ACE MICROMATIC Productivity Championship Awards 2022

Productivity and quality improvement in RA Housing & Case FRONT Axle (E68) machining lines

PARTICIPANT

ZANVAR GROUP

KASTURI FOUNDRY PVT LTD,
UNIT 1, KAGAL,KOLHAPUR

Brief Introduction of our Team

Mr. Prashant Dhoolappanavar

CEO

Mr. Madhukar Kumbhar

Manager - QMS

Mr. Sanjay Patil

Manager -Production

Mr. Bhushan Patil

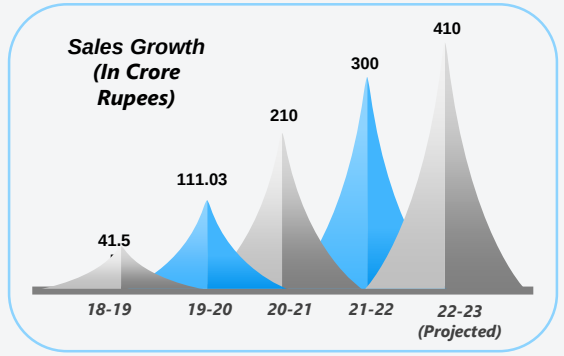
Manager - Engineering

About Us

Kasturi Foundry Pvt. Ltd.

Established - 2018

Manufacturers of machined components in Graded Grey Cast Iron | Ductile Iron | Compacted Graphite Iron



Manufacturing Excellence in

Engine Components, Heavy Engine Components, Drive Train, Transmission, Hydraulic, Brake System etc

ZANVAR GROUP

A Journey toward Industry 4.0

i-Melt, EMS, i-Core, ERP, BPR, Project Management, Charge Calculations, Inventory management, Tool Management, Maintenance Module, TPM track / online OEE monitoring

Foundry :

Two high pressure molding lines of capacity 8000MT per month from DISA with KW Auto pouring line & Digital laboratory

Machine Shop Facility:

more than 100 HMC ,50 SPM's and 20 other CNC's
16 machining lines are installed with Robotic arm technique.

Towards Excellence:

Six Sigma, Kaizen, 5S, Zero Defect Day, Quality Circle

Digital Learning platform:

Gurukul - Z-connect, knowledge portal

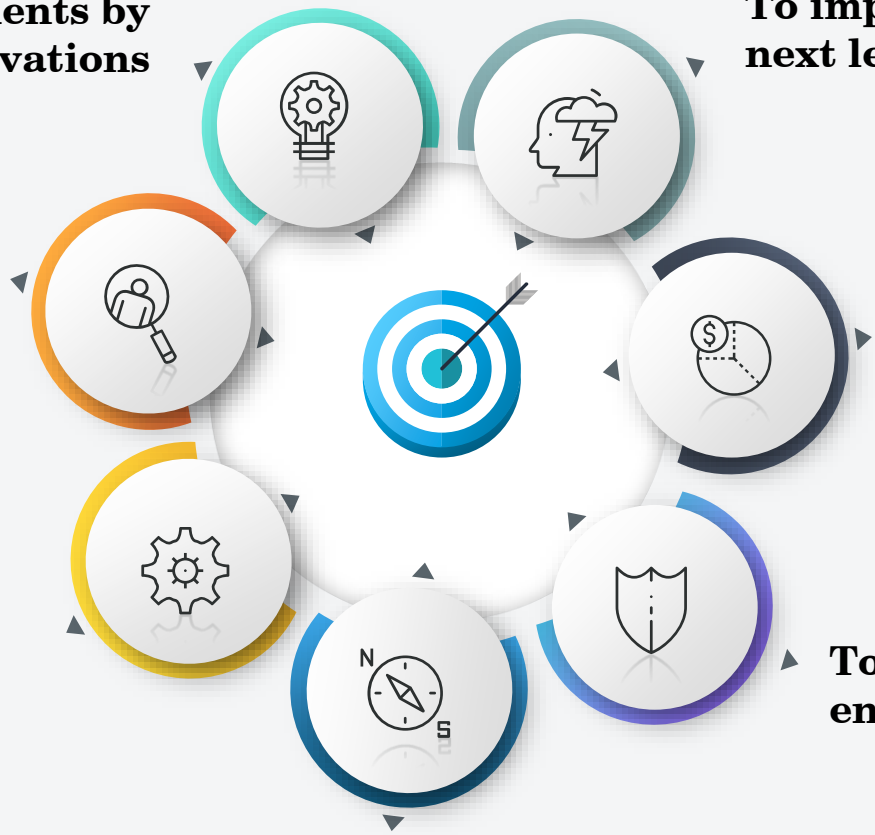
Productivity Summit 2022
IMTMA 2022

1.0 Brief description of the project- Project Kick off on 1st Feb 2021

Process improvements by adding new Innovations

To improve quality to next level

Retention of employee by Reducing their fatigue



Cost saving & Natural resources consumption reduction

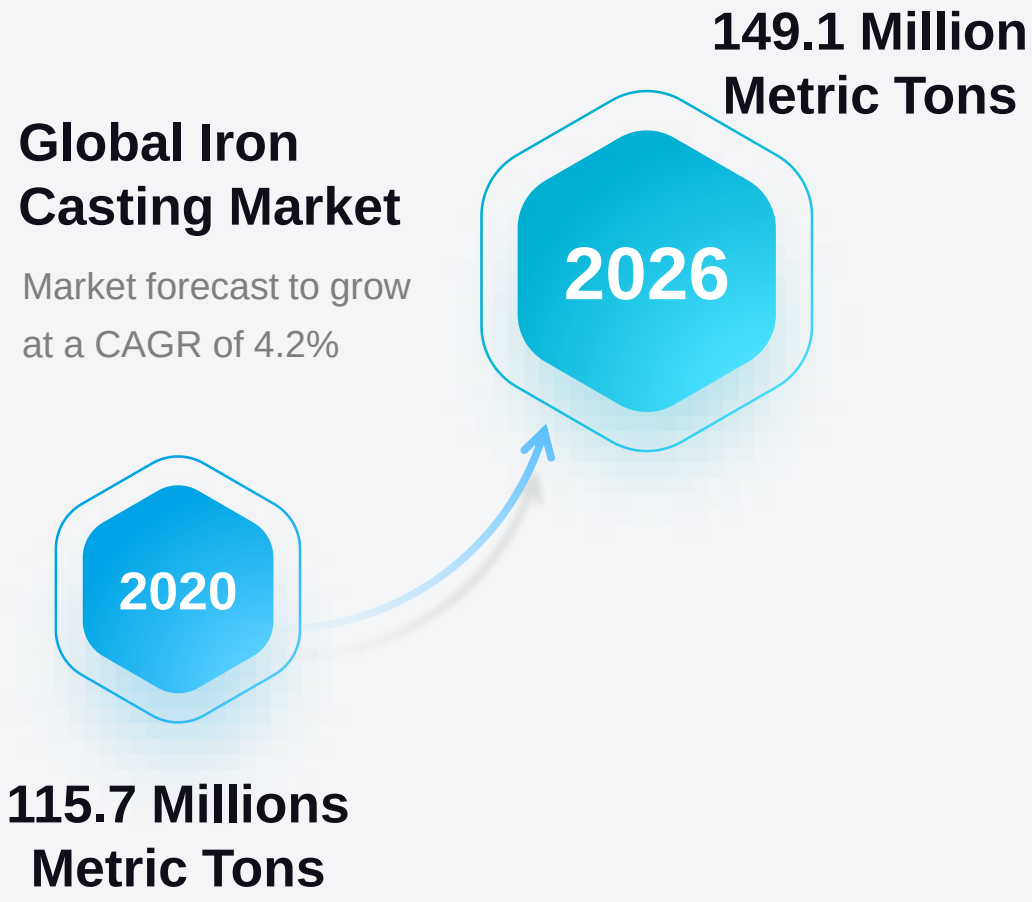
Increase in production to meet customer demand

To create Safe work environment

To meets few requirements of Industry 4.0

2.0 Trigger of the Project

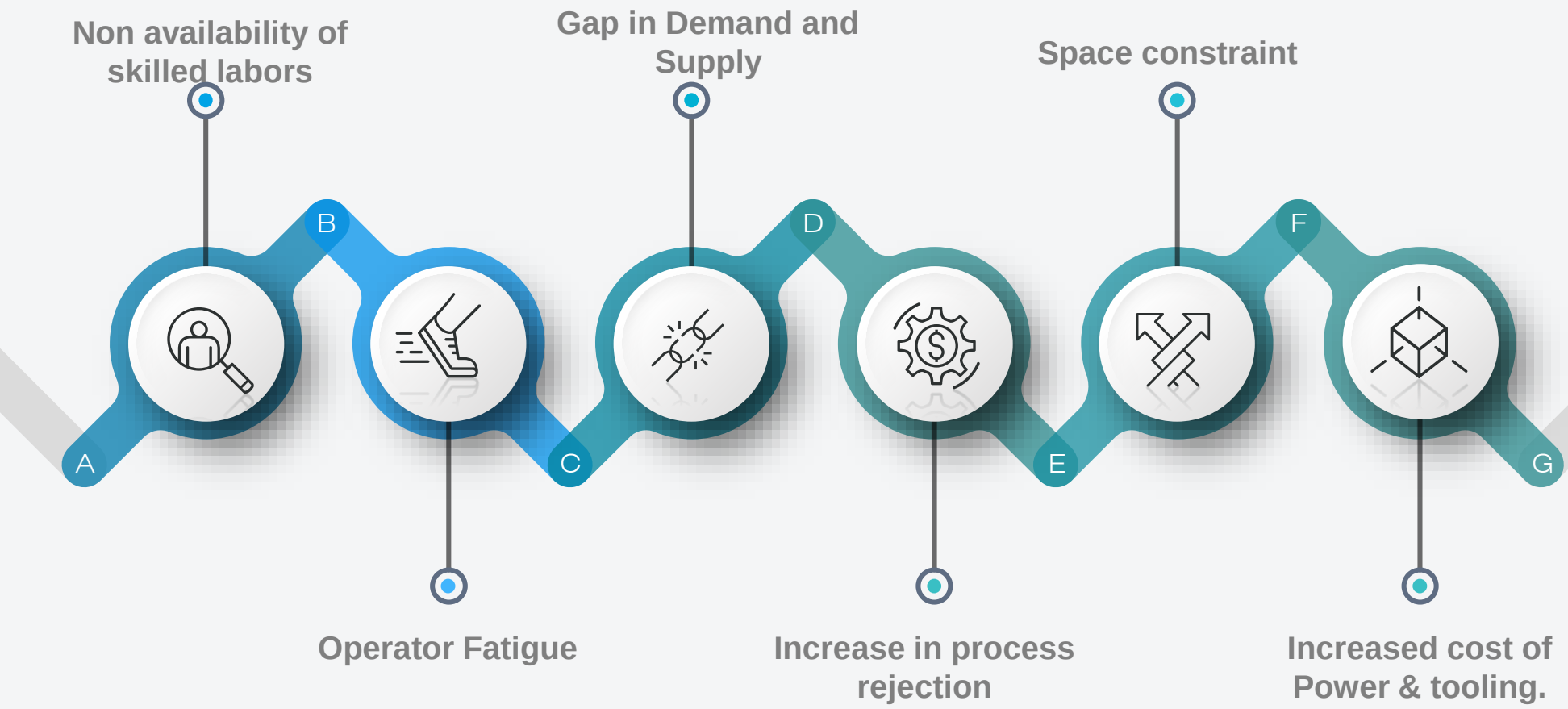
There is High potential in India for the Production of Cast Iron and machined components under Make In India drive.



How got the Business Opportunity ?

- John Deere is 2nd largest tractor manufacturing company in world.
- They have started working to localize the Global projects
- As space constraint at JD India , they have off loaded few of the projects to us and created space for Global project.
- And RA Housing one of that project , we took the challenge and proved to the certain extent.

2.1 Trigger of the Project – Challenges

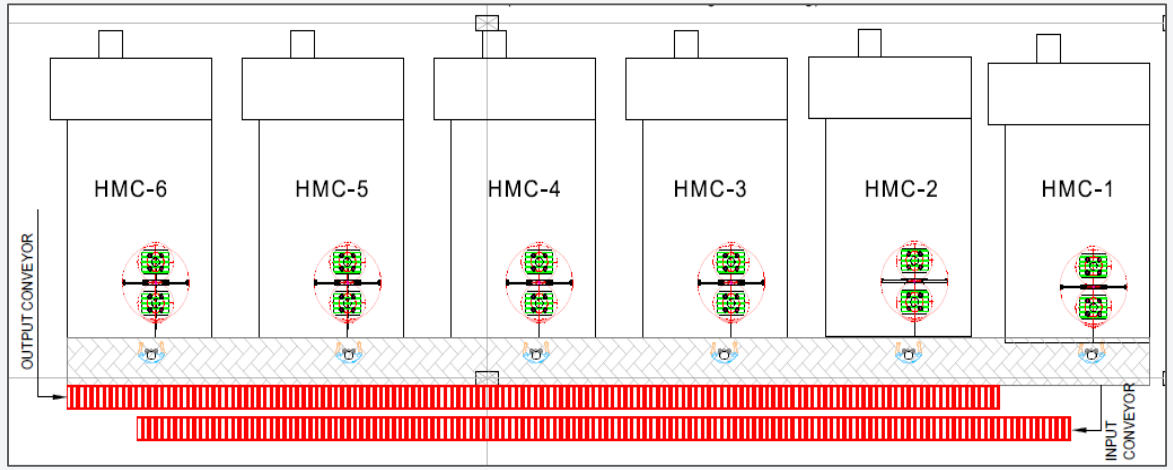


Quality Core Tools & lean management tools used as:

- VSM
- Why-Why analysis
- Brain storm
- 5 “s”
- Quality circles
- Six sigma –Minitab
- 8 Wastes
- TPM
- IoT
- PFMEA

2.2 Existing Project Study

Machining Layout (6HMC Machines)



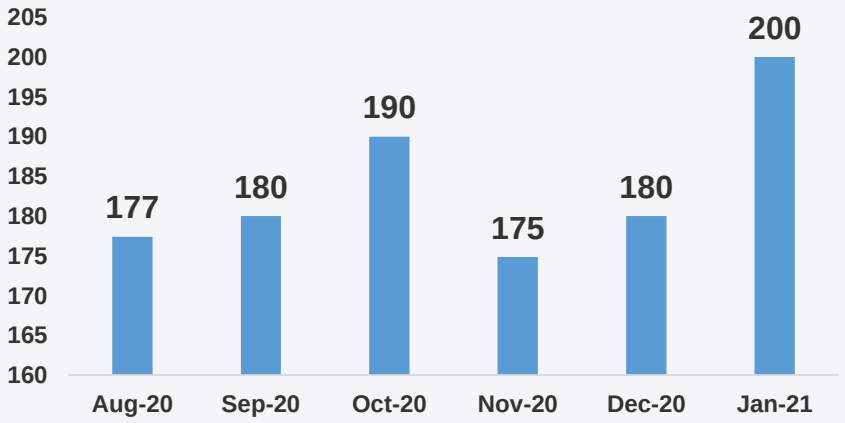
Number of tools (No. of tools 14)

Sr. No.	Operation Description	Dia mm	Cutting Speed m/min	RPM	Feed mm/rev	Cut Length mm	No of Cut	Total Length mm	Total CuttingTime min	Tool Change time-min	Job index time min	Approach time min	Total Time in Min. &Sec.
1	Ø 9.0 End mill	9	28	1000	0.1	5	3	15	0.15	0.10	0.05	0.10	24
2	Ø8.0 SC Drill	8	28	1100	0.07	52	3	156	2.03	0.10	0.05	0.10	137
3	Ø9.6 Hole Mill	9.6	36	1200	0.05	52	3	156	2.60	0.10	0.05	0.10	171
4	Ø10.0 Reamer	10	28	900	0.1	52	3	156	1.73	0.10	0.05	0.10	118
5	Ø312.5 Rough	312.5	245	250	0.12	30	1	30	1.00	0.10	0.05	0.10	75
6	Ø283.5 Rough	283.5	223	250	0.12	30	1	30	1.00	0.10	0.05	0.10	75
7	Ø315.5 Rough	315	247	250	0.15	30	1	30	0.80	0.10	0.05	0.10	63
8	Ø 316.0 Finish bore	316	278	280	0.08	30	1	30	1.34	0.10	0.05	0.10	95
9	Ø283.0 Finish	283	249	280	0.06	30	1	30	1.79	0.10	0.05	0.10	122
10	Ø313.0 Finish	313	275	280	0.06	30	1	30	1.79	0.10	0.05	0.10	122
11	Ø20 Spot face	20	16	250	0.06	3	2	6	0.40	0.10	0.05	0.10	39
12	Ø10 Drill	10	13	400	0.1	18	2	36	0.90	0.10	0.05	0.10	70
13	Ø10.5 x 22 Port Cutter	22	17	250	0.06	18	2	36	2.40	0.10	0.05	0.10	158
14	M12 x 1.5 Tap	12	8	200	1.5	18	2	36	0.12	0.10	0.05	0.10	22

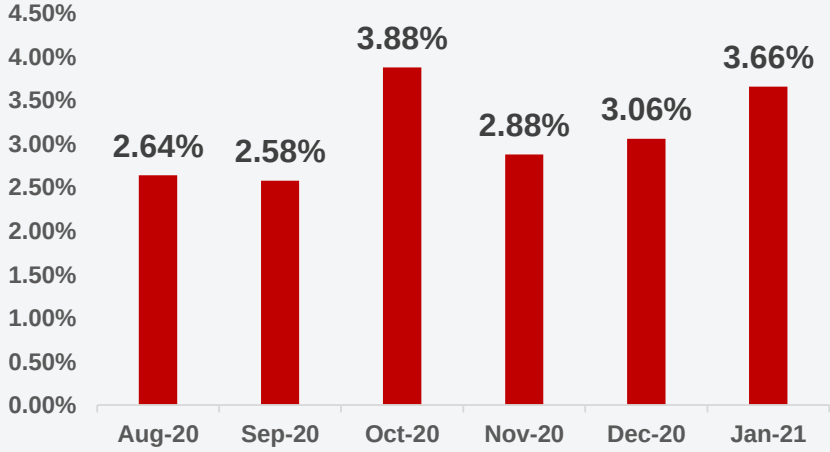
Loading time	0
Indexing time	9
Inspection time	0
Total cycle time	21 Min 40 Sec

Loading & unloading

Average Production: 180 / day

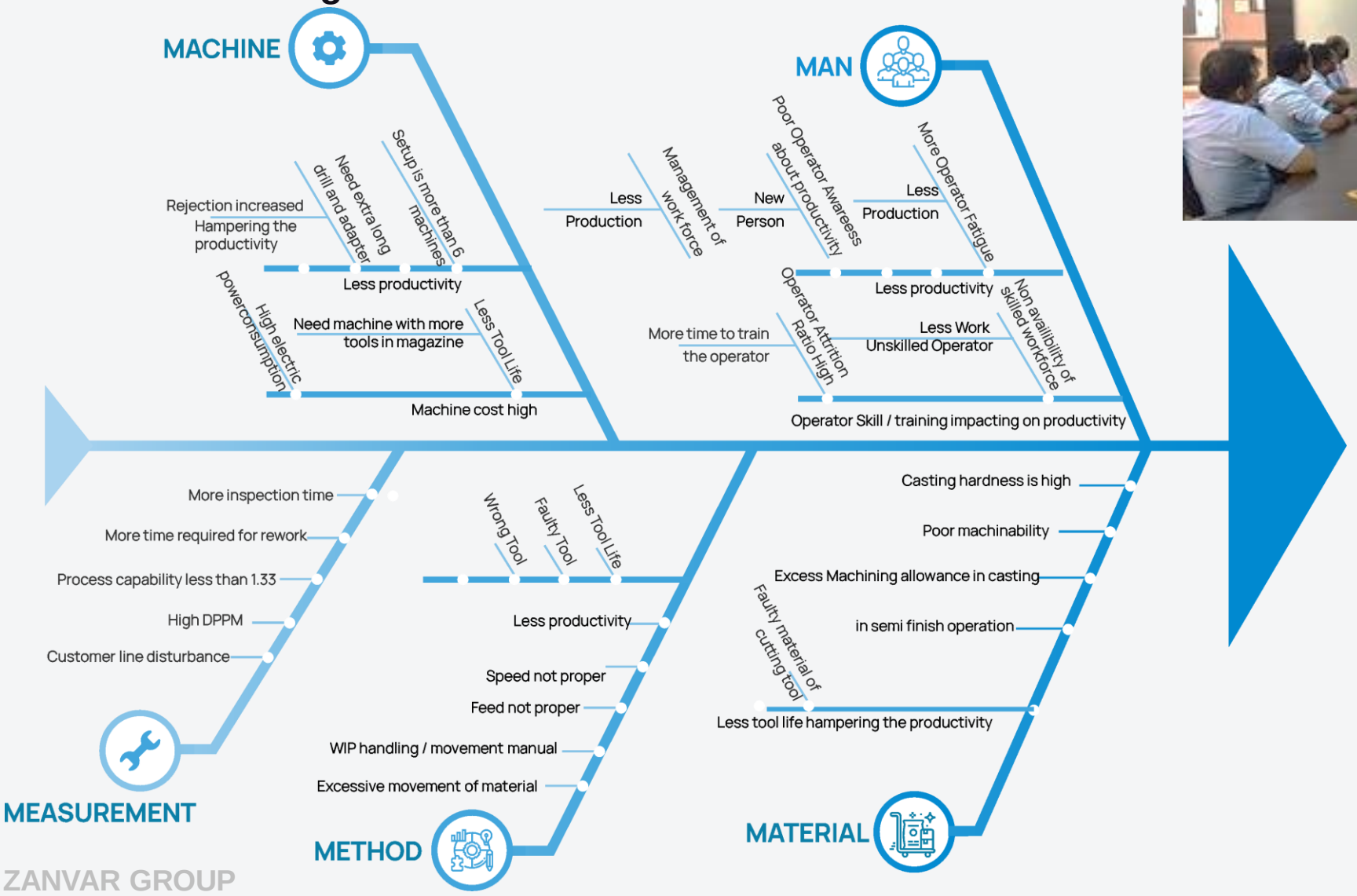


Average rejection 3%



3.0 Solution Generation – Brainstorming

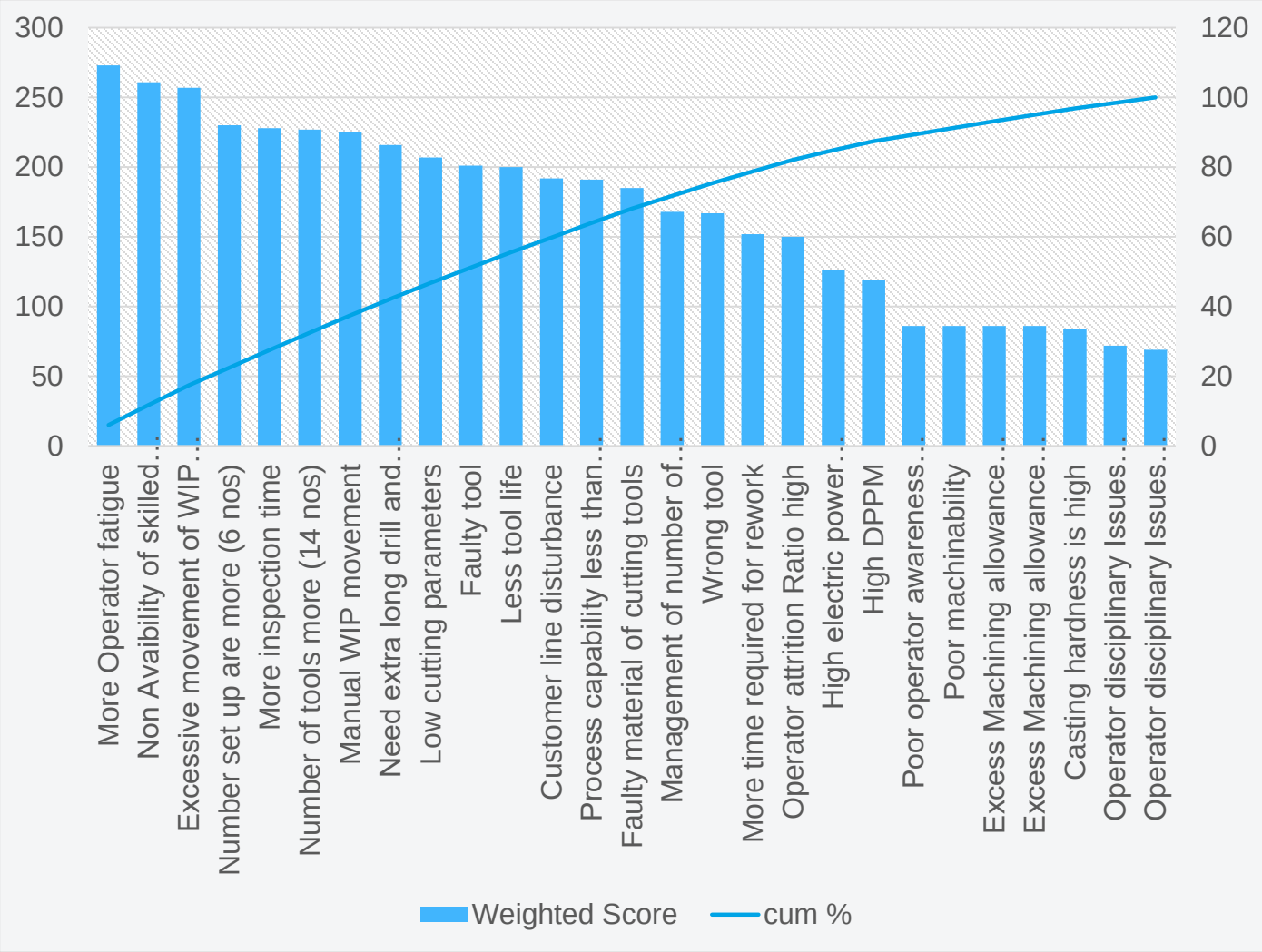
3.1 Fishbone Diagram



Less Productivity
Demand is 600 nos. /day
Actual production is 180 nos. /day

3.2 Root cause prioritization

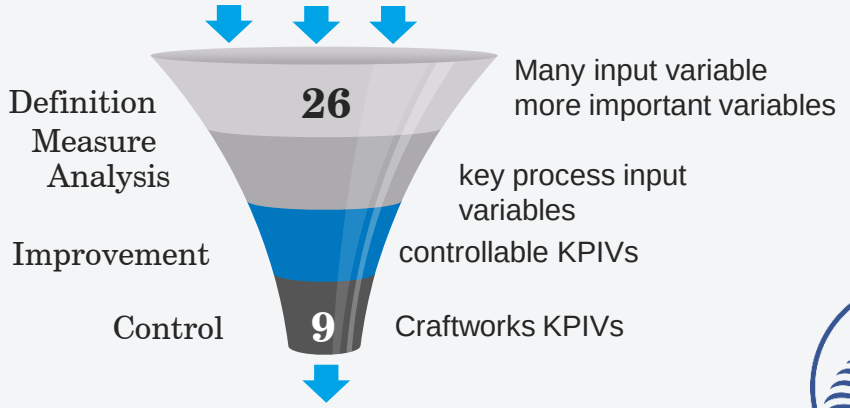
Pareto Analysis



Prioritization Matrix

Root Causes	Weighted Score	Cumulative	cum %
More Operator fatigue	273	273	6.008
Non Availability of skilled workforce	261	534	11.752
Excessive movement of WIP material	257	791	17.408
Number of set up are more (6 nos)	230	1021	22.469
More inspection time	228	1249	27.487
Number of tools more (14 nos)	227	1476	32.482
Manual WIP movement	225	1701	37.434
Need extra long drill and adaptor to drill port holes	216	1917	42.188
Low cutting parameters	207	2124	46.743
Faulty tool	201	2325	51.166
Less tool life	200	2525	55.568

Funnel analysis

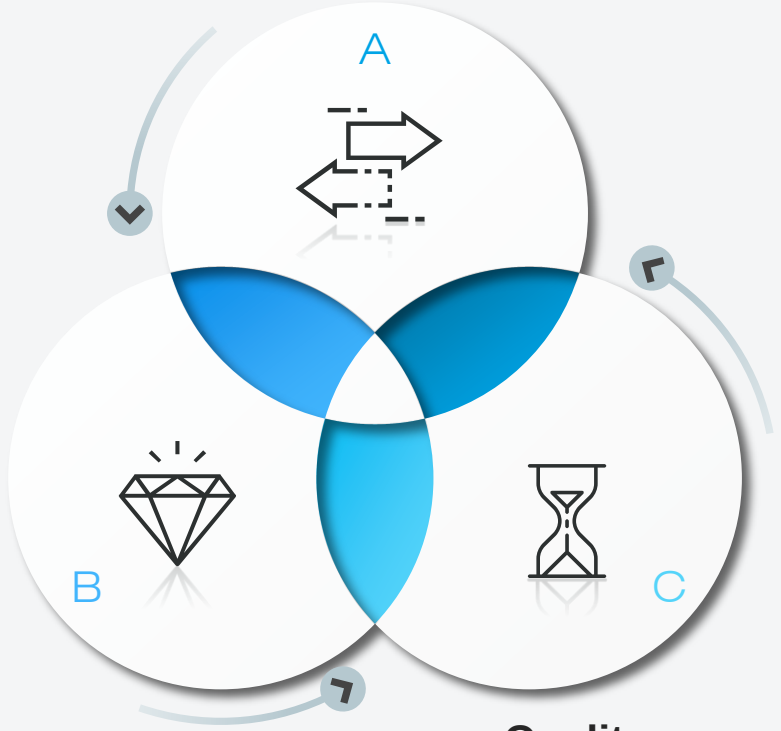


3.3 Key Targets to Achieve - 600 nos. /Day

Selected Root Cause to work on

Causes	Key targets
Need extra long drill and adaptor to drill the port holes on HMC	Reduction in Cycle time
Low cutting parameters and more number of tools	
Less tool life and process capability not achieved.	
More Operator fatigue	Material Movement Improvement
High workforce attrition and absentee rate	
Manual WIP movement and unsafe work conditions.	
Less process capability	Quality Improvement
High machining rejection	
More manual mistakes leads for rejection	

Reduction In Cycle Time (from 21 to 6 min.)



Material Movement Improvement (Achieve Takt 9 to 6 Min.)

Quality Improvement (3 to 0.25%)

4.0 Implementation – Road Map

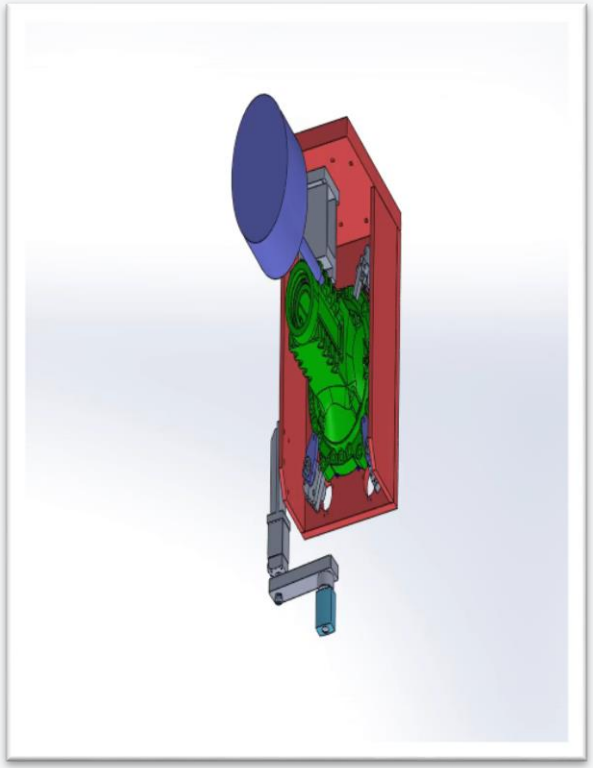
Sr. No.	Activities	FEB 2021				MAR 2021			
		1	2	3	4	1	2	3	4
1.	CFT Meeting – Feasibility study								
2.	SPM Design Approval Process								
3.	SPM Manufacturing								
4.	SPM Installation & Trials								
5.	New machine layout								
6.	HMC Installation								
7.	Robot installation								
8.	Line Erection with robotic integration								
9.	Robotic line production start								

Planned Actual Milestone Achieved

4.1 Cycle time reduction – By Optimizing Process

Action Decided : 1) Tool length reduction 2) Combination of tools 3) rigidity of Tools

HMC with long tools



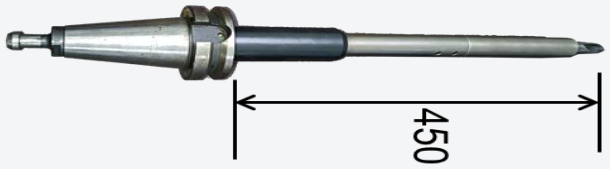
SPM with short tools

After Action Results:

Sr. No.	Operation Description	Dia mm	Cutting Speed m/min	RPM	Feed mm/rev	Cut Length mm	No of Cut	Total Length mm	Total Cutting Time-min	Tool Change time -min	Job index time min	Approach time min	Total Time in Min. &Sec.
1	Ø 9.0 End mill	9	28	1000	0.1	5	3	15	0.15	0.10	0.05	0.10	24
2	Ø8.0 SC Drill	8	28	1100	0.07	52	3	156	2.03	0.10	0.05	0.10	137
3	Ø9.6 Hole Mill	9.6	36	1200	0.05	52	3	156	2.60	0.10	0.05	0.10	171
4	Ø10.0 Reamer	10	28	900	0.1	52	3	156	1.73	0.10	0.05	0.10	118
5	Ø312.5 Rough	312.5	245	250	0.12	30	1	30	1.00	0.10	0.05	0.10	75
6	Ø283.5 Rough	283.5	223	250	0.12	30	1	30	1.00	0.10	0.05	0.10	75
7	Ø315.5 Rough	315	247	250	0.15	30	1	30	0.80	0.10	0.05	0.10	63
8	Ø 316.0 Finish	316	278	280	0.08	30	1	30	1.34	0.10	0.05	0.10	95
9	Ø283.0 Finish	283	249	280	0.06	30	1	30	1.79	0.10	0.05	0.10	122
10	Ø313.0 Finish	313	275	280	0.06	30	1	30	1.79	0.10	0.05	0.10	122
											Loading time		0
											Indexing time		9
											Inspection time		0
											Total cycle time		16 Min 51 Sec

- **Cutting time on SPM achieved 2 min which was 6 min on HMC**
- **Cutting tools reduced from 14 to 10 nos. HMC**
- **HMC cycle time reduced from 21 Min 40 sec to 16min 51 Sec.**

Extra long tool



Short tool

Time saved after all above actions:
4 Min 49 Sec

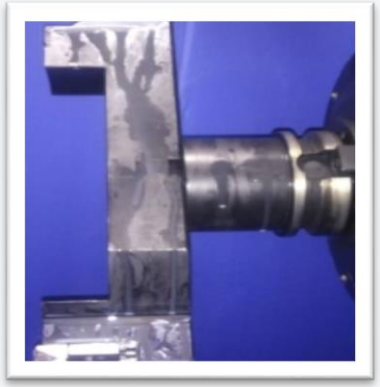
4.1 Cycle time reduction – By Optimizing Process

2) Combination of tools

Before: Multiple tools

Ø8 & 9.6 two drills

Ø313 Finish



Ø283 Finish

After Action Results:

Sr. No.	Operation Description	Dia mm	Cutting Speed m/min	RPM	Feed mm/rev	Cut Length mm	No of Cut	Total Length mm	Total Cutting Time-min	Tool Change time-min	Job index time-min	Approach time min	Total Time in Min. &Sec.
1	Ø 9.0 End mill	9	28	1000	0.1	5	3	15	0.15	0.10	0.05	0.10	24.00
3	Ø8 & Ø9.6 SC Comb. Dr	9.6	36	1200	0.05	52	3	156	2.60	0.10	0.05	0.10	171.00
4	Ø10.0 Reamer	10	28	900	0.1	52	3	156	1.73	0.10	0.05	0.10	118.00
4	Ø312.5 / Ø283.5 / Ø31	315	247	250	0.15	30	1	30	0.80	0.10	0.05	0.10	63.00
5	Ø 316.0 Finish bore	316	198	200	0.15	30	1	30	1.00	0.10	0.05	0.10	75.00
6	Ø283.0 / Ø313.0 Finish	313	197	200	0.1	30	1	30	1.50	0.10	0.05	0.10	105.00

Loading time	0.00
Indexing time	9.00
Inspection time	0.00
Total cycle time	9 Min 41 Sec

After: Combination tools

Ø8 & Ø9.6 Combo SC Drill

Ø283 & Ø313 Combine Boring Bar

- **Cutting tools reduced from 10 to 6 nos.**
- **HMC cycle time reduced from 16 Min 51 Sec to 9 min 41 Sec.**

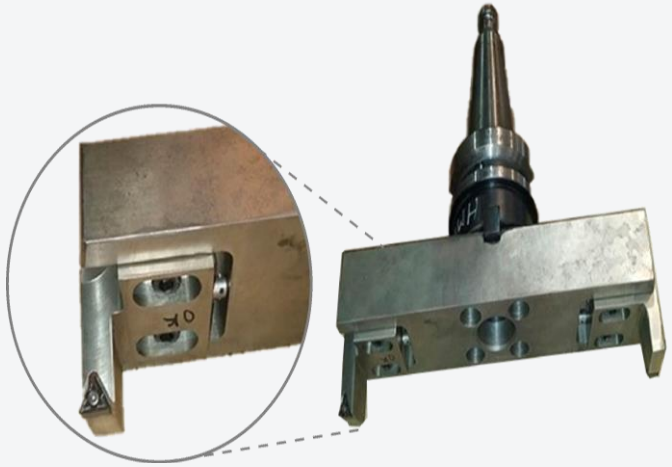
Time saved after all above actions:
7 Min 10 Sec

4.1 Cycle time reduction – By Optimizing Process

Further Improvements

Ø8 & Ø9.6 Double Margin SC Drill

3) <u>Increase the rigidity of tools</u>



After: Rigid Combine Boring Bars added. Overall boring bar rigidity increased by clamping Cartridges with two bolts and parameter also increased by using negative inserts, increasing the life of the inserts.

After Action Results:

Sr. No.	Operation Description	Dia mm	Cutting Speed m/min	RPM	Feed mm/rev	Cut Length mm	No of Cut	Total Length mm	Total Cutting Time-min	Tool Change time -min	Job index time min	Approach time min	Total Time in Min. &Sec.
1	Ø 9.0 End mill	9	28	1000	0.1	5	3	15	0.15	0.10	0.05	0.10	24
2	Ø8 & Ø9.6 SC Double Marg	9.6	60	2000	0.08	52	3	156	0.98	0.10	0.05	0.10	74
3	Ø10.0 Reamer	10	28	900	0.1	52	3	156	1.73	0.10	0.05	0.10	118
4	Ø312.5 / Ø283.5 / Ø315.5	315	346	350	0.22	30	1	30	0.39	0.10	0.05	0.10	38
5	Ø 316.0 Finish bore	316	347	350	0.22	30	1	30	0.39	0.10	0.05	0.10	38
6	Ø283.0 / Ø313.0 Finish	313	315	320	0.12	30	1	30	0.78	0.10	0.05	0.10	62
											Loading time		0
											Indexing time		9
											Inspection time		0
											Total cycle time		6 Min 5 Sec

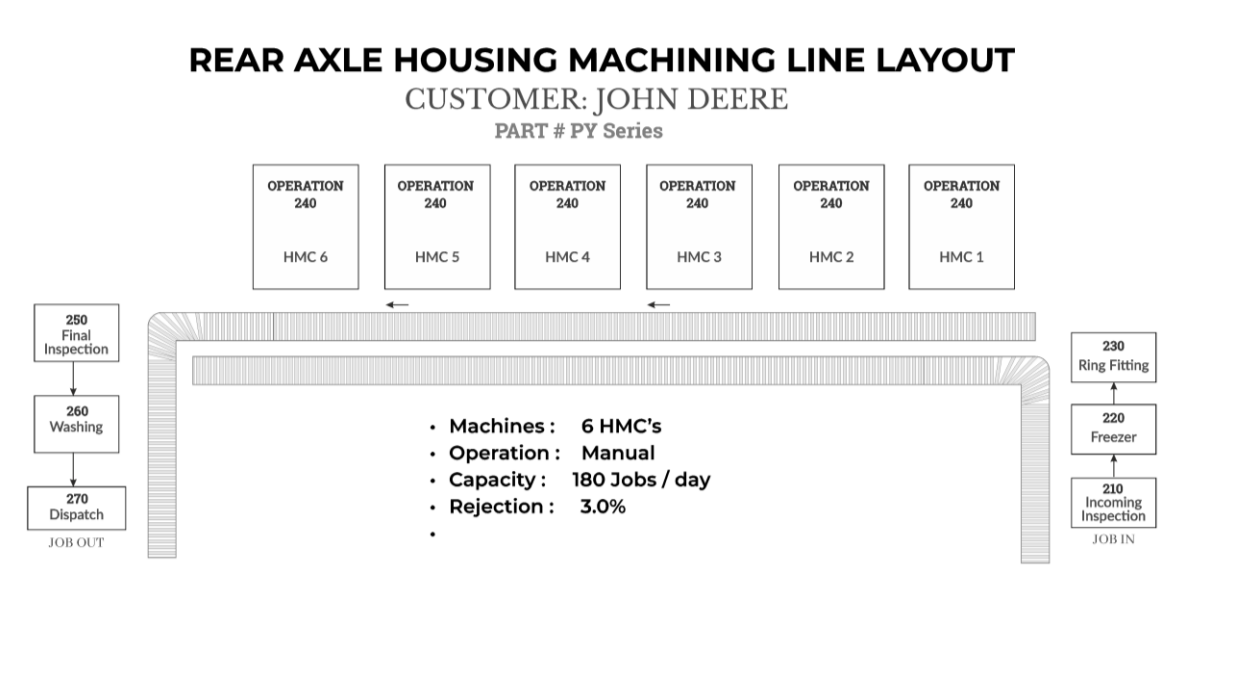
- HMC cycle time reduced from 9 Min 41 Sec to 6 min 5 Sec.
- By current cycle time, capacity achieved to 670 nos./day.

Time saved after all above actions:
3 Min 36 Sec

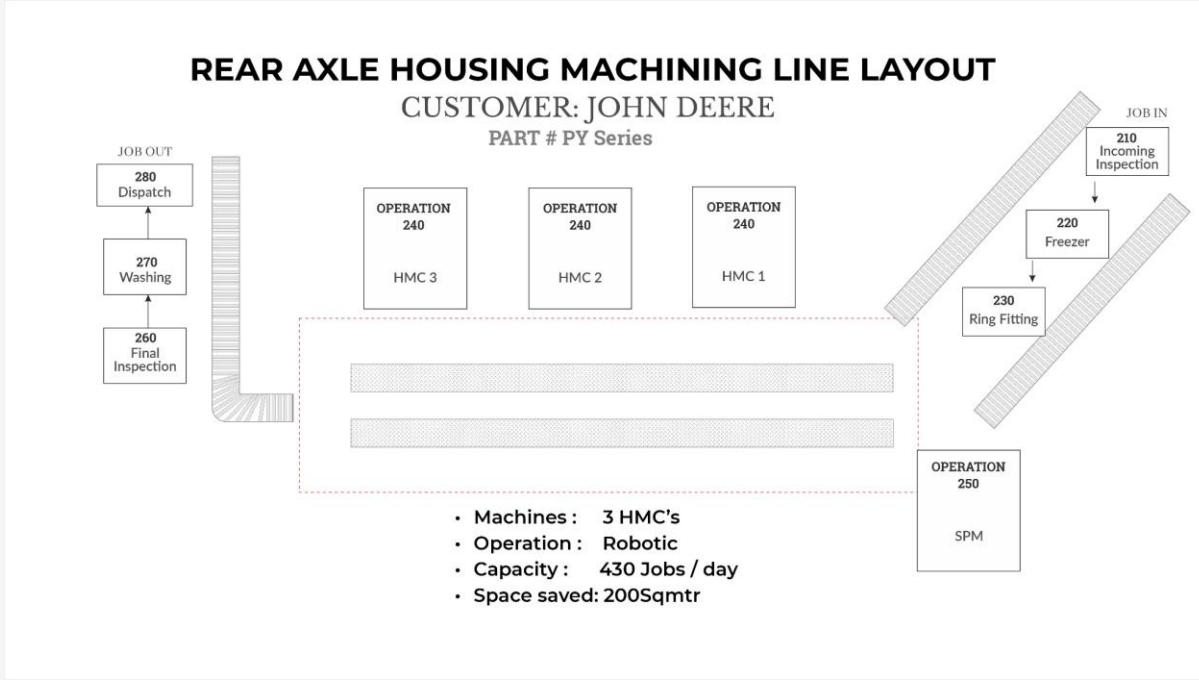
Cutting Time– Achieved 6 Min 5 Sec

4.1 Cycle time reduction – By Optimizing Process

Before



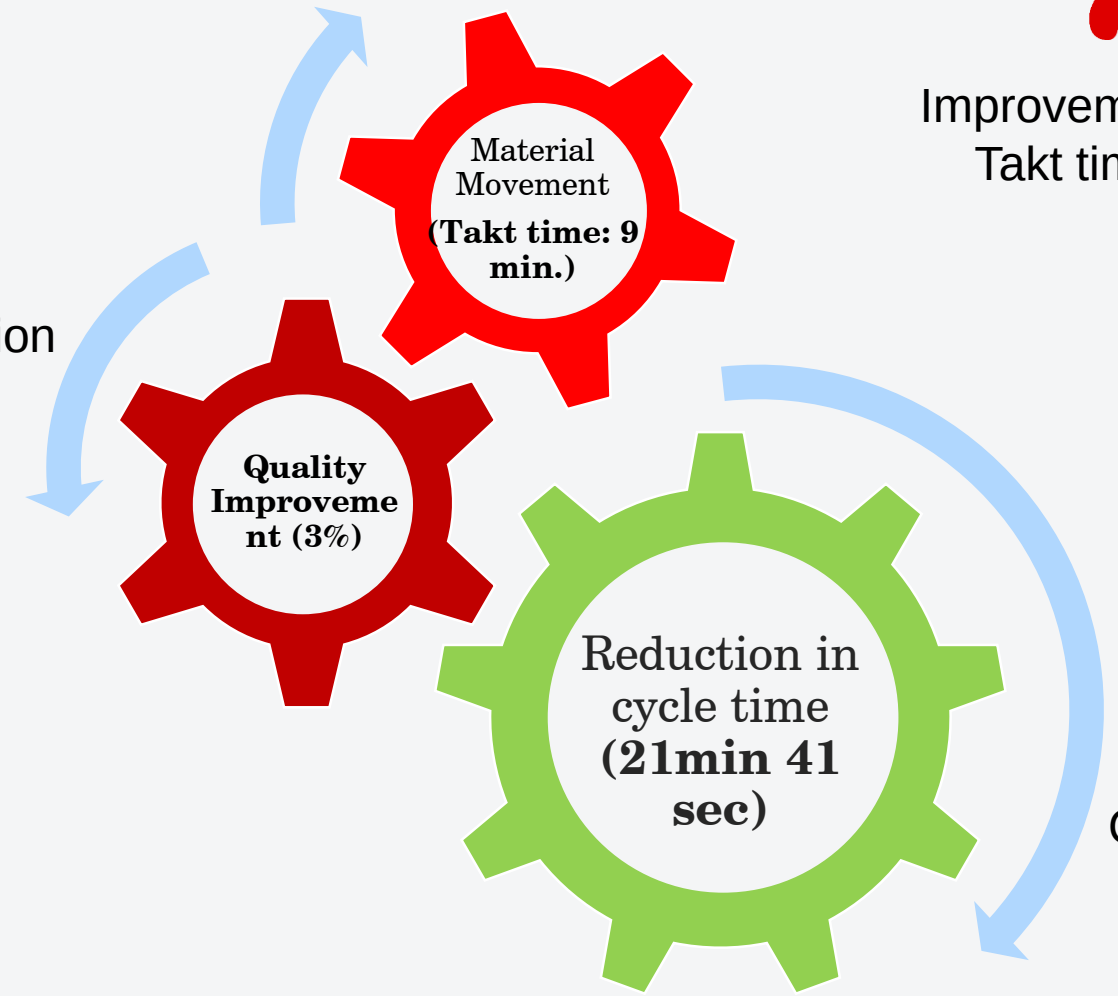
After



As cutting time reduced so decided to release 3 machines for other project and to run only three machine to achieve 600/day by working on non value added times

Improvement in Material Handling
Takt time not achieved 9 min

Machining rejection
3%

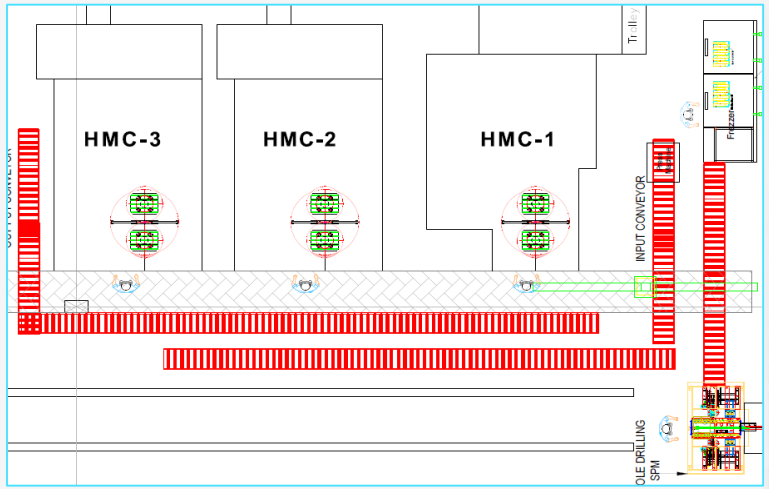


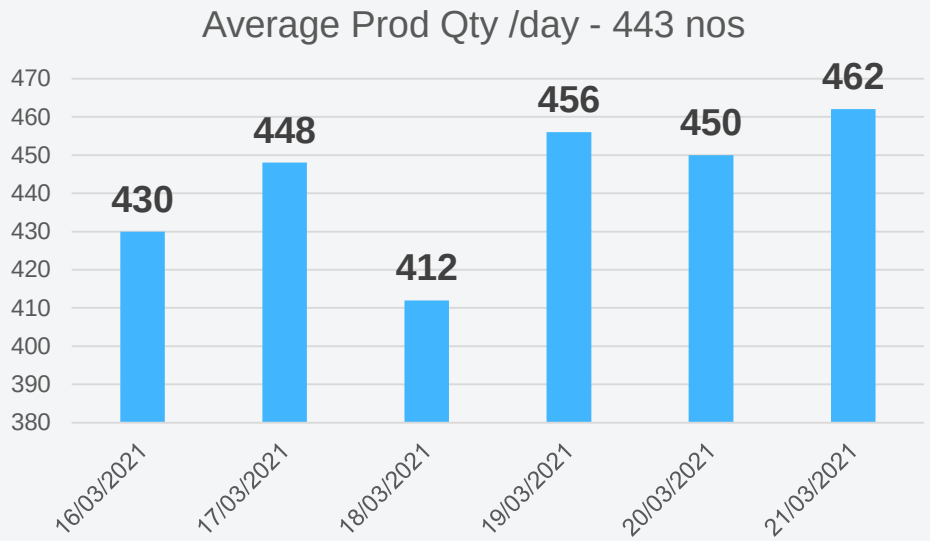
Cycle time achieved
6 min 5 sec

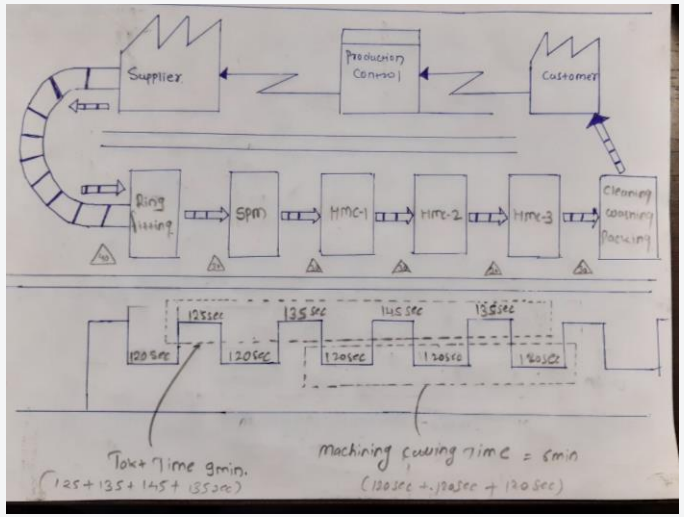
Takt time is not achieved , hence we go for improvement in material handling improvements

Improvement in Material Handling – To Reduce Takt Time

Phase 1: Layout







Actions decided thru Brain storming and VSM

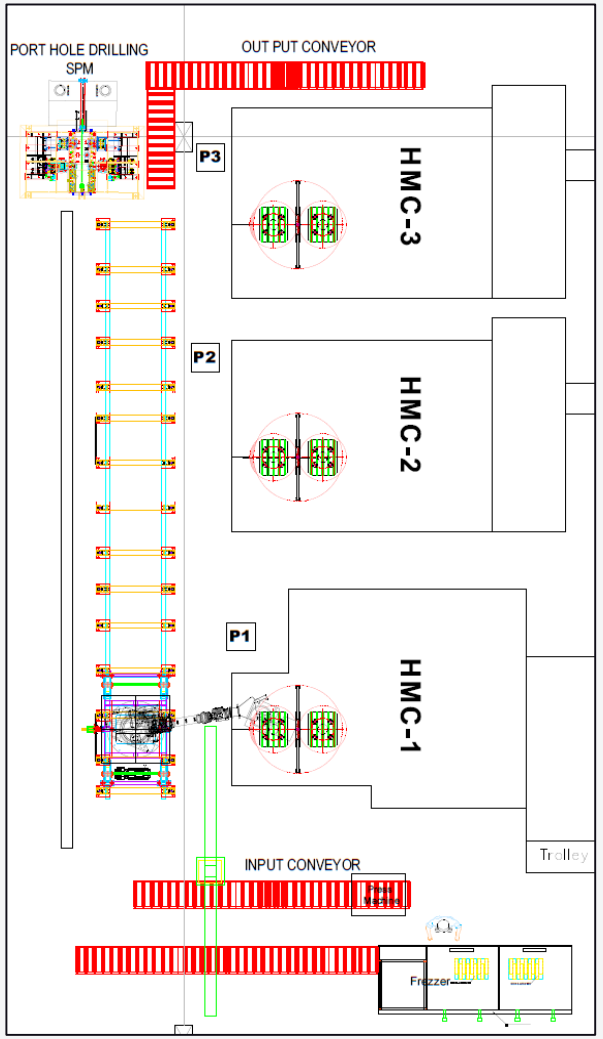
Taken target: to Load unload part within 90 sec

Thus following actions decided to reduce load unload time & Fatigue

1. Implementation of robotic ARM
2. Optimization of layout
3. Implementation of auto loader on SPM
4. Implementation of carrier

Improvement in Material Handling – To Reduce Takt Time

Load unload part must happen within 90 sec Which is not achieved .

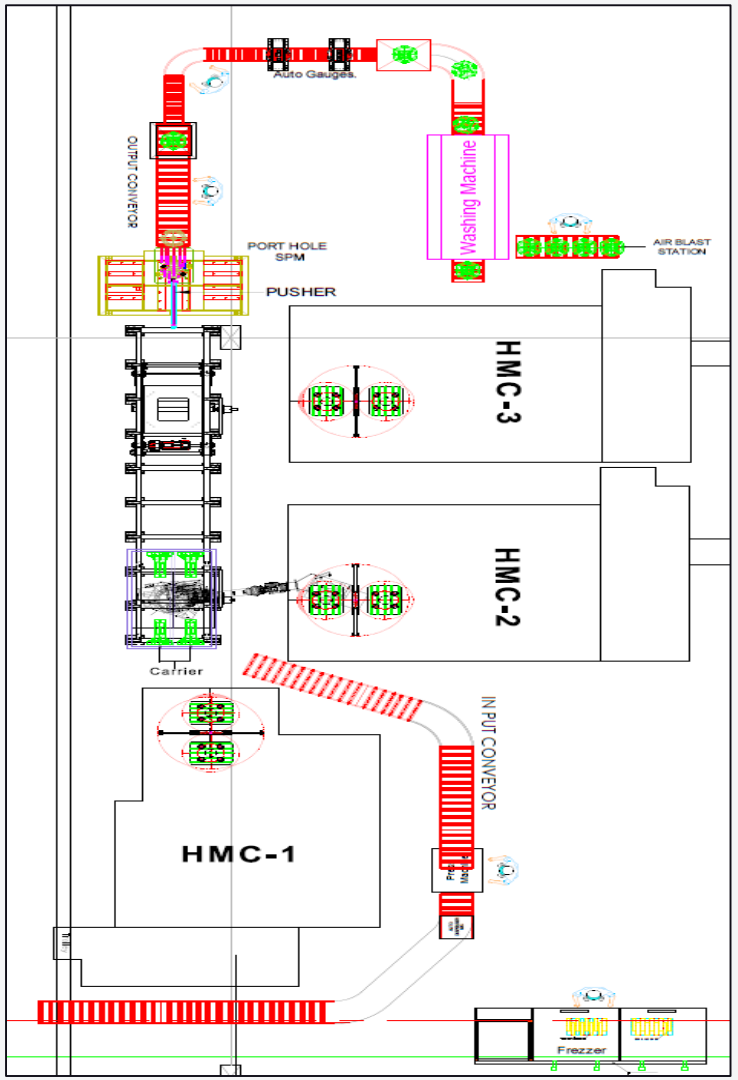


Sr. No.	Activity / Movement	Before (Time in Sec)
	HMC 1	
1	Part unload from SPM	32
2	Part unload from from HMC 1 and place in parking station	28
3	Part avalability sense at input station	6
4	Part load from input station to HMC 1	28
5	Part load to SPM from Parking Station 1	37
6	Robotic arm move from SPM to HMC 2	22
	Total	153
	HMC 2	
1	Part unload from HMC 2 & place in Parking Station 2	36
2	Part avalability sense at input station	6
3	Part Load from input station to HMC 2	34
4	Part unloading from SPM to next operation (inspection)	29
5	Part Load to SPM from Parking Station 2	37
6	Robotic arm move from SPM to HMC 3	15
	Total	157
	HMC 3	
1	Part unloading from HMC 3 to Parking Station 3	40
2	Part avalability sense at input station 2	6
3	Part loading from Input station to HMC 3	38
4	Part unloading from SPM to next operation (inspection)	30
5	Part loading from Parking Station 3 to SPM	26
	Total	140

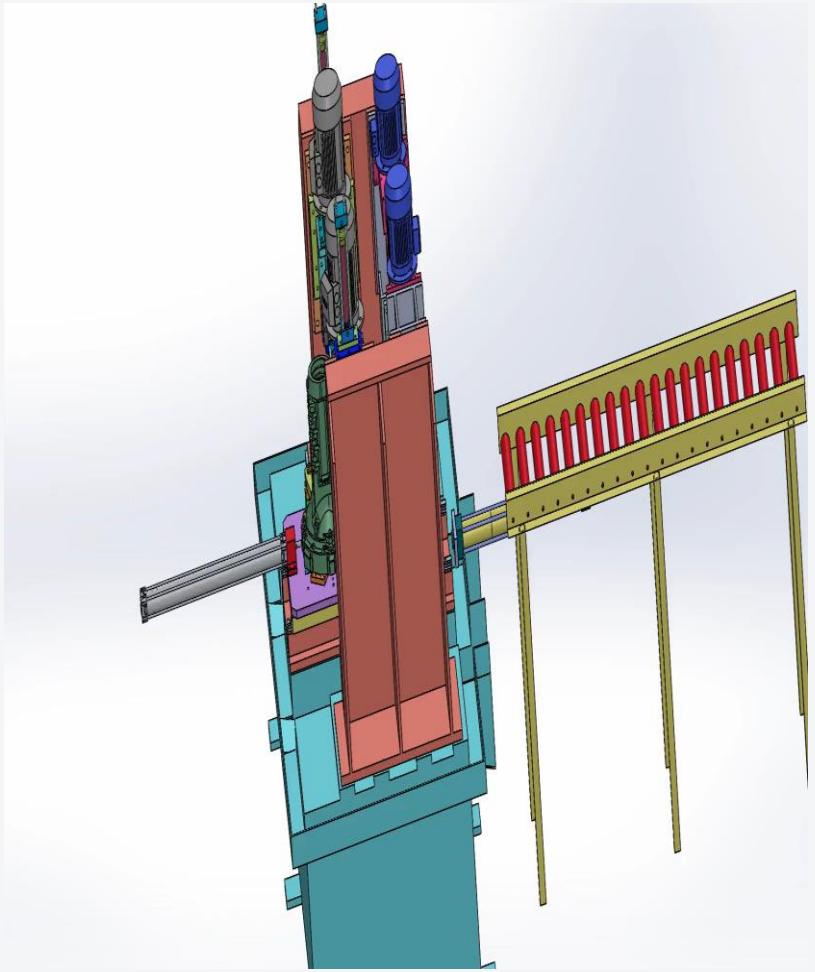
Achievement

- **Takt time 7.5 minutes & Productivity – 504 nos./day**

Improvement in Material Handling – To Reduce Takt Time



Optimization of layout



Auto un-loader at SPM

Robotic Arm With carrier

4.2 Improvements– in Material Handling

Station wise load unload time

Before

Sr. No.	Robotic Arm Activity / Movement	Before (Time in Sec)
	HMC 1	
1	Part unload from SPM	32
2	Part unload from from HMC 1 and place in parking station	28
3	Part avalability sense at input station	6
4	Part load from input station to HMC 1	28
5	Part load to SPM from Parking Station 1	37
6	Robotic arm move from SPM to HMC 2	22
	Total	153
	HMC 2	
1	Station 2	36
2	Part avalability sense at input station	6
3	Part Load from input station to HMC 2	34
4	Part unloading from SPM to next operation (inspection)	29
5	Part Load to SPM from Parking Station 2	37
6	Robotic arm move from SPM to HMC 3	15
	Total	157
	HMC 3	
1	Station 3	40
2	Part avalability sense at input station 2	6
3	Part loading from Input station to HMC 3	38
4	Part unloading from SPM to next operation (inspection)	30
5	Part loading from Parking Station 3 to SPM	26
	Total	140

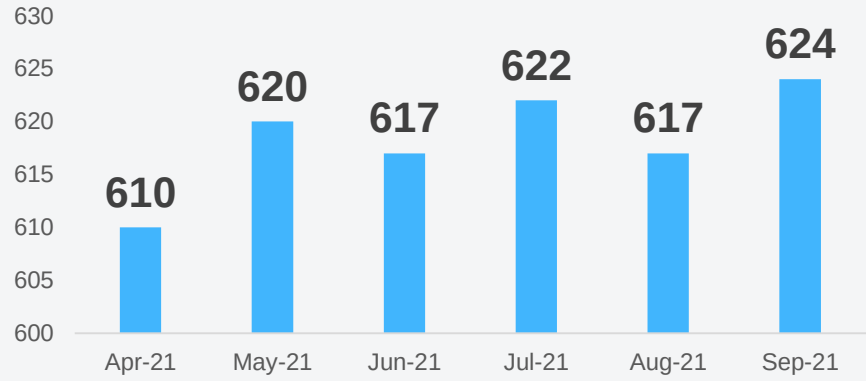
After

Sr. No.	Robotic Arm Activity / Movement	(Time in Sec)
	HMC 1	
1	Part unload from SPM	0
2	Part unload from from HMC 1 and place in parking station	26
3	Part avalability sense at input station	6
4	Part load from input station to HMC 1	26
5	Part load to SPM from Parking Station 1	12
6	Robotic arm move from SPM to HMC 2	0
	Total	70
	HMC 2	
1	Parking Station 2	26
2	Part avalability sense at input station	6
3	Part Load from input station to HMC 2	22
4	operation (inspection)	0
5	Part Load to SPM from Parking Station 2	12
6	Robotic arm move from SPM to HMC 3	0
	Total	66
	HMC 3	
1	Station 3	0
2	Part avalability sense at input station 2	6
3	Part loading from Input station to HMC 3	12
4	operation (inspection)	0
5	SPM	22
	Total	40

Achievement

- **Takt time** 6 minutes
- **Productivity** – 660 nos./day
- **Robot stations:** 2

Averagre per day Prod Qty-618 nos.



Result: The time for load and unload the part 90 sec is achieved.

Machining rejection
3%

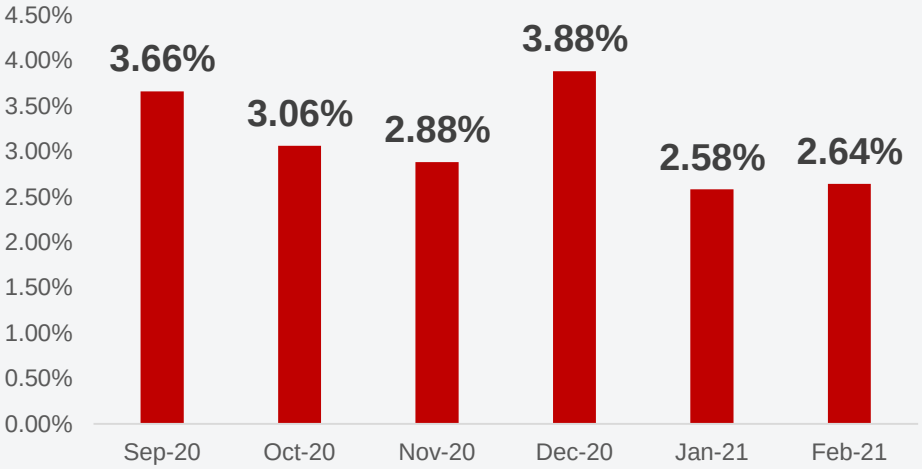
Improvement in Material Handling
Takt time is achieved 6 min

Cycle time achieved
6 min 5 sec

4.3 Improvement in part quality

Rejection trend chart

Average Rej. % 3.12



Analysis

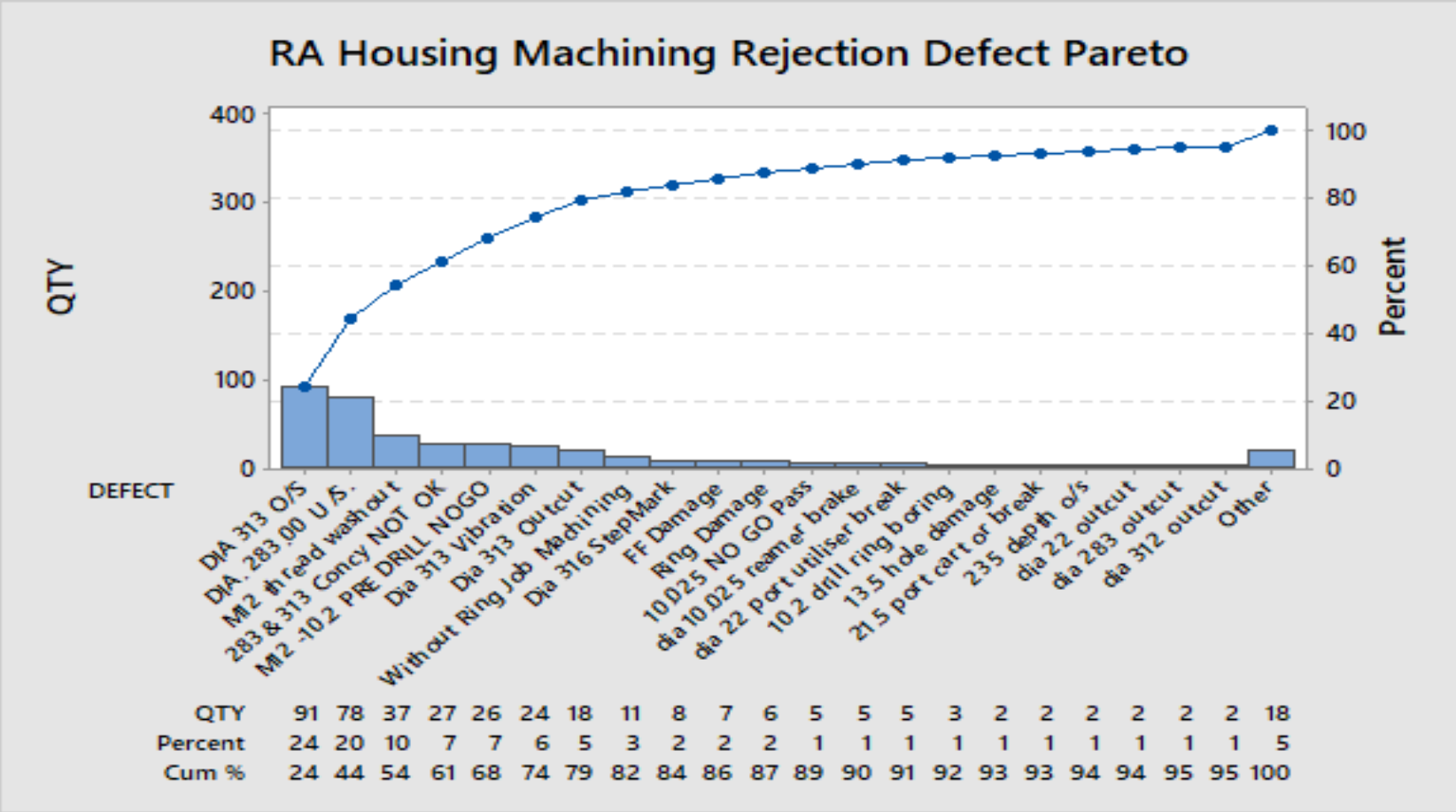
- Why – Why Analysis
- PFMEA
- Brain Storming
- 6 Sigma tools

Targets

- ✓ Rejection reduction from 3 to 0.3%
- ✓ Customer complaints Zero
- ✓ QPPM at John Deer <250

4.3 Improvement in part quality- Defect Pareto Analysis

Pareto chart drawn for Machining Rejection Defects & Defective Quantity. Data collected from Feb 2020 to Jan 2021

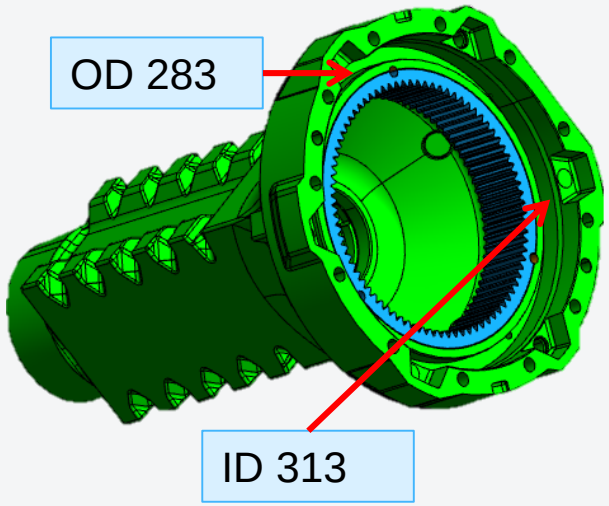


By 80-20 principle, we observed first 8 defects causing more rejection. Taken actions on them.

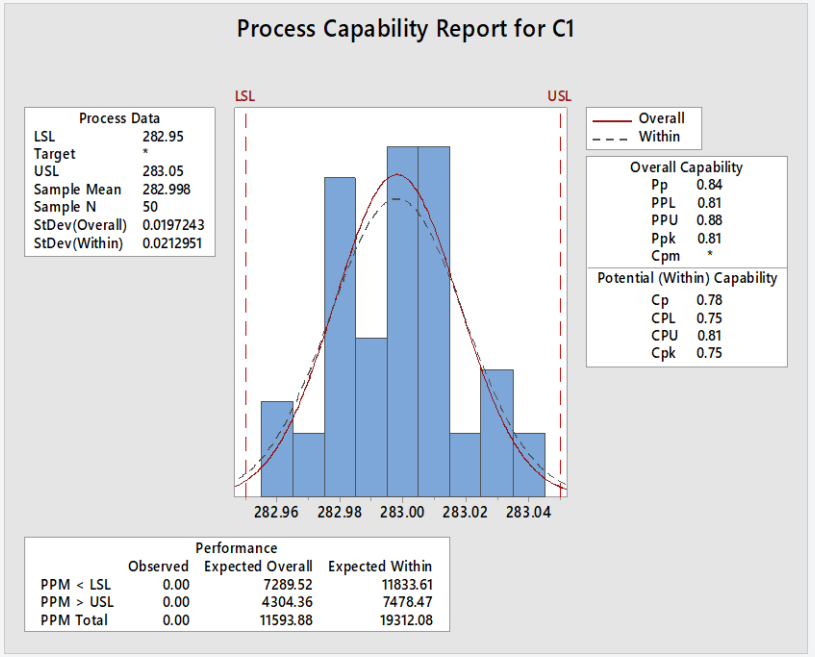
4.3 Defect Analysis & Action plan

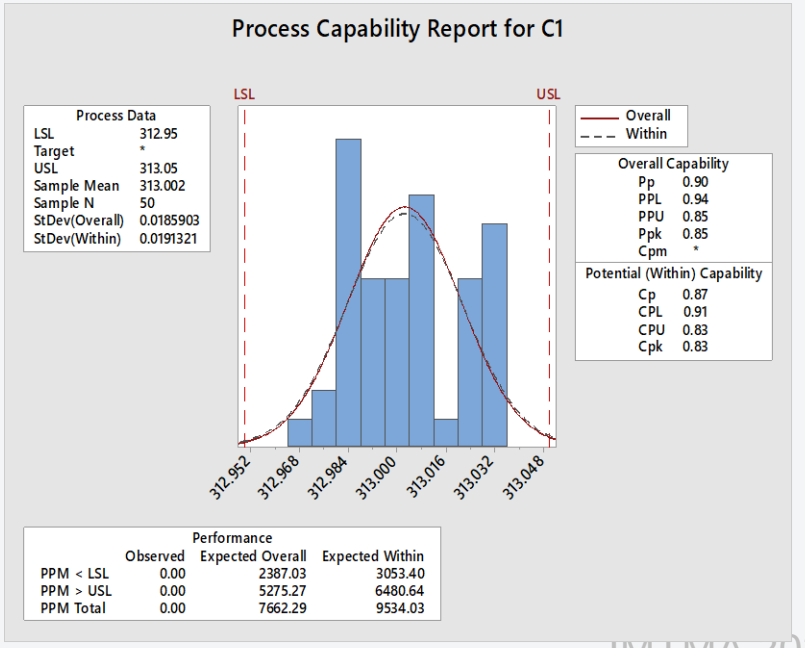
Defect: Ø313 O/S., Ø283U/S., Concentricity not ok, Ø313 Vibration, Ø313 Out cut.

Previous condition



Fixed Cartridge two Boring Bar





Process capability: Cp & Cpk for Ø313, Ø283 observes from 0.75 : 0.87

4.3 Defect Analysis & Action plan

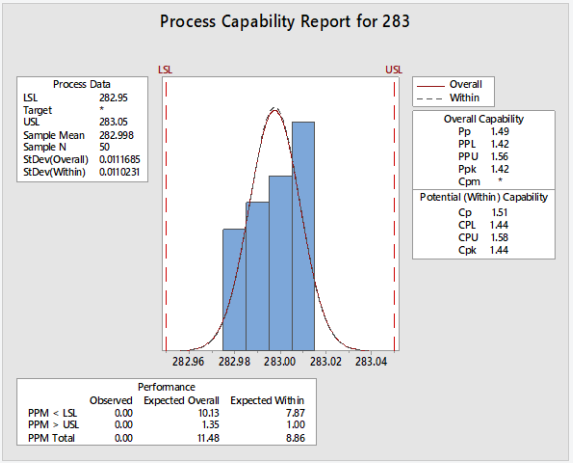
Defect: Ø313 O/S., Ø283U/S., Concentricity not ok, Ø313 Vibration, Ø313 Out cut.

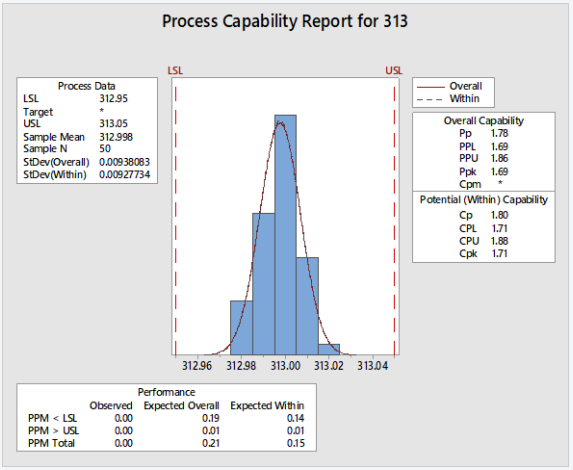
Why-Why Analysis:

WHY ?	Required size corrections again & again.
WHY ?	Consistency not achieve in bore sizes, concentricity for particular operation.
WHY ?	Two different boring bars for OD & ID with manual adjustment grub screw

Action : Instead of two fixed cartridge boring bar replaced with combination boring bar with micro adjustable (MBU) added.

Result: Cp & Cpk for Ø313, Ø283 improved to 1.51 : 1.80 . Boring bar with micro bore unit. Can decrease or increase bore size.





After above action, achieved Cp, Cpk above 1.33 but observed tool life38~40 nos. and setting time increased which is not acceptable in robotic line.

4.3 Defect Analysis & Action plan

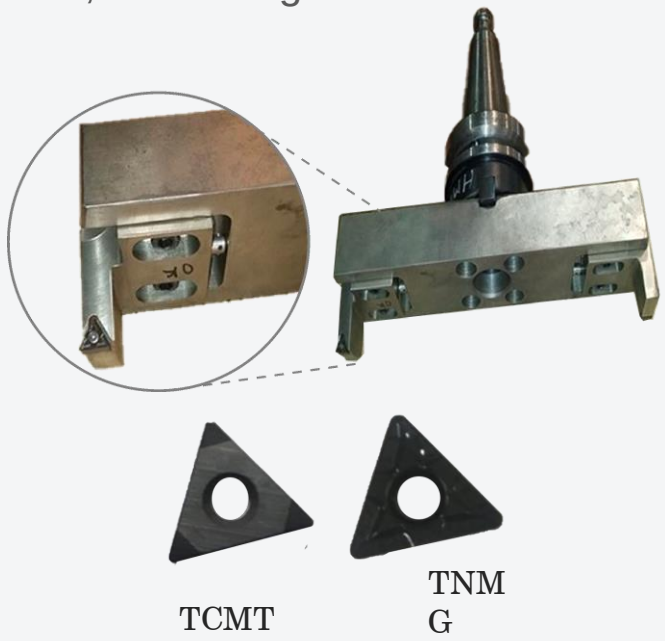
Defect: Less tool life and process capability

Result: Consistency in Cp & Cpk for Ø313, Ø283 observed above 1.67.

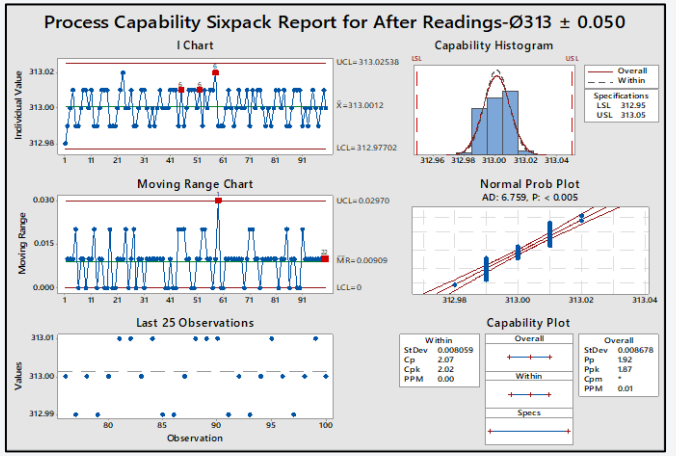
Why-Why Analysis:

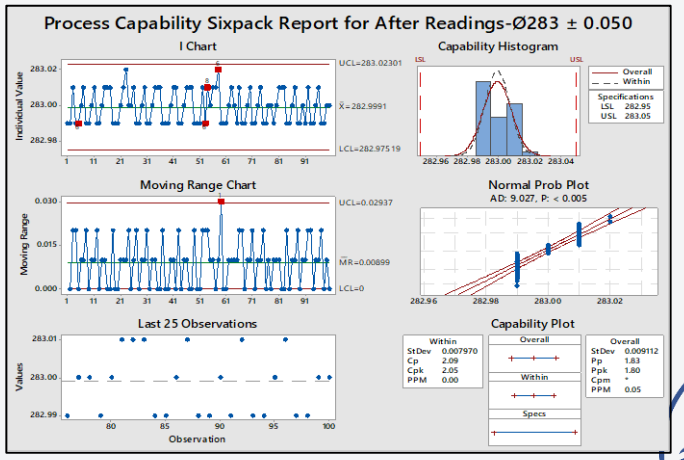
WHY ?	Less rigidity of boring bar and less tool life
WHY ?	Less neck-thickness of MBU tool bit and high positive rake insert

Action 2 : Overall boring bar rigidity increased by clamping Cartridges with two bolts and parameter also increased by using negative inserts, increasing the life of the inserts



TCMT TNMG

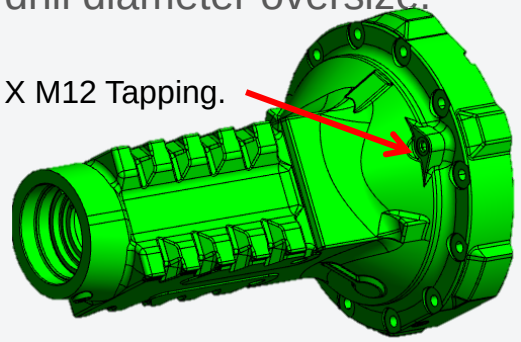




By this action implementation, tool life has increased from 40~200 nos. and process capability achieved

4.3 Defect Analysis & Action plan

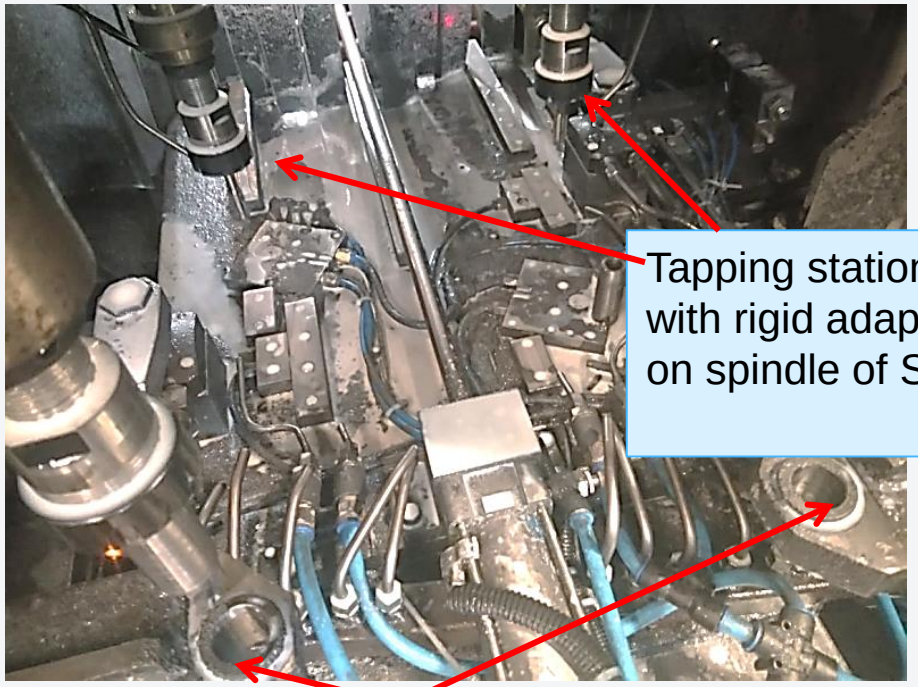
Defect:
M12 thread washout, M12 pre drill diameter oversize.



Why Why Analysis:

WHY ?	Due to overhang of cutting tools.
WHY ?	Operation on HMC with extra long adaptors & tools.
WHY ?	Bush guide not available on HMC as part load unload not feasible

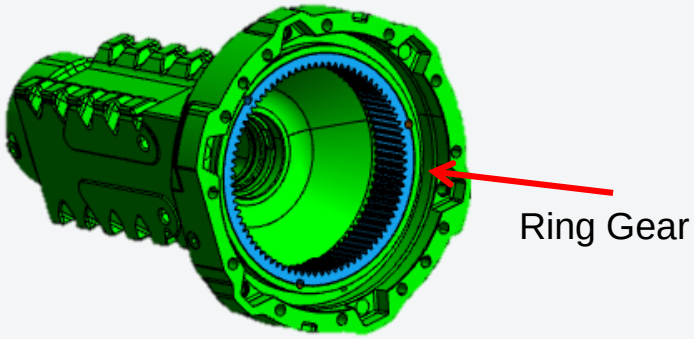
Action: Added SPM for M12 drilling & tapping. Two stations are made one for **drilling with jig bush guide** & another is tapping station. As bush guide for drilling, deflection eliminated. Hence rejection of M12 Thread washout, Pre drill diameter oversize eliminated.



Result: No rejection since SPM implemented

4.3 Defect Analysis & Action plan

Defect:
Ring Gear missing job got machined



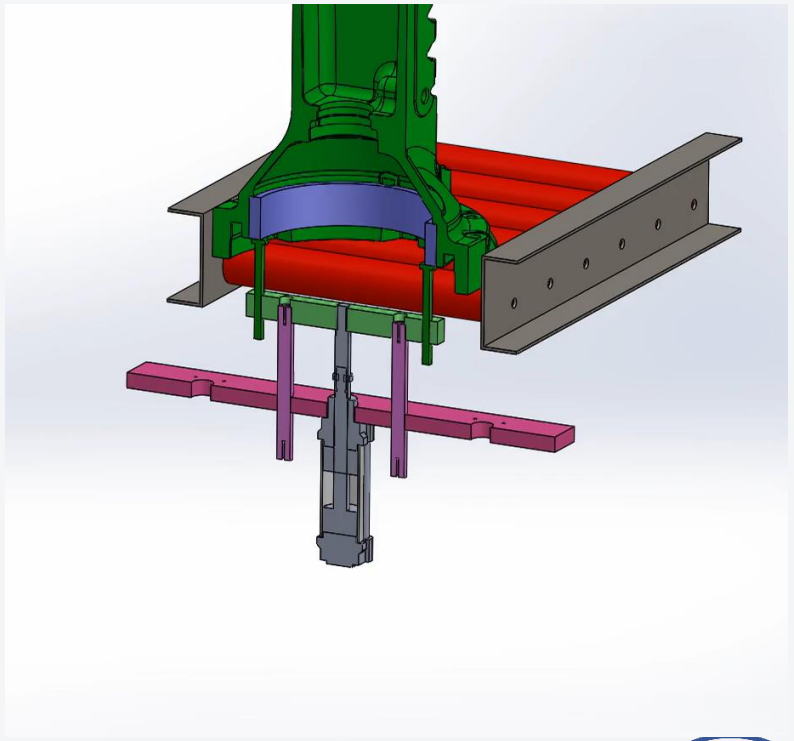
Why Why Analysis:

WHY ?	Without ring gear fitted part loaded on machine for machining.
WHY ?	Manual control on ring gear verification & so missed out.
WHY ?	Ring Gear present-absent auto detection facility not available at loading station.

Action: Added mistake proofing mechanism on conveyor . After ring gear fitting operation, added **mistake proofing pins with depth sensor mechanism** on conveyor. Ring gear missing get detected here. Without ring gear part not go for machining.

Mistake proofing pin mechanism to detect Ring Gear present.

Result: Since Robotic operation started, zero customer complaints observed.

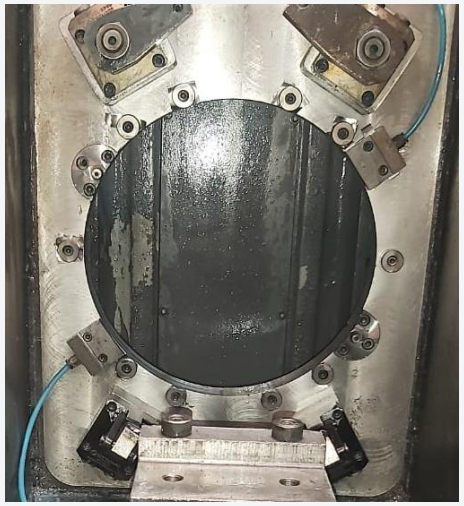


Animation

4.4 Sustenance – Action 1

Actions taken to reduce the rejection & Improve quality

1. Mistake Proofing_Air seat checker provision on each Machining Fixture.



To avoid the error in part resting, air seat checker provision made on each machining fixture and it is linked with machine through CNC program control. 0-1-0 logic is made to avoid wrong practices , air block , air leakage.

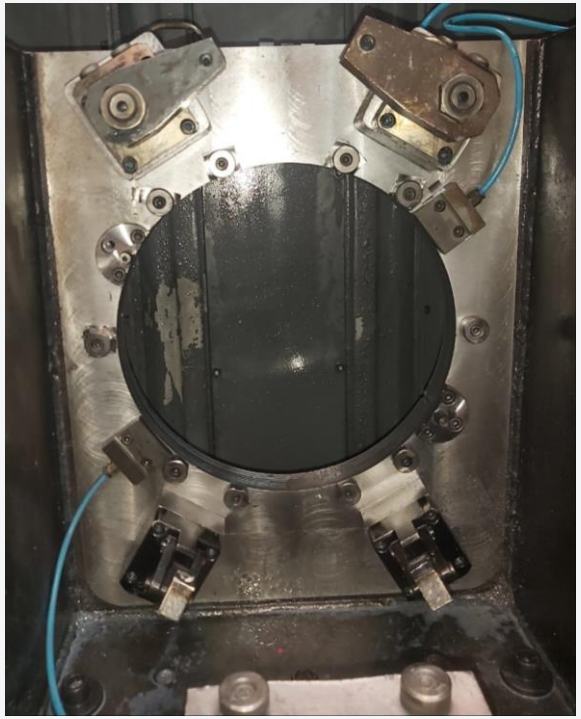
About 0-1-0 logic : It means after every operation end the red signal should come after unloading the part and green signal should come after loading the part before cycle starts (Red - Green -Red signal)

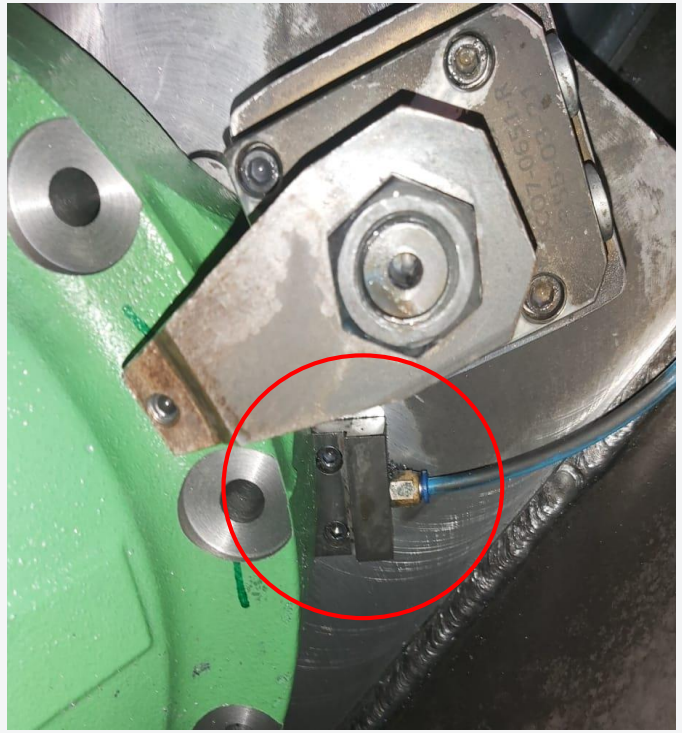
2. Auto cleaning of rest pads

Improvements on rest pads cleaning is made by using **coolant with pressurized spray. It is auto operated**. After unloading part from fixture, auto coolant spray starts which cleans all rest pads. No manual intervene.

4.4 Sustenance – Action 2

Auto Hydraulic clamping fixtures implementation.



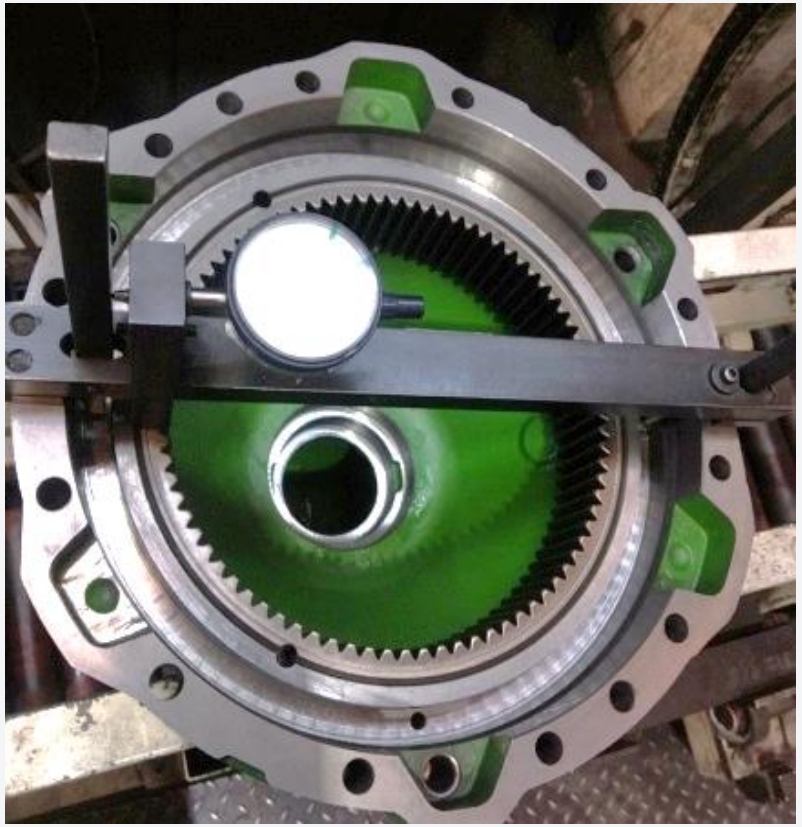


To avoid the error in clamping, Auto Hydraulic clamping fixtures implemented. **Hydraulic clamping co related with machine CNC programming & pallet changing**. Without clamping job get sensed by machine, pallet will not change & not start machining.

4.4 Sustenance – Action 3

Improvements in Inspection Facilities

Before



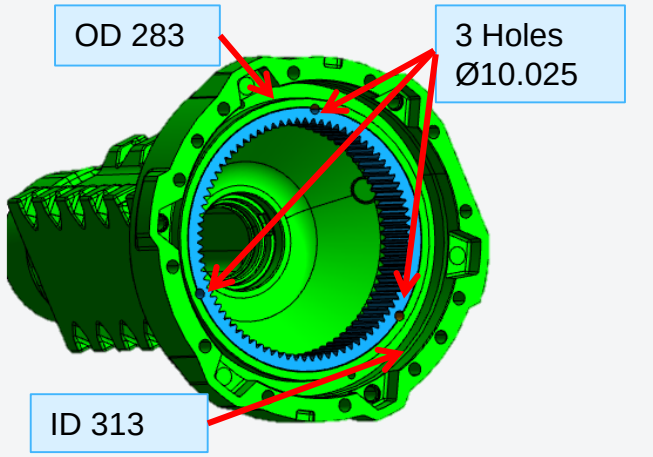
Special dial type gauge for Φ313 & Ø283 inspection. There is use of frame & bore dial. Manual error get added in setting & inspection.

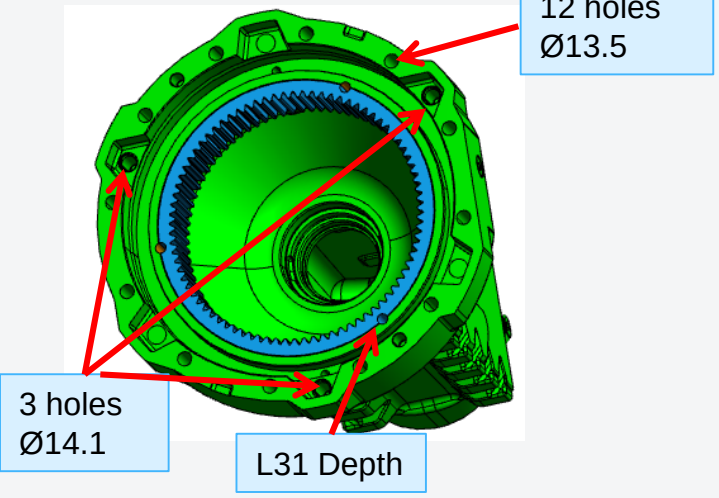
After

On line inspection with LVDT probe Auto gauge with digital display is added for both Φ283 & Φ313 KC parameters. This data get recorded on PC. Online capability can be verified. MSA improved. Appraiser variation eliminated.

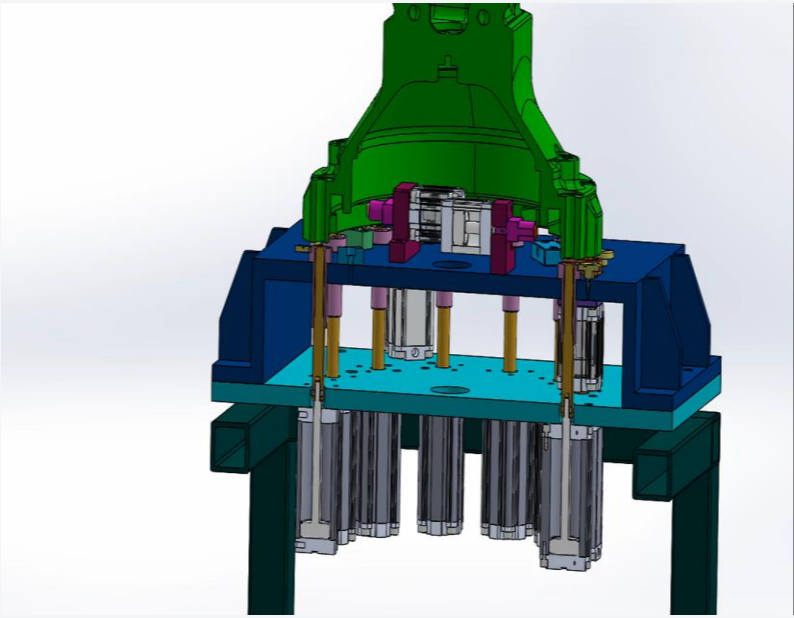
4.4 Sustenance – Action 4 & 5

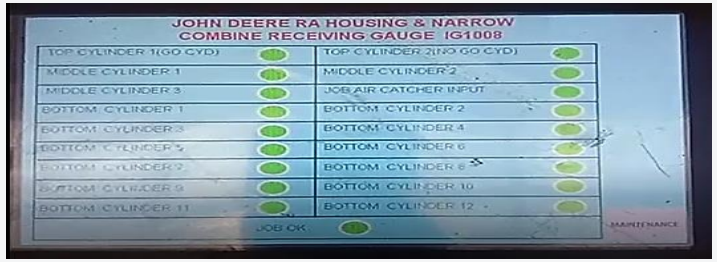
Online auto receiving gauges manufactured in-house





Auto Online Inspection





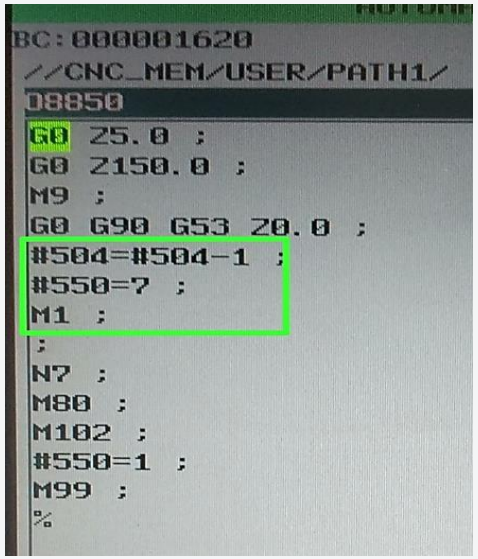
21 parameters are covered in auto inspection Receiving Gauge which is installed on conveyor

After OK job Screen display green ensures **OK** part.

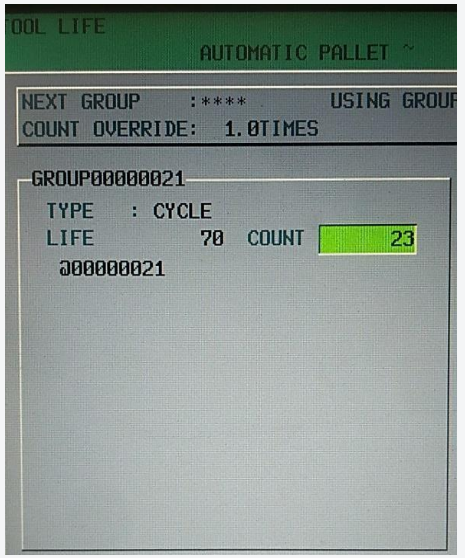
4.4 Sustenance – Action 6

Micro / Macro programming

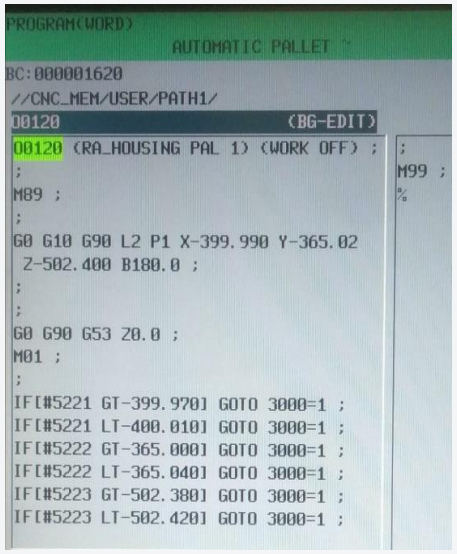
Sr. No.	Activity/Machine	AMS HMC CMH500_1	AMS HMC CMH500_2	AMS HMC CMH500_3
1	Drill Dwell Time	Done	Done	Done
2	Operation Sequence/ Power Failure/ Emergency stop	Done	Done	Done
3	Program Lock	Done	Done	Done
4	W/O Lock 0.02/Internal guard and Macro	Done	Done	Done
5	Tool Offset wear lock 0.02 Internal Gaurd and Macro	Done	Done	Done
6	Stand by Tool/Spare tool	Done	Done	Done
7	Tool Life monitoring with life alarm	Done	Done	Done
8	Part seating sensor(Air catcher)	Done	Done	Done
9	Part seating sensor interlock	Done	Done	Done
10	Part clamp-declamp interlock	Done	Done	Done



Program lock Operation Sequence, Power Failure, Emergency stop



Tool Life monitoring with life alarm



Work Offset lock, tool offset wear lock

4.5 Complexity - in handling 6 variants and tool set ups

Group A

RA Regular

40 T

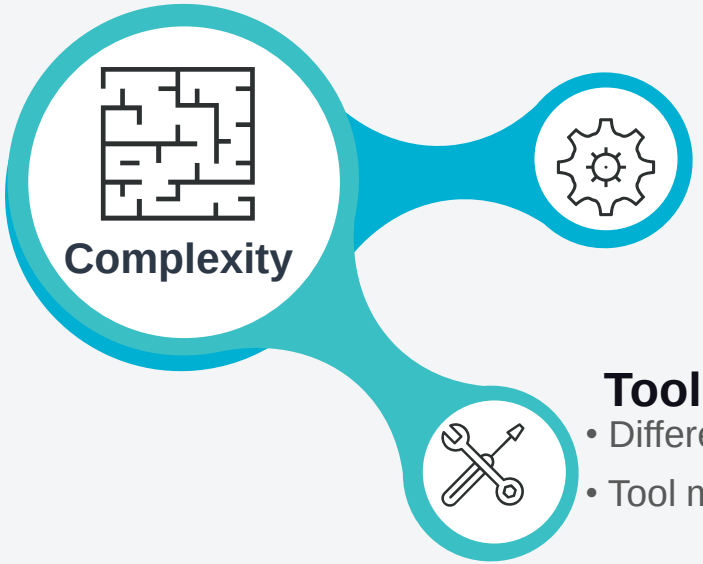
RA Suffix

Group B

RA Narrow

RA ILC

NON ILC 40T



Fixture

- Need to fixture change for every part
- Resting pad and location pins to be change

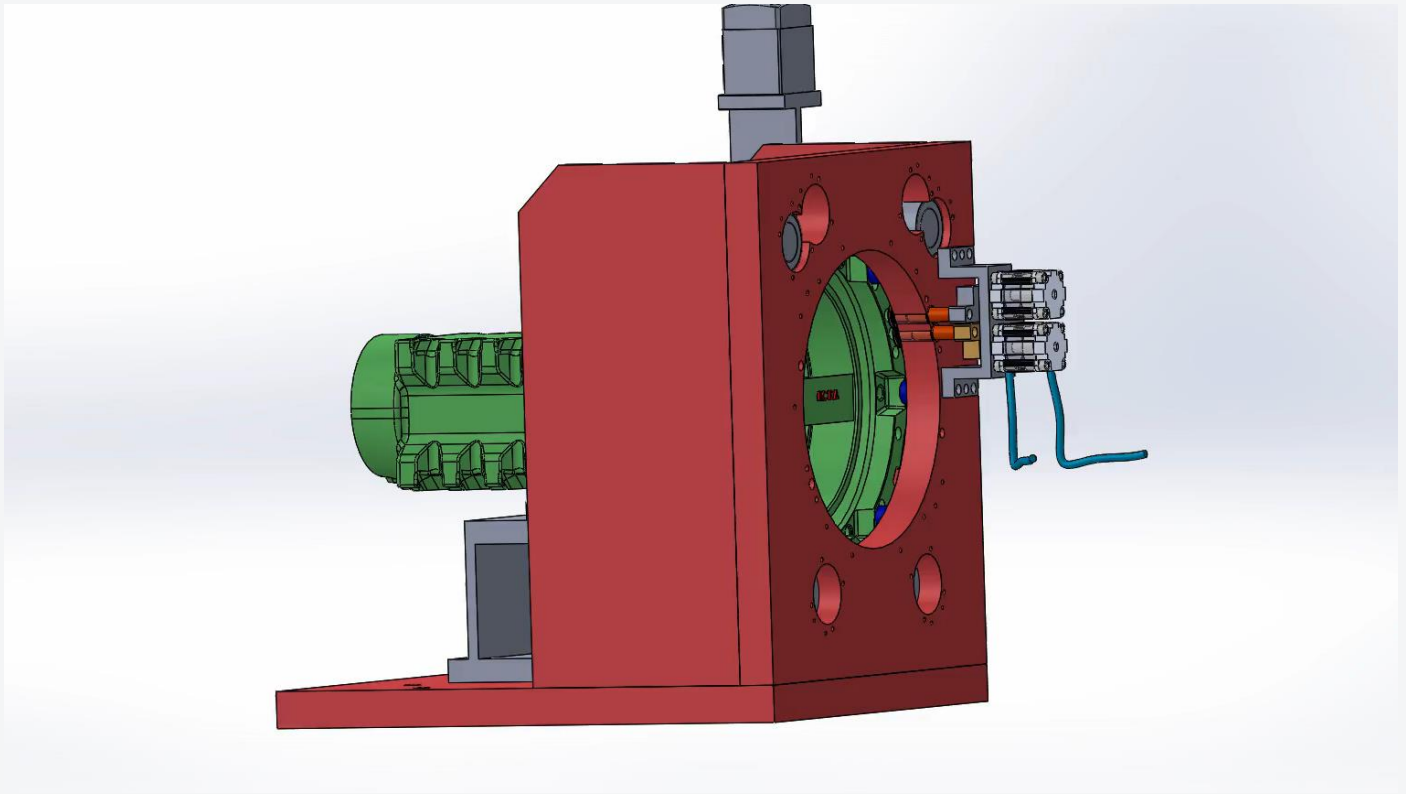
Tools

- Different tools required for every part
- Tool magazine size constraint

Brain storming :

- **Combine fixture** can be made by doing modification in existing fixture.
- Spare tool can be kept in magazine to accommodate all the variants

4.5 Complexity – Solution 1



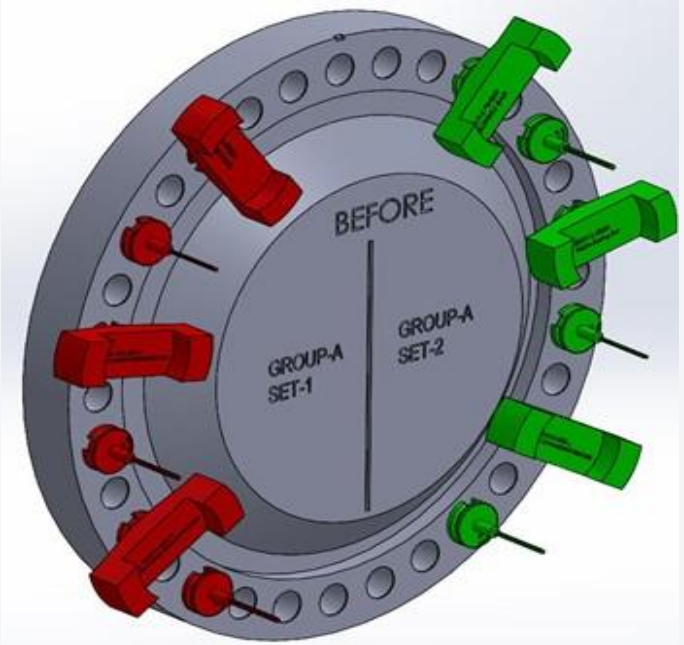
Modified the fixture to accommodate all variants. Two type location pins added in a fixture according to part specification. To change the variant we need to change removable location pins. After implementation, setup time drastically reduced.

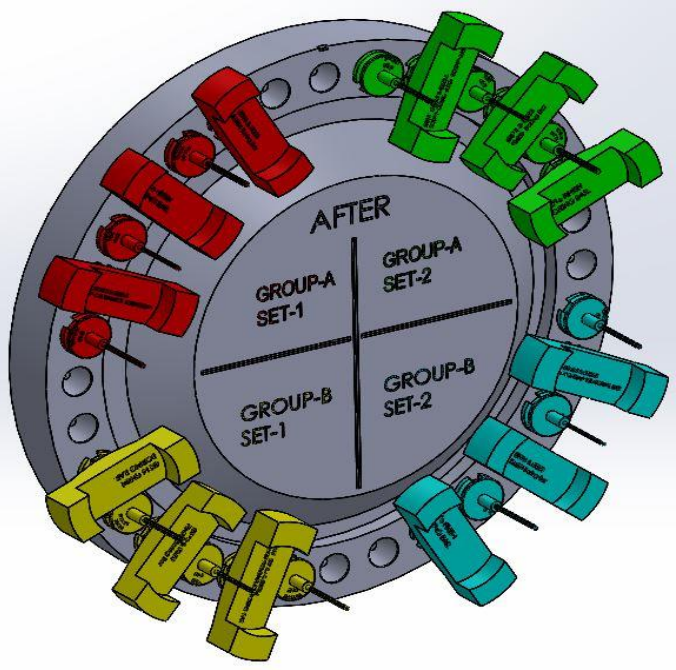
An innovative idea is generated to change the location pin according to the part variant through PLC program

4.5 Complexity – Solution 2

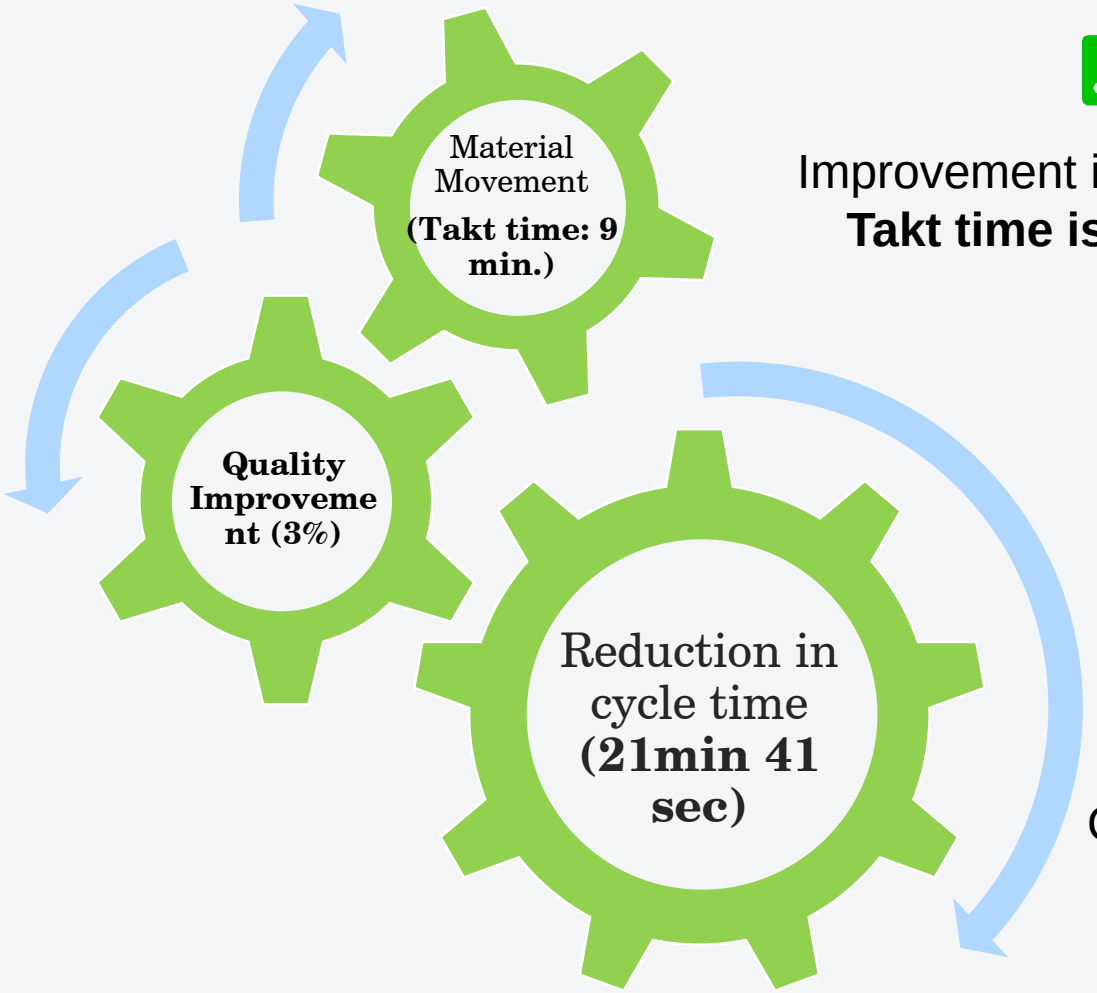
Sister Tool concept :-

Sister tools are installed to reduce the setup time and increase the part production





ATC with 30 tool packet is installed on machines. Tool set up time is reduced by implementing sister tools.



Improvement in Material Handling
Takt time is achieved 6 min

Machining rejection
Achieved 0.25%

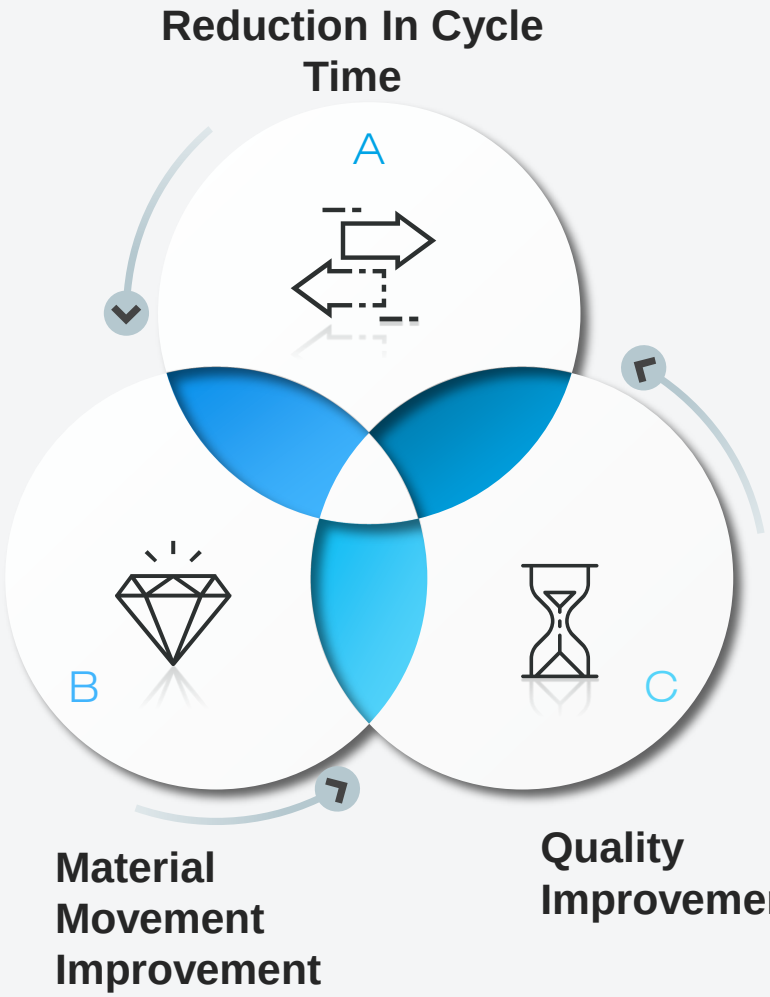
Cycle time achieved
6 min 5 sec

4.6 Horizontal Deployment – Case Front Axle (E68)

All actions from RA Housing project are implemented in Case Front Axle too

Key Targets for this project

- Cutting Time reduction (from 70 to 42 min.)
- Material Handling Improvement with Robotic ARM
- Quality Improvements (Process capability)

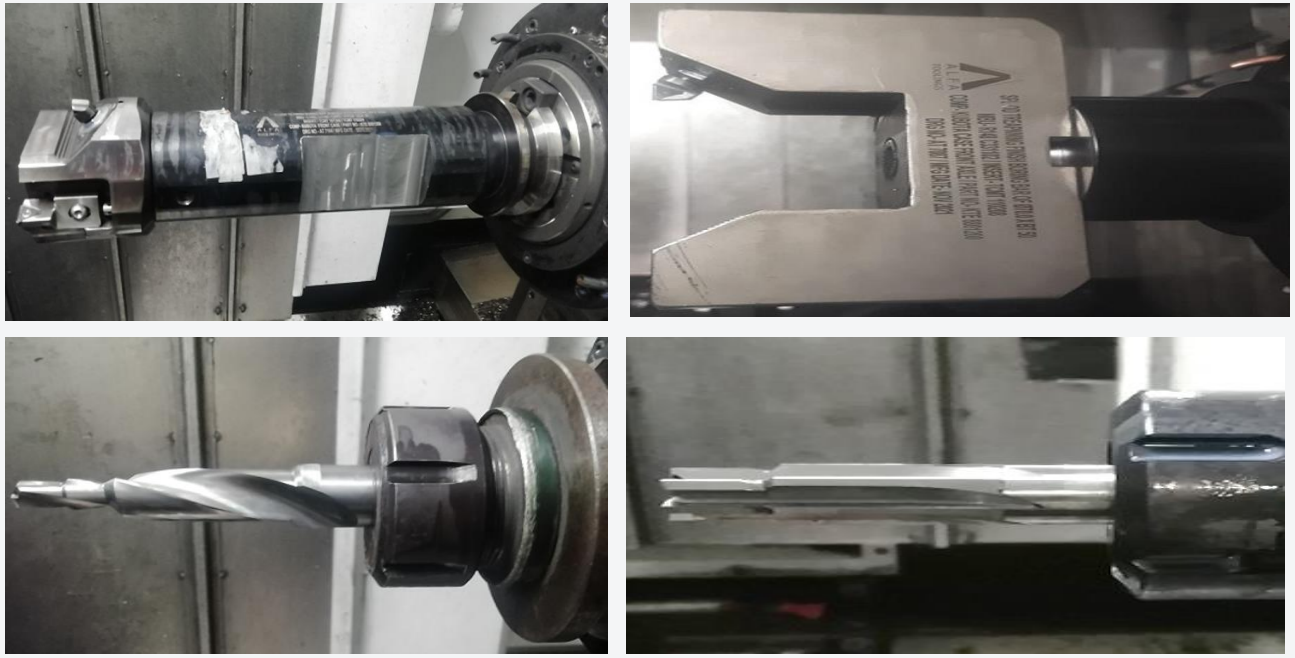


4.6 Horizontal Deployment – Case Front Axle (E68)

Reduction in cutting time- combination of tools are used

Before

After

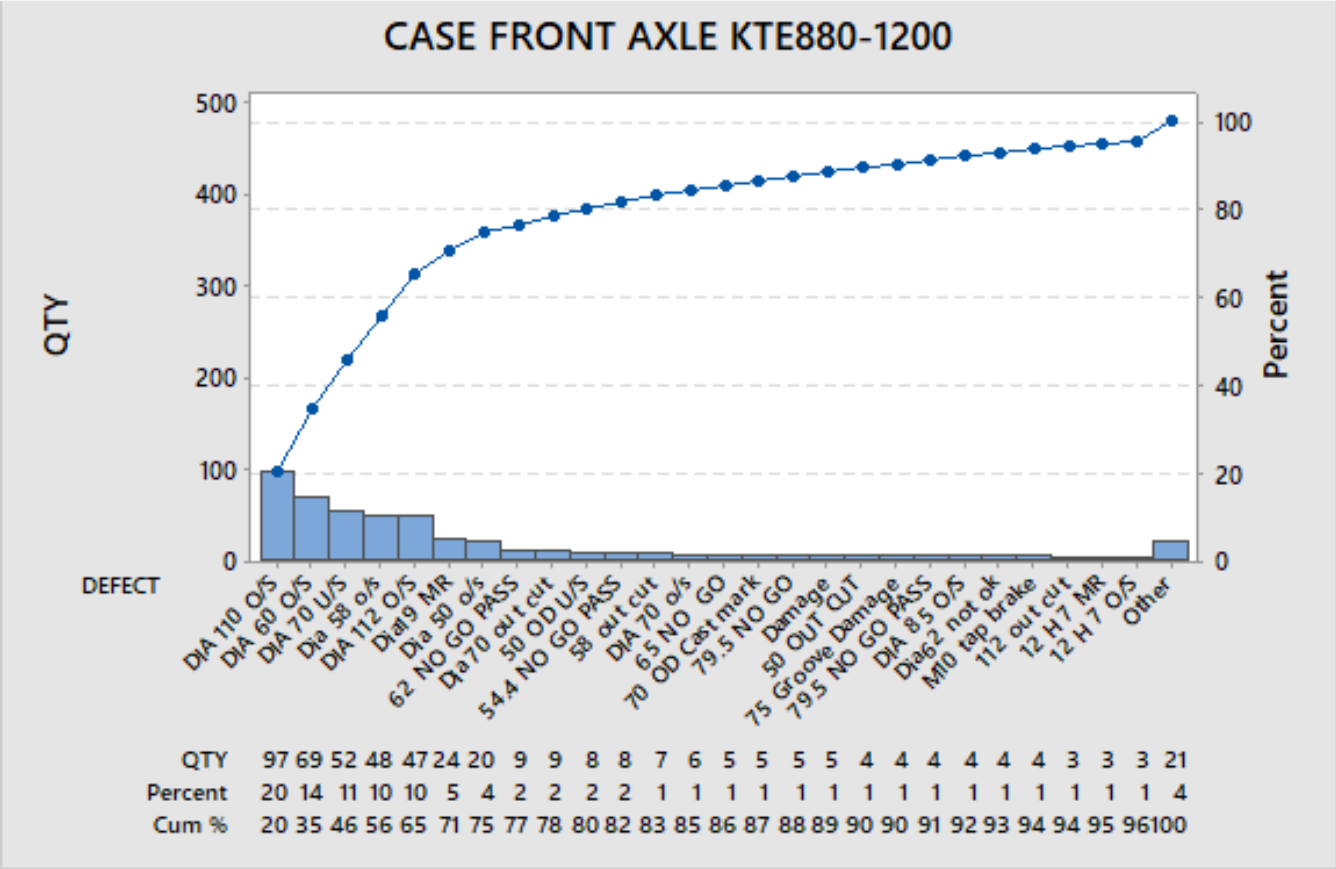


By implementing combined tools, tools reduced from 38 to 30, cycle time reduced by 40%.

4.6 Horizontal Deployment – Case Front Axle (E68)

Quality improvement

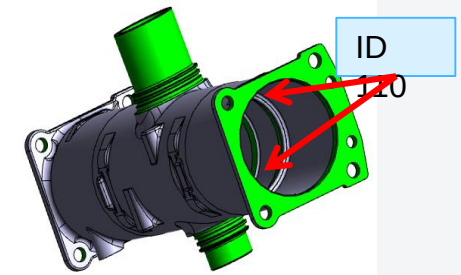
Pareto chart drawn for Machining Rejection Defects & Defective Quantity. Data collected from Feb 2021 to Jan 2022



By 80-20 principle, we observed first 7 defects causing more rejection. Taken actions on them.

4.6 Horizontal Deployment – Case Front Axle (E68)

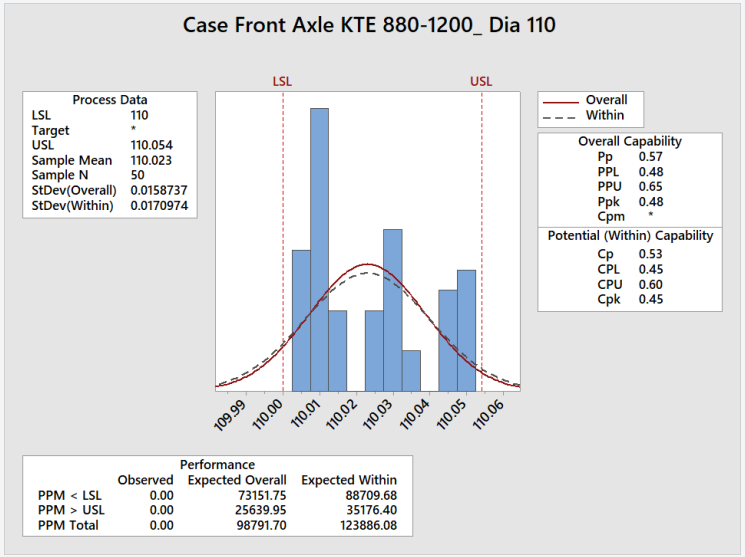
Defect: Ø110 oversize



Root Cause : extra long boring bars with MBU causing vibrations and backlashes

Action: Silent boring bars introduced with no backlash MBU's

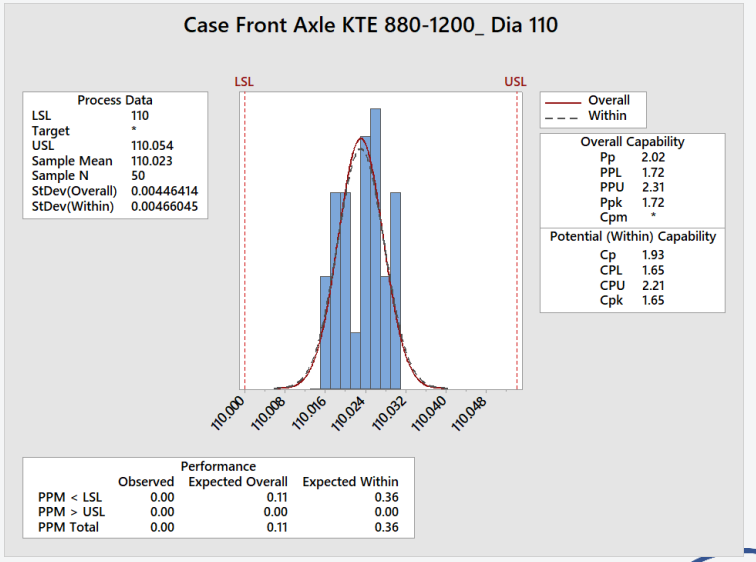
Result: Similar actions are implemented for six tools and achieved process capability more than 1.76



Process capability: Cp & Cpk for 110 observes 0.53 & 0.45

Before

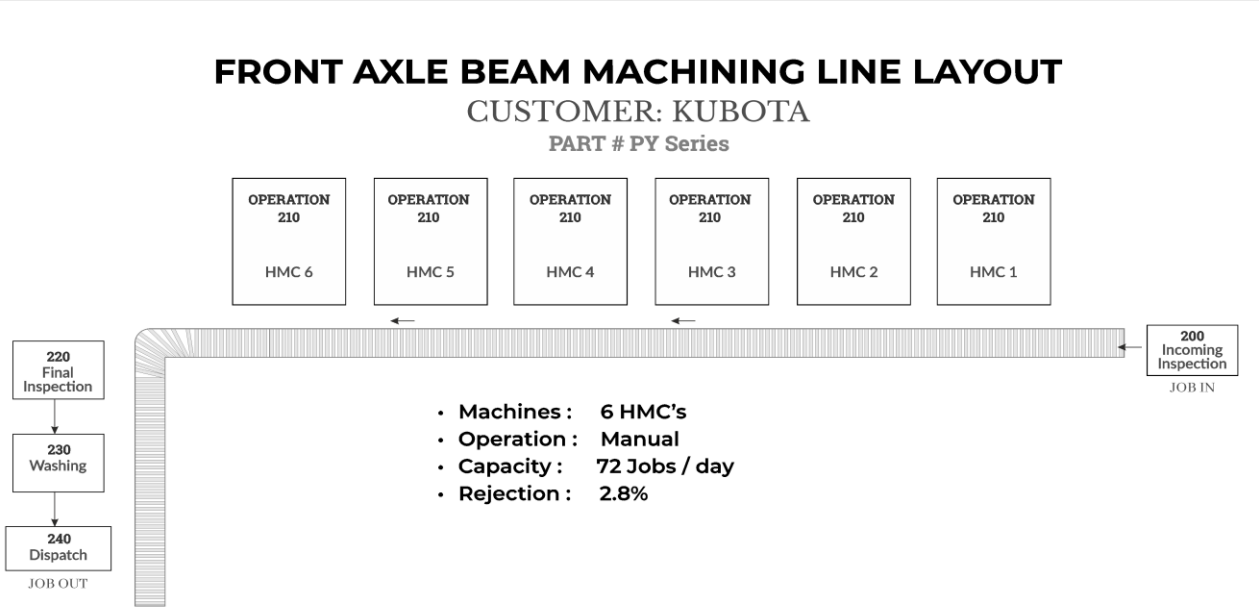
After



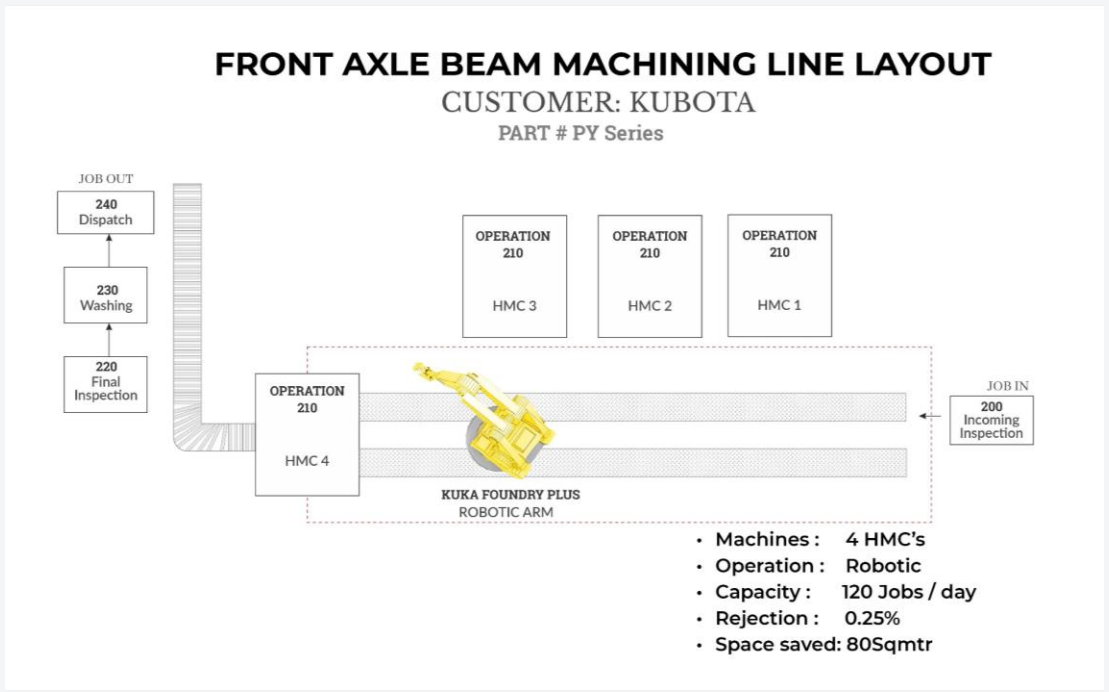
Process capability: Cp & Cpk for 110 observes 1.93 & 1.65

4.10.4 Horizontal Deployment – Case Front Axle (E68)

Before



After



4.6 Horizontal Deployment – Case Front Axle (E68)

Quality – Achieved

Process capability achieved from 0.45 to 1.93

Reduction in Cycle time –Achieved

Cycle time is achieved by 30 mins.

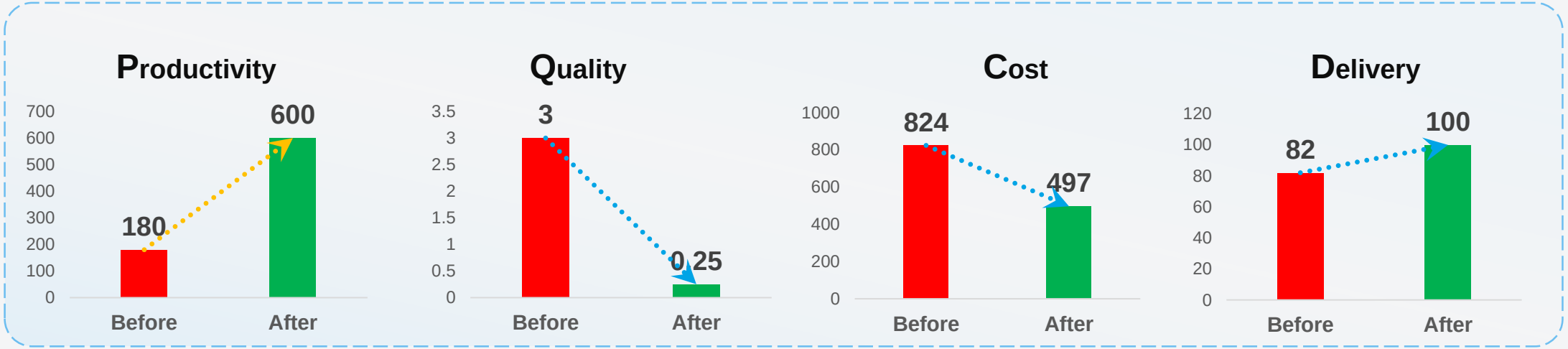
Material Movement – Achieved

Operator fatigue is eliminated

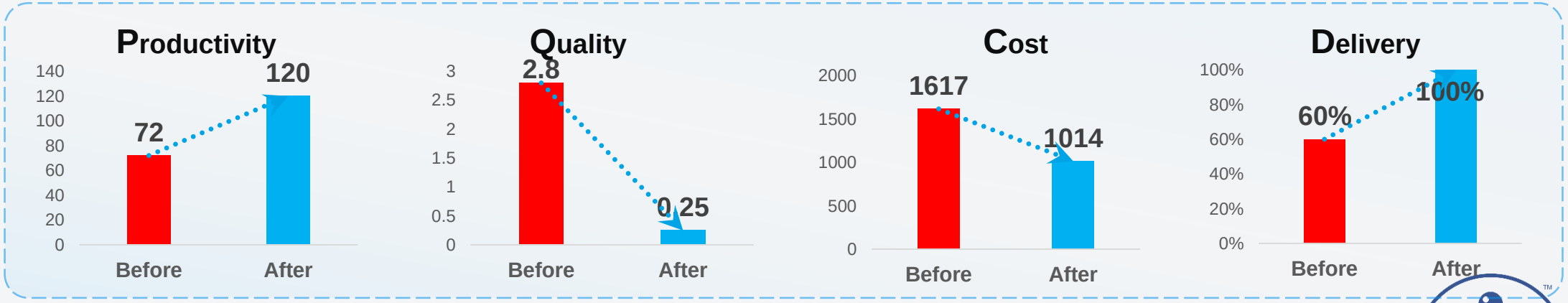
Skilled operator is not required

5.0 Result / Impact

Case Study :1
Rear Axle Housing
(John Deere)

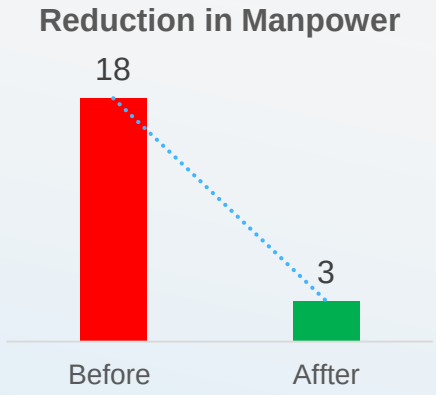


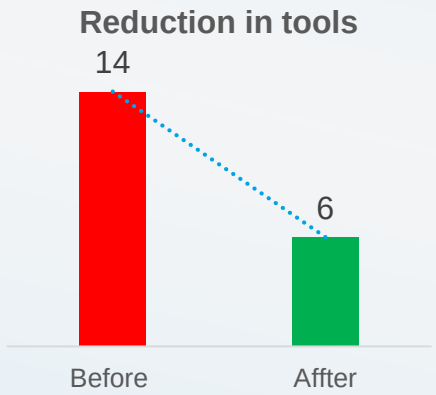
Case Study :2
Case Front Axle
(Kubota)

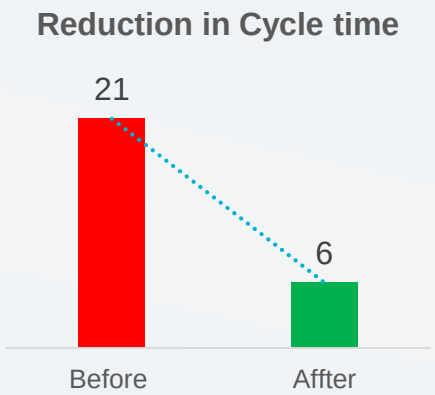


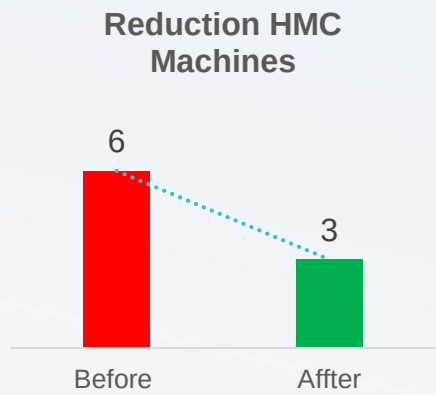
5.0 Result / Impact

Case Study :1
Rear Axle Housing
(John Deere)

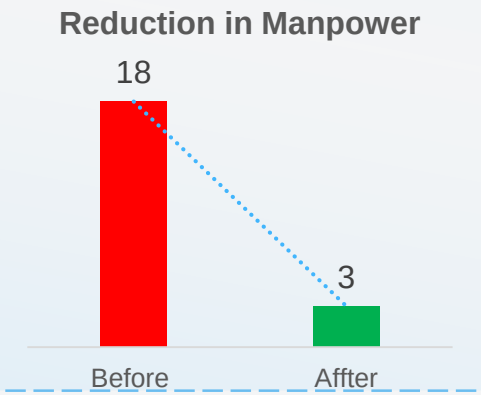


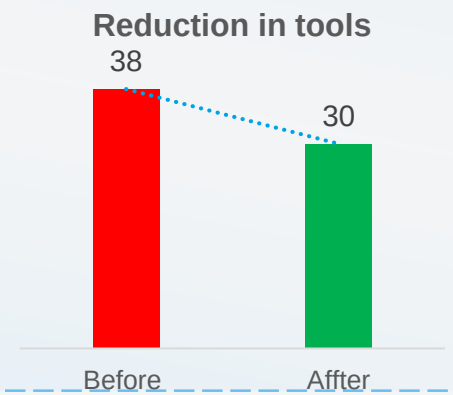


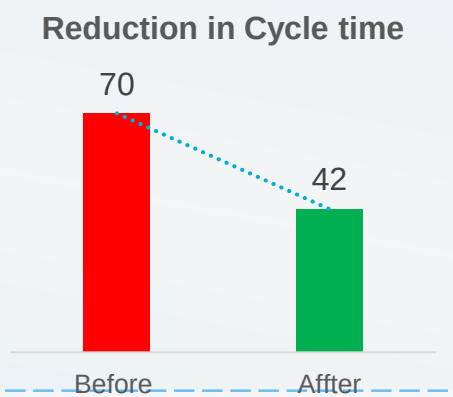


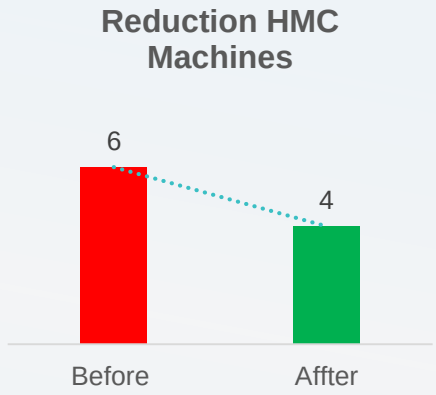


Case Study :2
Case Front Axle
(Kubota)









In both projects,
Direct cost saving ₹ 6.7 Cr /year &
In-direct cost saving ₹ 3.6 Cr saved

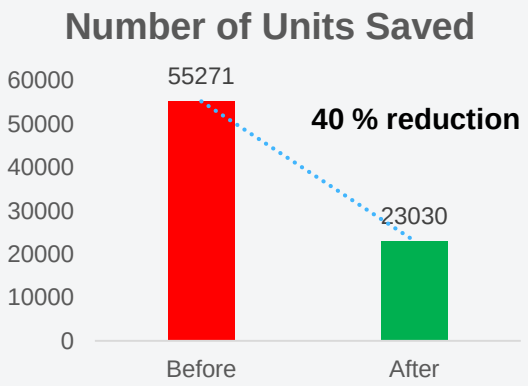
Uniqueness of this project:

1. Optimum OEE achieved through automisation
2. Journey towards Industry 4.0

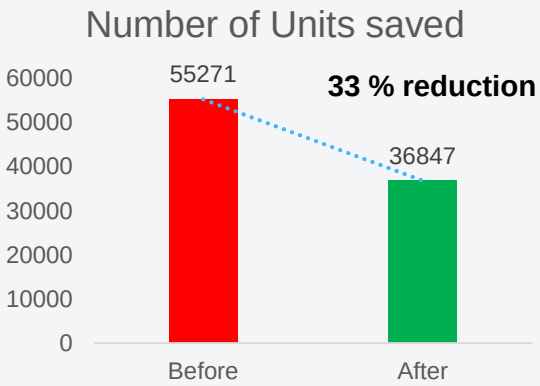
6.0 Resource Impact

6.1 Saving in Electricity

Case study 1



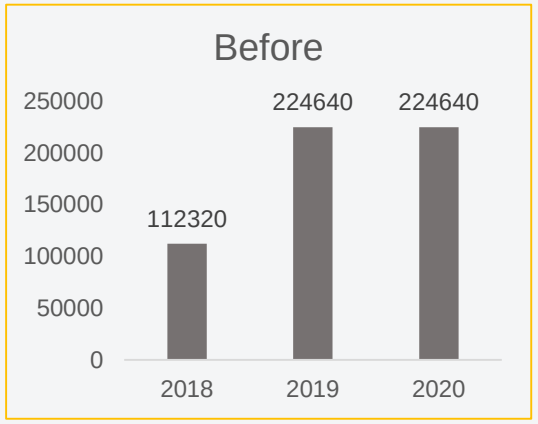
Case study 2

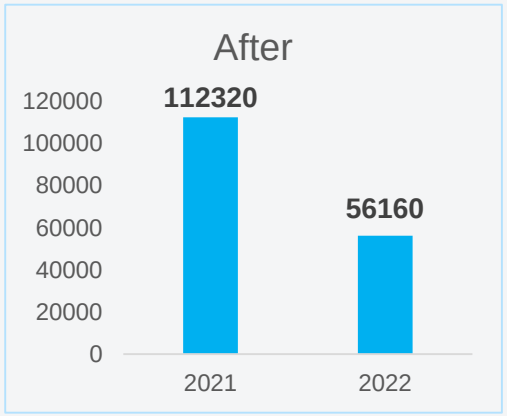


6.2 Safety

Zero accidents /Injuries achieved because of Robotic handling. The line auto-stops when there is manual intervention.

6.3 Coolant consumption





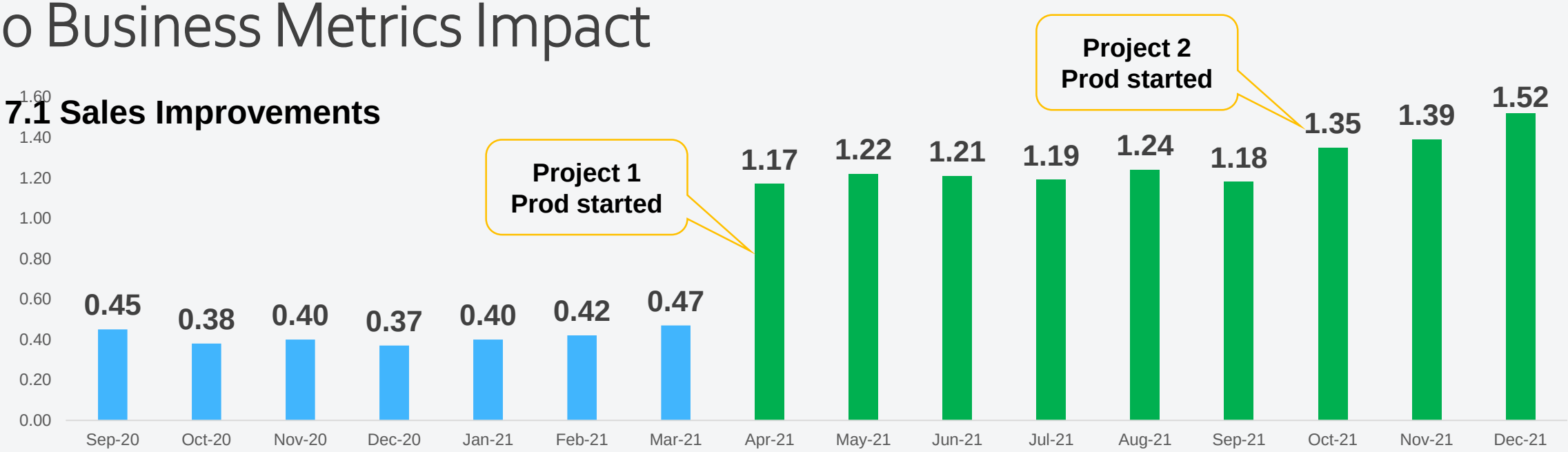
(Up to 75% Saving in coolants)

6. 4 Emission reduction /elimination

Carbon Footprint kg CO_2e saved by saving in the electricity by elimination of 5 HMC machines & other relative actions

7.0 Business Metrics Impact

7.1 Sales Improvements



7.2 Delivery PPM is achieved Zero after implementation of the project

Unit	Apr-21	Jun-21	Jun-21	Jul-21	Aug-21	Sep-21	Oct-21	Nov-21	Dec-21	Jan-22	Feb-22	Mar-22	Apr-22	May-22	Jun-22	Rolling12	FYTD PPM
Total Enterprise	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total A&T	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DEWAS WORKS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NAGPUR (PDC)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PUNE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

7.0 Business Metrics Impact

7.3 Customers Added

SCHAEFFLER

LUK INA FAG

DANA SPICER DRIVETRAIN PRODUCTS

TENNECO

7.4 New Parts added – 32 Nos.

8.0 External Recognition

8.1 Appreciation from John Deere - Best in class Quality & Delivery

8.2 Six Sigma Green Belt winner award

Fastest Ramp-up Award

8.o External Recognition

8.1 **Appreciation from John Deere** - Through email

Tue 02-11-2021 11:32

Kumar Abinash <KumarAbinash@JohnDeere.com>

Performance improvement & very good support in rear axle development from Kasturi Kagal - A Thank you note

To Madhukar Kumbhar; Sanjay Patil; Prashant Dhoolappanavar; Shrikant Sutar; Mahesh Munjannavar; Bhauso Deshmukh; Bhushan patil; Sachin Malabade

Cc Shinde Sahadev; Koshti Sadanand; Kulkarni Shrikrishna; Kulkarni Bhushan (jdepl); Chougule Ashish; Patil Sachin; Sawant Madhusudan; Neeraj Zanvar; Rohan Zanvar; Phadatare Avinash; Mohol Mahesh; Patil Shankar

You forwarded this message on 01-12-2021 14:21.

Hello Kasturi Team.
Wishing you and your family a very Happy. Safe and Prosperous Diwali Festival!

Team has faced various challenges in this development like (worst covid situation/ Changing of location from approved source -Ashta unit to Kasturi / New machine addition/ Shifting of machines/ New Manpower/ Limited visit...etc). Even after so many challenges team has demonstrated very good performance (60 % improvement over F'21 in Line issues) with first time right approach in 4 rear axles Op-20 development.

In coming year F'22 we have to lunch zero defect drive at Kasturi unit.

Please pass "thank you" note for improvement & maintaining this quality performance to all concerns who really work hard to achieve this.

Thanks & Regards,
Abinash Kumar.
John Deere India Private Limited
Off Pune-Nagar road, Sanaswadi, Pune-412208, India.
Office - +91 (2137) 66-7442
Mob : +91 8460157610

9.0 Scope for Horizontal Deployment

2022 and Beyond

Similar idea and principles will be used to implement unmanned / Robotic handling for below lines

- Customer: M/s Generac -- Flywheel Customer Demand – **1200 nos. / day**
- Customer : M/s Mahindra -- Clutch Housing , Customer Demand – **260 nos. /Day**
- Customer : M/s Kubota -- Rear Axle Housing , Customer Demand – **210 nos. /day**
- Customer M/s John Deere -- Block, Customer Demand –**210 nos. /Day**

Thank You

ZANVAR GROUP

ZANVAR GROUP

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