

GODREJ & BOYCE Mfg. Co. Ltd

VISION

Admired for
Sustainability Practices, Innovative Solutions
&
Superior Business Performance

Project :

Ramping up the production of a critical Defense system

Team :

Deepak Panchal (Plant Head)
Ajit Mayekar (Production Head)
Anand Sarda (Sr.GM, NPD)



Godrej Aerospace Overview

Location: Vikhroli, Mumbai, India

Manufacturing Area **20,000** Sq. Mts.

1000+ Engineers and Technicians

240+ Crs INR Investments

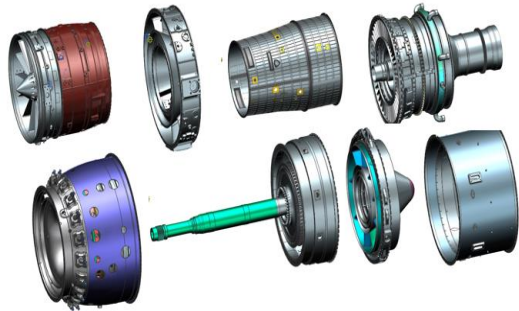
SALES: 2019 **270 Crs INR**
2020 **300 Crs INR**
2021 **369 Crs INR**
2022 **492 Crs INR**
2023 **550 Crs INR**



Product Portfolio

Defense:

- Airframe Systems
- Engine Modules
- Primary and Secondary Actuators
- Adaptor/Pylon
- UAV Airframe in Composites



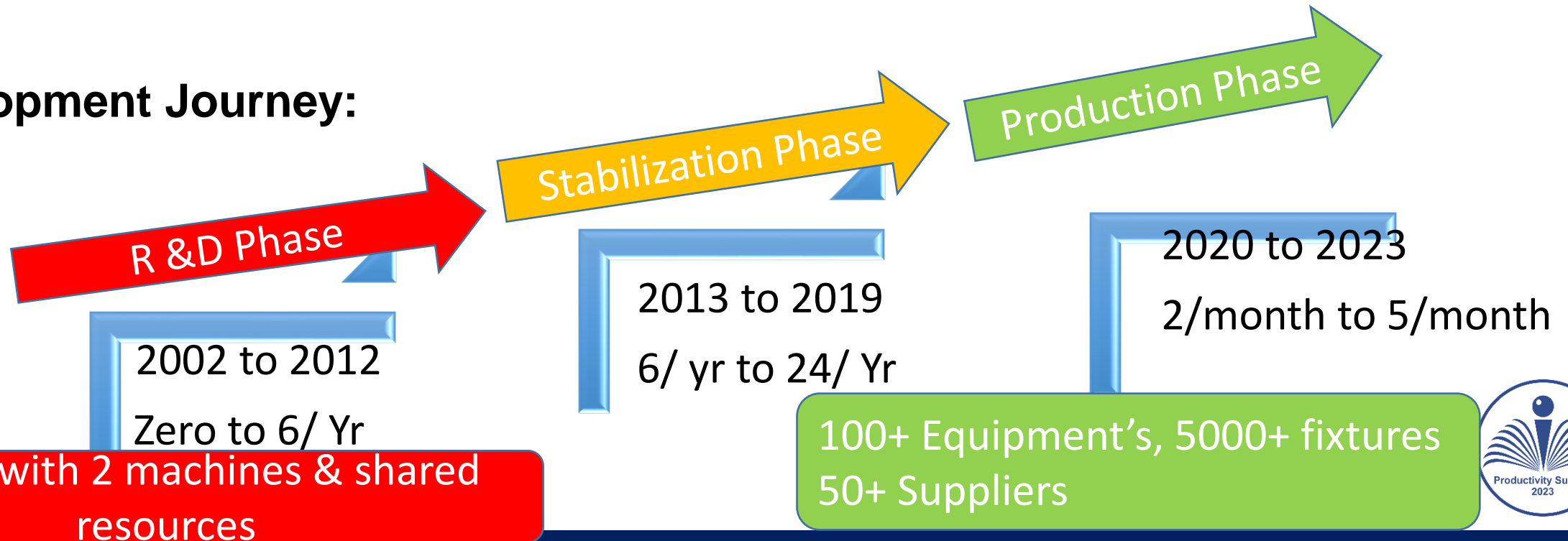
Special Technologies & Processes:

- ❖ Honeycomb Milling
- ❖ Plasma Ion Nitriding
- ❖ Titanium Brazing
- ❖ Friction Welding
- ❖ Bi-Metallic Stamping
- ❖ Flow Forming
- ❖ Spinning
- ❖ Acoustic Testing
- ❖ Hard Forming of Ti
- ❖ Resistance seam welding
- ❖ Helium Leak Testing
- ❖ TIG, MIG Welding (Aluminum)
- ❖ Anodization (Hard, Ti Pulse & Colour)
- ❖ HPL, SSL Coatings
- ❖ Immersion UT

Background:

Manufacturing	Inspection
5 Level of BOM	5000+ Inspection stages
400+ Sub assemblies	300% Validation Protocol (MSQAA)
10000+ Parts	Environmental qualification test of each batch
15+ Special processes	1% rejection allowance for imported & exotic material
	25000+ Inspection & QA plan

❖ Development Journey:



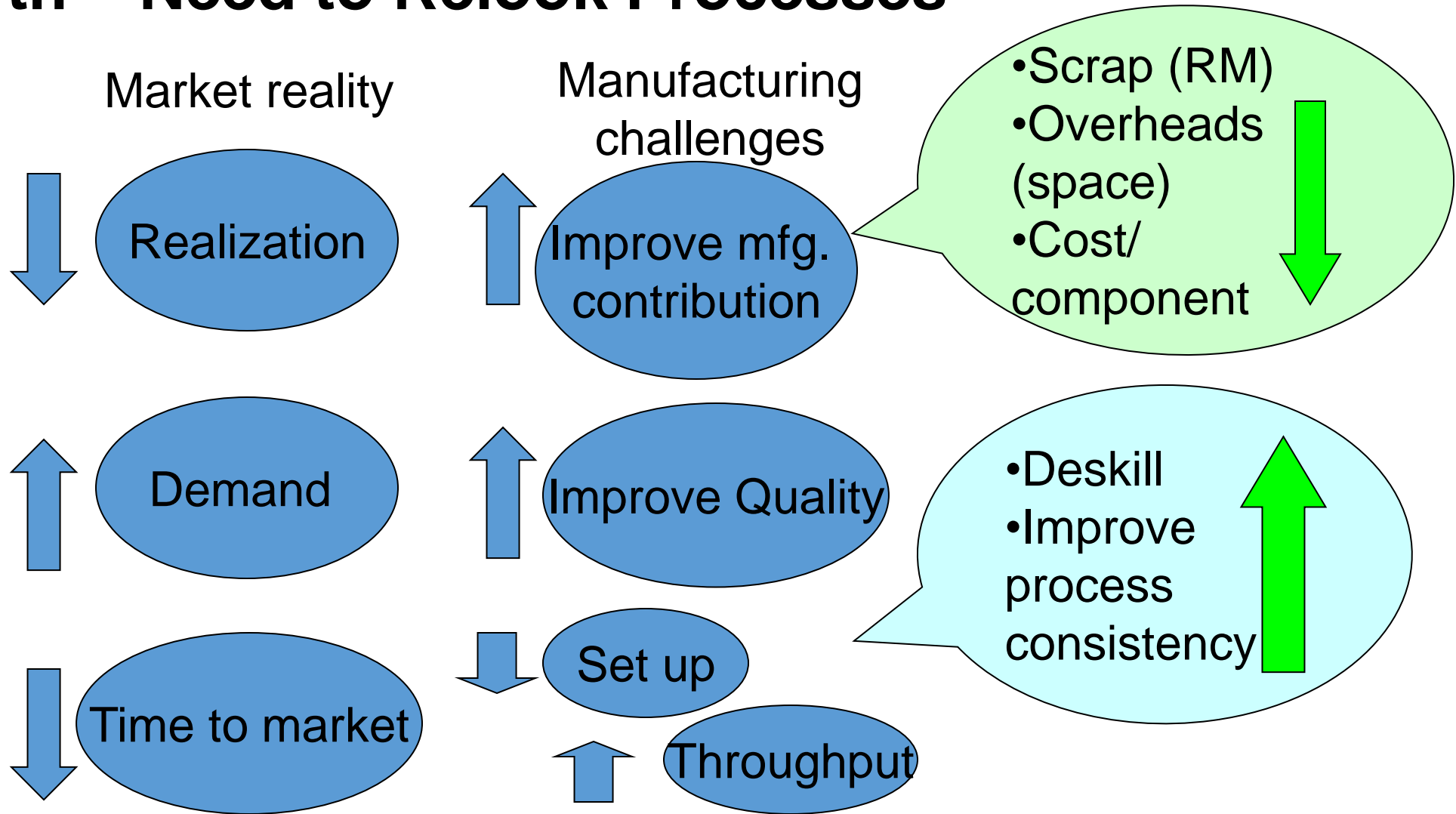
Driver of the Change in 2019-20:

- ❖ **Sudden Increase in demand from MoD due to Geopolitical Events & Government focus on Atmanirbahar Bharat :**

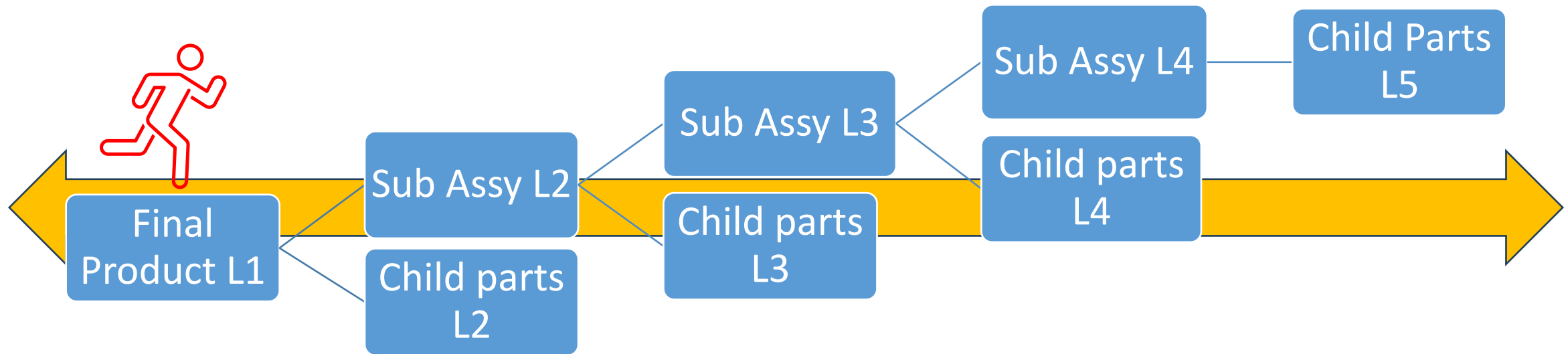


- ❖ **Objective :** Quick ramp-up of rate of production from 2 per month to 5 per month.

The Challenge: To Balance Market Demand & Profitable Growth – Need to Relook Processes



Consistency – A Key to increasing output. Scenario and layout in 2019



- ❖ **Single team working across 5 level BOM with manual co-ordination to drive the project**
- ❖ **Parts were Produced based on as and when requirement from assembly dept.**
- ❖ **Assembly and testing activities were managed by same set of operators and supervisors**
- ❖ **Skill dependency governed the flow/progress of products**

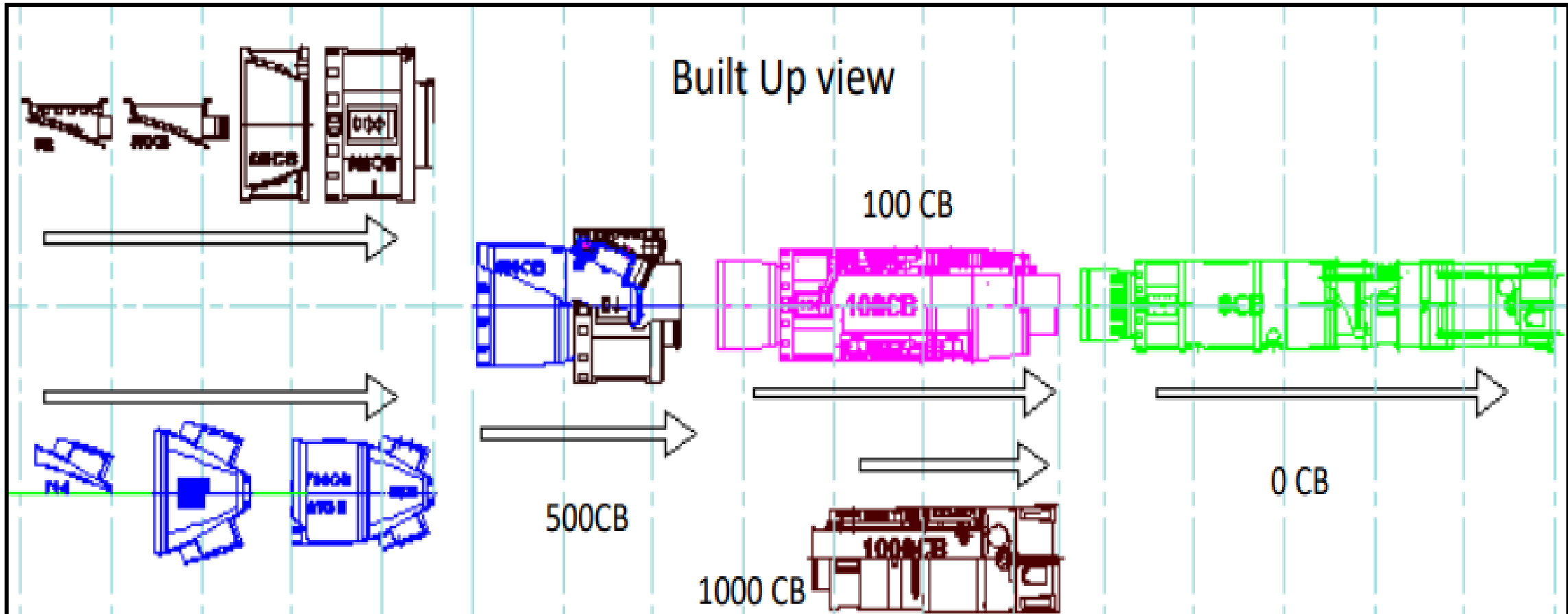
Consistency – A Key to increasing output. Mapping of improvement areas

Optimize operations to do more with available capacity

1. Production System Re-design =>
 - A. Process-oriented -> Product-oriented Layout with Work Centers
 - B. Virtual Line Balancing to match output from all Work Centers to Takt
2. Productivity improvement =>
 - A. Value Stream Mapping in each 27 Work Centers to identify Kaizen Bursts
 - B. Reducing cycle time in each Work Centre to improve speed of virtual Line

Capacity mapping to produce 1 Air frame in every 4 days

- Order Qty:- 5 per month (60 / year)
- Total Time Available with 85% efficiency per Month= $25 \times 22 \times 0.85 = 467.5$ hrs
- TAKT TIME (3 Shift Basis): $467.5 / 5 = 93.5$ HRS = 4.25 Days ~ 4 days



Did VSM of each of the 27 work centres:

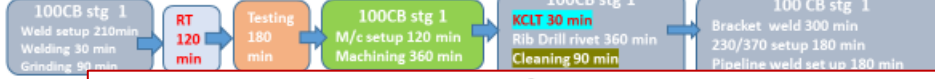
OCB manufacturing Sequence



F3 manufacturing Sequence 1000CB



F3 manufacturing Sequence - 100CB

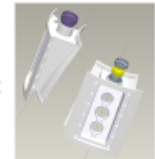


F3 manufacturing Sequence - 500CB

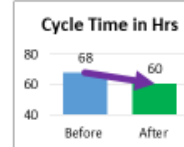
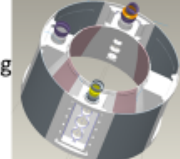


IMPROVEMENT IN CYCLE TIME FOR 0310-540CB PROCESS FLOW

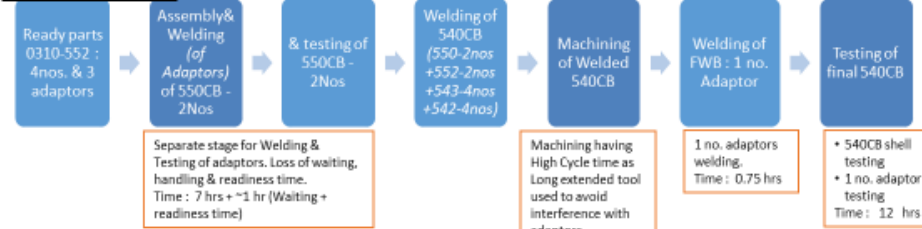
Old process
Adaptor welding at
0310-550CB



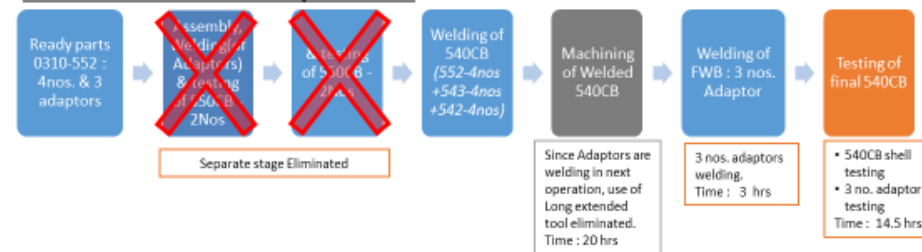
New process
Adaptor welding
at 0310-540CB



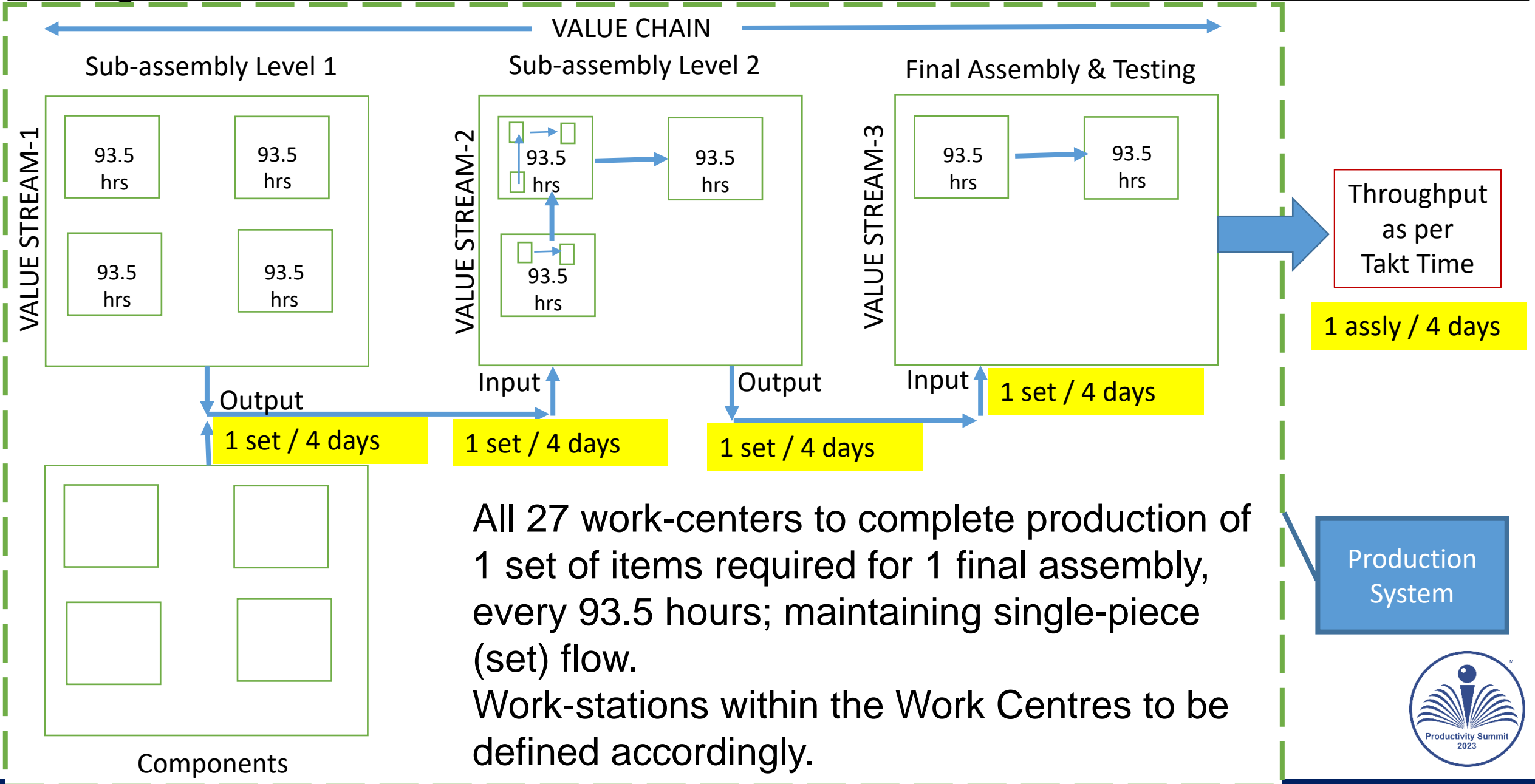
Old Process Flow



New Process Flow After Improvement



Design of the work stations in the value chain to meet the takt time



Consistency – A Key to increasing output.

Mapping of improvement areas & its results

Aera of Improvement	Problem faced	Action plan/ taken	Results achieved
Improve supplier Chain management	1.Inhouse capacity constrain. 2.Increased in demand was another challenge for Godrej.	1.New supplier to be identify outside Mumbai/Maharashtra. 2.Aerospace training to be give to existing supplier as well as new suppliers. 3.Capacity evaluation/mapping to be done for each suppliers.	1. 50 new suppliers were identified from different corners of Bharat based on their capabilities. 2. Trained them for Aerospace culture. 3. Got it approved from customer as well as from Government organization (MSQAA) & merge them into the mainstream.

Consistency – A Key to increasing output.

Mapping of improvement areas & its results

Aera of Improvement	Problem faced	Action plan/ taken	Results achieved
Automation	Conventional way of manufacturing which unable to take increased demand	<ol style="list-style-type: none"> 1. Identified 30 low-cost automation projects. 2. Get it sanctioned from management . 3. Implemented on shop with help of inhouse design team as well as from suppliers. 	<ol style="list-style-type: none"> 1. Saved Rs 10L/ Year
Kaizen burst		<ol style="list-style-type: none"> 1. Created a problem bank to achieve the target through brainstorming. 2. In each work centers targeted 2-3 mega Kaizen which further divided to multiple small kaizens. 	<ol style="list-style-type: none"> 1. More than 3700+ Kaizens identified and completed in past 3 years to reduce Cycle time by 40%. 2. Saved yearly Rs 2.5Cr. 3. Produced more number of articles.



Consistency – A Key to increasing output.

Mapping of improvement areas & its results

Aera of Improvement	Problem faced	Action plan/ taken	Results achieved
Quality	<ol style="list-style-type: none"> 1.Stringent quality requirements. 2.100% Witnessing from MSQAA and they work only on 2 shift basis. 3.Unable to run the shop 24x7. 	<ol style="list-style-type: none"> 1.Based on experience get the MSQAA confidence for QA stages delegation. 2.Improve quality system through digitization and visual control. 3.Bring consistence in manufacturing process through latest technologies. 	<ol style="list-style-type: none"> 1.Taken 90% QA stages delegation to Godrej QC from MSQAA. Only final level QA stages are now with MSQAA. 2.Now able to run the production shop 24x7. 3.All the resources now utilized in better way.

Consistency – A Key to increasing output.

Mapping of improvement areas & its results

Aera of Improvement	Problem faced	Action plan/ taken	Results achieved
Digitization	<ol style="list-style-type: none">1.In all functions there was a huge documentation process which was followed by hardcopy only.2. One Air frame required approx. 10000 pages of documents.3.It further create issue of documents handling and its prevention.	<ol style="list-style-type: none">1.Planned to convert all documents in soft format. (Eg. PS, IR, IP, WI)	<ol style="list-style-type: none">1.More than 85% of paperwork converted to digital format.2.15% documents are still in hard format as MSQAA wants to signed it physically.3.Planned to convert balance 15% also by digital signature.

Scheduling (Before)

Multiple jobs at a time in a single department

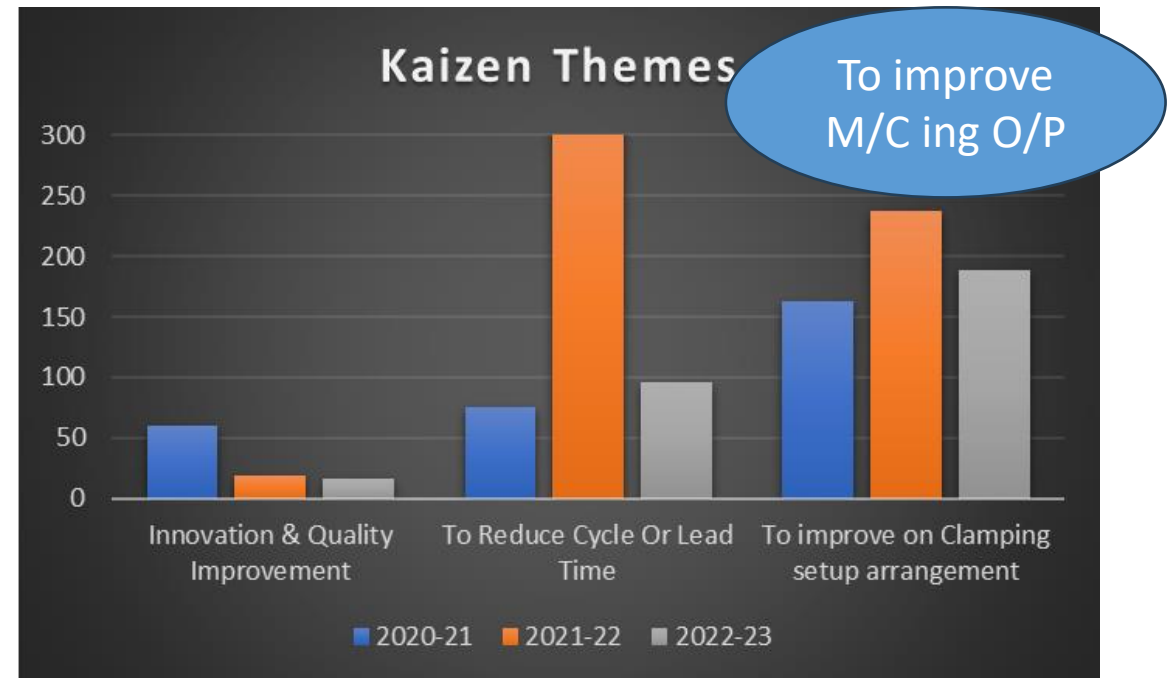
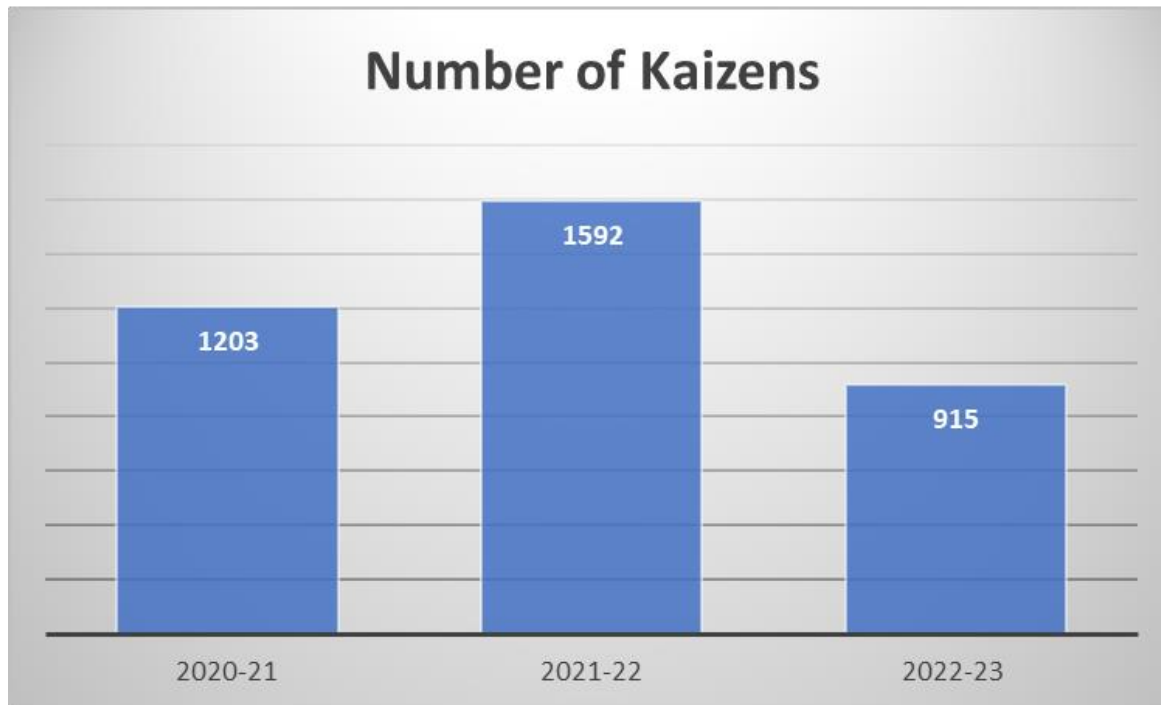
Job No	1	2	3	4	5
Departments					
Stores/Dispatch	X				
QC	X				
Surface Treat		X	X	X	
TEST		X	X	X	X
NDT			X	X	
Fabrication				X	X
QC				X	X
Machine Shop			X	X	X
Material					

Scheduling (after)

Line balanced at each work centers

Job No	1	2	3	4	5
Work Centers					
Stores/Dispatch	X				
QC	X				
OCB		X			
TEST		X			
1000CB			X		
100CB			X		
PIPELINES				X	
500CB				X	X
Shell Fab & M/C					X

3700+ Kaizens identified and completed in past 3 years to reduce Cycle time/ Lead time & to introduce SMED (Single minute exchange of die) culture.

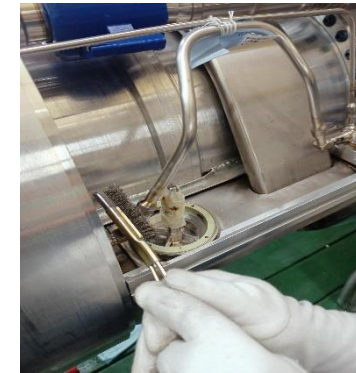


RECRUITED AND TRAINED THE TEAM

8D Training



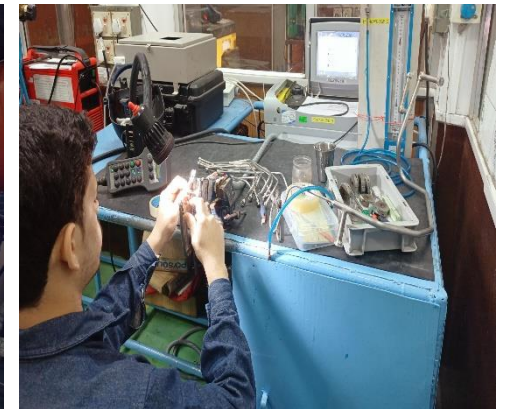
MSA + SPC Training



APQP- PPAP Training



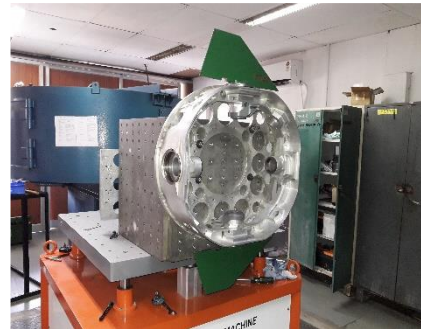
PFMEA-Control Plan



ADDED AND TRAINED ~ 40 NEW TEAM MEMBERS TO EXECUTE :

- COMPLEX AND PRECISION 3X , 5 X AND SPM MACHINING OPERATIONS
- SETUP, WELDING & QUALIFICATION IN ~50 TYPES OF JOINTS
- 800+ TYPES OF ASSEMBLY & TESTING PARTS
- 6000+ INSPECTION STAGES

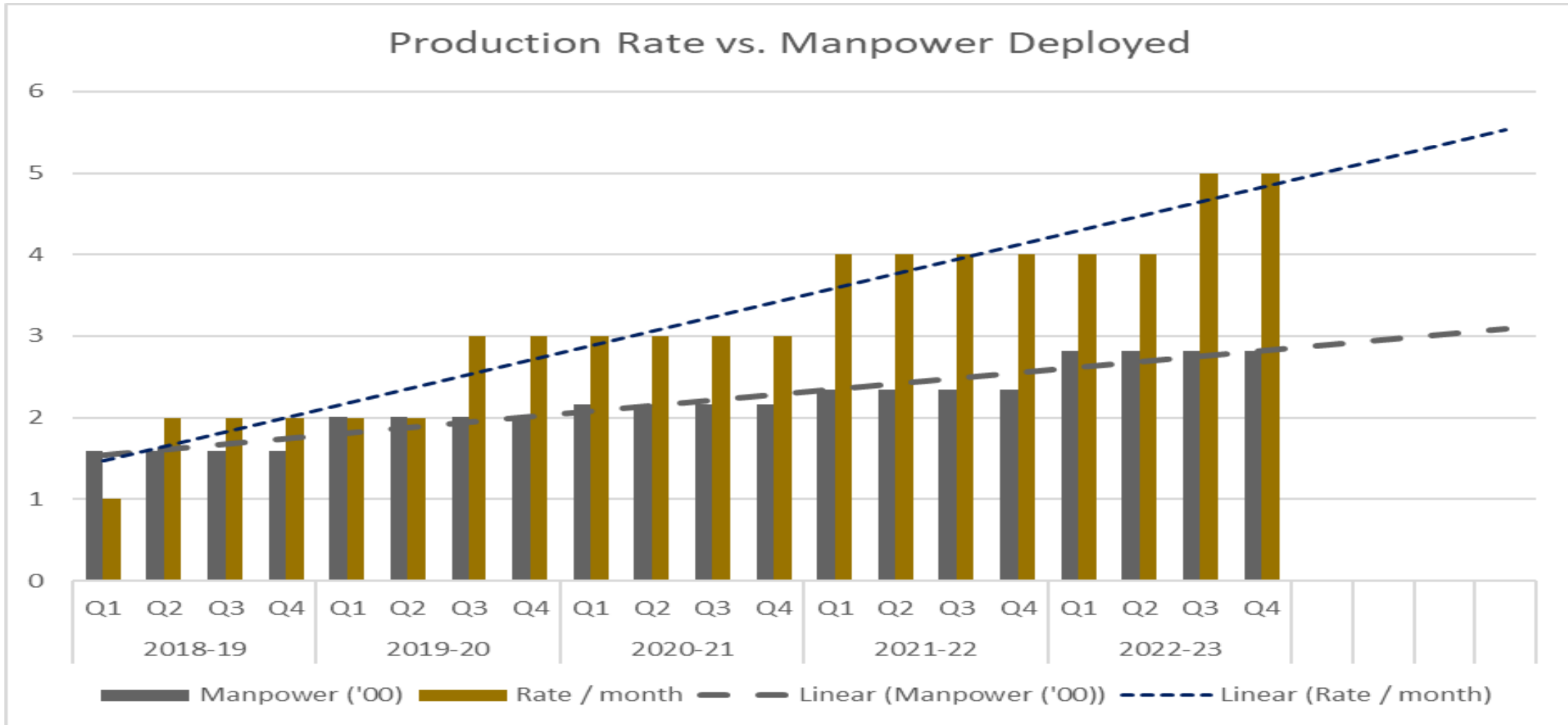
IMPROVING THE EXISTING FACILITIES



UPGRADED THE WELDING, RT AND TEST FACILITIES. IMPROVED HANDLING AND STORAGE TO CREATE 10% SPACE RELEASE FOR OTHER WCs

Results :

❖ While we increased rate of production 2.5 times (till Mar-23), we augmented manpower only by 1.8 times (no further addition planned till Mar-24) and infused capital only by 30%

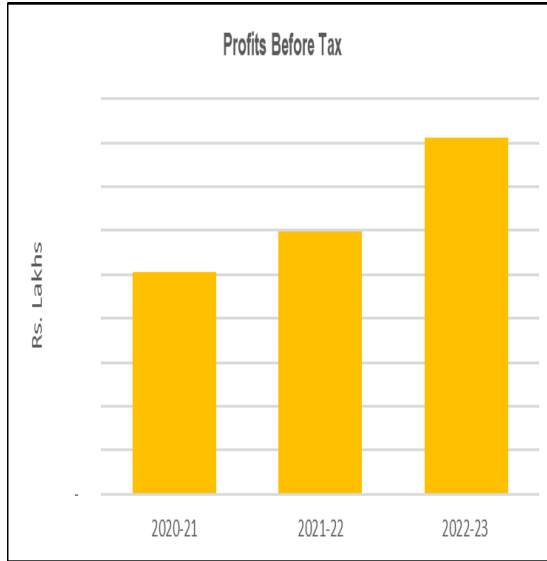


Results : Due to the focused work in Work Centers, we reaped benefits in all critical-to-success parameters viz. PQCDSME.

Parameters:	Before	After
1. Productivity details: Indicate metrics that showcase the productivity gains obtained.	Value Added/ Worker (27L p.a.)	Value Added/ Worker (39L p.a.)
2. Effort per Deliverable	2067 man-days	1454 man-days
3. Quality : Reduction of rejects and rework (First Pass Yield)	90.36%	93.78%
4. Direct Cost or Cost per piece/unit	Confidential	Confidential
5. Manpower cost (include all direct & indirect)	₹27 L / Deliverable	₹20.9L / Deliverable
6. Delivery (Nos. per month)	2 p.m.	5 p.m.
7. Safety Incidents (Nos. p.a.)	3 p.a.	1 p.a.
8. Input material	100%	95%
9. Net scrap after recycling	80%	40% (Target)



Business Impact :



Parameters:	Before	After
Share of business	50%	80%
Customer Satisfaction Index	85.8	93.4



Tools and Techniques learnt & used :

- ❖ TOC (Theory of Constraints)
- ❖ Work center concept
- ❖ TPM
- ❖ Line balancing
- ❖ IIoT and Digitization
- ❖ Low Cost Automation
- ❖ Vendor Cluster formation through vendor meets and distributed business.
(Outsourcing of lower-level Parts in the Value Chain and focusing more on higher-level Parts & Assemblies in-house)
- ❖ Supply chain and back-to-back agreements
- ❖ Improvement projects implementation related to P, Q, C, D, S, M, E
- ❖ Quality delegation through self certification
- ❖ Process capabilities and Journey towards zero defect



*THANK YOU
JAI HIND*

