

Manual No.1 : JISHU HOZEN IMPLEMENTATION

The TPM Club India, CII acknowledges the contribution of all the following 41 companies who added great value in sharing their experience of TPM Implementation. This manual is the first in the sequence of others to come , covering

- Planned Maintenance
 - Quality Maintenance
 - Office TPM, and
 - Safety
- in this year

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|----|---|----|---|
| 1 | Aditya Cement | 21 | Lucas TVS - FIE Division |
| 2 | Bajaj Auto Limited | 22 | Mahindra & Mahindra Limited - Auto |
| 3 | Bharat Seats Limited | 23 | MM Forgings Limited |
| 4 | Birla Tyres | 24 | Mother Dairy |
| 5 | BPL Limited PTI | 25 | QH Talbros Limited |
| 6 | Brakes India Limited, Brakes Div. | 26 | Shriram Pistons & Rings Limited |
| 7 | Brakes India Limited, Foundry Division | 27 | Sona Koyo Steering Systems Limited |
| 8 | Brakes India Limited, Padi | 28 | Sundaram Brakelinings Limited |
| 9 | Brakes India Limited, Pollambakam | 29 | Sundaram-Clayton Limited |
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| 17 | Jay Yuhshin Limited | 37 | Usha Beltron Limited - Cable Division |
| 18 | Jindal Strips Limited | 38 | Usha Beltron Limited - Alloys & Steel |
| 19 | Lakshmi Auto Components | 39 | Usha Martin Industries |
| 20 | Lakshmi Machine Works Limited | 40 | Vikram Cement |
| 21 | Lucas TVS - FIE Division | 41 | Vikram Ispat, Salow |

The TPM Club India greatly acknowledges, Mr. Yamaguchi's leadership in giving the directions for making TPM a movement. Without his support, this would not have been possible.

Senior Counsellor
TPM Club India

Jishu Hozen

How to implement Jishu Hozen?

Qs. 1 What training/awareness is required to start JH activities? (Step 0)

- a. Trainers selected from supervisors and operators to conduct the training on JH for operators. **3 day training*** given to all operators during block maintenance-shut down to carry out JH activities on the machines.
- b. Description/explanation to Union leaders essential
- c. Capsule for office workers to also be developed and used.
- d. JH Chairman gives the training to the Rank A machine operators for **2 hours*** before they begin.
- e. Content of training include
 - a. Importance and benefits of JH(I maintain my machine) to operators
 - b. Operators role in JH activity must be communicated in the awareness training programme itself.
 - c. Basic Construction of Machine, its schematic diagram & parts.
 - d. Awareness on Basic Equipment Condition
 - e. What is the meaning of 'abnormality'? – dirty, loose, hanging, leaking, splashing/spilling, broken, hardened, excess length/heat, vibration, corrosion, crushed, unwanted, missing, bent, holes, worn-out, abnormal noise, discoloration,
 - f. Explain each abnormality – 'leads to what' –losses, breakdown, rejections
 - g. Safety Aspects of the machine and clothes to wear while carrying out JH Activity
 - h. Difference between Forced & Natural Deterioration as seen for their own equipment
 - i. Explain red and white tags
 - j. Training on one point lessons
 - k. Materials required for 'Initial cleaning' – mull cloth, cotton waste, tool box, red & white tags, ladder, soap oil, kerosene, gloves, torchlight & lamp, video cameras, CTC.
 - l. Discover to discover
 - m. Discover by cleaning, tightening & inspection
 - n. Cleaning for inspection
 - o. Inspection for repairs of malfunction of equipment

Qs. 2 What preparation/precautions are to be taken to make JH a success? (Step 0)

- a. Feedback meetings to operators
- b. Very clear schedule of JH Activities with role clarity – who will do what portion of machine, when, which shift
- c. Activity board being maintained
- d. Highlighting response to tags and countermeasures in step 2.
- e. Top management audit

* Company Specific Examples

- f. Put names of all team members on the TPM Activity Board
- g. Managers present during the shift must assist
- h. In many companies they started with 1s, 2s before they started with manager's model activity. Recognition method also put in to get involvement of people in discovering the problems and proposing solutions.
- i. Reviews by top management every week on each pillar for **45 minutes per day*** to monitor progress.
- j. Commitment to Union leader at the beginning itself.
- k. Precaution is to be taken not to shift the operators to other job till they finish step-3
- l. CEO Selected in Manager's Model Team
- m. Roadmap for JH
- n. Very critical M/cs chosen
- o. Safety audit before starting JH

Qs. 3 What is JH for electrical and electronic parts?(Step 1)

The following abnormalities can be searched for in the electrical parts. Use the line diagram for doing the checking:

- a. Wires – hanging, loose, hardened, discolored – dress hanging, mesh and undressed wires. **Dress at 90 degrees*** to avoid pull on the wire. Mark the parts and wire for visual traceability. Discoloration, Hardening of wires. Ferruling the Wire connections for better traceability
- b. Motors – mountings to be checked and tightened if necessary, fan blades to be cleaned thoroughly, any abnormal heating – look for the reason
- c. Switches – limit switches, proximity switches, pressure switches. LS rollers to be cleaned, mountings tightened and minimum of 2 bolts to be ensured, bending of the wires at the end of proximity sensors to be checked.
- d. Panel coolers and oil coolers – check panel thermostat settings. Check for A/C Functioning and condensation
- e. Cam dogs – check tightness of settings
- f. Electrical panel – check wiring condition as in 1 – put a transparent cover on for making it easy to inspect. Check earthing, sealing to avoid dust
- g. discoloration of switch gears, any unwanted materials
- h. Do not handle electronic PCB's and Control systems during 'initial cleaning' without the specialist.
- i. Electrical boxes – loose open wires, blown fuses, carbon deposition , earthing
- j. No loosening of Card Clamping Knobs, indication lamps glowing
- k. Overload Relay, Basic Safety Requirements in Electrical Circuitry
- l. Indicator lamps-Solenoid valves
- m. Look for damaged glands
- n. Use of suction device to clean with Flow Control
- o. Start with 1S – 2S in panels

* Company Specific Examples

Qs .4 What points are to be considered for JH Audit after each step?(Step 1,2 & 3)

In one of the companies, after operating a step for about two months, the first audit was scheduled. Audit covered the following:

- a. Machine – surroundings – floor area
- b. Exterior – machine body, bed, all pipelines, guards etc.
- c. Hydraulic system, table guide ways, spindle unit, lead screws, magazine tooling etc.
- d. Peripheral equipment – coolant, lubrication system, chip conveyor, transformer etc.
- e. Make in all the above areas equipment free from dust, leaks, grease or dirt.
- f. M/c specific audit sheets will be required on the above points.
- g. Understanding, Involvement & Effective Implementation of each step and its accruing results.
- h. Adherence to schedule & preparedness for next step.
- i. Peripherals condition whether improving. Basic 1 ‘S’ and 2 ‘S’
- j. As progressing ahead whether the team is sustaining previous steps gain.
- k. Display of JH status on TPM Activity Board
- l. Whether before audit, whether Self Audit has been executed by Circle Members
- m. Time spent on JH Activities vis-à-vis the Benefits Accruing

Qs. 5 What is the difference between implementing JH in a new or an old plant ?
(attitudinal difficulties in implementing)(Step 0)

Human Factors : Old Plant – Apprehension and fear in mind of Job Security, Increase in workload, more focus on Numbers / output than on quality. They do not integrate these jobs with their activities.

This type of work culture requires repeated training, perseverance & incentive led suggestion schemes.

Machine Factors : Old Plant – Availability of Basic Data, Catalog and spares is a problem. Safety Issues need to be taken care in old Plant. Infact the Employees are to be told to take additional care.

In New Plant both Sporadic as well as Chronic Problems occur while in Old Plant, sporadic problems have already been debugged over period of time.

In old plants, there are human and machine factors which maybe very different from a new plant. To deal with both, companies have done the following:

- a. Start KK, Safety and Education simultaneously first before introducing JH.
- b. Canteens and toilets cleaned first
- c. Food quality improved first
- d. Training on Kaizen and recognition on that given before work started on JH.
- e. Suggestion schemes were incentivised with money.

Qs. 6 When to do JH(time) in (Step 1,2 & 3)

a. Continuous plant

- Running checks – operators do this at fixed timings (for e.g. Cycle End) with machine in running condition by checking/inspecting visual points
- Static / Hidden checks mostly during shut down time or repair and breakdown time, or when M/C stopped due to want of material
- Stand-by team for autonomous maintenance
- Calibration/CBMS
- On holidays for Painting / plating job

b. Batch of machines

- end of shift is better to hand over clean machine to next shift
- Each operator takes one machine in their respective shifts, cleans before every shift beginning and during Power cuts
- Stationary parks can be done anytime
- For a continuous running plant once in a year

c. Cellular manufacturing

Beginning of a shift is the ideal time and during minor repairs and breakdown.

1. During stoppage all teams KK, QM, PM and JH all need to work together on the machine that is down
2. Many items can be checked when the machine is running – so that check can be done on-line.
3. After crossing 2nd stage of JH, machine stoppage is not required
4. At 3rd step, m/c stoppage for changeovers can be used for doing any checkings required with the machine in a stopped condition.
5. At third stage, we must consider which machine of stopped for the lowest time – can have the highest increase in production – and then stop that machine only and get all the pillar teams to work on the machine.
6. Weekly Twice for one hour for whole Cell

Qs. 7 How to select JH committee members?(Step 0)

Chairman : Manufacturing head.

- Sub Committee Members mostly from Production. One each from Electrical and Mechanical Maintenance. A member from QA can be taken
- Leader with good knowledge of Machines and Operations & Capability of motivating team members. He should be a good Trainer / Facilitator.

Process Industry

Chairman: Plant head(or unit operations head)

Members: Production, Engineering, Quality

Qs. 8 How to select circle members ?(Step 0)

Usually 3-7 member team including supervisor and senior operator and operators from all shifts.

- a. Operators of same machine of all shifts.
- b. Maintenance – mechanical and electrical members
- c. Quality Inspector/staff.
- d. Setter of the cell and cell leader in case there is a cell layout.
- e. Fitters & Tool Design representatives

Process Industry

- a. Foreman to be leader with operators, fitters and electricians to be members.

Qs. 9 How to select the machine to start JH activities ?(Step 0)

- a. Machine having major losses in terms of P, Q, C, D, S, M.,i.e capacity, downtimes and rejections
- b. In line with scope of Horizontal deployment
- c. Machine having high level of abnormalities(old machines – but where manuals and spares are available).
- d. Matching with Rank A machines.
- e. High volume cells can also be declared as Rank A cells.
- f. Minimum number of machines required to ensure that the customer line is not disrupted.
- g. High breakdown machines – and there are no alternatives.
- h. High scrap, customer complaints, breakdowns and are bottleneck machines.

Process Industry

- a. Based on P,Q,C,D,S,M and horizontal deployment opportunity
- b. Worst basic conditions
- c. Rate loss is the highest / Leakages / Messy / Dirty
- d. Many losses, including high breakdown
- e. O.E.E less than 70%
- f. Whole plant

Qs. 10 How should One Point Lessons be developed ?

These lessons are developed to increase basic knowledge and skill improvement to reduce breakdowns and defect due to poor knowledge and skills.

- a. Relating to equipment abnormalities, safety, breakdown and Quality detected during trouble-shooting
- b. Machine leaders, maintenance staff, quality staff to prepare
- c. Team leader to teach
- d. Highly visual.
- e. Relating to repeated mistakes or can mistake areas which lead to Customer Complaints / BDs

- f. Topics may arise in other pillar activities such as PM, KK, QM or in plant reviews.
- g. Circle leaders usually take the initiative (become teachers) – they must not be criticized
- h. Initial facilitation may be required from managers to help them develop them
- i. Displays – visuals must be developed only and put near the work station and on the TPM Activity Board.
- j. Should be developed as Do's and Don'ts
- k. Cases which will increase the knowledge and will have bigger target for horizontal deployment
- l. Should also be covering unsafe conditions.

The format usually contains 'abnormality – what was wrong', corrective action – how to do it correctly, to whom it is given and by whom, how many more people does it need to be explained to.

Process Industry

- a. Based on questions asked or suggestions made by circle members
- b. Last man in relay goes to first man with message what he learnt to ensure that every body has learnt it consistently.

Qs. 11 How to do JH by one operator for long line of machine ?

- a. Other operators and maintenance people to join for initial cleaning.
- b. Can call people from office area after giving them training.
- c. Break up the machine into different parts and get operators from different shifts to take responsibility for different areas.

Process Industry

- a. Divide into sections – one m/c to one operator

Qs. 12 How to do JH by 1 operator for multiple machines ?

- a. Other operators and maintenance people to join for initial cleaning.
- b. If there are two shifts, then it maybe possible to stagger.
- c. Fix the time- whichever the machine
- d. Use change-over time, shift change-over time and take help from others whenever required.
- e. Does lubrication and inspection at start of shift on all machines he is handling.
- f. If one operator looking after two machines each operator takes on one machine in one shift and the other operator does on the second machine.

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- a. Selection of one type and then going to next
- b. Idle non-running machine done first
- c. During lunch time

Qs. 13 How to do JH when operator is in rotating shift duty ?

- a) Divide machine into different areas – hydraulic pack, control panel, spindle head etc & define ownership - Sub-Assembly wise, Shiftwise, Operator wise and schedule prepared.
- b) Assign to different members of the team.
- c) Then **10-15 minutes** at the beginning of every shift is used for the JH activity.

Process Industry

- a. Each shift schedule
- b. A-shift cleaning with circle members at fixed time and inspection staggered in other shifts
- c. Mostly in first shift
- d. Fixed time in each shift such as: 4:00 to 5:00 pm
- e. Machines distributed shift-wise
- f. They participate only when they come in morning shift

Qs. 14 How to do JH when multiskill operator on the job ?

- a. It is easier if the operator is multiskilled. Modern plants have this advantage.

Qs. 15 How to manage the tags ?

- a. Prepare tag matrix by team lead
- b. Decide priority for countermeasure(leak, dirty, missing,---)
- c. Tag removal on Sundays
- d. If tags are too many then call in a sub-contractor under supervision of maintenance for red tag removal as a one time activity.\
- e. Tags indicate “Abnormality” and “Related to” to indicate the impact of not removing the abnormality.
- f. Tags are removed as soon as the countermeasure action plan is complete. A trend chart is prepared on tags put and removed every month.
- g. Department Manager takes ownership to track the number of Red / white , their stratification and closure
- h. White tags removed by Circle Members , Red Tags removed by “Specialists” within the target date & this is coordinated by circle leader.
- i. Tag Removal Plan made & reviewed in JH Sub-committee Meetings
- j. Before Closure of Tag the JH Team should check whether permanent solution has been taken.
- k. Daily status of Tags on Black Board
- l. Why Why & 5W1H for source of contamination

PM team will have separate tags.

Process Industry

- a. Minor fuguais not tagged, red tags put by operators, and fitters put white tags.

Qs. 16 How is Step 1 audit done ?

- a. Audit to be in line with JIPM methodology, for covering each machine of plant, specifically by sub-committee member/HOD/Leader
- b. By circle, followed by section head/deptt. Head followed by plant manager/top management
- c. Audit checklists are specific for each machine.
- d. These check lists do not have items of step 2.
- e. By going to the Machine and ascertaining the level of understanding of TPM Methodology by Team Member
- f. Is done by Team themselves followed by Sub-Committee. Final Audit by TPM Secretariat.
- g. Self audit marks are more than 90% then cross audit by 2 team leaders & one person from TPM secretariat means its considered OK.

Qs. 17. How are easy methods adopted for visual inspection ?

- a. oil level indicator for minimum and maximum levels
- b. Putting gauges on all pressure lines – as close as possible to the point of use
- c. floats with flower or doll mechanisms
- d. transparent covers for panels, belts to show direction of rotation
- e. stickers for inspection(ear, hand etc.)
- f. red and green zones on gauges, meters
- g. Write details of proximity switches near the point of their fixing
- h. Paper fans near motor to see the cooling unit operation.
- i. All lubricator units – on and outside machines – different colour used to indicate different type of oils including on pouring conical flasks
- j. Green paint for Not Open valves, Red for Not closed and semi-circular knob valves for midway positions.
- k. Matching marks on bolts and nuts
- l. Display of inspection route map
- m. Provision of ladders for visual inspection at heights
- n. Acrylic sheets to expose closed drives
- o. Transparent doors wherever possible.
- p. Lifting of machines by 6-9 inches.
- q. Main lines and sub-lines for all utilities marked with standard colours.
- r. Pin Bar for Checking Belt Tensioning
- s. 'Theme' of Visual Inspection-Inside Abnormality Invisibility to be made visible to Operator without touching / opening the equipment as far as possible.
- t. Pressure drop by Toys based on Unfurling / Uncoiling of Toys based on Bourdoun Principle.
- u. Kaleidoscope Concept for High Reach Check Points.
- v. Vibratory Toys on Spring to note Abnormal Vibration.

Process Industry

- a. Innovative ideas such as colour coding, stickers, matching marks, range on gauges in colour
- b. Hot & Cold written on such objects that are very hot or cold

- c. Colour coding of supply lines (utilities)

Qs. 18. How to select 'Good to find cases' ?

These are usually found during JH activity and maintenance/engineers can contribute to this significantly. Study of the circuits, drawings, helps to find these.

- a. surprise points/hidden
- b. crack in machine body
- c. grease nipple painted or hidden
- d. broken insulation
- e. During step 0 and 1.
- f. Part of tag removal – this activity can be done at that stage.
- g. Can prevent an accident
- h. Not too difficult to do or maintain by operators
- i. Can lead to deterioration in house-keeping
- j. Can prevent breakdowns or defects
- k. Localised guards, chute for collection of coolant and burr.
“Hand Made Taste” by Circle Members.
- l. Zinc Plating Line Cable were taken overhead to avoid forced deterioration.
“Hand Made Taste” by Circle Member

Qs. 19. How to develop and improve inspection standards ?

Initially tentative standards from past breakdown causes are developed in the following way:

- a) To develop these standards, distribute the machine into different areas and make a list of all
 - 1. nuts and bolts
 - 2. proximity switches
 - 3. valves
 - 4. gauges and dials
 - 5. lubricators
 - 6. level indicators
 - 7. belts safety devices
 - 8. pipe joints
 - 9. motors and couplings
 - 10. List up all points where regular tightening, cleaning, lubricating and inspection has to be done. Also take points from PM and QM activities.
- b) After implementing Kaizens, take countermeasures and identify the inspection points, which will indicate natural deterioration only.
- c) Make a standard having Location, Sub-assembly, Item, What to do, Why to do, Who will do, What frequency, required condition, and Action if required condition is not achieved.
- d) Make a checklist based on the standard above having location, sub-assembly, item, what to do, who will do, what frequency and dates
- e) Distribute the activities evenly over all shifts

- f) Follow the checklist and improve it based on further kaizens and experience gains
- g) Do why-why analysis for every failure because of poor JH.
- h) Inspection standards will be made after taking Countermeasures in Step-2, for something on which no action has been thought (for root cause) and that can only be taken care by a scheduled check.
- i) Most important it should have time for C,L,I against each checkpoint to find “still” hard to Clean, Lubricate and Inspection points, so as to reduce them to make it a regular feature.

These standards are usually:

- a. pictorial
- b. for each area of machine
- c. Maintenance man to do major help
- d. Improved based on practice/reviews to add/remove standards.
- e. Monitored for ‘time to do inspection’, ‘time to clean, lubricate and tighten’.
- f. Improved to reduce inspection time and frequency of inspection by monitoring the time at all times.
- g. On completing step 1 and 2, time to inspect should reduce. After monitoring this for one to two months – confirm the tentative standards as more permanent.

Process Industry

- a. Maintenance department to help with making these inspection standards
- b. Standards must be developed from step 0 itself
- c. By 5W and 1 H based on experience and supplier recommendations
- d. Tentative standards made based on critically of the requirement to inspect based on five senses.

Qs. 20 How to do step-wise implementation and monitor the progress ?

- a. Action Plan & Review in Every Scheduled Meetings for various Pillars and their impact on PQCDMS Results.

Qs. 21 How to develop audit sheets, auditing and control for each step ?

- a. Leader of model machine did the first audit.
- b. Members of the team did the audit
- c. Only if members score was more than 90 did they request the section or department head to do an audit.
- d. Only if section head’s audit indicated a score more than 80, did the plant head get invited to do the audit.
- e. This method was used to graduate from step 1 to 2 to 3 and so on.
- f. Training on learnings from model M/Cs.
- g. Relevant one point lesson training

Qs. 22 How to plan horizontal deployment ?

- a. Horizontal deployment of JH in other machines
- b. Steering committee to decide next batch in line with Kobetsu Kaizen requirements.
- c. Use of Why-why analysis and one point lessons can help to do Horizontal deployment

Process Industry

- a. Plan a date for execution of similar type.
- b. Based on P,Q,C,D,S,M – rank machines and do HD

Qs. 23 How model machines are to be managed ?

- a. Keep taking photographs from the same position at regular intervals.
- b. Plant manager selects machines based on loss data
- c. Instructor will help/teach each step and do.
- d. Team formation by Plant manager consisting of production, maintenance, quality, tooling and operators of that machine
- e. Focus on safety aspects.
- f. Activity/Audit targets fixed by Plant manager and team leader.
- g. Every Monthly discussion / meeting will lead to planned future reduction in BD and Rejection.

Initially the model machines are managed by managers, with daily reviews being done to monitor the results by them. After achieving the results, there is a joint meeting with all the workers who are then shown how to carry out the daily cleaning and inspection activities. This would happen after tentative standards have been made.

Process Industry

- a. Led by managers with a time-bound action plan and monitoring the progress.

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Manual No.5

OFFICE TPM IMPLEMENTATION

12th May,2001

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