Improving Productivity Using Automation Process

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ABSTRACT

The Yoke sleeve is mostly used in the transmission shaft in automotive sector. The past manufacturing process for manufacturing the yoke sleeve is conventional. As it is very time consuming and costly it is not getting feasible in previous finalized rates. The fixtures used in this is more complicated and time consuming. So, to solve this problem industry want to change the process and make it automation oriented. We are going to change the process of manufacturing the yoke sleeve by replacing the fixtures, tooling, gauges or eliminating some process. With the help of automated machines, the process is going be more productive and user-friendly. The process replacement will increase the productivity, user-friendly. The quality will be very much better than previous conventional one. The rate of reproducibility will be increased. As the process will be more stable the rejection rate is reduced. Tooling life is more.

Keyword: - *Yoke Sleeve, Automation, Productivity, User-friendly, transmission shaft, tooling, gauges*

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1. Introduction

Power transmission system consists of several components like yoke assembly, propeller shaft, differential. The yoke assembly consists of two forged steel yokes joined to the two shafts together. A spider hinges are used to connect two yokes together in such way that faces of both yokes situated at right angle to each other. An automotive drive train is an assembly of one or more driveshaft, universal joint, and slip joint that forms the connection between the transmission and the drive axle. The function of drive train is that it allows the driver to control the power flow, speed and multiple the engines torque. A universal joint (U joint) is a joint in a rigid rod that permits the rod to move up and down while spinning in order to transmit power by changing the angle between the transmission output shaft and the driveshaft. The most common types of U joint used in automotive industry is Hooke or Cardan joint. A basic U joint consists of driving yoke, driven yoke, spider and trunnions. Each connection part of the spider and trunnion are assembled in needle bearing together with the two yokes. In the transmission system of a motor vehicle, the transmission main shaft, propeller shaft and the differential pinion shaft are not in one line, and hence the connection between them is made by the universal coupling. One universal joint is used to connect the transmission main shaft and the propeller shaft, other universal joint is used to connect the other end of the propeller shaft and the differential pinion shaft.

Fig -1: Yoke Sleeve

1.1 Problem Statement

1. The Yoke sleeve has been manufactured from conventional process in the past 30 years ago, with a large process time and rejection percentage.
2. High cost of manufacturing.
3. Time Required is more

1.2 Objectives

1. To Develop an Automated Process.
2. To Reduce the Running cost.
3. To Increase Productivity.
4. To Reduce cycle Time.

2. Methodology

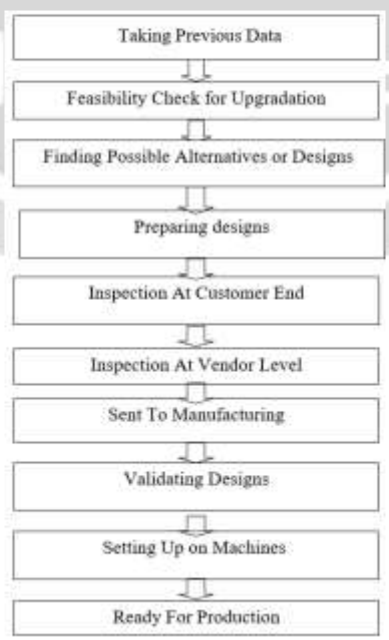

Fig -2: Methodology

2.1 Literature:

[1] K.M.Arunraja, S.Selvakumar and P.Praveen, “Welding Fixture Optimization for Sheet Metal Components using DOE”, According to their Work, Most of the studies Finite Element Software (ANSYS) used for predicting Workpiece elastic deformation. The fixturing elements such as locating and clamping positions are considered as point contact.

[2] H. Bayrakceken , S. Tasgetiren, I. Yavuz, Two cases of failure in the power transmission system on vehicles: A universal joint yoke and a drive shaft, according to their Work, Analyzed fracture analysis of a universal joint yoke and a drive shaft of an automobile power transmission system. For the determination of stress conditions at the failed section, stress analyses are also carried out.

[3] Aditya Gandhi, Aradhya Gupte, Shourya Gorivale, Mihir Khedkar, Prof. Mrs. S. A. Dhavale, Principles for Effective Design of Fixtures, According to their Work, The efficiency and reliability of the fixture design has enhanced by the system and the result of the fixture design has made more reasonable. To reduce cycle time required for loading and unloading of part,this approach is useful.

[4] Shailesh S.Pachbhai, Laukik P.Raut, A Review on Design of Fixtures, This papers refers to numerous clamping methodologies that different authors has implemented. Fixture design technique, basic rules of fixture design.

[5] Luma adnan Alkindi, Halla Atiya, A Systematic Literature Review of Design & Manufacturing for Sustainable Product, this paper refers to literature review on design and manufacturing of product. Optimum design features.

3. Comparison Between Productivity of Conventional And Automated Process

Sr no.	Old Process	Cycle Time (Min)	New Process	Cycle Time (Min)
1.	Facing centring 15 Nos per hour	3	Centring 15 Nos per Hour.	10 sec
2.	Between centre OD Turning 12 Nos per hour.	3	OD Turning 20 Nos per hour	2
3.	Main Hole drilling 7 Nos per hour	7	-	-
4.	ID Finish 10 Nos per hour.	5	ID Finish 15 Nos per hour.	4
5.	Cross Hole 8 Nos per hour.	6	Cross Hole 15 Nos per hour.	3
6.	Chamfering 46 Nos per hour	1.30	Chamfering 46 Nos per hour.	1.30
	Total Time	25.3 per unit	**Total Time**	11 per unit

Table-1: Comparison Between Productivity of Conventional And Automated Process

3.1 Productivity (Old Process)

Productivity per shift= Monthly Production/Days

= 5000/26

= 193 per day

Productivity per shift= 193/2

= 97 per shift

3.2 Productivity (New Process)

Productivity per shift= Monthly Production/Days

= 10000/26

= 384 per day

Productivity per shift= 384/2

= 192 per shift

4. Costing of Conventional and Automated Process

4.1 Costing of Conventional Process

Operation Parameter	Facing Centring	Between centre OD Turning	Main hole Drilling	ID Finish	Cross hole	Chamfe ring	Per Hour
Power	26.4	72	114	90	54	26.4	383
Labour	44	44	50	50	44	44	276
Factory (per day)	66	66	66	66	66	66	396
Overhead	30	40	50	30	40	50	200
Total	Rs.166.4	Rs.222	Rs.280	Rs.236	Rs. 204	Rs.186.4	Rs.1255

Table-2 Costing of Conventional Process

4.1.1 Calculations for Costing of Conventional Process

Costing per Unit= (facing centring+ Between Centre OD turning+ Main hole drilling+ ID Finish+ Cross hole+ Chamfering)/6

= (11.09+18.5+40+23.6+25.4+4.05)/6

Costing per Unit = 122.64 per unit.

4.2 Costing of Automated Process

Operation Parameter	Facing Centring	Between centre OD Turning	ID Finish	Cross hole	Chamfering	Per Hour
Power	26.4	90	114	90	26.4	347
Labour	40	57	57	57	40	251
Factory (per day)	40	90	90	40	40	300
Overhead	50	60	50	50	50	260
Total	Rs. 156	Rs. 297	Rs. 311	Rs. 237	Rs. 156	Rs. 1163

Table-2 Costing of Automated Process

4.2.1 Calculations for Costing of Automated Process

Costing per Unit= (Centring+ OD turning+ ID Finishing+ Cross hole+ Chamfering)/5

= (17+15+23+19+5)/5

Costing per Unit = 79 per unit.

5. CONCLUSIONS

In conclusion, the development of our project has been a resounding success, meeting our objectives of creating a user-friendly environment, improving productivity by reducing the rejection rate which occurred during the old process. Throughout the project, we followed a systematic approach, starting with extensive research and analysis of available data. We then proceeded to design and develop the fixtures. The results and findings from testing and feedback have been overwhelmingly positive. Upon evaluation, we found that the project successfully met its objectives. The project was completed within the defined budget and timeline, showcasing our team's efficiency and commitment. Throughout the project, we encountered some challenges, such as optimizing the process and reducing overall cost. However, our team collaborated effectively, utilizing agile development methodologies to address these obstacles promptly. Based on the lessons learned, we recommend further research and development to expand the production and plant size. Additionally, ongoing maintenance and updates will be crucial to ensure the system or environment remains up-to-date and compatible with evolving technologies. We would like to express our gratitude to the project team members for their dedication and expertise throughout the development process. We are proud of the outcomes of this project and look forward to its continued success in the future.

6. REFERENCES

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