

Review Paper on Productivity Enhancement through Development of Welding Fixture

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ABSTRACT

Productivity improvement is to do the right things better and make it a part of continuous process. Therefore it is important to adopt efficient productivity improvement technique so as to ensure individuals and organizations growth in productivity. Productivity is the ratio between output and input. It is quantitative relationship between what we produce and what we have spent to produce. Productivity is nothing but reduction in wastage of resources like men, material, machine, time, space, capital etc. Fixture is required in various industries according to their application. Design of new fixture is a modified over the old fixture due to some drawback. The fixture setup for component is done manually therefore more cycle time is required for loading and unloading the material. So, there is need to develop system which can help in improving productivity, accuracy and reduction of time.

Keywords: - Productivity, Fixtures, Lead Time

1. INTRODUCTION

Productivity improvement is to do the right things better and make it a part of continuous process. Therefore it is important to adopt efficient productivity improvement technique so as to ensure individuals and organizations growth in productivity. Productivity is the ratio between output and input. It is quantitative relationship between what we produce and what we have spent to produce. Productivity is nothing but reduction in wastage of resources like men, material, machine, time, space, capital etc. It can be expressed as human efforts to produce more and more with less and less inputs of resources so that there will be maximum distribution of benefits among maximum number of people. Productivity denotes relationship between output and one or all associated inputs. Productivity in any organization is the crucial area for controlling and optimizing. As the productivity increases ultimately causes increase in the profit and this is the ultimate goal of the growing organization. Productivity is the area of interest as it has a vast variable factor which upon optimizing produces vital results.

$$\text{Productivity} = \text{Output} / \text{Resource utilized}$$

Fixture is required in various industries according to their application. Design of new fixture is a modified over the old fixture due to some drawback. The fixture setup for component is done manually therefore more cycle time is required for loading and unloading the material. So, there is need to develop system which can help in improving productivity, accuracy and reduction of time. Over the past century, manufacturing has made considerable progress. New machine tools, high-performance cutting tools, and modern manufacturing processes enable today's industries to make parts faster and better than ever before. The work holding methods have also advanced considerably, the basic principles of clamping and locating are still the same. Mass production methods demand a fast and easy method of positioning work for accurate operations on it.

2. LITERATURE REVIEW

Prit Shah et al. [1] proposed the modular welding fixture to enhance the productivity. Design consists of designing the frame structure for the maximum allowable load on the table. Different elements are used for location and how the same elements can be rearranged for different shapes and sizes of workpiece and hence the same fixture can be used for infinite number of arrangements.

Soosung Kim et al. [2] studied design and fabrication of remote welding equipment. The remote welding equipment for nuclear fuel bundle fabrication in a hot-cell was designed and developed. To achieve this, a preliminary investigation of hands-on fuel fabrication outside a hot-cell was conducted with a consideration of the constraints caused by the welding in a hot-cell. Some basic experiments were also carried out to improve the end-plate welding process for nuclear fuel bundle fabrication.

S.N. Shinde et al. [3] designed the fixture which reduces cycle time and operator labor while increasing functionality; and allows complex welding operations to be completed on simple two axis welding arms.

Bing Li et al. [4] proposed the quality design of fixture planning for sheet metal assembly. A quality design model of fixture planning for sheet metal assembly with resistance spot welding is then developed; both the performance expectation and the variance are considered in the formulation of the objective function.

H. Nalbandh et al. [5] reviewed the optimized fixture design using genetic algorithm. Genetic Algorithm method has been selected as optimization of fixture design. The author presented a brief review of Fixture Design optimization and Genetic Algorithm integration in terms of fixture layout, clamping position and part deformation

Biswajit Parida et al. [6] developed a clamping system and an instrumented setup for a vertical milling machine for friction stir welding (FSW) operations and measuring the process forces. Taking into account the gap formation (i.e., lateral movement) and transverse movement of the workpiece, a new type of adjustable fixture was designed to hold the workpiece being welded.

Yasunova T.A et al. [7] studied Influence of tool shape on friction stir welded joint of aluminum and steel with circular weld line is used to achieve the circular weld line was performed, and effect of welding tool shape was investigated for improving the weldability.

Naveen A M et al [8] Studied the Design And Analysis Of Welding Fixture For Motor Case Assembly. The motor case assembly is approximately about 4 meter length of assembly .which have welded for the brackets and ducts on the motor case assembly. Required tolerances on the motor case assembly the shaft/support pipe is designed as a main part of the welding fixture and the different parts are mounted on this shaft / support pipe.

Kalpesh Khetani et al. [9] studied about design and thermal stress analysis of welding fixture of a brake pedal of tractor by using ANSYS Workbench 14.5 From results of the thermal analysis they have observed by the graph. They found that the temperature Variation with respective time and also observed by thermal stresses are distributed around welding points.

Omkar Joshi et al [10] studied the Design and Analysis of Welding Fixture for Orbital Welding Machine. Fixture required Specialization to accurately hold the work-piece during the welding operation. The Fixture designed hold job and rotate the job at required Speed. The reduce cycle time and operator labor while increasing functionality. The analysis is done by transmitting shaft Stress analysis. The design solve problem and new calculation value are find out.

Yogesh Ingale et al. [11] designed and analyzed of Welding Fixture for Inlet Header of Shell and Tube Heat Exchanger, Design, modeling and analysis of welding fixture components for inlet header of shell and tube heat exchanger. The V locators, Clamp Wheel, Side Bracket and supporting plates are used for locating, clamping the inlet header and to get dimensional accuracy and constrain Degree of Freedom (DOF) completely

Jigar D Suthar et al [12] designed and fabricated the fixture for welding an exhaust impeller. The structure of impeller itself as fixture and which has been resulted in the reduction of distortion producing welding.

Chetan D. Borse et al [13] proposed the welding fixture for the body of a stone crusher. Fixtures are used to securely locate and support the work, ensuring that all parts produced using the fixture will maintain conformity and interchange ability. The material used in the manufacture of different parts of body of a stone crusher is Mild steel which is one of the most commonly used materials in the field of fabrication. In weld fixture by using UNIGRAPHICS NX8.0

Vaishak bhandary M et al [14] investigated the Robot Full Welding Fixture for Front Chassis of Wheel Loader. In machining fixtures, minimizing work piece deformation due to clamping and cutting forces is essential to maintain the machining accuracy. The fixture set up for component is done manually. For that more cycle time required for loading and unloading the material. So, there is need to develop system which can help in improving productivity

and time. Fixtures reduce operation time and increases productivity and high quality of operation is possible. Analysis is done on modified model to find stress and deflection using hyper mesh software

A. M. Mhaske et al [15] introduced the Finite Element Analysis of Load all Inner Boom using ANSYS 14 software. The geometry of Load all Inner Boom is prepared in CATIA software as per the design considerations. After generating 3D model in CATIA software, convert model in IGES and STEP format and analyzed it using ANSYS 14 software Finite Element Analysis (FEA) has been realized in simulating the assembling process in order to predict the possible variation of the interested feature on a complex assembly due to deformations.

C. A. Kubade et al [16] presented design and analysis of Welding Fixture for Automotive Component using FEA The Materials are selected as per functional requirements and based on previous designs. The general arrangement is made and fixture is designed with the use of analytical method which includes pneumatic cylinder selection, L-shaped bracket design and positioning of units. Power clamps and LM guides are selected as per the fixture requirements.

Sharma H et al [17] experimentally Analyzed the Friction Stir Welding of Dissimilar Alloys AA6061 and Mg AZ31 Using Circular Butt Joint Geometry is used stir welding of size and shape parts has to be weld very common are circular and straight welds.

Raut .M et al [18] reviewed on design of fixtures in which The efficiency and reliability of the fixture design has enhanced by the system and the result of the fixture design has made more reasonable.

Yong .G et al [19] proposed the design and fabrication of MIG welding jigs tends for designing and fabrication of the MIG welding jigs, 5 concepts were designed in order to find for the best concept.

Girish V et al [20] design of Welding Fixtures and Positioners are use to the process of conducting operations related to welding fixture and positions help in gaining a deeper understanding as well as effective project process.

Shinde A et al [21] design of Welding Fixture for Head End Sub-Assembly of Motor Case are design practice of the welding fixture and at the bottom of clamp plate the arsenic copper provide the support so that there is no effect of clamping force on the part head end sub-assembly.

Simon et al [22] designed spot welding trainer for body shop assembly line by using a test plate that is clamped to the new teaching aid, it can help to reduce parts problem. The advantages of this welding jig are it can be located in many different angles.

Okechukwu E et al [23] investigated the design and need for Jigs and Fixtures in Manufacturing to adequate strength and rigidity, mild steel with 16 millimeters in diameter was chosen for the design of a sample jig and fixture for the making of jigs of fixtures.

Singh M et al [24] studied the interpretation and implementation of Some Aspects of Welding Process and Fixture for Increasing SPR in Manufacturing Industry developed welding fixtures that able to clamp workpiece and reduce the rejection ratio in production. Clamping design and common welding jigs material was studied in order to design and generate concept for the MIG welding jigs

Anbarasan I et al [25] designed and fabricated of jig and fixture for hollow cylindrical component in drilling machine concluded that the project design and fabrication of a jig and fixture holding and indexing of the circular job is made easy.

2.1 Critical Literature Review

Paper Name	Author Name	Objectives	Remarks
Design And Analysis Of Welding Fixture For Motor Case Assembly	Naveen A M, V A Girisha, Pruthvi H M	To design Welding Fixture To analyzed welding fixture	Design and analysis of welding fixture for motor case assembly
Design and Thermal Stress Analysis of Welding Fixture of a Brake Pedal	Kalpesh Khetani, Jafar Shah, Vishal Patel	To analyze fixture	Thermal Stress analysis
Design And Analysis Of Welding Fixture For Orbital Welding Machine	Omkar Joshi, Dr. Arunkumar	To design Welding Fixture To analyzed welding fixture	Design and analysis of welding fixture for orbital welding machine
Design and analysis of fixture for welding an exhaust impeller	Jigar D Suthar, K.M Patel, Sanjay G Luhana	To design Welding Fixture To analyzed welding	Proposed welding fixture for an exhaust impeller

		fixture	
Design and analysis of the welding fixture for the body of a stone crusher.	Chetan D. Borse, Prasad V. Thete, Ravi, P. Vishwakarma, Jainendrakumar S. Yadav	To secure the work piece with at most interchangeability.	securely locate and support the work, ensuring that all parts produced using the fixture will maintain conformity and interchange ability
Design and Analysis of Welding Fixture for Tacking and Welding of Inner Boom of Loadall Handler	A. M. Mhaske, R. M. Metkar, S. D. Hiwase	To design and analyzed welding fixture	Finite Element Analysis (FEA) is used for analysis and CATIA for drafting
Design and Analysis of Welding Fixture for Automotive Component using FEA	C. A. Kubade , Dr. S.V. Patil , Mr. V. P. Pati	To select the material for fixture	Finite Element Analysis (FEA)

Concluding Remarks

- [1] Many of the researchers had gone through the design and analysis of the different welding fixtures
- [2] While dealing with varying manufacturing environment the need of the welding fixture is immensely arises
- [3] There is a substantially change in the basic requirement of the different components fixtures
- [4] Fixture design requires greater time and it is a complicated process
- [5] Modification of fixture is required as per necessity
- [6] Fixture is most widely used in varieties of industries
- [7] Various software are useful for design and analysis
- [8] Some of the developments are carried out in view of weight reduction of fixture

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