Production System Management

Successful
Future
Innovation
Solutions

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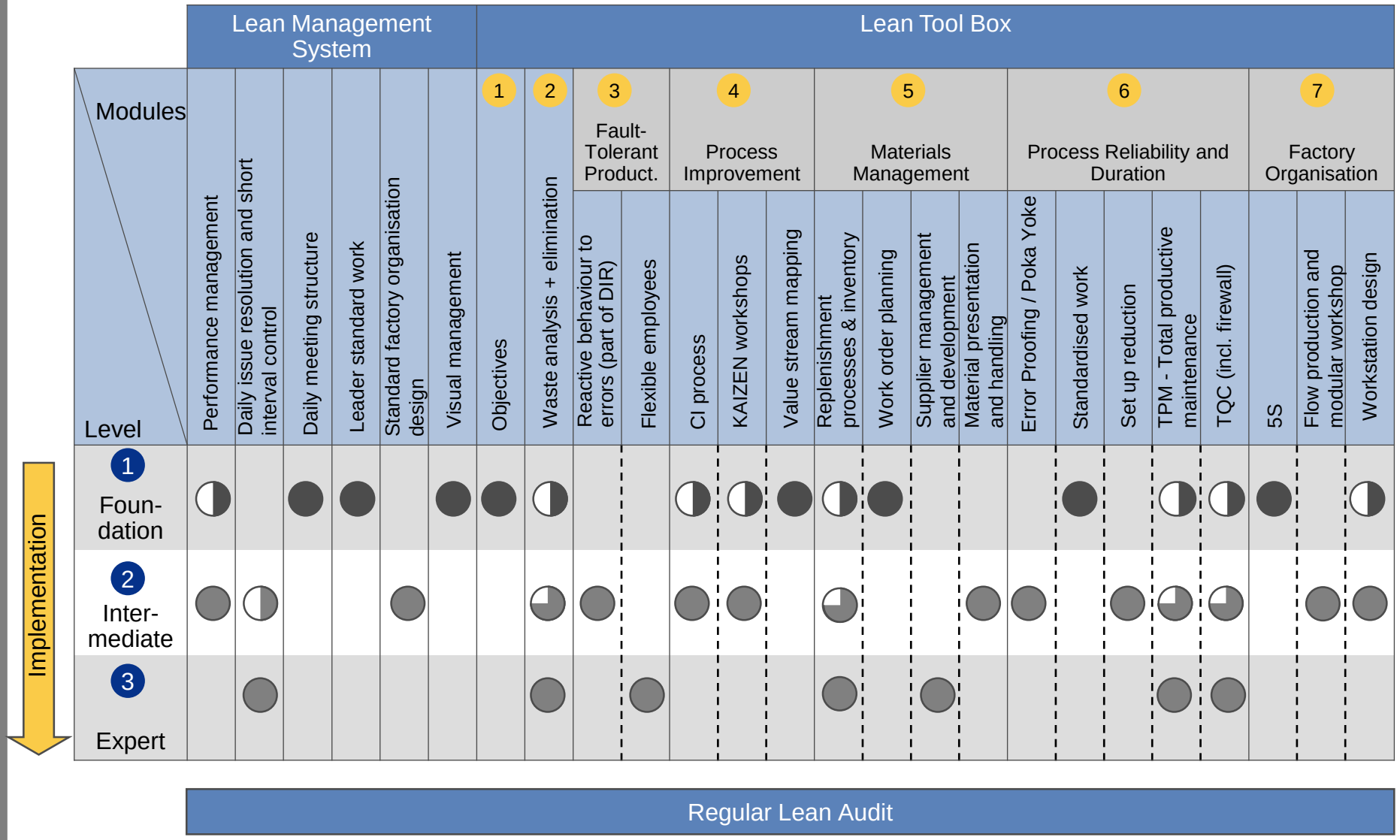
LEAN Concept

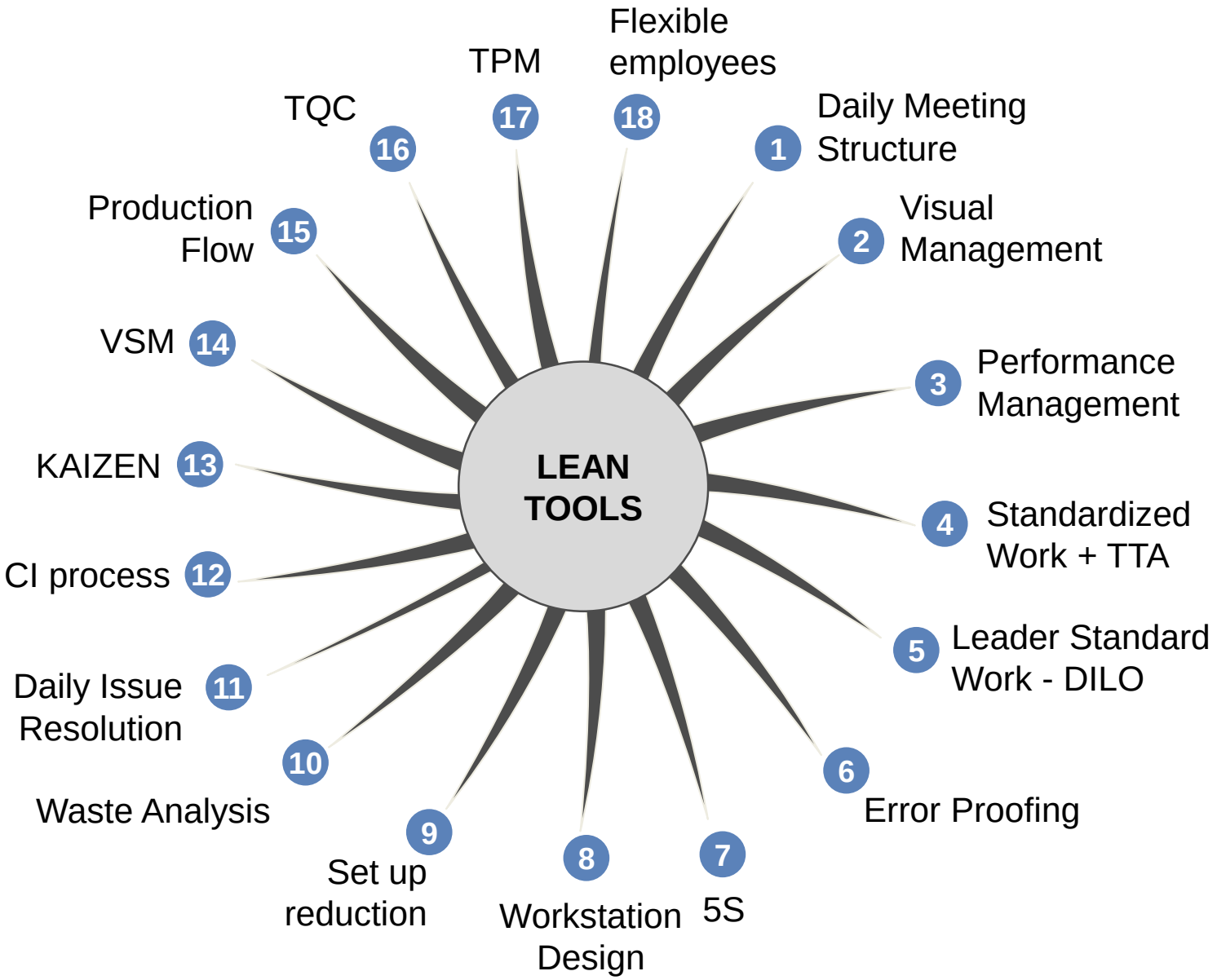
Overall Lean Production System Framework



◑◔ Indicates partial implementation of module in level

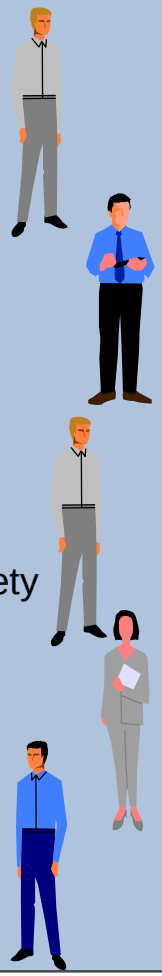
● Indicates full implementation of module in level

Lean modules overview



1) Daily Meeting Structure

Functional Support



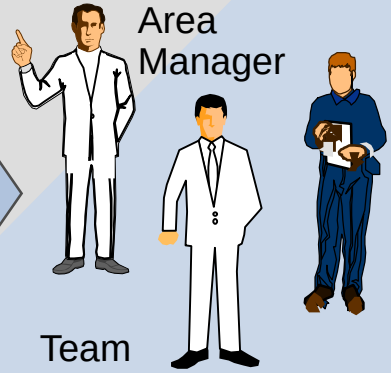
- Engineering
- Quality
- Maintenance
- Logistics
- Planning
- Health and safety
- HR
- Finance

- Support functions provide effective information and solutions to remove production job delays
- If job delays happen, this are removed in 1 hour
- Clearly defined roles and responsibilities

Production Inputs

- Trained people
- Materials
- Work instructions
- Equipment
- Tools
- Services

Production



Area Manager

Production Worker

Team Leaders

Job Done

OR ...

Daily Meeting Framework

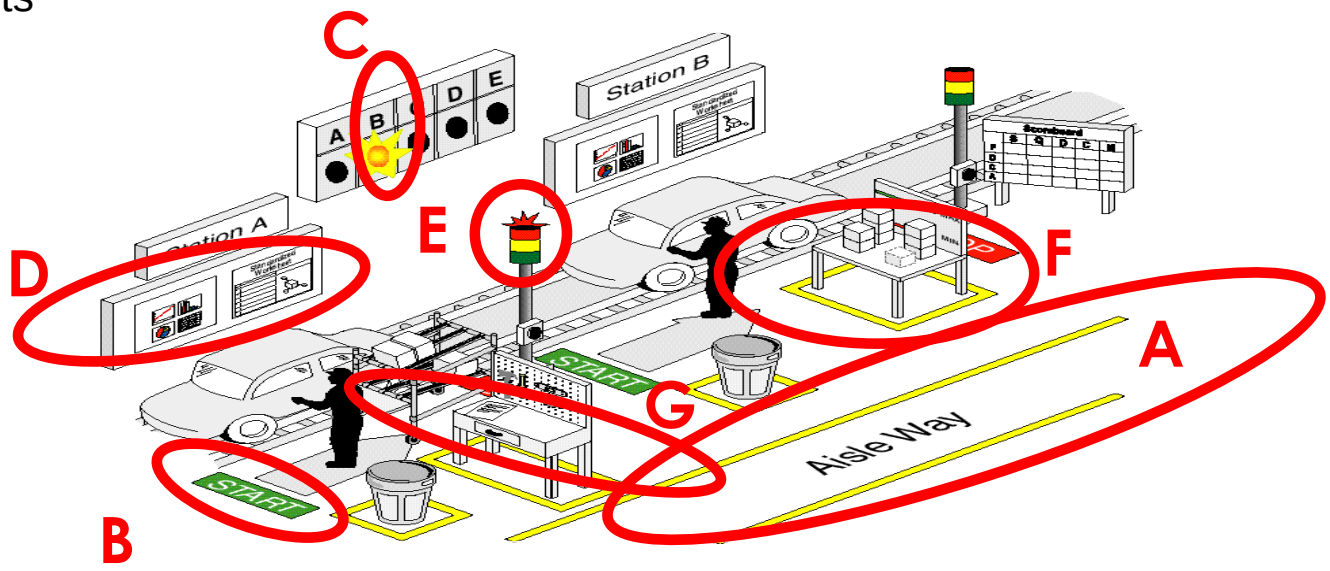
All actions to be resolved within 1 hour

- **Job delays**
- **Deficiencies**
- **Problems**

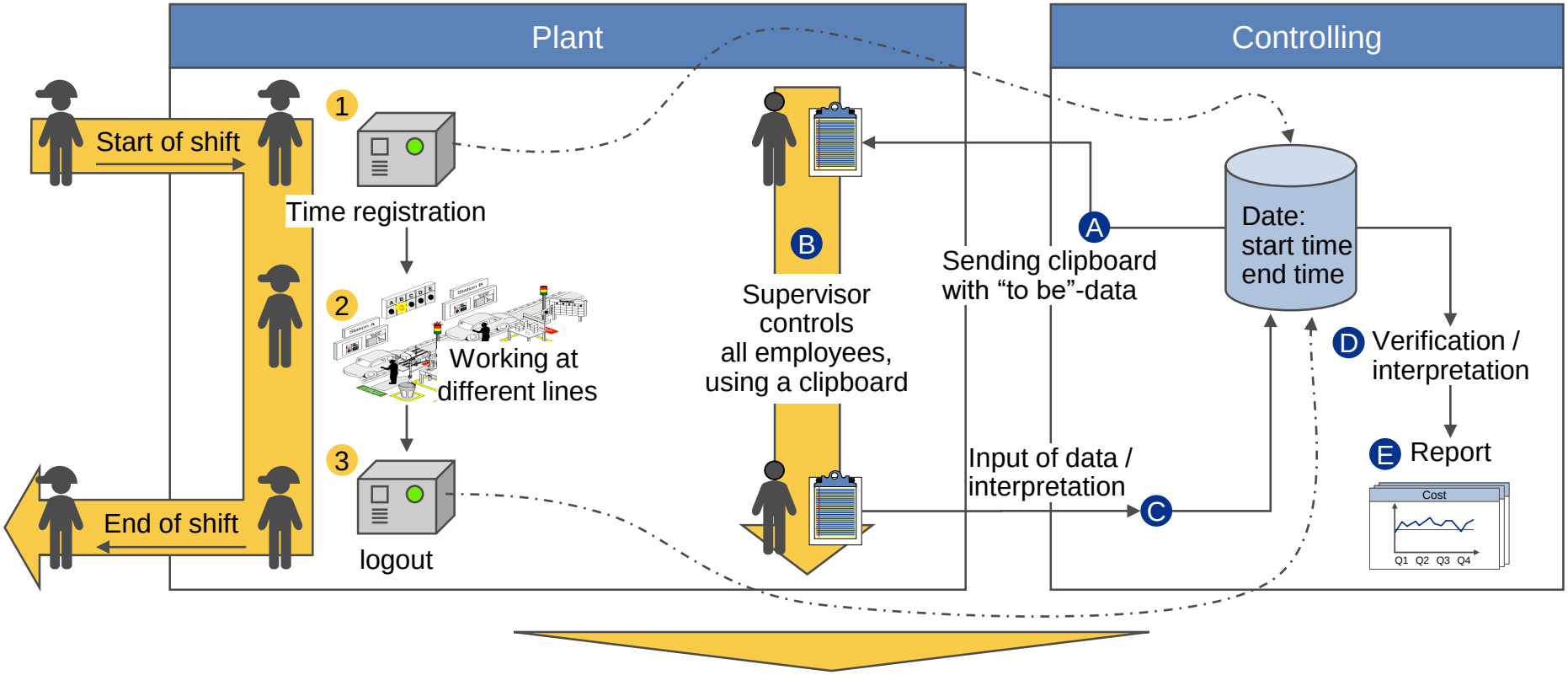
The key design principle in lean production is to develop team working and solve job delays.

2) Visual Management

- Standard Work Instructions
- Safety Check Points
- Quality Care Points
- 5S Audit Boards
- KPI Measures
- Control Point Checklists
- Pre-job Briefs
- Cycle Timing Standard Process Sheets
- Tool Boards
- Visual Control Boards
- Maintenance Checklists
- Single Point Lessons



3) Performance Management



- Agree standard man hours and number of people required by each major process
- Communicate target standards to production teams in line on barchart process
- The Supervisor gets the role of a coach that has to control / steer his team
- Implementation of a “Clipboard process”, where all the direct / NVA work and movements between different orders, shells is tracked
- On the basis of the data of this process, Controlling will make a verification, whether the currently implemented process works or not

: Automated process

: Manual process

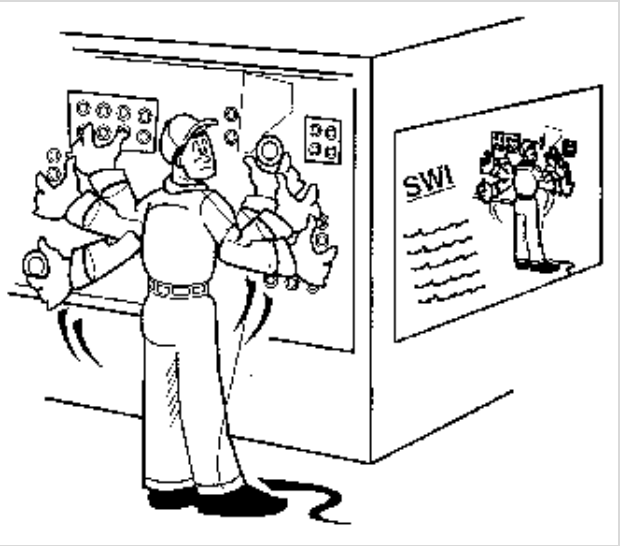
: Supervisor

: Blue-Collar Worker

4) Standardized Work + Team & Task Assignment

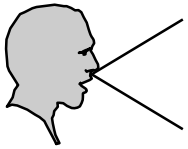
Standard Work Instructions

- An approved method for completing an operation
- A simple, visual means of promoting standardized work
- A method designed to help monitor operations
- A living document that changes as continuous improvement takes place
- SW include: Repair Instructions, Acceptance Criteria, Work Instructions, Team and Task Assignments, Control Instructions



Task		Task origin	Timeline				
			5	10	15	20	25
FTE			9	9	9	9	9
Capacity			9	9	9	9	9
Production line			Line preparation				
Mould preparation		Section					
1	Gel Coat mixing min. 30 minutes before gelcoat application	general	1				
2	Gel Coat area preparation for application (plastic foil)	general	2	3	3		
3	Root plate cleaning and preparation	root	2	2	2		
4	Cleaning of root flange, Chemlease 5141 flange wax application and checking for burres and missing washers	root	1	1	1		
5	Mould surface, edges and flange cleaninng and wiping off the mould	general	3	3	3	3	3
6	Chemlease 765 100mm down in the mould application and position serial number plate in downwind mould and apply wax on top of it	general				2	2
7	Cover paper application and put mould flaps in the vertical position	general				2	2
8	Check the customer specification if preparations need to be taken for vortex generators!	general				1	1
9	Ventilation setting change for more efficient work if possible	general				1	1

5) Leader Standard Work – DILO „Day In Life Of ..”



1 Spend at least 60% of each day managing by walkabout:

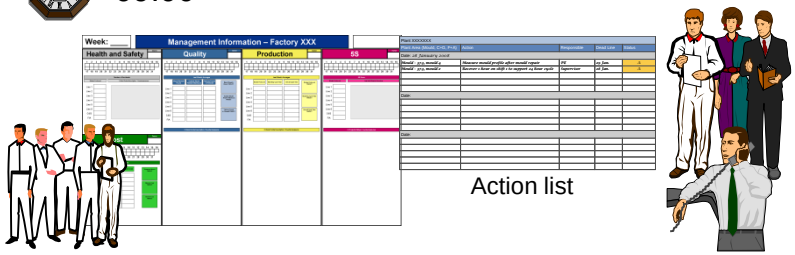
- Ensuring effective operation and adherence to standard process
- Continual tracking of man hours and material costs by blade / mould
- Reviewing health and safety
- Supporting continuous improvement activities

05:00 or 06:00 or 07:00

2 Confirm no start of shift delays

- Confirm all teams are resourced
- Ensure previous shift have completed checklist tasks

09.00



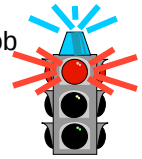
3 Attend Daily Production meeting

- Confirm key actions
- Confirm cycle time status
- Confirm quality performance

4 Complete / resolve actions received during Production meeting

5 Continually monitor:

- Help to resolve job delays as they occur

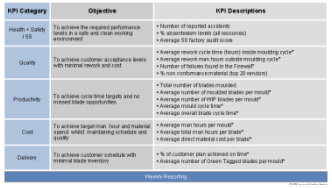


6 Day to day:

- Co-ordinate and liaise with other area managers
- Ensure compliance to WI
- Consistent review of quality levels
- Tracking of man hours and material costs per blade

7 Conduct weekly 5S audits and ensure accident free environment

8 Clear communication of daily KPI’s



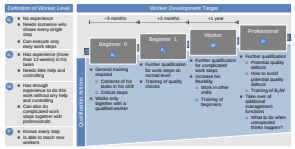
9 Conduct end of shift review and resolve any conflicts between blades

- Ensure clear plans for remaining shifts

14:45 or 10:45 or 06:45

10 Develop training requirements and budgets

- Ensure skills matrices are up to date for all teams
- Create budgets



6) Error Proofing / Poka Yoke

Proactively building standards into the system, at the lowest point of activity, to prevent events caused by:

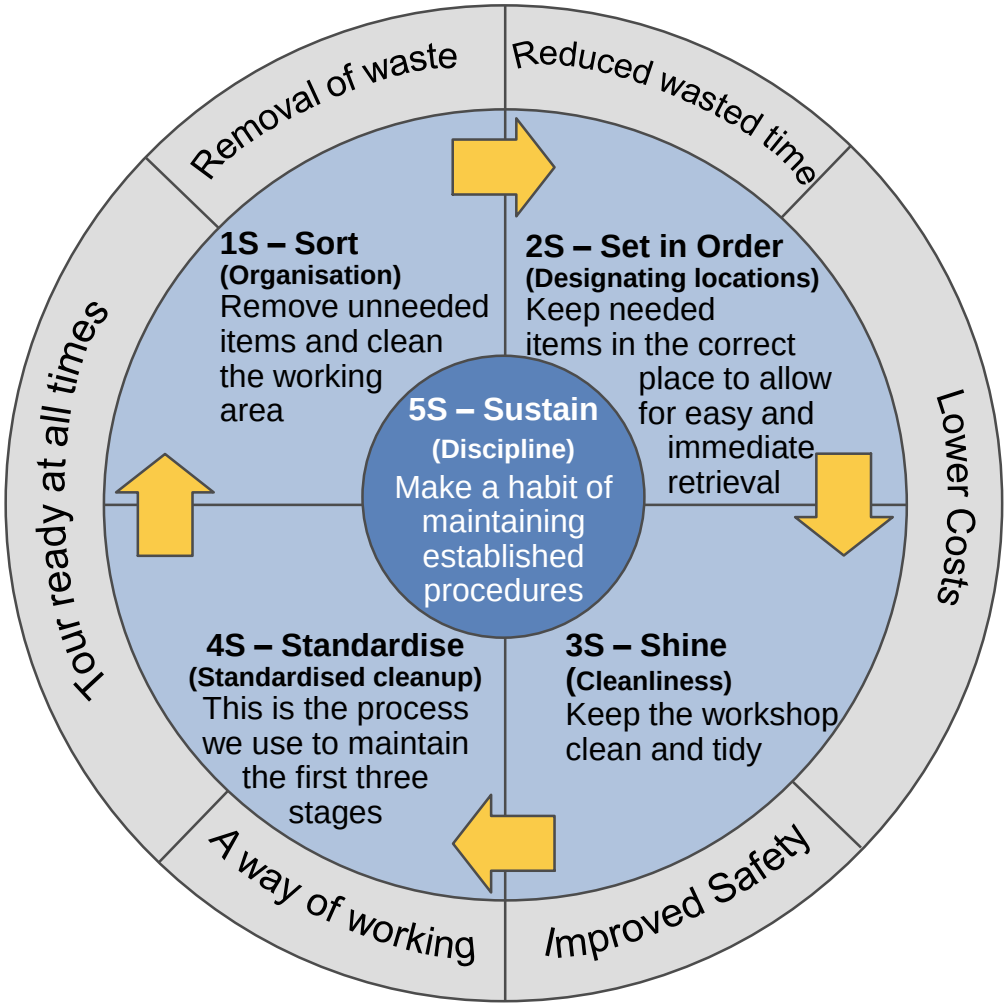
- Human
- Machine
- Process errors

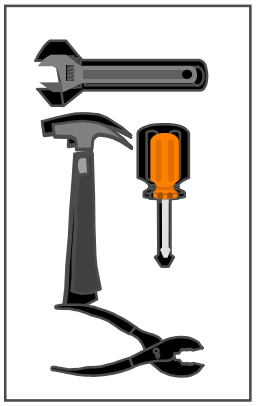
Error prone **tasks** not …
Error prone **people**

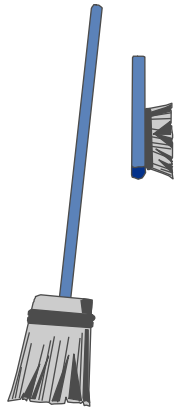
Defect	Any deviation from a known specification leading to internal/external customer dissatisfaction
Error	Any deviation from a specified process ■ There can be error without a defect **but** cannot have a defect without an error
Prevention	Stops errors or defects from occurring
Inspection/ Correction	Detects defects and initiates corrective actions to prevent multiple defects from leaving the area

7) 5S

Red Tag		
Category	1. Machine 2. Parts 3. Tools 4. Measuring Equipment	5. Jigs 6. Raw Material 7. Notices 8. Other: .....
Description		
Part/Tool No.		
Quantity	No.	
Reason For Tagging (qty, freque-ncy of use)	1. Not needed 2. Defective 3. Use unknown 4. Too many	5. Scrap 6. Used rarely 7. Other: .....
Action	1. Discard 2. Return (Supplier) 3. Red Tag Store 4. Store Elsewhere	5. Apply Orderliness 6. Other: .....
Red Tag File No.		
Date Of Red Tagging		





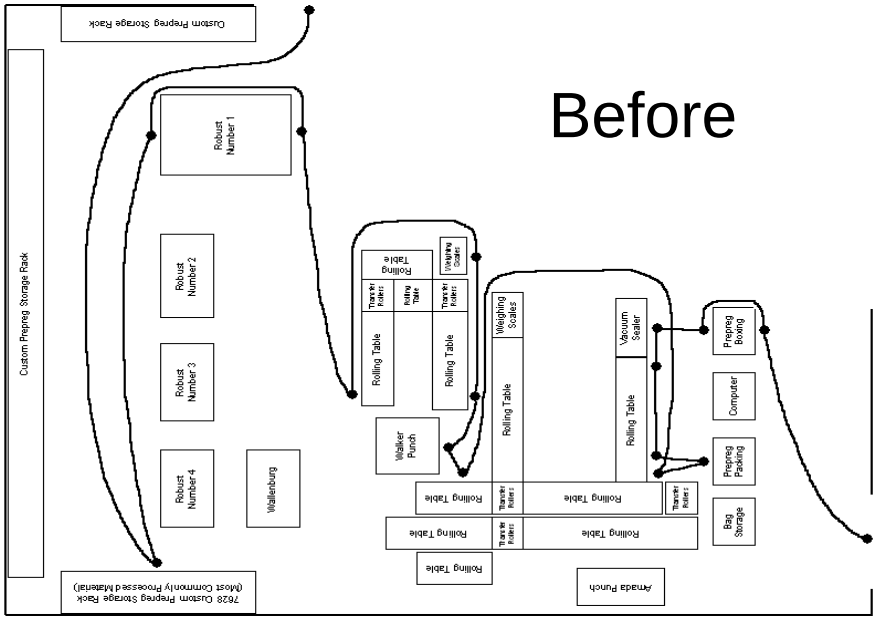


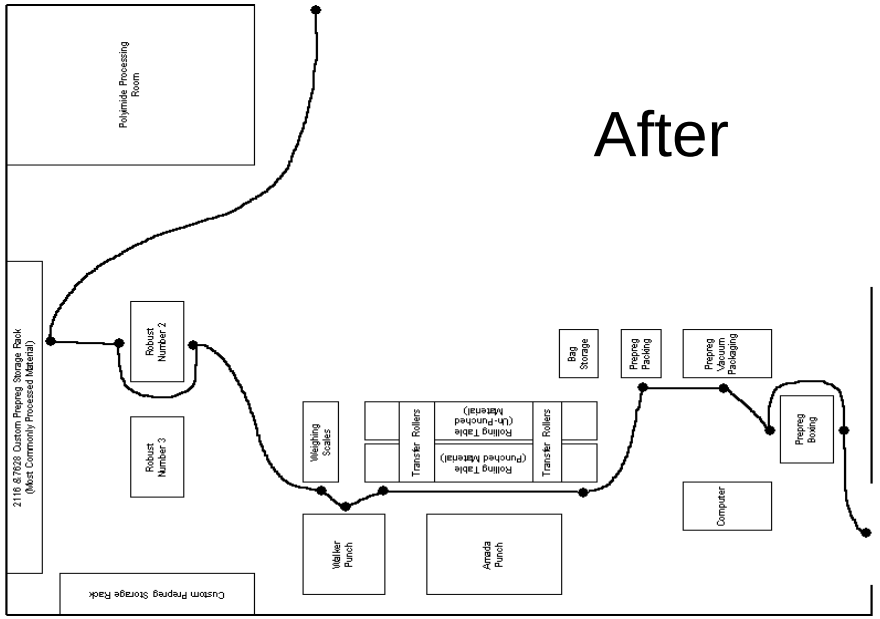
Nov. 2018								
	Oct. 2018							
		Sept. 2018						
5								
12	5				1	2	3	4
19	12	5	6	7	8	9	10	11
26	19	12	13	14	15	16	17	18
	26	19	20	21	22	23	24	25
		26	27	28	29	30	31	

8) Workstation Design

Workstation design is very important to:

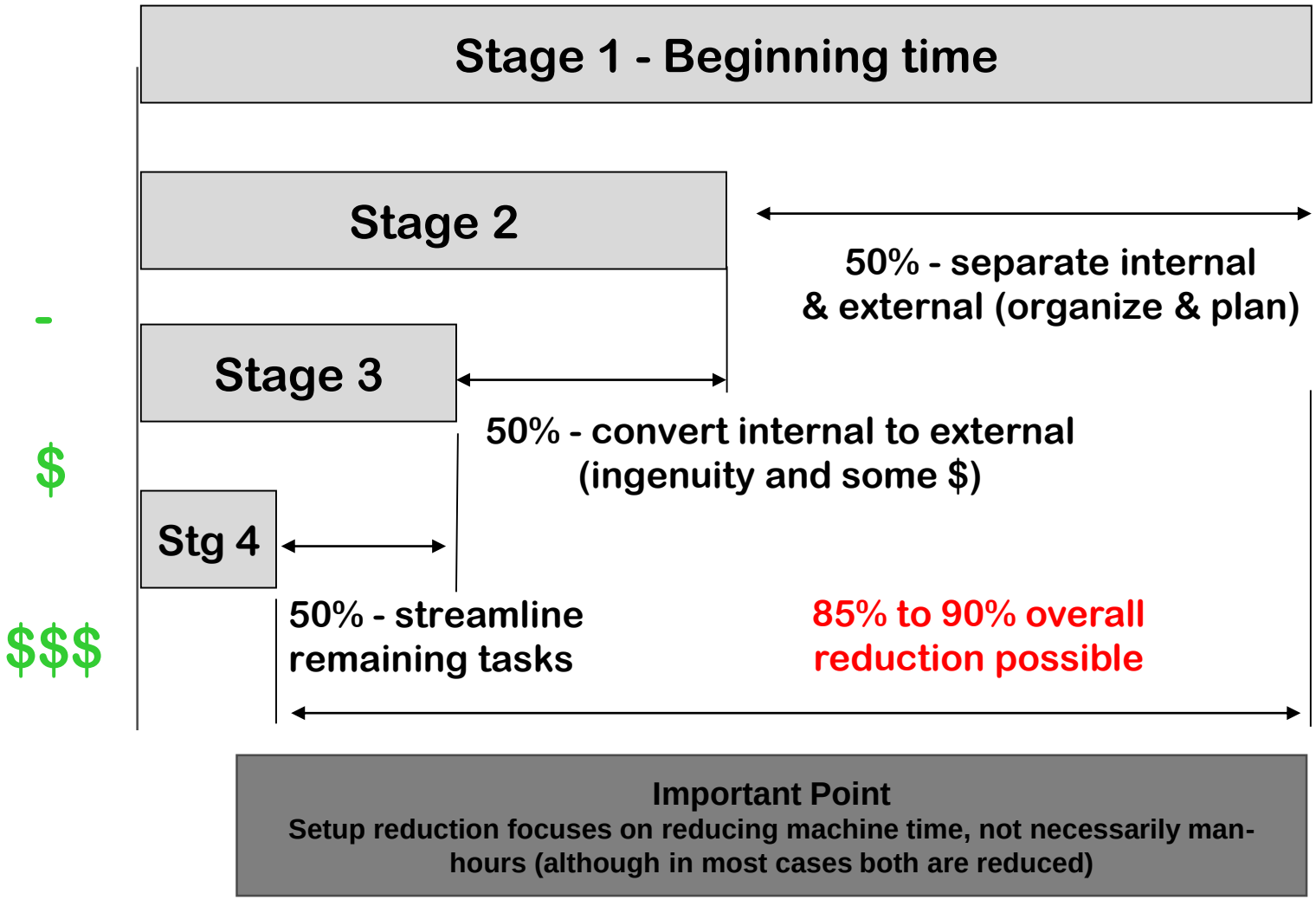
- Eliminate waste of motion: reaching, twisting, turning, bending;
- Eliminate waste of transportation: walking, use of equipment or vehicles;
- Improve the safety environment.





9) Set Up Reduction

Each stage of setup reduction offers 50% opportunity

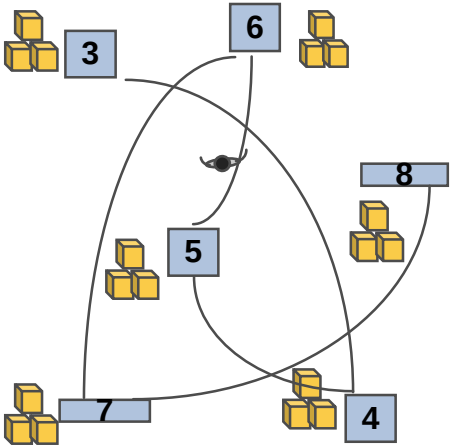


Important Point

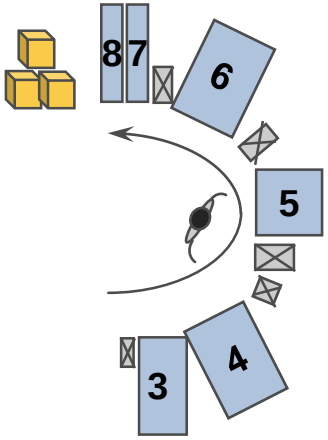
Setup reduction focuses on reducing machine time, not necessarily man-hours (although in most cases both are reduced)

10) Waste Analysis - The 10 Wastes

Waste type	Example
Transportation	Shipping, moving, carrying
Inventory	Stockpiled parts, orders, time
Motion	Walking, bending, reaching
Waiting	Material or information downtime
Overproduction	Producing more than needed
Over-processing	Over-automation
Defects	Service and process errors
Space	Holding obsolete stock
Energy	Leaving machinery on overnight
Human potential	Not involving people in continuous improvement

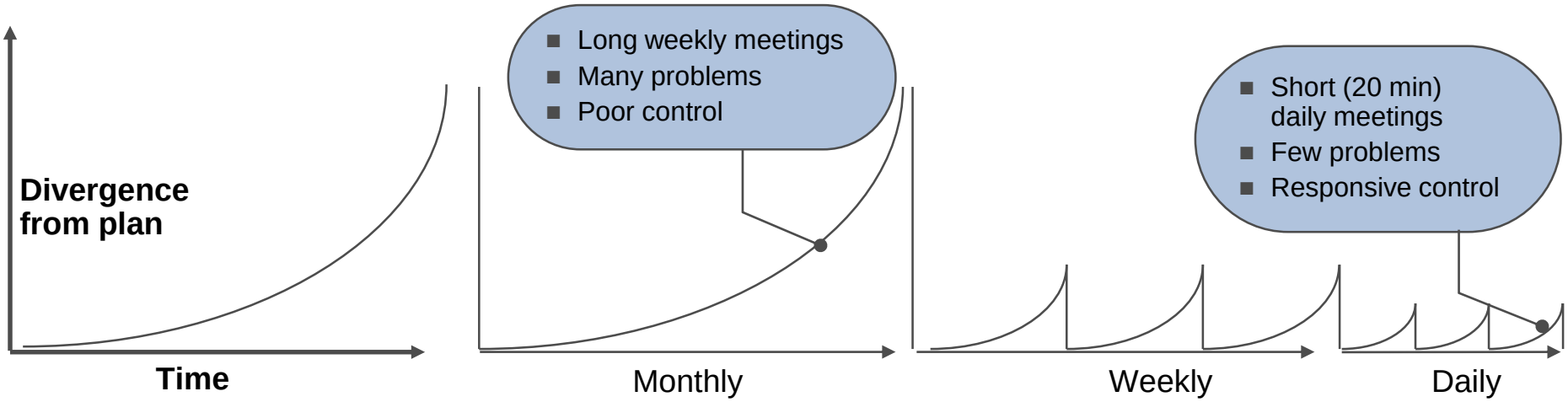


Poorly Designed Work Area



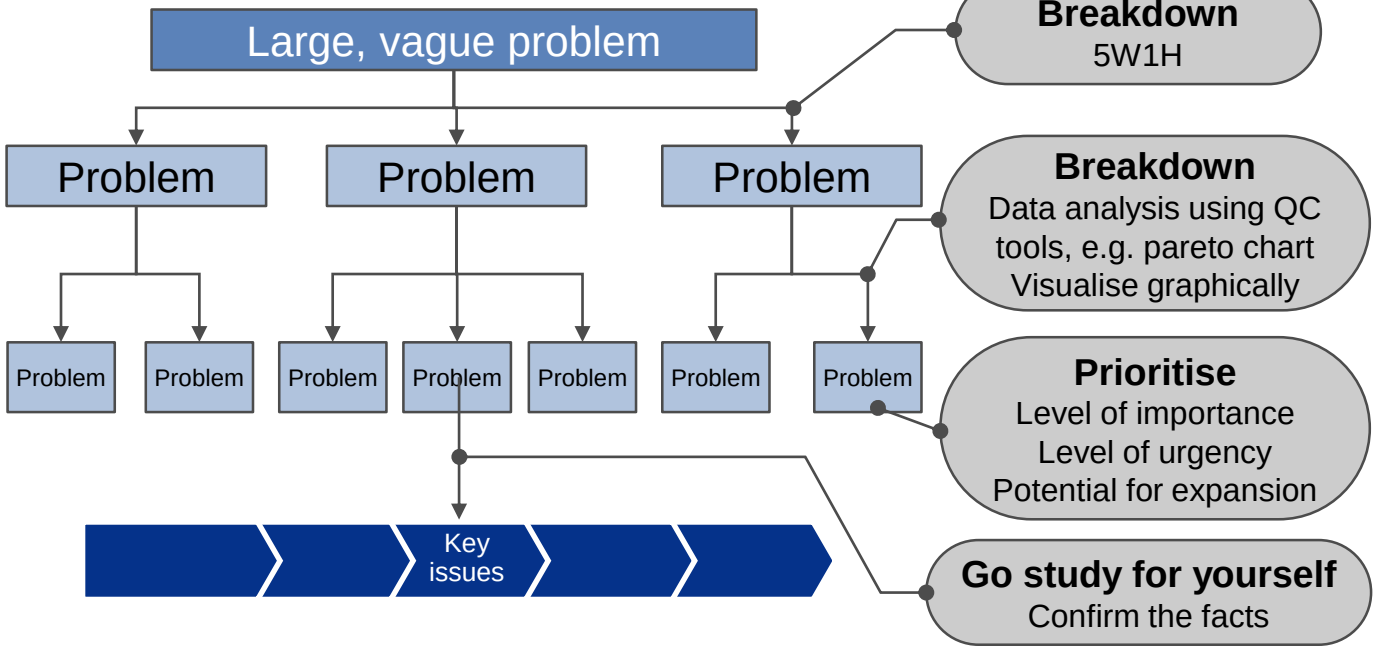
Properly Designed Work Area

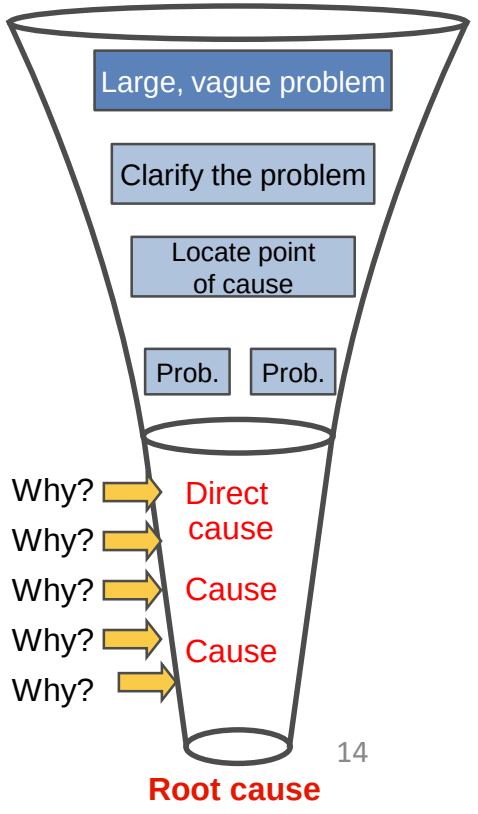
11) Daily Issue Resolution



Generally we want to do three things every day:

1. Break down the problem,
2. Select the appropriate problem to solve,
3. Confirm the facts through go and study.





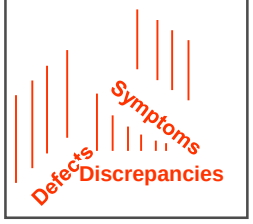
12) CI – Continuous Improvement

Practical Problem Solving
Seven Process Overview Steps as a part of Continuous Improvement process

1 Problem Description

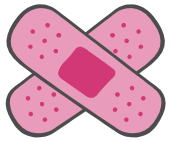
- Grasp the situation
- A statement that describes in general terms the current status or situation
- Break the large problem into smaller, more specific problems

2 Problem Definition



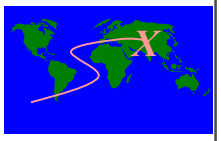
- Clearly describes the deviation between the expected and actual results
- The definition should contain:
  - The standard/ target
  - The deviation
  - The actual situation
  - The time period

3 Shortterm Containment



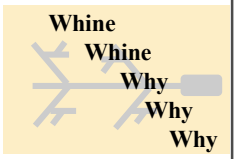
- A band-aid
- A temporary solution to stop the problem from exiting the area. Containment action usually adds necessary extra work to the process
- Stop the shortterm solution once the permanent countermeasure is in place

4 Locate Point of Cause



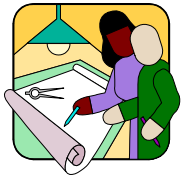
- The physical location where the problem is first seen
- Maybe different from where the symptom is first observed

5 Cause and Effect Analysis for Root Cause



- To identify root cause
- Use of fish bone and 5-why

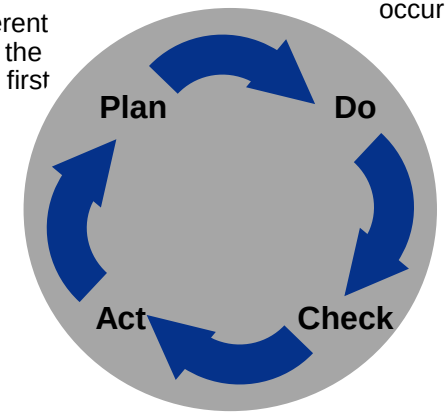
6 Longterm Counter-measures



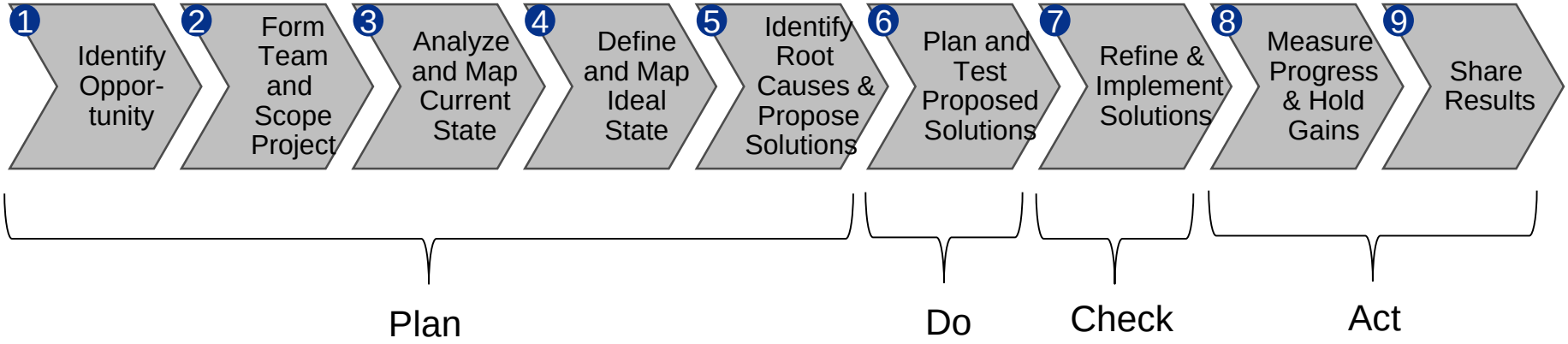
- Permanent solution to eliminate the root cause
- Impossible for the same problem to re-occur

7 Follow-up

- Implement countermeasure
- Follow-up to check the results
- Standardize the process if successful

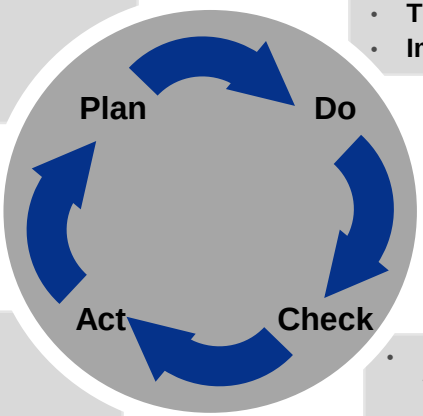


13) KAIZEN as a part of CI Process



- **Define the problem in its current state**
- **Analyze processes in their current state**
- **Brainstorm potential solutions**
- **Define your solution using a hypothesis**

- **Test the solution quickly and inexpensively**
- **Implement the solution on a trial basis**



If the experiment produced the desired result:

- **Adopt and standardise the solution**
- **Consider expanding the solution**
- **Continue to look for improvements**

If the experiment does not produce the desired result:

- **Analyse to determine why**
- **Strategise revisions to the hypothesis**
- **Test your revised solutions until you achieve the desired result**

- **Evaluate the results by directly observing your solution in action**
- **Observe what happened and why**
- **Understand cause and effect**

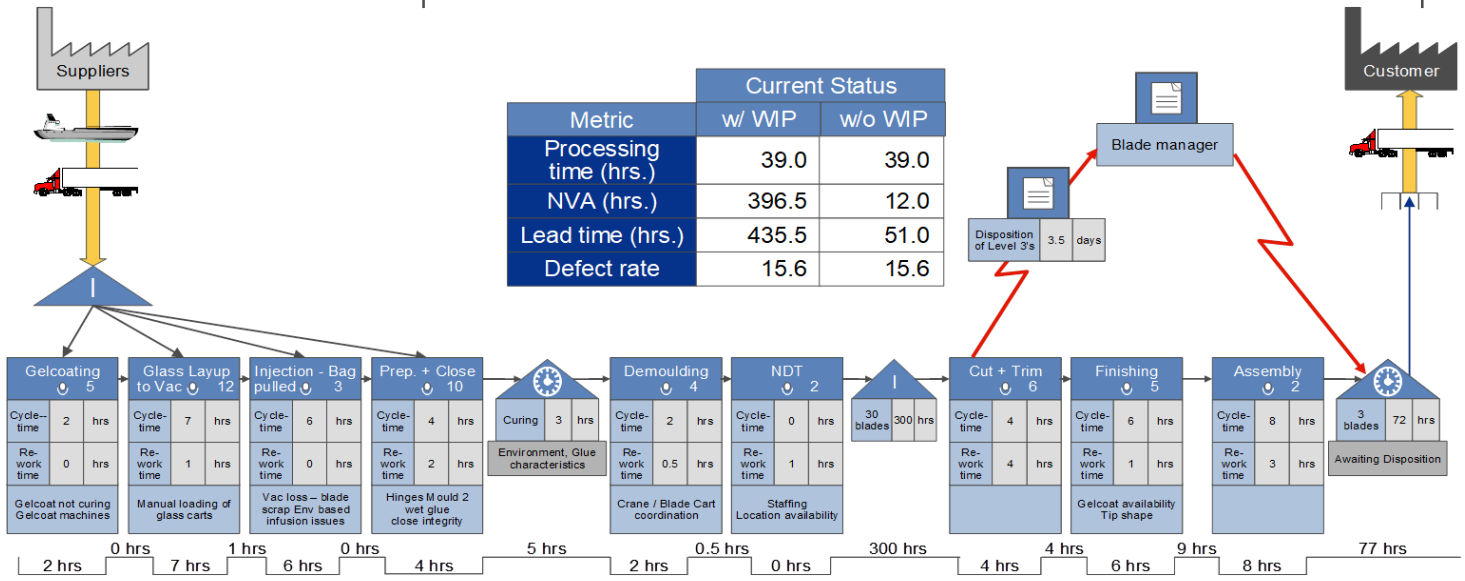
14) VSM – Value Stream Mapping

VSM focus will be on steps 3, 4, 5

The step-by-step process ensures all critical relationships in the system are surfaced and understood

1. Identify Oppor-tunity
2. Form Team and Scope Project
3. Analyze and Map Current State
4. Define and Map Ideal State
5. Identify Root Causes & Propose Solutions
6. Plan and Test Proposed Solutions
7. Refine & Implement Solutions
8. Measure Progress & Hold Gains
9. Share Results

Pre-Workshop | **During Workshop** | **Post Workshop**



Metric	Current Status w/ WIP	w/o WIP
Processing time (hrs.)	39.0	39.0
NVA (hrs.)	396.5	12.0
Lead time (hrs.)	435.5	51.0
Defect rate	15.6	15.6

15) Production Flow

There are 5 key reasons for the inability of a process to generate smooth product flow

Reasons for Poor Flow

1. Layout
2. Lack of standard process
3. Processes not in control
4. Batch size
5. Material availability

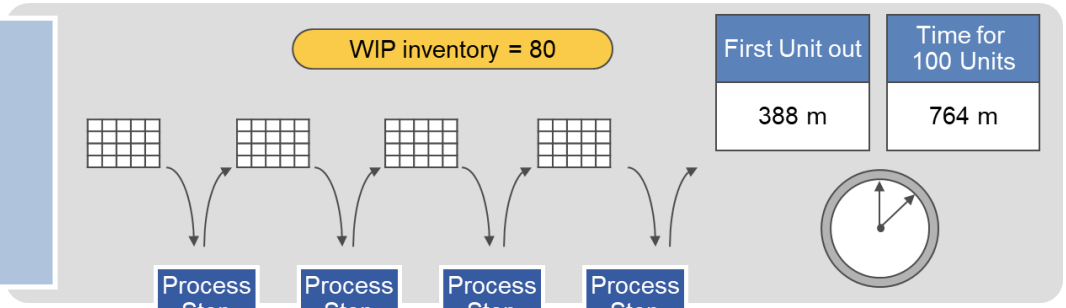
There are some basic tools which can be applied to generate and sustain product flow

Tools to Create Flow

1. Spaghetti diagram
2. Line balancing
3. Process stability
4. Small batch sizes
5. Material availability
6. Continuous improvement

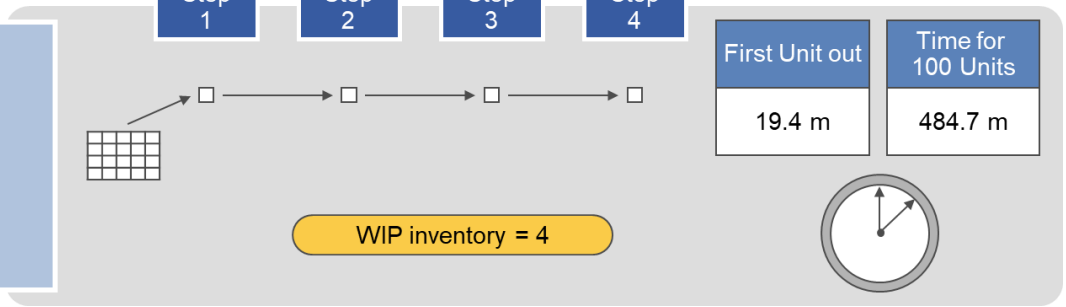
Scenario 1

- 4 process steps
- LT1 = 5.0m
  LT2 = 4.8m
  LT3 = 4.9m
  LT4 = 4.7m
- Batch size = 20



Scenario 2

- 4 process steps
- LT1 = 5.0 m
  LT2 = 4.8 m
  LT3 = 4.9 m
  LT4 = 4.7 m
- Batch size = 1



In this example:

The 1-piece flow approach delivers the first unit in a fraction of the time.

The lead time for 100 units is 36% lower, with 95% lower WIP

16) TQC – Total Quality Control

Definition

- TQC is a philosophy that seeks to integrate all organizational functions (engineering, production, procurement, customer service, etc.) to focus on meeting customer objectives
- TQC views an organization as a collection of processes. It maintains that organizations improve these processes by incorporating the knowledge and experience of workers
- TQC builds quality into the product without the need for extra inspection
- TQC is “do the right thing, right the first time, every time”

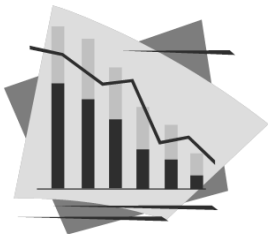
TQC is the foundation for activities, which include…

- Commitment by senior management and all employees
- Meeting customer requirements
- Reducing cycle times and increasing productivity levels
- Reducing service costs
- Improvement teams
- Recognition and celebration
- Challenging quantified goals and benchmarking
- Focus on processes/improvement plans
- Specific incorporation in strategic planning

Quality of raw materials	X	Quality of processes and systems	X	Quality of products	=	Quality of the company
Suppliers / Supply-Chain		Company		Customer		TQC

17) TPM - Total Preventive Maintenance

1. Select Equipment for PM Routines
2. Create Plans to Maintain Normal Machine Conditions
3. Implement and Sustain PM Measures
4. Detect Any Abnormal Conditions Quickly
5. Develop Countermeasures to Maintain Normal Conditions

Production Data	Analytical Data	Visual Data
		
■ Daily Production Sheets ■ Pareto Charts of Downtime ■ Maintenance Logs ■ Setup Time ■ Ask Operators	■ Find bottlenecks using modeling programs ■ Perform what-if analysis with different MTBF and MTTR	■ Walk the floor and look for inventory ■ Often shows potential bottleneck ■ Potential frequent downtime area that needs to be buffered

18) Flexible employees

		Process											Equipment							
		Proc. #1	Proc. #2	Proc. #3	Proc. #4	Proc. #5	Proc. #6	Proc. #7	Proc. #8	Proc. #9	Proc. #10	Inspec-tion	Mach. #1	Mach. #2	Mach. #3	Mach. #4	Mach. #5	Over-head Crane	Forklift	Repairs
	Operator 1	●	◕	◕	●	◑	◕	◕	◕	◕	●	◑								
	Operator 2	◑	◕	◔	◑	●	◕	◑	◔	◕	◔	●								
	Operator 3	◔	◔	◑	●	◑	◕	◑	◑	◕	●	◕								
	Operator 4	◑	◔	○	◔	◔	○	○	◔	◔	◔	○								
	Operator 5	◔	●	◑	◑	◔	◔	◔	◑	◑	◑	◔								
	Operator 6	◔	●	●	◔	◕	◕	●	●	●	●	◑								
	Operator 7	◑	◔	◔	◕	●	◑	◔	◑	◕	◕	●								
	Operator 8	○	◑	○	○	○	○	○	◔	○	◔	◔								
	Operator 9	○	○	◑	◔	○	◔	○	◑	◔	○	◔								
	Operator 10	○	◑	◔	◔	◔	◔	○	○	○	◔	◑								

Operator photo

○ Level 0: No experience	Requires training
◔ Level 1: Basic	Understands how to operate process under supervision
◑ Level 2: Intermediate	Self monitors quality and has completed all practical evaluations
◕ Level 3: Advanced	Trains colleagues on process knowledge
● Level 4: Expert	Repeatedly mentors or trains colleagues

Thank you for your time

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