



**FOR LARGE AND MEDIUM
COMPANIES
(Unit level / SBU level
turnover > Rs.100 Crores)**

IMTMA - ACE MICROMATIC Productivity Championship Awards 2022

Rules & Guidelines governing the competition

Competition open to companies engaged in the manufacture of Engineering products / Components.

Contestants are advised to read the following guidelines carefully before filling in the format

- The objective of National Productivity Summit is to showcase best productivity practices in Indian manufacturing space, by sharing knowledge and experience.
- **Participation in this competition is FREE.** Please submit your case study through productivity portal www.productivity.imtma.in
- **The filled in format should be uploaded in the productivity portal www.productivity.imtma.in on or before 20th July 2022.** Please ensure that the file size being uploaded does not exceed 20 MB. Subsequently the hard copy of the entry duly signed and certified by the senior management should be sent to IMTMA's Bangalore office at the below address.
- Companies must submit Case study(s) that will showcase and highlight breakthrough achievements that have brought significant competitive advantage to the company. The case study(s) must clearly bring out the value creation and results achieved.
- While companies can send a maximum of 2 entries per plant/ manufacturing location, please note that only ONE best entry shall be considered for evaluation.
- **Project must have been implemented and put into regular operation for a minimum period of one year. The project start date must be after January 2018.** Entries that were submitted for the previous IMTMA Productivity championship competition(s) must not be resubmitted. Such entries will be summarily disqualified.

Note:

- Minor improvements, Kaizens, will not be considered. Participants are expected to submit case studies that have brought in significant improvements to their business.
- Projects having application of standard products for productivity improvement / Service plugins that are commercially available will not be considered.
- Companies must submit their entry(s) strictly in the below format along with **Annexure A & B**. Entries without structured information on the case study(s) stands the risk of disqualification.
- The selected case study must be presented at the National

Productivity Summit 2022 scheduled on 18-19 November 2022, Bangalore, by a member of the Senior Management of the organization responsible for the project implementation. The presentation must be made in English language only.

- Entries will be judged by an independent jury comprising of eminent professionals, whose decision will be final. While significant weightage will be given to the conceptualization, link to business need, associated impact, value creation to stakeholders and business sustainability parameters, the other criteria for evaluation will also include analysis, determination of requirements, generation and evaluation of alternatives, innovativeness and the thoroughness of planning and implementation. Neither IMTMA nor ACE MICROMATIC will have any role in judging of entries. The jury reserves the right to accept or reject an entry without assigning any reasons thereof. Therefore IMTMA is not obliged to provide reasons for rejection.
- Projects may be validated onsite (physically or virtually) by the evaluation team as part of the process, if required.
- Winners will be awarded cash prizes, a trophy and a certificate. Multiple or partial awards may also be given. Cash prizes will be awarded to Individuals / Team Members. **Further, based on the discretion of the jury, one outstanding entry may be recognized with a special award (PRODUCTIVITY EXCELLENCE AWARD).**
- **Applicants are assured of the confidentiality and their IP rights. Presentations can contain concepts and broad contours of the project without disclosing confidential information.**
- IMTMA reserves the right to publicise the selected case study in their programs / website and other event promotional collaterals.

For any queries please contact:

INDIAN MACHINE TOOL MANUFACTURERS' ASSOCIATION (IMTMA)
@ Bangalore International Exhibition Centre (BIEC)
10th Mile, Tumkur Road, Madavara Post, Bangalore – 562 123

Abhishek (Email: abhishek@imtma.in)
Mob: 9844294387, Tel: 080 66246829) or
Madan (Email: madan@imtma.in)
Mob: 7899437625, Tel: 080 66246711)



Indian Machine Tool Manufacturers' Association (IMTMA)
Head Office : 10th Mile, Tumkur Road, Madavara Post,
Bangalore – 562123, Karnataka, India.
T: 080-6624 6829 / 6624 6711 W: www.productivity.imtma.in

Annexure: A

IMTMA-ACE MICROMATIC PRODUCTIVITY CHAMPIONSHIP AWARDS 2022

FORMAT FOR SUBMISSION OF CASE STUDY
FOR LARGE & MEDIUM COMPANIES ONLY
(Unit level / SBU level turnover > Rs.100 Crores)

Title of the Case Study: EV SHOP CAPACITY ENHANCEMENT THROUGH PRODUCTIVITY IMPROVEMENT AND INNOVATION

1. Name of company: TATA MOTORS PASSENGER VEHICLES LIMITED

Address of the Plant / Site location: SECTOR 15 & 15A, PCNTDA, CHIKHALI, PUNE 411062

Tel No.: 020

Turnover (in Rs. Cr) FY22: Consolidated Revenues ₹ 278.5KCr at Tata Motors , ₹ 31,515 Cr at Tata Motors Passenger Vehicles (<https://www.tatamotors.com/investors/results-press-releases/>)

No. of employees: 2088 Technician + 755 Staff = 2843

Industry sector (Pl. specify): AUTOMOTIVE

2. Name of the project leader: BHAGWAN BHOSALE

Designation : DEPTUTY GENERAL MANAGER (EV MANUFACTURING)

Mobile No.: 7276099293

Email ID: bhagwan.bhosale@tatamotors.com

Alternate contact person: TUSHAR KARVE

Designation : HEAD AND GENERAL MANAGER (EV MANUFACTURING)

Mobile No.: 9028059105

Email ID: tushar.karve@tatamotors.com

3. Project implementation

We certify that the project described here is factually correct and is in continuous operation.

We confirm that we have read the rules and guidelines governing this competition and agree to abide by the same.

We agree to nominate a member of our senior management to make the presentation at Bangalore, in case this entry is short listed for final evaluation of the award.

We have no objections in IMTMA publicizing our case study in their programs / website and other event promotional collaterals.

Name :__SHYAM SINGH_____

(Head of Company/Business Unit / Division)

Designation: _PLANT HEAD & SR GENERAL MANAGER TMPVL PUNE WORKS_____

Electronic Signature:_____



IMTMA-ACE MICROMATIC PRODUCTIVITY CHAMPIONSHIP AWARDS 2022

Annexure: B

Tick(✓) the appropriate box(es) that best describe your Case study

1. **Scope of the project:** (Please tick as appropriate)

- Multiple Value streams** (Improvements in Multiple Value streams/ product families resulting in breakthrough benefits).
- Single Value stream** (Improvements in a Value stream / product family with significant benefits).
- Localized improvement within a Value stream** (Improvements in identified processes / pockets within a value stream, with incremental benefits).

2. **Project sponsor:** Top management Senior management (CEO / CXO level)
 Middle management (GM/ DGM/ AGM level)

3. **Project trigger:**

3.1 External conditions Internal competitiveness

3.2 **Market conditions:**

- Uncertain demand Cyclical demand Low volume- High variety Sudden increase in demand

3.3 **Project approach selection**

- Primarily driven by the costs involved
- Based on financial benefits, gains
- Based largely on adoption by peers/ Industry standard

4.

Project focus :

- | | |
|--|---|
| <input type="checkbox"/> Manufacturing System Redesign (MSR) | <input checked="" type="checkbox"/> Better Asset Utilization (BAU) |
| <input checked="" type="checkbox"/> Productivity Through Quality improvement (PTQ) | <input type="checkbox"/> Optimizing Metal working Process (OMP) |
| <input checked="" type="checkbox"/> Digital Manufacturing | <input type="checkbox"/> Total Productive Maintenance (TPM) |
| <input checked="" type="checkbox"/> Total Quality Management (TQM) | <input type="checkbox"/> I 4.0 <input type="checkbox"/> Green & Clean |
| <input checked="" type="checkbox"/> Other innovation (Please specify) | |

5.

Quality / Analytical tools: Please tick If you have used any of the tools listed below for developing productivity improvement solutions.

- | | |
|--|--|
| <input type="checkbox"/> Statistical Process Control (SPC) | <input type="checkbox"/> Design of Experiments (DOE) |
| <input type="checkbox"/> Eight Disciplines of problem solving (8D) | <input checked="" type="checkbox"/> Root Cause Analysis (RCA) |
| <input checked="" type="checkbox"/> Standard problem solving tool | <input checked="" type="checkbox"/> Theory of Constraints (TOC) |
| <input type="checkbox"/> Six Sigma | <input checked="" type="checkbox"/> 7 QC Tools <input type="checkbox"/> Lean |
| Others (Please specify)..... | |

6.

Project implementation includes

- All activities within the organization
- Upstream and Downstream partners/ suppliers

7.

Productivity improvement includes: Enhanced output Reduced inputs Manpower Rationalization



IMTMA-ACE MICROMATIC PRODUCTIVITY CHAMPIONSHIP AWARDS 2022

FORMAT FOR SUBMISSION OF CASE STUDY

Instructions:

- Contestants are expected to present the case study on the following parameters within Eight (8) A4 size pages.
- Font size should not be smaller than Arial 11. Only MS Word format is to be used.
- Contestants are encouraged to include charts/ tables/ graphs/sketches/ photos / URL linked videos and other graphical illustrations to bring out the merits of their project / case study.

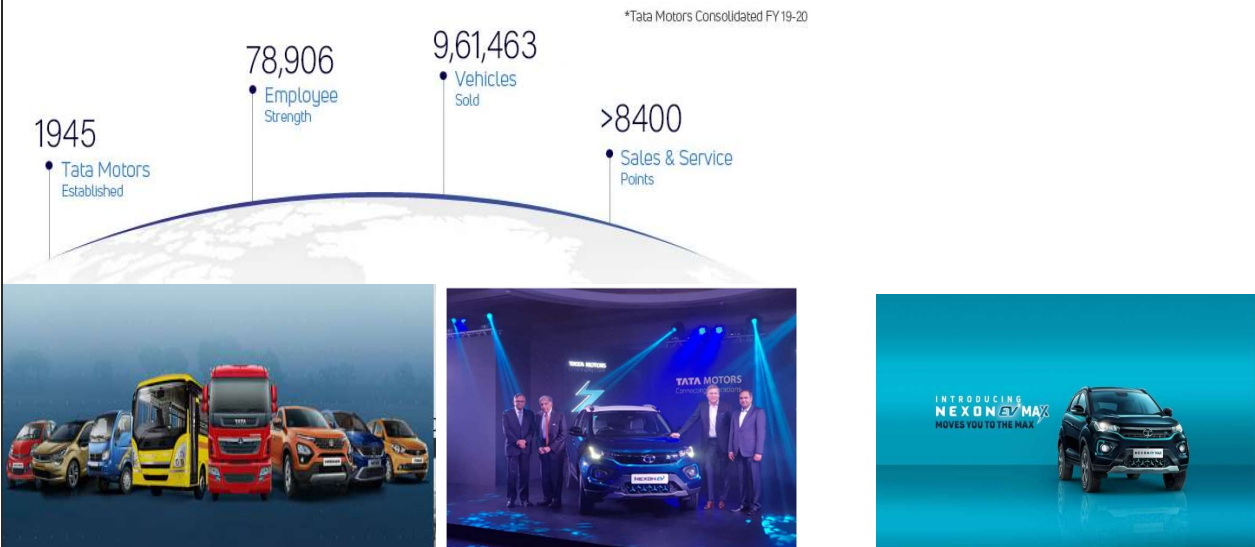
Note: All sections listed below must be adequately addressed and cannot be left blank

Your case study will be evaluated based on following criteria (as per the weightage points listed below) relative to the other entries.

- (a) Trigger for the project (b) Solution generation, Innovation and Complexity (c) Implementation (d) Results / Impact (e) Resource impact (f) Business metrics (g) External recognitions / Internal stakeholder appreciation (h) Scope for horizontal deployment

1 Brief description of the project.

Tata Motors Group (Tata Motors) is a \$44 billion organisation. It is a leading global automobile manufacturing company. Its diverse portfolio includes an extensive range of cars, sports utility vehicles, trucks, buses and defence vehicles. Tata Motors is one of India's largest OEMs offering an extensive range of integrated, smart and e-mobility solutions



Tata Motors vision is to give sustainable mobility solutions for customers.

Tata Motors entered in EV Segment in FY20-21 with Nexon EV and leading the EV Mobility with 90% Market share. Its Flagship products include Nexon EV, TIGOR EV & Recently Launched High Range Nexon EV Max.

This Project is conceived & executed in TML, Pune Plant where Nexon EV are being Produced.



IMTMA-ACE MICROMATIC PRODUCTIVITY CHAMPIONSHIP AWARDS 2022

FORMAT FOR SUBMISSION OF CASE STUDY (Contd.)

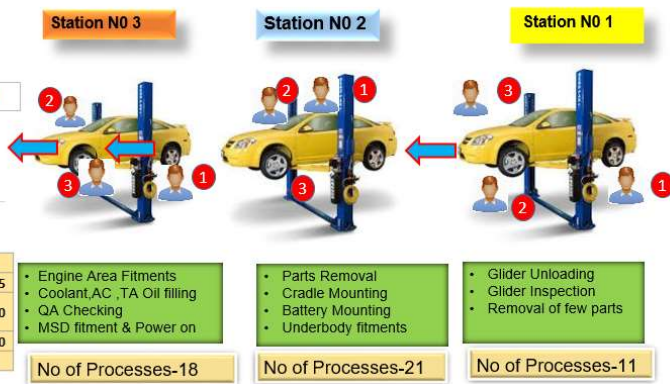
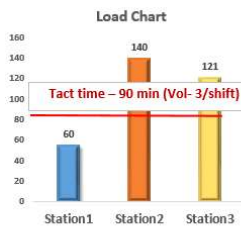
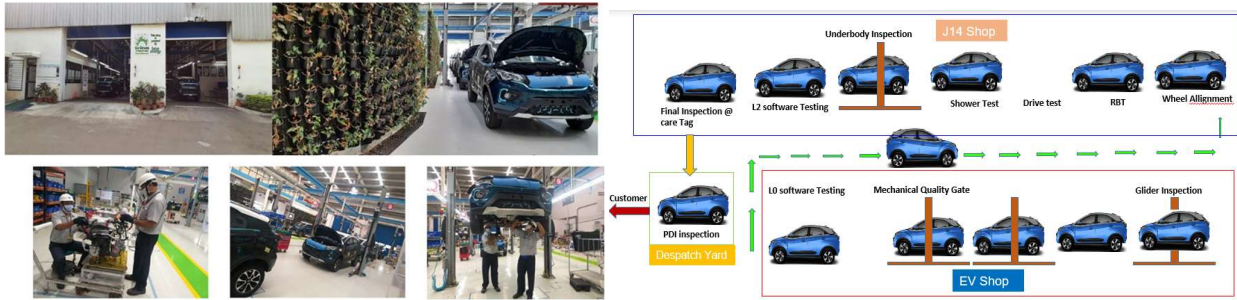
EV Shop was originally Planned for Capacity 8/day in 3 shifts .With Increased customer Demand due to good market response we needed to improve the productivity & hence the capacity of Shop.This Project was to improve the Capacity of EV Shop focussing on special Levers.

Trigger for the project. (10 points)

With Sudden rise in the demand for Nexon EV which has gone upto 60-70/day with good market response & product popularity, it was necessary to fulfil this customer delivery requirements through increased capacity of EV Shop.

As this EV Shop was planned with very small volume in mind, it was like a proto-shop where assembly Operations are being done on two post Lifts. It was equally challenging to respond in agile way so that opportunities are not lost...

Target decided to improve productivity & Capacity of EV Shop to 65/Day from Current 8/day through Systematic Approach...



Current Timing	A	B	C
Time available	455	455	365
Time 90% Efficiency (410	410	310
Cycle time)	140	140	140
Production	3	3	2

Solution generation, Innovation and Complexity. (20 points)

How did you generate the solution?

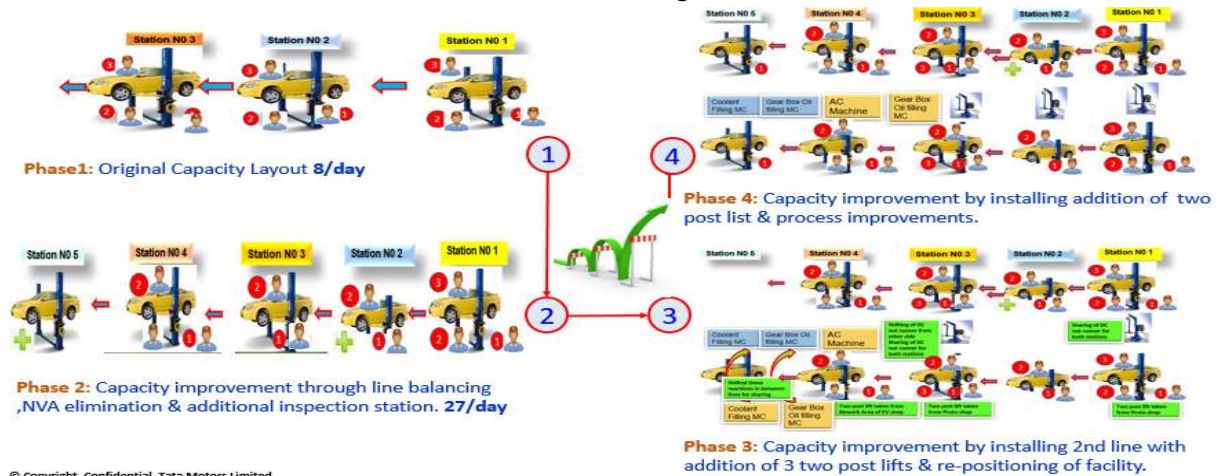
Solution generation, Innovation and Complexity. (20 points)

How did you generate the solution?

Following Levers were identified through CFT. Each lever to be exploited for possible solution & opportunity of innovation. Special task force from LOW COST AUTOMATION joined hands to facilitate the actions identified by CFT




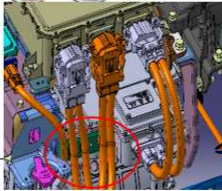
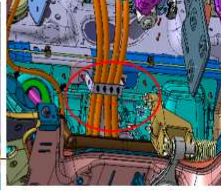
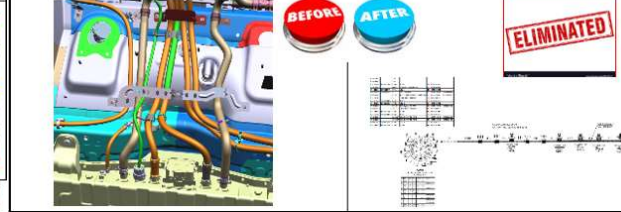
Lever 1: Line Balancing & NVA Elimination Line operation balancing done to evenly load all the stations. NVA activities were identified & small kaizens done through Low Cost Automation Team...






Design for Assembly – Few design modifications were implemented in Design to facilitate ease in the assembly process eliminating cycle time of the Process Few Examples

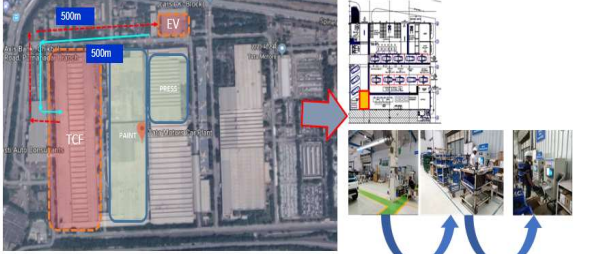
Before	Problem	After	Results	Before	Problem	After	Results
Chiller unit after subassembly is assembled at station number 1 from below the underbody.	Due to this un-ergonomic position it gives lots of strain on the operator neck causing Fatigue. Also 2 operators are required for this Fitment	Design modification was suggested by team to ERC. Instead of bolt hole stud welding on bracket was implemented through design release. Now operator locates the chiller subassembly on these studs and tightens the joint with nut without needing another operator	As process is made within reach fatigue reduced Operation time of process reduced by 3 MIN. No need for other person for this Fitment	Mounting bracket hole mismatch with BW	Due to this mismatch lot of time consumed for battery fitment. The fitment done this way was forced fitment leading many times BW battery mounting tapping getting spoiled resulting in heavy rework. Due to this this station had become bottleneck station on line	As this rear bracket has been assembled on slope and slope angle can not be controlled well in welding process, rear bracket hole changed from round hole to slot hole. Sufficient adjustment allowance is now available	1. Ease in the fitment 2. Reduced cycle time of activity by 5 min. removed bottleneck 3. Quality fitment as no stress in fitment. 4. Improved safety 5. Increased morale



Before	Problem	After	Results
Due to hard cable it is very difficult to mount the HV cable on cradle mounting bracket as position is non ergonomic	.Non ergonomic & time consuming process.	Parking eliminated from Bracket by ERC.ICA done for parking on Firewall bracket. PCA done to park these cables by modified firewall bracket	Ease in performing the process. Process cycle time reduced by 4 MIN
			

Process Re-engineering: Processes modified to eliminate/reduce loss during fitment & address Quality issues leading into loss in production...

Before	Problem	Measures Taken	Results
Removal of driveshaft after glider receipt for cradle stuffing and again fitting after cradle stuffing	Due to this NVA of removal and refitment of driveshaft, cycle-time of the process is increased. Also many times driveshaft were found damaged during transits	With CV joint, The gliders are received without driveshaft which are directly fitted at EV shop eliminating NVA	1.As operation of removal of driveshaft eliminated, cycle time reduced improved productivity. 2.Driveshaft damage cases eliminated
			



Process Provided by TS was to get VECU flashed in TCF. Every day team member had to walk/ jumbo more than **1 km** for this. Additionally there was waiting time @ TCF as this is common facility for both TCF & EV which was leading to downtime in EV shop due to EVCU Shortage. Dedicated manpower was required for this

New Station created in EV shop itself avoiding the need to go to TCF. Now any operator within the shop can perform the task avoiding any delay. Further it was shifted to area where other station person can perform the task. Later on new controller developed to put another machine eliminating need to run C shift

Automation : Processes which are done manually and requires Manual check & mistakes thereof through in-house Automation.

In **Nexon** EVs the major components include battery and motor which, on use, require cooling. We have two cooling systems namely : Motor Cooling System [MCS] and Battery Cooling System[BCS]. Coolant plays an important role in cooling down the two systems. The coolant is filled for 2 models Kanger1 & Kanger 2 having separate Coolant requirements

The filling includes: 4 possible combinations
Kanger 1 -> MCS
Kanger 1 -> BCS
Kanger 2 -> MCS
Kanger 2 -> BCS


The Earlier coolant filling process involved
1. Locking of Gun
2. Selector Switch (KANGER 1 and KANGER 2)
3. Selector Switch (Motor and Battery)
4. Master ON (Pushbutton)
5. Auto Process START (Pushbutton)

New Method:
Lock the gun in coolant tank.
Scan the VIN No. from Check Sheet of the car using zebra scanner.
Scan the QR code(Part No.) of LH (Left Headlamp) for BCS and RH(Right Headlamp) for MCS.

With existing Gear Oil dispensing following issues were identified:
Oil Dispenser cycle was getting aborted when there was low level signal. Due to this the oil quantity filled in the gearbox will not be the same as the cycle is interrupted in between.

With No or less oil in the gear box, the gears run out of Lubrication causing these gears to come in contact with each other generating Gear Noise. This being silent car this noise is immediately noted

PLC cycle modified such that the current running filling cycle will be completed despite of there is low level alarm. And the next cycle will not start until the oil tank low level alarm is cleared.
Scanner interfaced to store the Vehicle number and oil quantity filled. PLC logic modified with optimized memory mapping which will store the data against VIN No.



Muda Elimination: Identification of the all Muda(Non Value added activities and doing innovating material handling systems to ensure loss is Eliminated

Before	Problem	After	Results
Team member uses non ergonomic process to put A & B mount Team member has to walk down from platform 3 times for getting fasteners & 3 different torque wrenches of	Innovative Platform prepared.. Muda of motion with excess walking consuming time to get tools & fasteners.	Innovative Platform prepared.. Arrangement made on Trolley itself and made storage location of all the material and tool required	As process is made within reach(Golden Zone, fatigue reduced Work content of process reduced by 125 sec



Operator movement of 6-7 steps to get material required for subassembly of chiller and DCDC



Due to this NVA movements cycle time of activity is more resulting in production loss.



Layout changed & logistics trolley kept near subassembly fixtures to avoid NVA movements and achieving Golden Zone



As material & Tool are available in A zone, NVA time of deduced improving productivity



Station-1 BEFORE
Description of Activity being performed:
E drive consisting of induction motor & gear box required to be mounted on cradle assembly for assembly activity.
This lifting of e drive from pallet is being done with Belt & crane
1. As belt has to be put in lifting tackles on e drive, there becomes unbalance in the load causing wobbling movement of e drive which was resulting in inaccurate positioning of e drive on fixture causing fall hazard.
2. Ergonomically it is not recommended process as heavy load gets on the hand while doing the adjustment to mount e drive on fixture. This was time consuming activity and usually 2 Men are required to perform the task.

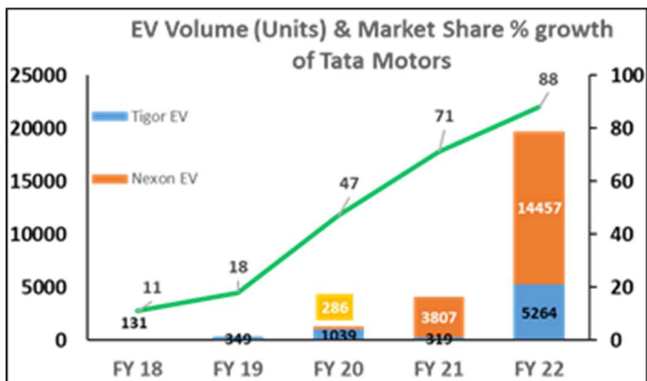
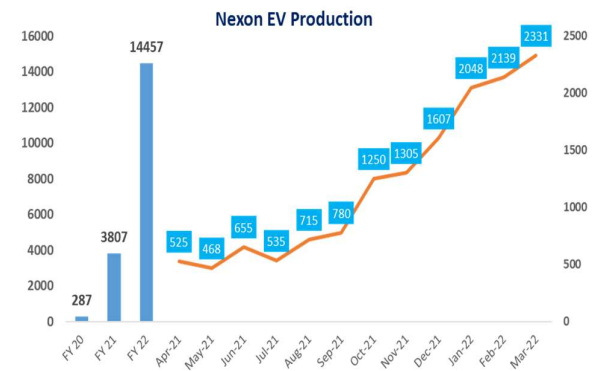
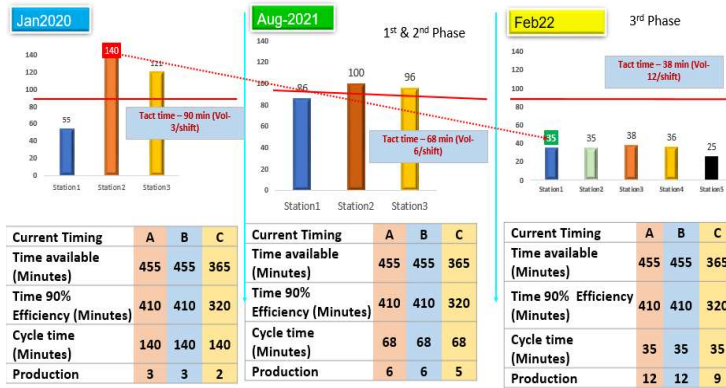
AFTER
Solution Implemented to Eliminate the Existing High Hazard. Please provide information around 1. To eliminate the previously mentioned hazards, trolley which was available in TCF has been identified and chiller subassemblies put on these trolleys. This placement is in Golden Zone. 2. This trolley was prepared with without any investment



Station-1 AFTER
Solution Implemented:
To eliminate the productivity loss caused by this process, a separate hydraulically operated chain hoist was made with available raw material generated through unused inventory. With simple Push button operator can load this e drive on Cradle fixture precisely without losing balance.
1. Solution was conceived within the company, no external help was required.
2. HIRA was reviewed to tackle and manage these changes.
3. Cycle time improvement of 60 sec
4. 1 Man Saving for the operation



Results & Impacts:

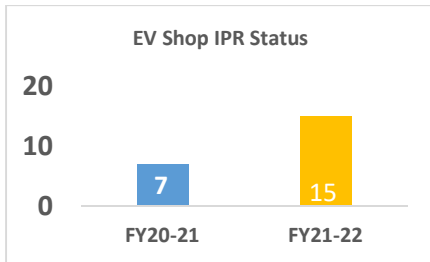


Resource Impact:

Impact on Cost – All the material handling platforms, lifting mechanisms identified have been made by LCA (Low cost Automation) team with ZERO investment.

Additional Capacity for Second line was established by taking unused equipment & Tools from Other Shops without any Capex Investment.

Innovation – Last two years 22 IPR registered for various innovative kaizens



Safety:

- 1.Improved safety through good ergonomic processes & Avoidance of Hazards
- 2.Reduction in near miss and critical safety

Quality:

- 1.Driveshaft leakage issue eliminated.
- 2.Battery fitment quality issues resolved

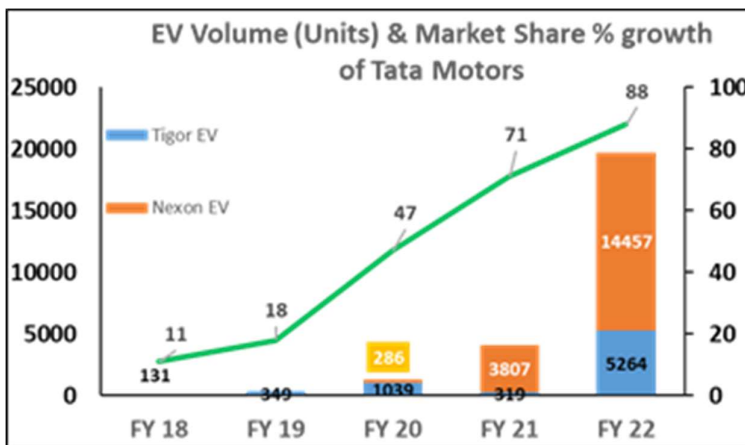
Morale:

- Improved Innovative approach
- Improved Employee participation

Cost:

Zero Capex for installation: All the LCA Material Handling improvement done through available resources..
Cost Saving of 5 Lacs by Eliminating PO for CV Units & Tilting fixture

Business metrics. With Increased Production TML EV penetration in the Market increased to 88%



8.External recognitions / Internal stakeholder appreciation and any other additional info.,

EV Shop awarded Runner up Trophy in 5th CII National LCA circle competition

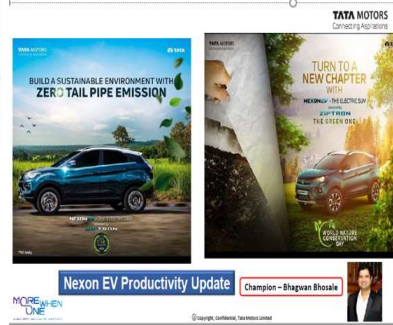
Tata Motor Passenger Vehicle Ltd,Pune bagged Runner Up Award in 5th CII National LCA (Low-Cost Automation) circle competition 2022 recently held on 26th-27th April 2022 on CII virtual Platform.
The Case study on Productivity improvement through Low Cost Automation in EV Shop was presented by Mr.Bhagwan Bhosale ,Mr.Nilesh Patil & Mr.Pravin Shinde. More than 30 companies across India participated to showcase their LCA improvements under 7 different categories.
Team received Certificate of achievement at the hands of Mr. Shyam Singh,Plant Head (Car Plant, Pune)

TATA MOTO
Connection Aspirations



Recognition from IIE :EV Shop Bagged Bronze Award in a Productivity Case Study Contest Organised by Pune Chapter of Indian Institute of Industrial Engineering.

TATA MOTORS
Connecting Aspirations



5th CII National LCA (Low-Cost Automation) Circle Competition 2022

Theme: LCA for Improving Business Performance
Tuesday – Wednesday; 26-27 April 2022, on CII Virtual Platform
(Low-Cost Automation Competition)

Presented By : Tata Motors Passenger Vehicles Limited (TMPVL) EV Shop
Category Name : Low cost automation for Productivity Improvement
Theme : Productivity improvement through reduction in NVA (Non Value Added Activities) by implementing various innovative Material Handling tools & Equipment



Champion - Bhagwan Bhosale
Electric Vehicle Shop



9.Scope for horizontal deployment.: All these ideas shared with TML,Pantnagar & TML,Sanand for Horizontal Deployment



These actions have been shared with ACE & TIGOR EV team for Horizontal Deployment.....

