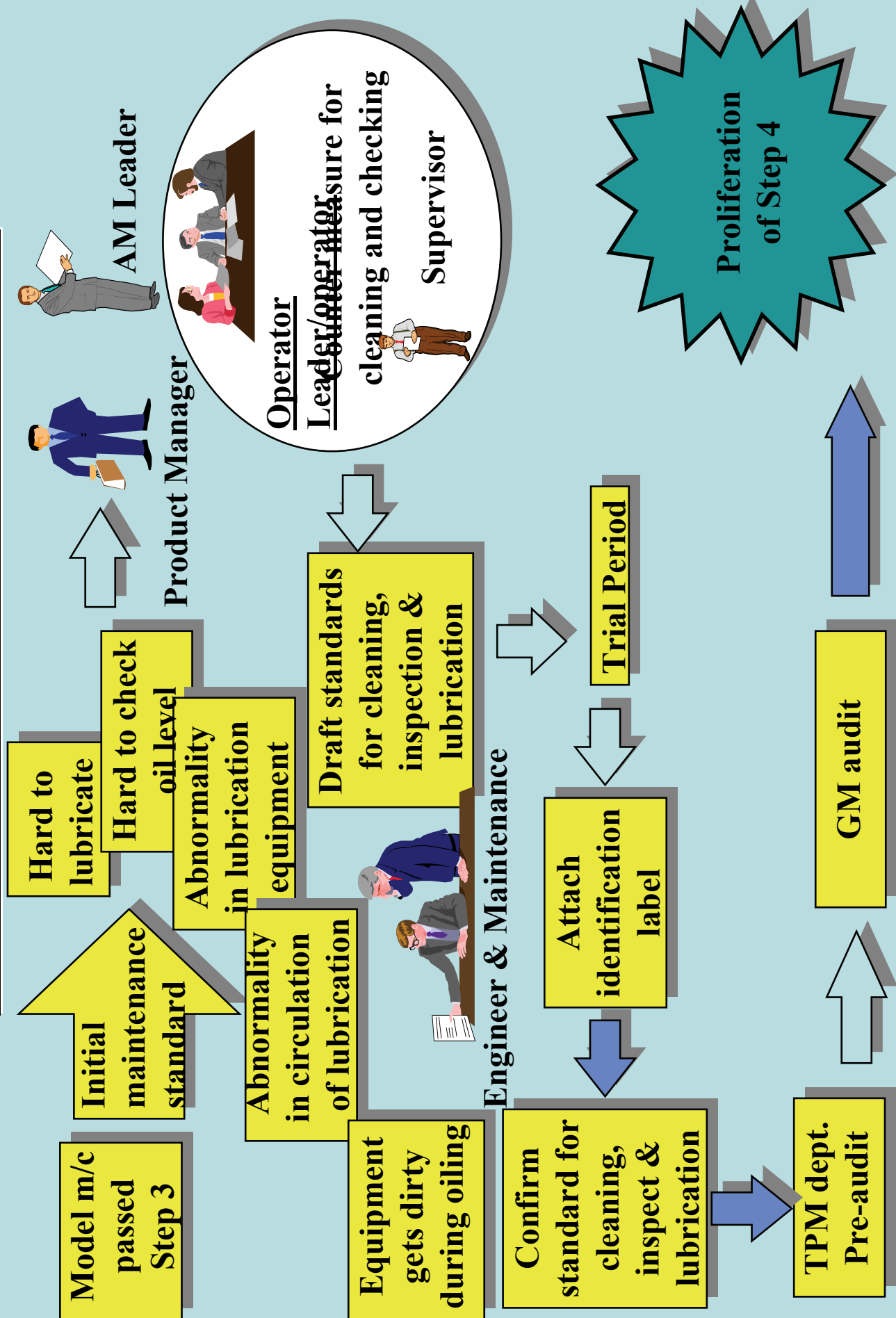
LANGKAH-3 : MEMUDAHKAN KERJA-KERJA PEMBERSIHAN,

PEMERIKSAAN DAN PELINCIRAN

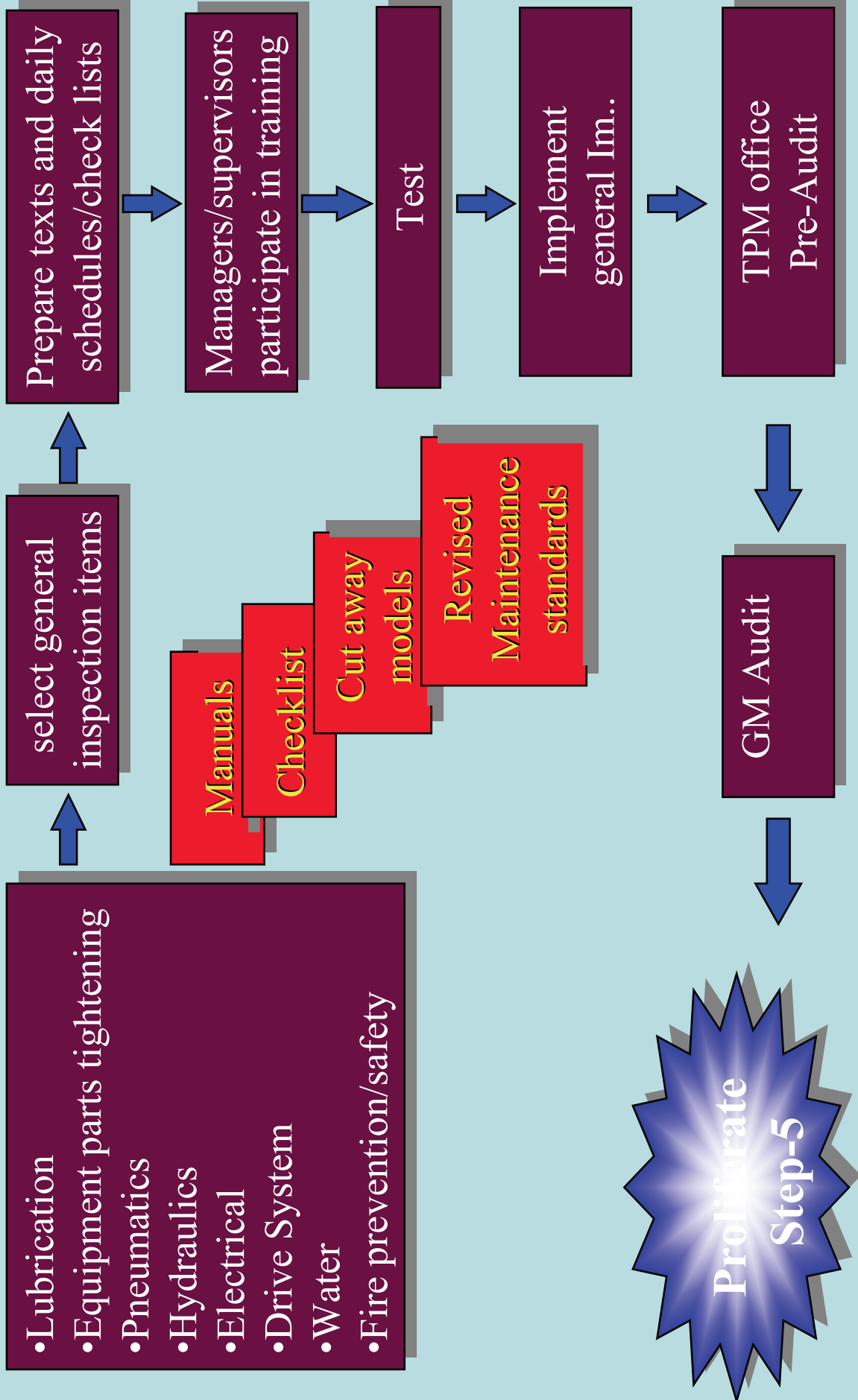
(STEP 3 : IMPROVE EQUIPMENT ACCESSIBILITY).



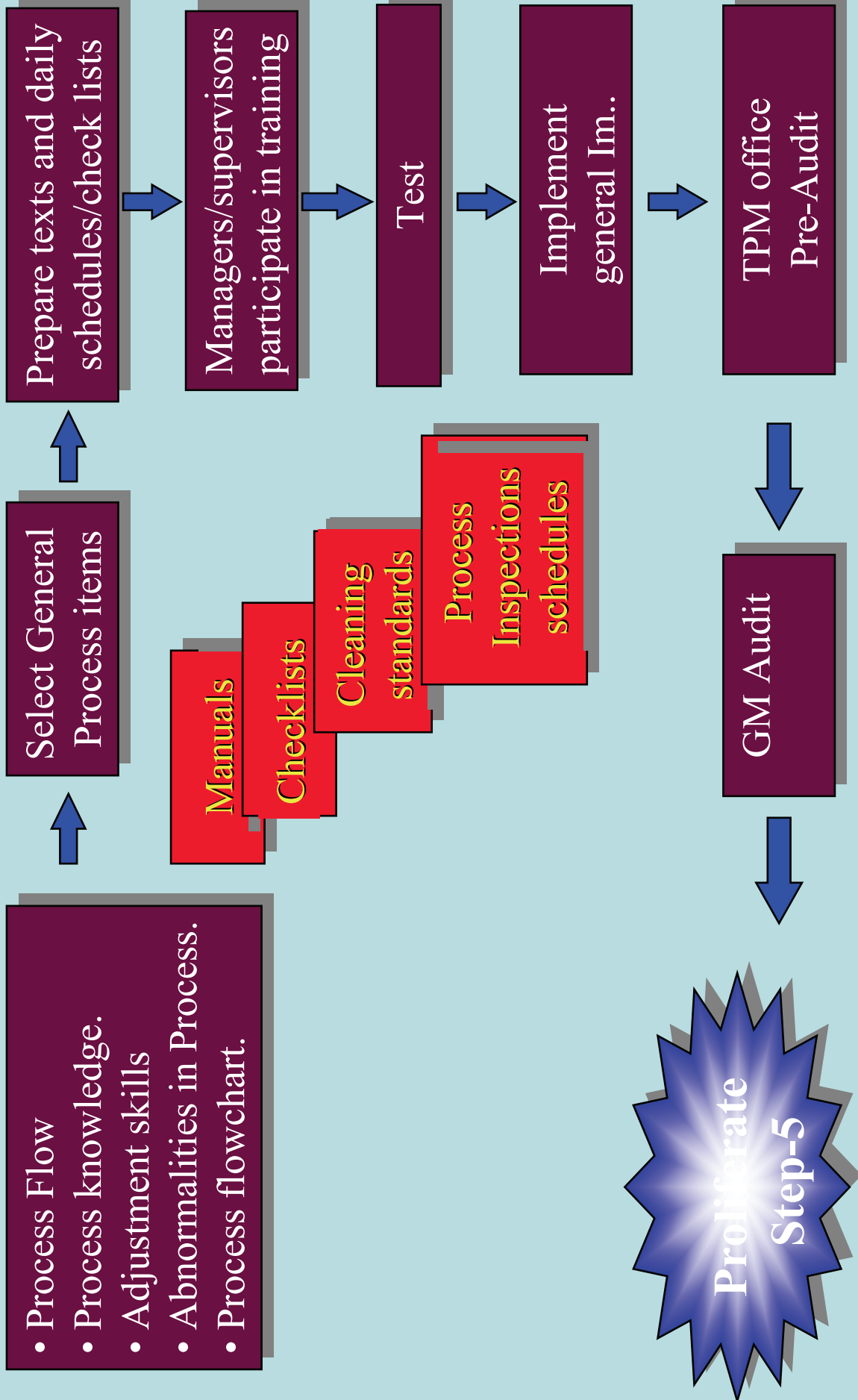
Langkah-4 : Piawaian Penyelenggaraan Awal (Step 4 : Initial Maintenance Standards)



Langkah-5 : Skil Pemeriksaan Am (Step 5 : General Inspection skills)



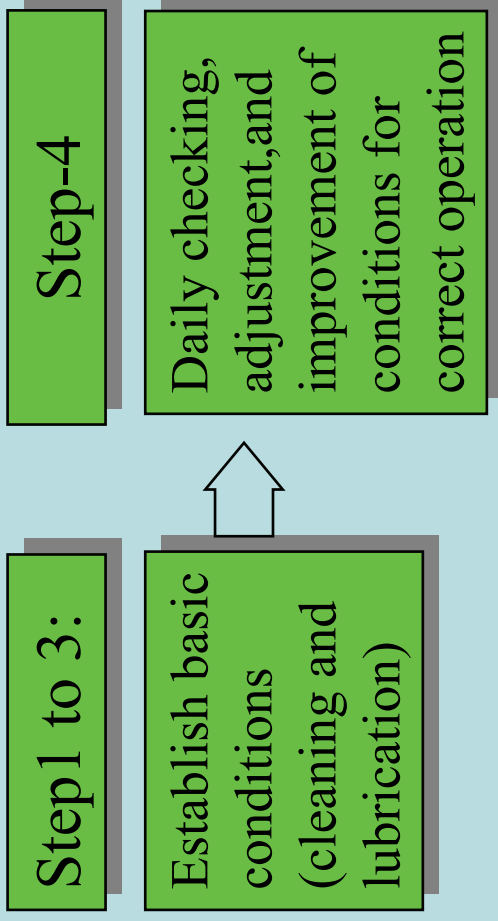
(Step 5 : General Process Inspection)



Langkah-6 : Pemeriksaan Autonomi
(Step-6 : Autonomous Inspection)



Step-5 Revise provisional standards



Operators who understand their equipment (able to maintain inspection standards)

Inspection skill check-up

Finalise standards for cleaning and lubricat

Langkah-7 : Mengatur Dan Menguruskan Tempat Kerja
Step-7 : Organise and Manage Workplace

Organise and set standards for :

**EQUIPMENT PRECISION
INSPECTION ITEMS**

**STANDARDS FOR
INDIVIDUAL WORK
RESPONSIBILITIES**

**TOOLS AND MATERIALS
FLOW AND STORAGE**

OEE

= Availability * Performance Rate * Quality

Rate

= Maximum 100%

Under Actual Manufacturing conditions, some losses are inevitable. Hence the Best Practices have adopted **85% as a realistic monthly target.**

Equipment OEE Losses

Equipment Total Available time in 8 hr shift = 480 mins.

Equip. Loading time = 460 mins
Equip. Planned D/T = 20 mins

Equip. Operating time
Equip. UnPlanned D/T = 60 mins

Equip. Net Operating time
Equip Speed Performance Losses.

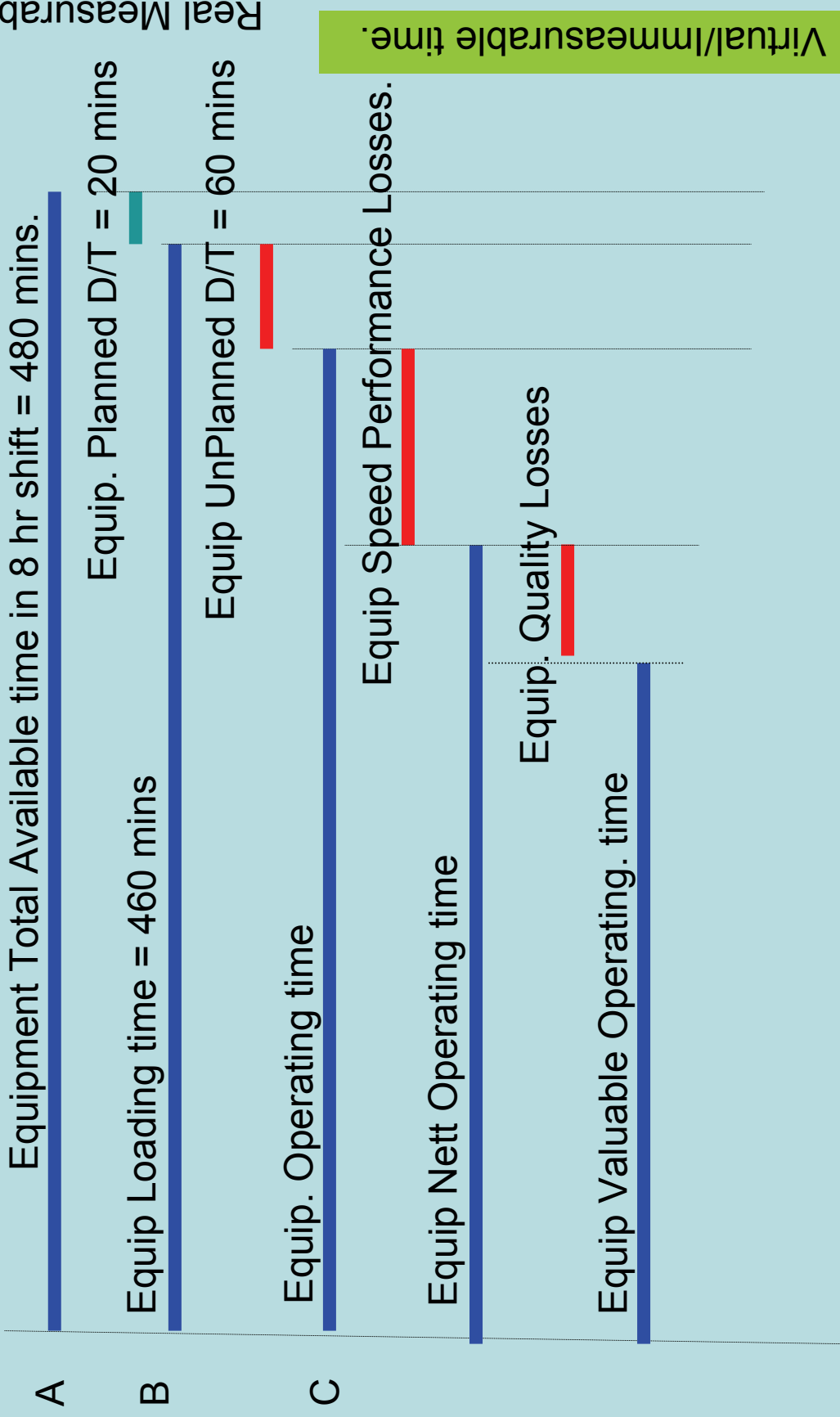
Equip. Valuable Operating. time
Equip. Quality Losses

Virtual/Immeasurable time.

Real Measurable time

Calculating
Availability
in OEE .

Equipment OEE Losses



Real Measurable time

Availability & Utilization

- Losses due to unplanned downtime only.
- The unplanned events are Machine Breakdown and Setups.
- Small fluctuations.

- Losses due to the same reasons plus
- Planned downtime mainly due to 'no schedule' during poor business conditions or holidays, PM shuts

Calculating **Performance Rate** in OEE .

Equipment OEE Losses

Equipment Total Available time in 8 hr shift = 480 mins.

1. Equip Breakdown losses.
2. Equip Setup losses (>10min)

Equip. Planned D/T = 20 mins

3. Minor Stoppages losses.
4. Reduced Speed losses.

Equip UnPlanned D/T = 60 mins

5. Defect losses
6. Yield/startup losses

Equip Speed Performance Losses.

Equip. Quality Losses

Equip Valuable Operating. time

Virtual/Immeasurable time.

Real Measurable time

USEFULNESS OF OEE

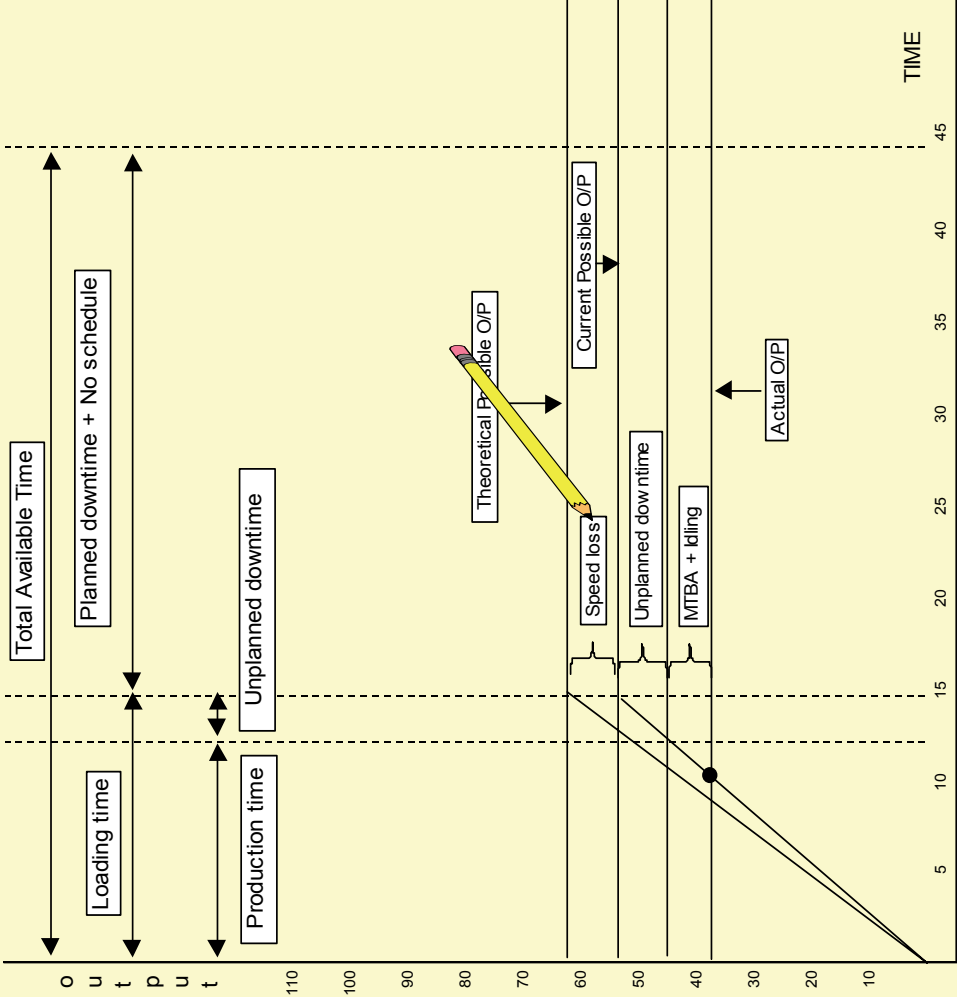
- Provides a long-term baseline of equipment condition for improvement measurement.
- When an OEE analysis chart is plotted, the exact reasons in terms of the 6 Big Losses are clearly understood.
- Suitable tools can be used to address specific selected Losses.

IDENTIFY THE MAJOR LOSSES THROUGH THE OEE ANALYSIS

Before

OEE-Analysis Format

1-Month Summarized Data in Minutes	
1. Total available time	= 44640 min
2. No schedule time	= 26870 min
3. Planned downtime	= 3655 min
3a. PM time	= 0 min
3b. Meeting time	= 0 min
3c. Housekeeping / TPM	= 3655 min
4. Loading time = 1 - 2 - 3	= 14115 min
	= 846900 sec
5. Unplanned downtime	= 2941 min
5a. Machine breakdown	= 2168 min
5b. Engineering time	= 0 min
5c. QC / QA time	= 193 min
5d. P. Parts shortage	= 580 min
5e. No material (Lot waiting)	= 0 min
5f. Facility stoppages	= 0 min
5g. Break time / No operator	= 0 min
5h. Rework / Retest	= 0 min
5i. Conv. / Setup	= 0 min
6. Production time = 4 - 5	= 11174 min
7. Total quantity processed (Actual O/P)	= 33877 frame
8. TCT (theoretical cycle time)	= 109.86 sec
8a. Theoretical possible O/P = 4/8	= 61671 frame
9. MCT (machine cycle time)	= 128.32 sec
9a. Currently possible O/P = 4/9	= 52799 frame
Other remarks:	
10. Availability rate	= 79.16 %
Performance rate	= 69.39 %
Quality rate	= 99.80 %
11. OEE	= 54.82 %



Scale: Y-1 : 5k X-1 : 2.5k

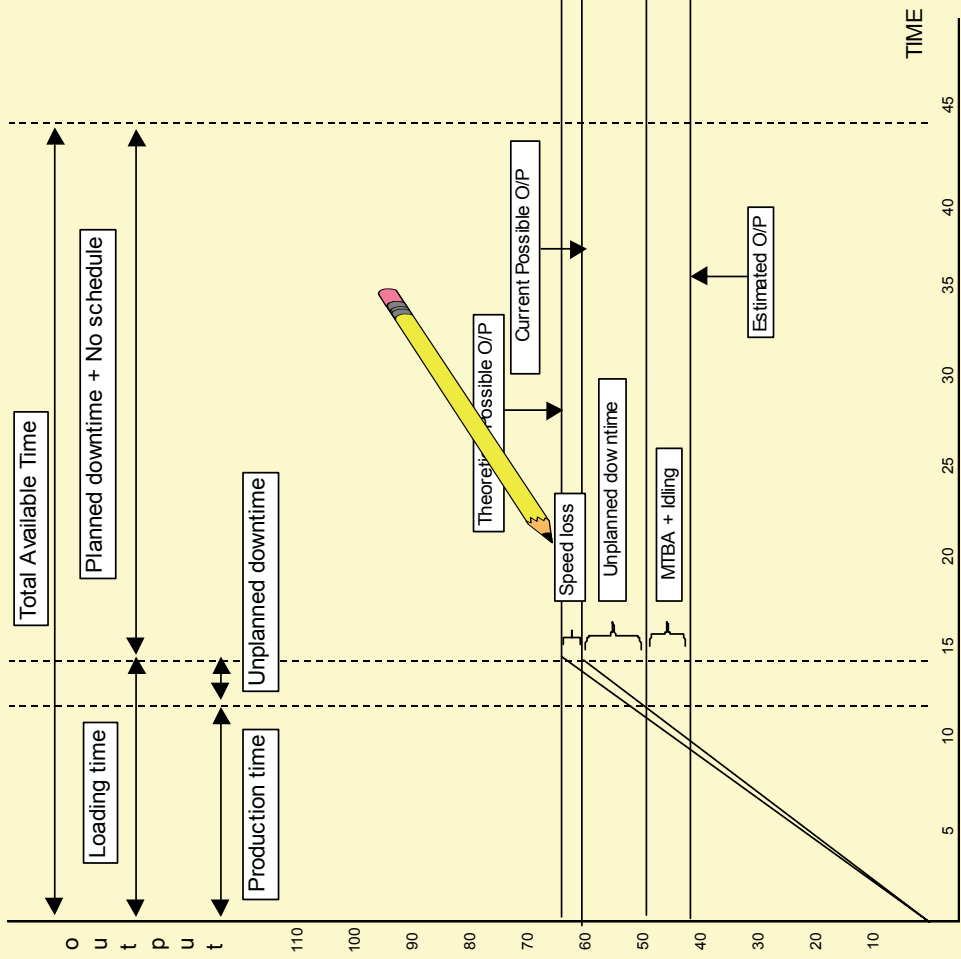
Remarks: TSSOP 14 / 16 Id = 50 unit / frame.

IMPROVEMENT DONE CAN BE OBSERVED THROUGH THE OEE ANALYSIS



OEE-Analysis Format

1-Month Summarized Data in Minutes	
1. Total available time	= 44640 min
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5f. Facility stoppages	= 0 min
5g. Break time / No operator	= 0 min
5h. Rework / Retest	= 0 min
5i. Conv. / Setup	= 0 min
6. Production time = 4 - 5	= 11174 min
7. Total quantity processed (Actual O/P)	= (estimated) frame
8. TCT (theoretical cycle time)	= 106.79 sec
8a. Theoretical possible O/P = 4/8	= 63444 frame
9. MCT (machine cycle time)	= 112.64 sec
9a. Currently possible O/P = 4/9	= 60149 frame
Other remarks:	
10. Availability rate	= 79.16 %
Performance rate	= 81.63 % (etd)
Quality rate	= 99.80 %
11. OEE	= 64.48 % (estimated)

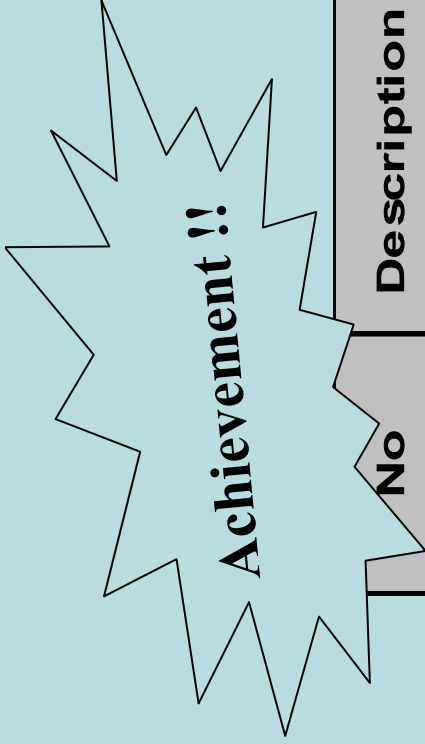


Scale: Y-1: 5k X-1: 2.5k

Remarks: TSSOP 14 / 16 Id = 50 unit / frame.

Various Examples Of Improving OEE.

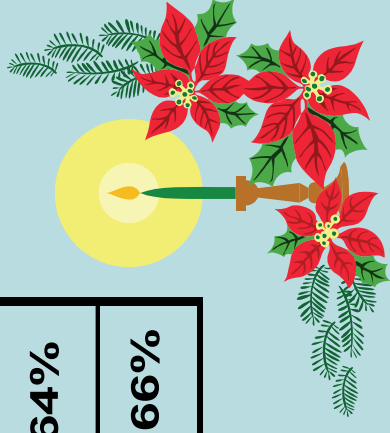
Speed Improvement



No	Description	Improvement		Delta (%)
		Before	After	
1	TCT	109.86	106.79	2.79%
2	MCT	128.32	112.64	12.22%
3	UPH	2579	2905	12.64%
4	OEE	54.82%	64.48%	* 9.66%

Note: Item 1, 2 & 3 are calculated by IE department

* item 4 is base on no loss from lot-waiting

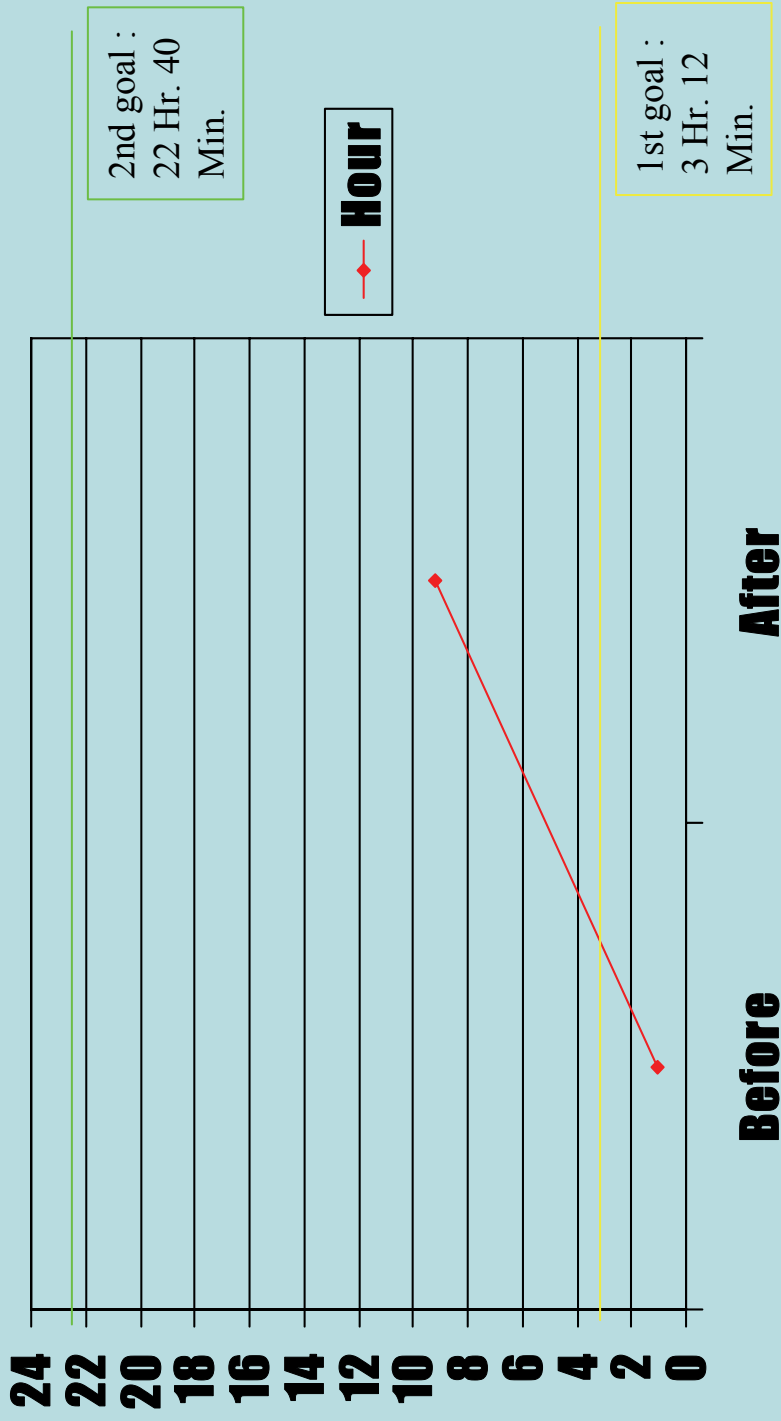


**Example Of
Improving
Performance Rate
through Improving
the Equipment
MTBA Losses.**

Summary of “Static” Restoration Activities (1st Part)

- Six standards “static” conditions were checked and identified areas need to be restored.
- ✘ Indexer clamp’s parallelism was out.
- ✘ The index clamper and back rail gap were out of the required spec.
- ✘ Output index clamper position not parallel when a lead-frame is clamped.
- ✘ One hot plate screw was missing.

'Before' and 'After' Restoration MTBA



* MTBA based only on Alignment Error stoppages.

Equipment Quality Rate Losses.

