5S (Improvement activities) or Kaizen

- **Seiri (Sort)**
  - Remove all of the clutter from the work place

- **Seiton (Set in order)**
  - Organize in an efficient and ergonomic manner.

- **Seison (Shine)**
  - Clean up the entire area removing all dirt

- **Seiketsu (Standardize)**
  - Ensure standard ways of working for the first three stages.

- **Shitsuke (Sustain)**
  - Ensure that 5S principles are part of the culture

Dr. Dinesh Kumar
PIE, NITJSR
Excessive Setup Time

Excessive Setup Time

- Internal Elements (M/C stop)
- External Elements (M/C Operation)
Cluttered Work Place
Defective Materials/Products

• Point Photography is a good option
Unsafe Acts and Conditions

**Unsafe Acts**
- Operating equipment without qualification or authorization
- Lack of/or improper use of PPE
- Operation equipment at unsafe speeds
- Failure to warn
- Bypass or removal of safety devices
- Using defective equipment

**Unsafe Conditions**
- Defective tools, equipment or supplies
- Inadequate supports or guards
- Congestion in the workplace
- Inadequate warning systems
- Fire and explosion hazards
- Poor housekeeping (Oil spillage)
- Hazardous atmospheric conditions
Missed Delivery Times

• Each of the input should function properly including
  • Man
  • Machine
  • Material
  • Money
<table>
<thead>
<tr>
<th>In Japanese</th>
<th>5S in English</th>
<th>5S in Hindi</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seiri</td>
<td>Sort</td>
<td>छांटना</td>
</tr>
<tr>
<td>Seiton</td>
<td>Set in Order</td>
<td>सुव्यवस्था</td>
</tr>
<tr>
<td>Seiso</td>
<td>Shine</td>
<td>चमकाना</td>
</tr>
<tr>
<td>Seiketsu</td>
<td>Standardize</td>
<td>मानकीकरण</td>
</tr>
<tr>
<td>Shitsuke</td>
<td>Sustainable</td>
<td>अनुशासन</td>
</tr>
</tbody>
</table>
1st S is Seiri or Visual Seiri (Sorting) or **red label technique**

1. **Establishment of red label project**
   1. Shop wise: Every day
   2. Company wise: Once or twice a year

2. **Determine the objects to be sealed**
   1. Inventories (raw material, WIP, half finished)
   2. Machines (Machines, facilities, carts, pallets, jigs, tools, cutting instruments, tables, chairs, dies, vehicles and equipment)
   3. Space (floors, passages, shelves, storages)

3. **Determine the labeling criteria** (Label the objects that will not be used for upcoming batch)
Contd... Visual Seiri (Sorting) or red label technique

4. Preparation of labels:

<table>
<thead>
<tr>
<th>Model</th>
<th>SZ-250P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product name</td>
<td>door</td>
</tr>
<tr>
<td>Lot size</td>
<td>40</td>
</tr>
<tr>
<td>Quantity</td>
<td>1 pallet</td>
</tr>
<tr>
<td>Process</td>
<td>door welding</td>
</tr>
<tr>
<td>Reasons</td>
<td>Sep. 2/1990</td>
</tr>
<tr>
<td>Reasons</td>
<td>Dent</td>
</tr>
</tbody>
</table>

<table>
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</tr>
</thead>
<tbody>
<tr>
<td>Item name</td>
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<td>Quantity</td>
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<td></td>
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</tr>
<tr>
<td>Reasons</td>
<td>unnecessary, defective</td>
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<td></td>
<td></td>
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<tr>
<td>Department</td>
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<td>Date</td>
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<td></td>
</tr>
</tbody>
</table>
Contd… Visual Seiri (Sorting) or red label technique

5. **Labeling** (Person related to the particular workshop will do the labeling)

6. **Evaluation of sealed items and recommended actions**
   1. Defective/dead stock (discarded or sold away)
   2. Usable parts (to be placed in red label stock)
2nd S is Seiton or Visual Seiton (Set in Order)

1. Decide item placement
   • Identify the frequently used items and place them nearby the worker
   • Less used items may be kept farther away
   • Items should be kept between shoulder height and west

2. Prepare the container

3. Indicate the position of each item (Slide 12)

4. Indicate the item code and its quantity (Slide 13)

5. Make seiton a habit
Practical Rules for Seiton

• Seiton for WIP
  • Rule 1: FIFO is used over LIFO (new parts pile up over older in LIFO) Slide 15
  • Rule 2: Setup for easy handling (Slide 16)
  • Rule 3: Regard stock space as part of manufacturing line (if job shop production then parts should be stored on the basis of similarity, if mass production then the parts should be arranged and stored on the basis of production line)

• Seiton for Jigs and Tools: (Neatly and close proximity placed) Following points to be considered
  • Can jigs and tools be eliminated? (eg: the wrench can be replaced with a switch or nob headed screw)
  • Can the variety of jigs and tools be decreased? (eg. Low variety of fasteners)
  • Are tools positioned ergonomically? (place the frequently used tool b/w west and shoulder height)
  • Can the worker easily identify storage places for the tools? (tracing the outline of tool on the board where it is kept) (slide 17)

• Seiton for cutting instruments, measures and oil
• Visual Control for limit standards
FIFO

Various goods are piled up on pallets

(a)

(b)

In and Out

Passage

→← Direction of the forklift

(a) Incorrect arrangement

(b) Correct arrangement
Material handling index of liveliness (MHIL)

<table>
<thead>
<tr>
<th>Classification</th>
<th>Index of liveliness</th>
<th>Number of required tasks</th>
<th>Variety of required tasks</th>
<th>Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>In bulk</td>
<td>0</td>
<td>4</td>
<td>〇 〇 〇 〇 〇</td>
<td>Left in bulk directly on the floor or tables</td>
</tr>
<tr>
<td>Unified in a box or batch</td>
<td>1</td>
<td>3</td>
<td>-- 〇 〇 〇</td>
<td>Placed in a container or grouped in a bundle</td>
</tr>
<tr>
<td>In box with bolsters</td>
<td>2</td>
<td>2</td>
<td>-- -- 〇 〇</td>
<td>Raised by pallets or skids</td>
</tr>
<tr>
<td>On a carriage</td>
<td>3</td>
<td>1</td>
<td>-- -- -- 〇</td>
<td>Set on carriages or something with castors</td>
</tr>
<tr>
<td>On the move</td>
<td>4</td>
<td>0</td>
<td>-- -- -- --</td>
<td>Moving by conveyor, chute, or carriages</td>
</tr>
</tbody>
</table>

Number of tasks required for material handling

\[
\frac{1}{\text{Liveliness index}}
\]

Averaged Material handling index of liveliness

\[
\text{Averaged index of liveliness} = \frac{\text{Summed up liveliness index}}{\text{Number of steps}}
\]

\[
= \frac{(1+3+4+1+2+4+2+4+3+4)}{10} = 2.8
\]
Tracing Control
Contd... Practical Rules for Seiton

- **Seiton for cutting instruments, measures and oil**
  - Provide adequate space between the blades
  - The precision measuring instruments should be kept away from dust and vibration.
  - Colour coding of lubricating oil containers and feeders.

<table>
<thead>
<tr>
<th>COLOUR</th>
<th>SHAPE</th>
<th>TYPE OF LUBRICANT</th>
<th>NAME OF PRODUCT</th>
<th>VISCOSITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>RED</td>
<td></td>
<td>Gear Box Oil</td>
<td>Shell Omala 220</td>
<td>ISO 220</td>
</tr>
<tr>
<td>BLUE</td>
<td></td>
<td>Gear Box Oil</td>
<td>Total GEAR 680</td>
<td>ISO 680</td>
</tr>
<tr>
<td>MID GREEN</td>
<td></td>
<td>Hydraulic Oil</td>
<td>Fuchs Hydro 46</td>
<td>ISO 46</td>
</tr>
<tr>
<td>BLACK</td>
<td></td>
<td>Hydraulic Oil</td>
<td>BP Hydrol 32</td>
<td>ISO 32</td>
</tr>
<tr>
<td>GREY</td>
<td></td>
<td>Transmission Oil</td>
<td>Caterpillar Transol</td>
<td>ISO 120</td>
</tr>
<tr>
<td>PURPLE</td>
<td></td>
<td>Transmission Oil</td>
<td>Shell Transol HT</td>
<td>SAE 10W</td>
</tr>
<tr>
<td>BEIGE</td>
<td></td>
<td>Compressor Oil</td>
<td>Klüber Comprı XTC</td>
<td>ISO 46</td>
</tr>
<tr>
<td>DARK GREEN</td>
<td></td>
<td>General Lube Oil</td>
<td>Mobil Generol 220</td>
<td>ISO 220</td>
</tr>
<tr>
<td>YELLOW</td>
<td></td>
<td>Turbine Oil</td>
<td>Texaco Turbo T12</td>
<td>ISO 55</td>
</tr>
<tr>
<td>ORANGE</td>
<td></td>
<td>Motor Oil</td>
<td>Sunoco Synturo S</td>
<td>SAE 20W</td>
</tr>
</tbody>
</table>
Contd... Practical Rules for Seiton

• Visual Control for limit standards
  
  • Colour line (floor taping) for zone separation (Slide 20)
  
  • Fit line marks on nut and bolt (Marking lines on bolt head and nut should match)
  
  • Needle based control or sensor based control of each process
<table>
<thead>
<tr>
<th>Color</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yellow</td>
<td>Aisleways &amp; Traffic Lanes; Paths of Egress; Work Cells</td>
</tr>
<tr>
<td>White</td>
<td>Production; Racks, Machines, Carts, Benches, &amp; Other Equipment</td>
</tr>
<tr>
<td>Red</td>
<td>Defect/Scrap Area; Red Tag Area</td>
</tr>
<tr>
<td>Orange</td>
<td>Material or Product Inspection; Energized Equipment</td>
</tr>
<tr>
<td>Green</td>
<td>Materials &amp; Manufacturing: Finished Goods</td>
</tr>
<tr>
<td>Blue</td>
<td>Materials &amp; Manufacturing: Raw Materials</td>
</tr>
<tr>
<td>Black</td>
<td>Materials &amp; Manufacturing: Works in Progress</td>
</tr>
<tr>
<td>Black &amp; Yellow</td>
<td>Areas which present physical or health risks to employees</td>
</tr>
<tr>
<td>Red &amp; White</td>
<td>Areas to be kept clear for safety reasons</td>
</tr>
<tr>
<td>Black &amp; White</td>
<td>Areas to be kept clear for operational purposes</td>
</tr>
</tbody>
</table>
3rd S is Seiso *(Shine)*

**Goals of Seiso are**
- To set the new standard for cleanliness
- To learn how to maintain that level of cleanliness

**Procedure of Seiso**
- Assign small teams to work on different sections of the factory
- Clean and inspect everything: machinery, work stations, storage cabinets, open floor space
- Take notes of what had to be cleaned or tidied; how frequently it may be needed; resources require
- Finish documenting the results by taking a photograph of the final result – this becomes the new standard
Questions that a Seiso team should ask themselves (health check of M/c)

- Does grime cause problems in operating the equipment?
- Is grit causing the machinery to wear prematurely?
- Is the work station clean enough for safety and comfort?
- What does the "dirt" tell us about the equipment (like the leaking hydraulic fluid example)?
- Is the "dirt" – especially powder, gas or liquid – harmful or toxic?
- What tools, chemicals or methods are appropriate?
- Could careless cleaning actually damage the equipment?
- Could we perform routine maintenance – like checking the engine oil when washing your car – be performed while cleaning?
- Was "dirt" hiding any problems, such as rusting equipment or uneven floors?
Improvements due to effective Seiso
4th S is Seiketsu *(Standardize the Cleanliness)*

• Seiketsu enables and ensures compliance to the new standards of cleanliness (To be practiced regularly)

• Simplify the way of maintaining cleanliness

• Develop, procedure, schedule and practices for Seiri, Seiton and Seiso

• Continue to assess the use and disposal of items

• All employees doing the same job should be able to work in any station with the same tools that are in the same location in every station
5\textsuperscript{th} S is Shitsuke \textit{(Sustained discipline)}

Tasks to be done in Shitsuke by the management for the employees

- Introduce and support audit and certification programs, to formally ensure that the new standards are supported and implemented
- Develop Seiketsu (standardized cleanup) procedures and review the standards from time to time
- Conduct inspections to ensure the standards are met
- Devote time and resources to the less-frequent cleanups
- Provide training, storage space, cleaning supplies, replacement parts and other resources as required to enable the standards to be met
- Train new employees in the 5S methods, as well as explaining the principles
- Communicate the 5S principles to the workers on a regular basis – perhaps by installing and updating posters that emphasize one or another aspect of the 5S program
Point Photography is a good assessment tool of 5S