

Electrical Core Manufacturing Industry: A Case Study

About the Client

- Client is one of the largest soft ferrite manufacturers and suppliers in India.
- Client's vision is to be the leader in providing innovative electrical cores designs.

Aims/Objectives

- Project Scope included the following areas, Press Shop, Sintering Shop, Grinding Shop, Tumbling Shop, Coating Shop & Packing
- Work content measurement using PMTS techniques.
- Work Distribution for manpower utilization.
- Dashboards for production planning as per demand for both daily and monthly production and resource calculations i.e., manpower as well as machines.
- Improvement & Suggestions

Key Points

- For Existing Condition
 - a. Productivity improvement by 35.22%.
 - b. Manpower reduction by 26.94%.
- For Proposed Condition based on Multi-manning and Layout Modifications
 - a. Productivity improvement by 59.49%.
 - b. Manpower reduction by 38.55%.

Client's Challenge

- Work standardisation across various variety of cores produced.
- Reduction in manpower fatigue.
- Dashboards for production planning as per demand for both daily and monthly production.
- Low manpower utilization.
- Layout Modification
- Low-Cost Automation wherever applicable

PMI's Approach

The study was organized in a 3-stage process:

1. Data Collection - Video shooting of all activities on the line.
2. Estimation & Data Analysis – MODAPTS estimation, work distribution, Area wise dashboard preparation, Area wise Monthly Production Dashboard.

- Results and Conclusion – Dashboards for future planning, fatigue reduction, improved productivity, improved manpower utilization, identification of NVA work content.

Involvement of Associates –

- PMI – 1 Project Manager, 2 Engineers.
- Client – 2 Project Co-ordinators.

Data Collection-

- Recording videos by PMI Engineers.
- Interaction with client to understand process.
- Production Data for 2-3 month.
- Data requirement posted for all the kinds of cores produced and process carried out based on different variety of cores.

Data Analysis -

- Preparation of elemental details using PMTS technique & validation by client.
- Analysis (Work distribution/VA-NVA identification) for manpower calculation, optimum manpower utilization & identifying capacity.
- Dashboard preparation for Area wise production planning as per demand.
- Layout Modification to improve the process/eliminate NVA movement.
- Improvement & suggestions for fatigue reduction & making existing system better.

| Area | Shifts for which Machine is Engaged | Shifts run | Days to achieve production | Machines available | Machines req. (per shift) | Mandays | Manpower/Day |
|--|-------------------------------------|------------|----------------------------|--------------------|---------------------------|------------|--------------|
| Hydraulic | 139.0 | 3.0 | 31.0 | 5.0 | 1.49 | 140.00 | 5 |
| Rotary-Lean | 419.6 | 3.0 | 31.0 | 16.0 | 4.51 | 186.00 | 6 |
| Rotary-others | 201.4 | 3.0 | 31.0 | 6.0 | 2.17 | 202.00 | 7 |
| Dorst | 411.7 | 3.0 | 31.0 | 13.0 | 4.43 | 279.00 | 9 |
| Overall Basic Manpower | | | | | | 807 | 27 |
| Total Reliever MP | | | | | | | 5 |
| Total MP with 8% Absenteeism + Reliever | | | | | | | 36 |

Shift Time (Min) 400

Input Geometry name & Production Qty here.

| Geometry name | Orders (Pcs) | Machine Auto per core (Sec) | Manual WC per core (Sec) | Capacity per shift | Required Total Machine time (min) | No. of shifts required | No. of days required | Setup (min) | Machine type | Press |
|---------------|--------------|-----------------------------|--------------------------|--------------------|-----------------------------------|------------------------|----------------------|-------------|--------------|---------------------|
| CPT8010 | 0 | 24.00 | 12.50 | 1000 | 0 | 0.00 | 0 | 120 | Hydraulic | PR06/PR07 |
| EC4215 | 0 | 5.00 | 2.74 | 4800 | 0 | 0.00 | 0 | 40 | Dorst | PR10/PR51/52/53/54 |
| EC7017 | 180 | 7.50 | 4.37 | 3200 | 22.5 | 0.06 | 0.01875 | 40 | Dorst | PR10/PR51/52/53/54 |
| EE10028 | 2200 | 40.00 | 12.61 | 600 | 1466.667 | 3.67 | 1.222222 | 120 | Hydraulic | PR05 |
| EE1011B | 4962850 | 0.33 | 0.04 | 72000 | 27571.39 | 68.93 | 22.97616 | 150 | Rotary | PR18/19/20/21/22/23 |
| EE11036A | 600 | 24.00 | 12.66 | 1000 | 240 | 0.60 | 0.2 | 120 | Hydraulic | PR04 |
| EE12820 | 124 | 40.00 | 12.66 | 600 | 82.66667 | 0.21 | 0.068889 | 120 | Hydraulic | PR05 |
| EE1306 | 1313600 | 0.25 | 0.04 | 96000 | 5473.333 | 13.68 | 4.561111 | 150 | Rotary | Rotary-Lean |
| EE1306C | 11893860 | 0.33 | 0.13 | 72000 | 66077 | 165.19 | 55.06417 | 150 | Rotary | Rotary-Lean |
| EE1310C | 475876 | 0.25 | 0.09 | 96000 | 1982.817 | 4.96 | 1.652347 | 150 | Rotary | Rotary-Lean |

Monthly Dashboard based on production.

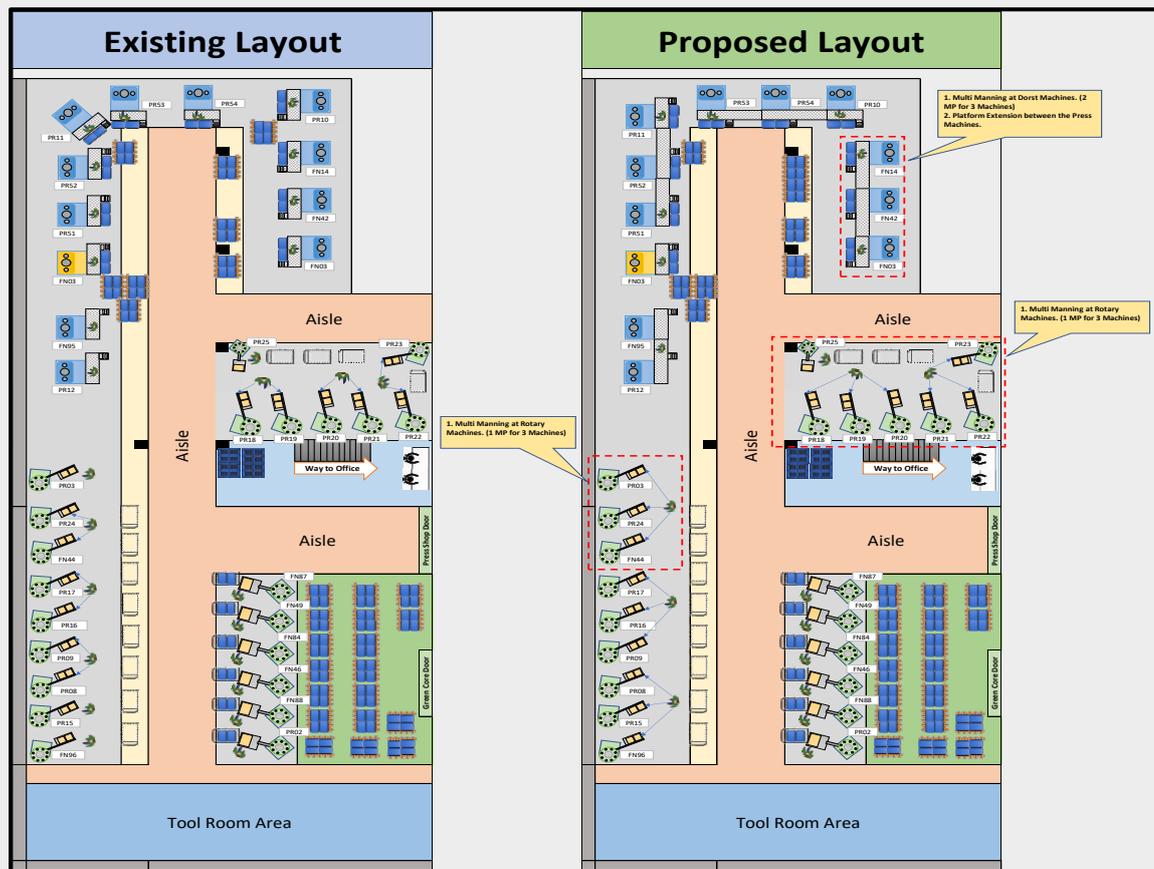
| Area | Machine Engagemen t Shifts | Shifts run | Days to achieve production | Machines available | Machines req. (per shift) | Mandays | Manpower/ Day |
|--|----------------------------|------------|----------------------------|--------------------|---------------------------|------------|---------------|
| Hydraulic | 139.0 | 3.0 | 31.0 | 5.0 | 1.49 | 140.00 | 5 |
| Rotary-Lean | 419.6 | 3.0 | 31.0 | 16.0 | 4.51 | 186.00 | 6 |
| Rotary-others | 201.4 | 3.0 | 31.0 | 6.0 | 2.17 | 202.00 | 7 |
| Dorst | 411.7 | 3.0 | 31.0 | 13.0 | 4.43 | 279.00 | 9 |
| Overall Basic Manpower | | | | | | 807 | 27 |
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| Total MP with 8% Absenteeism + Reliever | | | | | | | 36 |

Shift Time (Min) 400

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| Geometry name | Orders (Pcs) | Machine Auto | Manual WC | Capacity | Total Machine time | No. of shifts required | No. of days required | Setup | Machine type | Press |
|---------------|--------------|--------------|-----------|----------|--------------------|------------------------|----------------------|-------|--------------|---------------------|
| CPT8010 | 0 | 24.00 | 12.50 | 1000 | 0 | 0.00 | 0 | 120 | Hydraulic | PRO6/PRO7 |
| EC4215 | 0 | 5.00 | 2.74 | 4800 | 0 | 0.00 | 0 | 40 | Dorst | PR10/PR51/52/53/54 |
| EC7017 | 180 | 7.50 | 4.37 | 3200 | 22.5 | 0.06 | 0.01875 | 40 | Dorst | PR10/PR51/52/53/54 |
| EE10028 | 2200 | 40.00 | 12.61 | 600 | 1466.667 | 3.67 | 1.222222 | 120 | Hydraulic | PRO5 |
| EE1011B | 4962850 | 0.33 | 0.04 | 72000 | 27571.39 | 68.93 | 22.97616 | 150 | Rotary | PR18/19/20/21/22/23 |
| EE11036A | 600 | 24.00 | 12.66 | 1000 | 240 | 0.60 | 0.2 | 120 | Hydraulic | PRO4 |
| EE12820 | 124 | 40.00 | 12.66 | 600 | 82.66667 | 0.21 | 0.068889 | 120 | Hydraulic | PRO5 |
| EE1306 | 1313600 | 0.25 | 0.04 | 96000 | 5473.333 | 13.68 | 4.561111 | 150 | Rotary | Rotary-Lean |

Area wise Dashboards



Layout Modification/Multi-manning

Results & Conclusion

After doing analysis and evaluation following results were obtained –

1. Improved productivity by 59.49%.
2. Multi-manning to address low utilization of manpower.
3. Layout modification for reduction of motion-loss NVA in some areas.
4. Dashboards for future planning as per demand & as per working lines.

| S.No | Area | Manpower Actual Mar-2023 (HR Data) Nos | Manpower Proposal 1 based on Existing Scenario Mar-2023 Nos | Gap wrto Proposal based on Existing Scenario Nos | Manpower Reduction % | Productivity Improvement % | Proposed 2 Manpower Nos | Gap wrto Proposal based on Existing Scenario Nos | Manpower Reduction % wrto Proposal 1 | Productivity Improvement % wrto Proposal 1 |
|-----------------------|----------------------------|--|---|--|----------------------|----------------------------|-------------------------|--|--------------------------------------|--|
| 1 | Press + Mixing | 78 | 67 | 11 | 14.1% | 16.4% | 51 | 16 | 23.88% | 31.37% |
| 2 | Sintering/Sorting/Tumbling | 75 | 66 | 9 | 12.0% | 13.6% | 59 | 7 | 10.61% | 11.86% |
| 3 | Grinding | 51 | 34 | 17 | 33.3% | 50.0% | | | | |
| 4 | Packing | 74 | 42 | 32 | 43.2% | 76.2% | 64 | 12 | 15.79% | 18.75% |
| 5 | Coating | 19 | 15 | 4 | 21.1% | 26.7% | 15 | 0 | 0.00% | 0.00% |
| Total Manpower | | 297 | 224 | 73 | 24.6% | 32.6% | 189 | 35 | 15.63% | 18.52% |

Overall Summary Chart

5. Improvements and Suggestions

- Safety related Improvements suggested like usage of Face mask and Hand gloves in Press Shop and Sintering area.
- FIFO system implementation in the Green Core storage area rigorously.

6. Implementation of project at site was done by verifying the manpower summary generated by the monthly dashboards and providing the client guidelines for usage of Area wise Monthly Dynamic Dashboards.

7. Actionable points given to the client to get immediate improvements.

| S.No | Area | Manpower Actual Mar-2023 (HR Data) | Manpower Proposal 1 based on Existing Scenario Mar-2023 | Gap wrto Proposal based on Existing Scenario | Problem Statement | Existing Situation | Immediate Action to be taken within 15 days | Next Action Plan | Proposed 2 Manpower | Gap wrto Proposal based on Existing Scenario | Action Plan for further improvement |
|-----------------------|----------------------------|------------------------------------|---|--|---|---|---|---|---------------------|--|---|
| 1 | Press + Mixing | 78 | 67 | 11 | Machines are not getting utilize up to its fullest capacity | <ul style="list-style-type: none"> Losses are not getting recorded thus no tracking of losses Losses due to powder are at least 3-2 times/machine leads to machine stoppages thus causes losses of 1 to 2 hrs in shift For rotary presses tool availability is not 100% thus production losses Tool is getting changed when defective production is removed from machine New jimee are directly deployed on machine for working thus losses are observed and low machine utilization | <ul style="list-style-type: none"> DWM (Daily Work Management) meeting to be initiated Losses Capturing and daily review at shift end to be initiated with immediate effect MP (Material Preparation) Operators to be notified immediately and losses due to powder issues to be tracked and reviewed daily/weekly/monthly As per machines requirement okay tools should be loaded on all machines Tool life to be decide and maintenance should be done for all tools New jimee should be passed through proper training and OJT (On Job Training) | <ul style="list-style-type: none"> OOE monitoring to be start on daily basis MP (Material Preparation) Operators to be notified immediately and losses due to powder issues to be tracked and reviewed daily/weekly/monthly Tooling availability to be ensured for all machines Plan for tool maintenance should be prepared Assessment should be done for skill set level to deploy operator on machine Standard to be prepared for new jimee classroom training | 51 | 16 | <ul style="list-style-type: none"> Rotary Lean Machine - 1 Manpower for 3 Machine Dorst - 2 Manpower for 3 Machine Rotary Other - 1 Manpower for 1 Machine |
| 2 | Sintering/Sorting/Tumbling | 75 | 66 | 9 | Green Cores searching For Sintering loading stacking of trays are done with trail and error method HPT not available Searching for spacers | <ul style="list-style-type: none"> In green core area, operator search for the required material from the stacked bins Stacking is done with trail and error methodology Searching for HPT throughout the shop floor All spacers are kept in bin and thus bin contains all mix types of spacers | <ul style="list-style-type: none"> Tagging should be done to each bin Training for stacking of sintering trays loading should be covered in training module HPT Naming should be done based on area and ownership to be provided Based on existing HPT quantity, HPT should be distributed to the areas combining based on loads Bins for segregation of spacers should be provided | <ul style="list-style-type: none"> Green Core area to be segregated with signage based on core type (like torrida, EE, HPT, etc.) Monitor to be displayed for Planning FIFO should be follow using rack system Guidelines for stacking for geometry to be prepared Area wise when common location should be finalise for HPT placement After unloading operator should keep spacers segregated | 59 | 7 | <ul style="list-style-type: none"> Common loading and unloading for K3 & K4 |
| 3 | Grinding | 51 | 34 | 17 | Cores are not getting dried and cleaned properly Searching for Sintered Cores | <ul style="list-style-type: none"> Temporary unloading on carton sheet Clearing of ferrite dust Unloading of cores on final carton box Sometimes operators searched for sintered cores | <ul style="list-style-type: none"> Dryer operation should be start immediately Area to be segregated with signage based on core type (like torrida, EE, HPT, etc.) Dryer operation should be start immediately Completely for gauging should be minimize by using sintering issues | <ul style="list-style-type: none"> Ferrite dust should be clean at the time of unloading FIFO should be follow using rack system Ferrite dust should be clean at the time of unloading Visual inspection machine should be used for auto gauging | | | |
| 4 | Packing | 74 | 42 | 32 | Rework and Gauging Extra work due to improper packaging material Coating Visuals | <ul style="list-style-type: none"> Water tanks of grinding are not cleaned Operators are using extra packaging material by cutting of foams and carton sheets for final packaging Packaging boxes are wet and thus operators are spending 15 min over for drying Defective parts are observed due to dust and extra layer of paint on cores | <ul style="list-style-type: none"> System cleaning should be done immediately CTT to be form between purchase and production team Poor quality of boxes should be rejected and sent back to supplier Cleaning of paint shop areas to be done on immediate basis System Cleaning (Technical Cleaning) of paint area to be done | <ul style="list-style-type: none"> Based on frequency of cleaning required for whole plant system cleaning (technical cleaning) should be done New Vendor Development and Supplier Quality Assurance to be in place over a period of time Only right quality of boxes should be accepted If required vendor to be changes if there is no improvement in quality Plates as well as gratings used for painting should be clean after define number of cycle of painting Plates as well as gratings used for painting should be clean after define number of cycle of painting | 64 | 12 | <ul style="list-style-type: none"> Loading and Unloading manpower included Rework consideration is 8% |
| 5 | Coating | 19 | 15 | 4 | Rework Material Movement | <ul style="list-style-type: none"> Due to rework movement of material for painting and binning | <ul style="list-style-type: none"> Rework should be minimize by system cleaning as mentioned above | <ul style="list-style-type: none"> System cleaning should be in place to avoid reworks and extra movements | 15 | 0 | <ul style="list-style-type: none"> Rework consideration is 30% |
| Total Manpower | | 297 | 224 | 73 | | | | | 189 | 35 | |

Contact Details

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