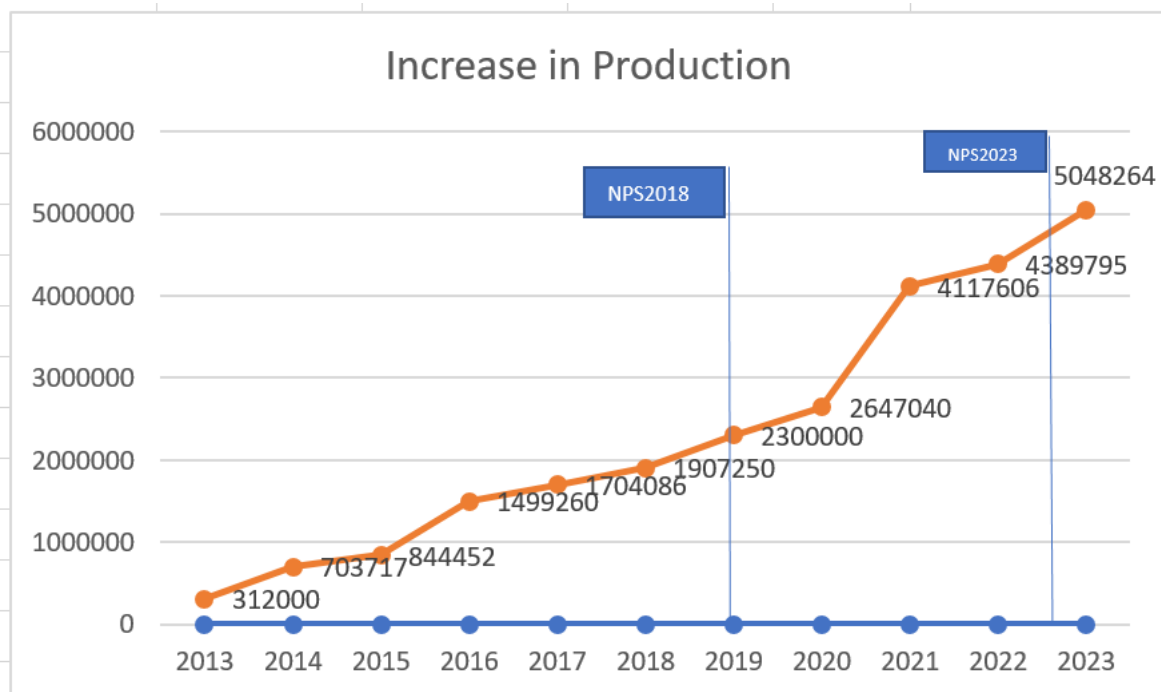


Brief description of the project.

Please state the objectives, scope of the project, its context, and the challenges under which the project was taken up. This being a Productivity Championship contest, the principal aim must be to showcase productivity of machine/line/ Project, people or material, or all of these. The challenges inherent in the project should be brought out. Clearly bring out the expected outcomes that were intended to be achieved (Please quantify)

Objective : To develop dedicated machine to produce more from less resources.

Background : We are precision component manufacturers for a leading gear pump manufacturer. We manufacture a component called bearing bush the volume is about 500000 pcs per month. It has 3 operations. We made robo integration for operation 20 and presented the case study during 2018 NPS in SME category. In this NPS of 2023, we have taken up OP30 of the same component.



What made your company to take up this project? Describe briefly.

Project triggers could be business need, customer requirement, business sustainability, competition, competitive advantage, need to minimize investment, optimize manpower, speed up outcomes or avert unsafe or poor environmental conditions etc. Please list the targets that were expected to be fulfilled by the project.

- Customer requirement increased year on year by 20% to reach 500000 pcs per month
- Single source supplier to the customer both India and Germany plant : So very reliable system is required
- To meet Customer expectation for YOY cost reduction by 2 % - 3%

Following parameters and targets were considered while deriving the solution :

Table : 1

Sl. No.	Description	Old method	Required new method
1	Manufacturing strategy	Flexible CNC Machines VMCs	Dedicated SPMs
2	No .of Machines	7 nos to produce required Qty	2 Machines to Produce Required Qty
3	Idle time to Cycle Timer ratio	54%	Eliminate Completely
4	Use of Pallet Changer	Not possible due to repeatability Issues	Fixed Column configuration to avoid repeatability Issues
5	Floor Space required	552 sqft	364 Sqft
6	Total Connected load	105KVA	61 KVA
7	Loading Unloading	Manual	Manual with less fatigue
8	No of Operators	14 (2 shifts of 12 hrs)	4 (2 Shifts of 12 Hrs)
9	Fatigue of Operator	Standing Posture	Sitting Posture
10	Nature of operators	Skilled	Semi Skilled
11	Coolant Tank	870	715
12	Initial investment	High	Moderate
13	Cost levels (in the scale of 100)	100	54 (40 % Cheaper)
14	Rejection levels	2 -3 %	Less than 1%

How did you generate the solution?

Explain how alternative solutions were developed and evaluated with analysis of data. This is a step that requires depth and skillful use of data and techniques. Describe the tools used. Solutions could be engineering or technology oriented, or application of industrial engineering / statistical methods or a combination of these. The engineering and detailing of the chosen solution, innovative approaches and complexity involved thereof could be elaborated.

Currently, 7 VMCs make this component to reach the required quantity of 500000 pcs per month i.e 20000 pcs per day. It was consuming lot of space, power, operators, coolant, rejections etc. The management decided to build 2 SPMs dedicated to produce the parts which consumed less space ,less power, less coolant, less tools, less operators, less rejections and still making the required quantity at lesser cost.

- As the volumes increased, it started becoming difficult to manage with the flexible Manufacturing system i.e. VMCs
- We thought of robot integration for all 7 machines, but it was quite expensive and not feasible due to productivity loss. : Hence dropped idea.
- We decided to develop 2 SPMs dedicated for the operation with the targets depicted in table 1
- We originally cameout with a concept of Rotary SPM. But the maintainability point of view and machine building complexity point of view the Idea of Rotary SPM was dropped.
- After several iterations of the SPMs we derived following desires / inferences of new SPM.

Table :2 : Desires / Inferences

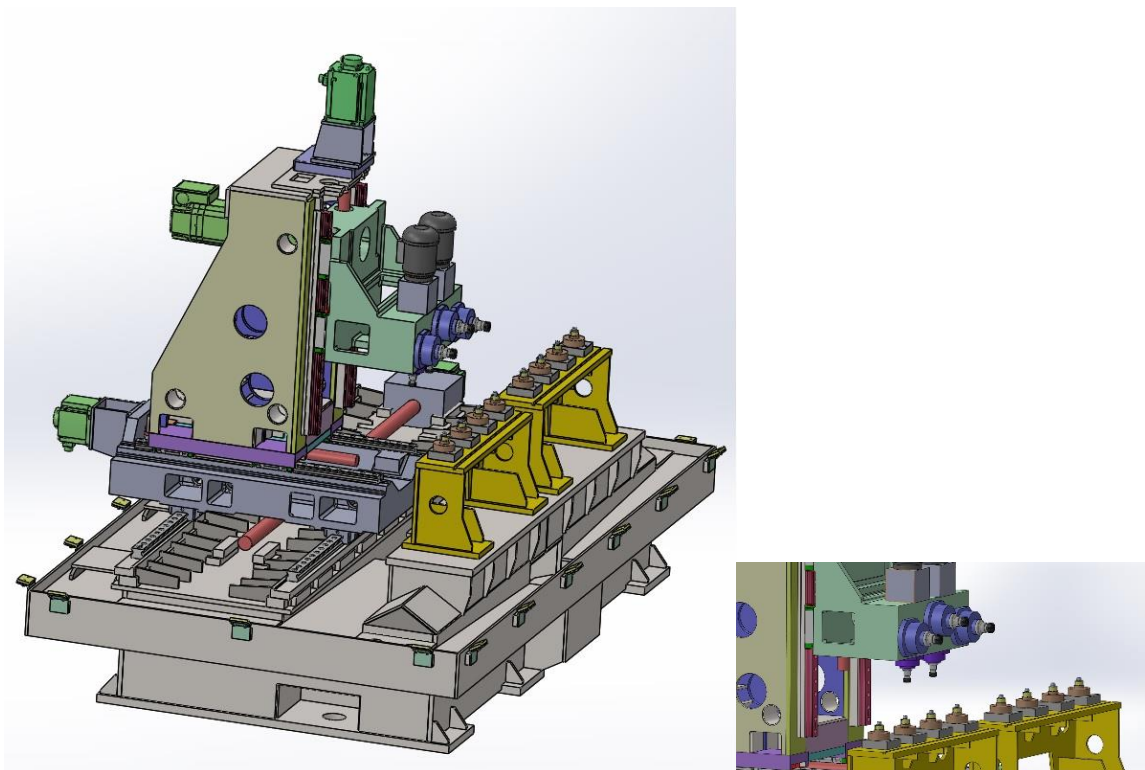
Sl. No.	Description	Desires / Inferences derived
1	Manufacturing strategy	Should be 5 Spindle SPM
2	No .of Machines	Because of Multi Spindle, many simultaneous operations were possible : So only 2 machiens should be sufficient
3	Idle time to Cycle Timer ratio	2 Stations configuration. One for Loading / Unloading and other for operations
4	Use of Pallet Changer	Component loading on fixed table so as to get maximum repeatability. Moving Column configuration required.
5	Floor Space required	Less floor space
6	Total Connected load	Less Power
7	Loading Unloading	Operator work reduced by 50% as one re-loading is completely eliminated
8	No of Operators	Only 2 machines with 4 operators one each for 12 hrs shift.
9	Fatigue of Operator	Operator to be in sitting posture
10	Nature of operators	No frequent offset correction , tool change etc. SO less skilled manpower should be sufficient
11	Coolant Tank	Less Coolant
12	Initial investment	In-House developed SPM
13	Cost levels (in the scale of 100)	Lot of cost savings
14	Rejection levels	Earlier 7 spindles and 3 tools in each operation $7 \times 3 = 21$ offset corrections, Thermal stabilization in 7 spindles , Several setting rejections resulting in too many rejections
15	Risk of Obsolescence	The developed CNC SPM machine should be convertible into Horizontal or Vertical Drilling Machine which can be used for any other purpose. (Only Spindle Head may go waste !)

Describe how the selected solution was implemented. (15 Points)

- Some of the aspects could be implementation details involving execution excellence that could include Roadmap, Challenges, Risk management, Innovation, Resource management, Technical and Managerial challenges, Consensus building and Teamwork.
- Please explain how the project incorporates “GREEN as a management concept”. Does the project have a positive impact on environment, natural resources, water, power, emissions, carbon footprint.

(5 Points)

- We approached leading SPM builders in the industry and the quotations and concepts were received.
- They were very high and not affordable to us.
- We decided to develop on our own taking examples of some component manufacturers like Sansera who builds their own machines.
- Thanks to the promoters experience of working in leading Indian Machine tool companies in Bangalore.
- Bangalore has a very good eco-system for machine tool business.
- We conceptualized, designed, developed the SPMs using external resources and internal resources.
- The machines were approved after statistical process capability and machine capability tests.



Picture 1 : Schematics of the machine

Also the machines were equipped with in-house developed cloud based machine monitoring systems which eliminated the production book writing.

Value Creation with Productivity as a focused theme.

Please show the overall impact of your project on the company – both financial and non-financial. What value was added? Is there a competitive advantage, in terms of price or quality, or ability to deliver quantities? Does it impact market standing or market share? Has a new technology been developed? Or a management method or technique? Are there patent applications or other IPR benefits? How sustainable are these outcomes over a period of time?

Table : 3

Mandatory parameters:	Before	After	Unit of Measurement
1. Productivity details: Indicate metrics that showcase the productivity gains obtained. (Output in relation to the inputs used)- These could include reduction of material in various stages such as raw materials/ semi finished goods/ WIP etc. that showcase efficiencies obtained	20000 pcs using 7 VMCs	20000 pcs using 2 SPMS	Nos
2. Reduction of rejects and rework	About 6000 pcs for 500000 pcs produced	Reduced to 2840 pcs for 500000 pcs produced	Nos
3. Quality	1.6% Rejection	0.7%rejection	%
4. Direct Cost or Cost per piece/unit	Ref Table - 4		INR
5. Manpower cost (Can include direct/ indirect labour/ contract/ temp resources and man-hours & overtime if any)	2,24,000/- per month	64,000/- per month	INR
6. Delivery & Safety	100 % delivery actualization with difficulty	100 % delivery actualization with stability	%
7. Safety	Less safe as operator enters operating zone	Safe as operator is isolated from operation zone	Attributive
8. Production MOnitoring	Manual	Through Cloud Based monitoring systems. Paper less	
9. Use of resources	More power, More coolant, More space, More operators More tools More offsets More rejections Less opn. stability More Capex and Opex	Less power Less Coolant Less Space Less No. of Operators Less tools Less Offsets Less Rejections More opn. Stability Less Capex and Opex	For quantitative figures please see table 4
(Note: Please add any additional parameters as applicable)			

Table : 4

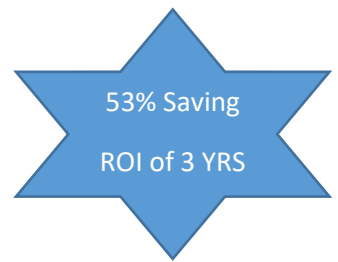
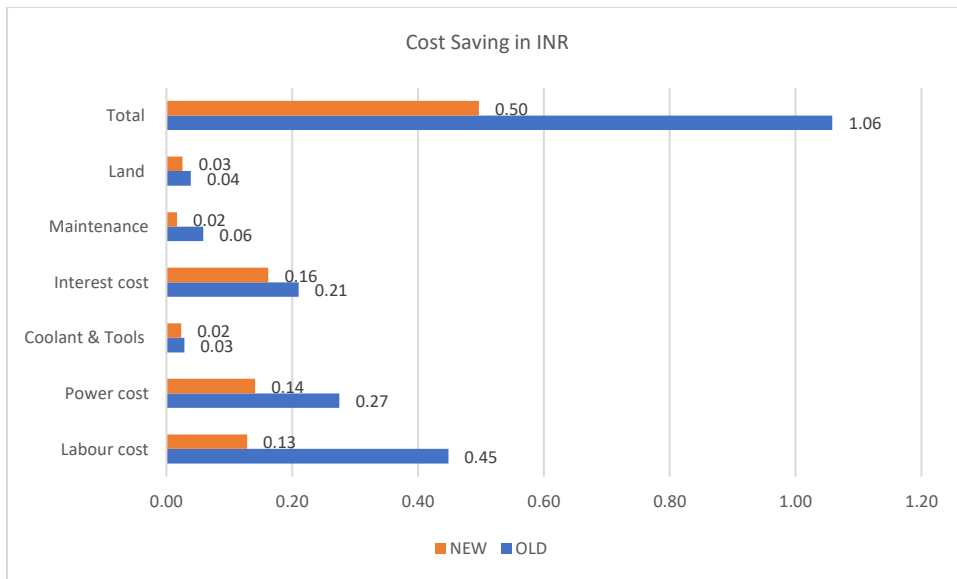
EXISTING COSTING :

Sl. No.	Cost Head	Description	Cost	No. ofPcs produced	Cost Per Pc
1	Labour cost	16 K x 14 people	224000	500000	0.45
2	Power cost	105 KW @ Rs.6.8	137445	500000	0.27
3	Coolant & Tools	870 Ltrs	14192	500000	0.03
4	Interest cost	9% of 1.4 Cr	105000	500000	0.21
5	Maintenance	50000 per mc over no. of compts producecd	29167	500000	0.06
6	Land	Rs.35 / sq ft (552 Sqft)	19320	500000	0.04
				Existing :	1.06

NEW COSTING :

Sl. No.	Cost Head	Description	Cost	No. ofPcs produced	Cost Per Pc
1	Labour cost	16 K x 4 people	64000	500000	0.13
2	Power cost	61 KW @ Rs.6.8	70455	500000	0.14
3	Coolant & Tools	715 Ltrs	11663	500000	0.02
4	Interest cost	12% of 100 Lakhs	81000	500000	0.16
5	Maintenance	50000 per mc over no. of compts producecd	8333	500000	0.02
6	Land	Rs.35 / sq ft (364 Sqft)	12740	500000	0.03
				New :	0.50

Comparison of results :



Describe how this project has a link to the future roadmap of the organization.

Elaborate on how this project is a part of larger gameplan (operationally / strategically) and could help the company to be competitive and how this will be sustained over a time period.

- Customer convinced about our commitment towards delivery , cost , quality.
- 7 VMCs which became free are available for other projects and new customer projects of Mid Volume and Mid Variety (Suitable for Flexible Machines) Eg. For current project ,we were using only 3 tools though the machines had 12 tool magazine. Pallets were not able to use. These are all usable now.
- Keeping one of the VMCs as back-up machine in case of any break-down of SPM.
- Plan for similar project for OP10 in the years to come based on the experience of building our OWN SPM by ourselves.
- Customer impressed about our technical capabilities.
- Our factory has become a factory of Bush Excellence which has attracted another multinational company for the same product.

Resource impact. (10 points)

What is the impact of your project on resources? Eg. Energy savings, reduction/ elimination of waste generated and/or toxic material, preserving natural resources, user and societal safety enhancement, mitigation of pollution/emission effects, reduction in Carbon footprint and so on.

1. Water / Power/ Utilities such as Compressed Air/ Lubricant / Coolant etc. :Covered in table 4
2. Commodities / other direct / derived resources used as applicable : Covered in table 4
3. Emission reduction / elimination as appropriate : NA
4. Waste reduction/ elimination as appropriate : Covered in table 3 Reduction in rejection
5. Patents / IP etc. : Not applied

(Segmented details, as applicable may be shared in a tabular column with 'Before & After' and its Unit of measurement) **Graphical illustrations with 3 year data to be submitted**

Parameters:	Before	After	Unit of Measurement
1			
2			

(Note: Please add any additional parameters as applicable)			
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Business metrics. (10 points)

Please share details of the impact on the Business and stakeholders;

- Market share / sales volume / Competitive market position (Indexed figures are permitted),
- Internal service level adherence (SLA), Customer satisfaction scores/ ratings.

(Segmented details, as applicable may be shared in a tabular column with **'Before & After'** and its Unit of measurement) **Graphical illustrations with 3 year data to be submitted**

Parameters:	Before	After	Unit of Measurement
1 Cost per pc	1.06 INR	0.5 INR	INR
2 Rejections	1.6%	0.7%	%
(Note: Please add any additional parameters as applicable)	Covered in section table 4		

Scope for horizontal deployment. (5 points)

Can the ideas, principles, concepts or techniques developed by you be implemented in other areas in your company and in similar / other industry? Give brief details with the associated impact.

- Plan for similar project for OP10 in the years to come based on the experience of building our OWN SPM by ourselves.
- Our factory has become a factory of Bush Excellence which has attracted another multinational company for the same product.