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"TEST RIG DESIGN FOR STOP LOG TESTING: A REVIEW"

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ABSTRACT

The project was assigned by AECOM Asia Co. Ltd. and its aim was to design a well functioning test rig for testing of their stop log units. The designe of new test rig's should be based on criteria of testing is given by the AECOM Asia Co. Ltd. for this we need to know how can we develop a test rig and fixture to hold job and perform test on it. This study includes servey of literature and bringout a concept for the same and analys the model against total deformation and equivallent stress.

Keyword: *FEA, Stop-Log AECOM, SPM (Special Purpose Machine)*

I. INTRODUCTION

Stoplogs are hydraulic engineering control elements that are used in floodgates to adjust the water level or discharge in a river, canal, or reservoir. Stoplogs are sometimes confused with flashboards, as both elements are used in bulkhead or crest gates. Stoplogs are typically long rectangular timber beams or boards that are placed on top of each other and dropped into premade slots inside a weir, gate, or channel. Present day, the process of adding and removing stoplogs is not manual, but done with hydraulic stop log lifters and hoists.

Since the height of the barrier can only be adjusted through the addition and removal of stoplogs, finding a lighter and stronger material other than wood or concrete became a more desirable choice. Other materials, including steel and composites, can be used as stoplogs as well. Stoplogs are designed to cut off or stop flow through a conduit.

Fig: 1.1 Stop Log picuture

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Stoplogs are modular in nature, giving the operator of a gated structure the ability to control the water level in a channel by adding or removing individual stoplogs. A gate may make use of one or more *logs*. Each log is lowered horizontally into a space or bay between two grooved piers referred to as a stop log check. In larger gate structures, there will be multiple bays in which stoplogs can be placed to better control the discharge through the structure.

Stoplogs are frequently used to temporarily block flow through a spillway or canal during routine maintenance. At other times stoplogs can be used over longer periods of times, such as when a field is flooded and stoplogs are being used in smaller gates in order to control the depth of water in fields. The logs may be left in and adjusted during the entire time that the field is submerged.

In most cases, the boards used are subjected to high flow conditions. As individual stoplogs begin to age they are replaced. Typically small amounts of water will leak between individual logs.

II. PROBLEM STATEMENT

When we are consider a mass production of stop logs for the dam and accuracy and sustaniny of logs against failure is required, then we need to test each log before installation on the dam. For this purpose client "***AECOM Asia Co. Ltd.***" are seeking a rig which can test the quality of stop logs through a test fixture or rig. For developing a test rig we need to do some study about the parameters affecting rig design and what mechanism should be installed to get exact testing enviorements as manually testing does and speed of testing will be the main part for new fixture design.

III. LITERATURE REVIEW

Li Hui, Chen Weifang, Shi Shengjie [1] represented **"Design and Application of flexible fixture".** The Flexible Fixture has been applied in many areas because it can adapt to the workpiece shape and size change, such as aircraft integral structure parts manufacturing, and air surface parts manufacturing , aircraft assembly. Due to the use of flexible fixture, greatly reducing the manufacturing cost and improves the production efficiency. The design of flexible clamping platform is studied and the application is showed in a case. Through comparing the simulated results, it is found that flexible fixture with the follow-up support has higher accuracy.

M. Calabrese, T. Primo, A. Del Prete[2] described the "**Optimization of machining fixture for aeronautical thin-walled components**". The optimization of the fixtures performance used in thin-walled workpiece machining depending on the local rigidity characteristics of the component to be machined. An extensive topology optimization activity has been performed both on fixture-workpiece systems modelled with shell elements and on fixture-workpiece systems modelled with solid elements, varying the topology design variables and/or optimization constraints for each optimization problem, in order to provide a new design of fixture. Finally, a new blended Solid-Lattice design of the fixture, starting by the design topologically optimized, has been created. In this way, it has been possible to identify void regions in the design space, where the material can be removed, regions where solid material is needed, and regions where lattice structure is required. This has allowed to generate the optimal hybrid or blended solid-lattice design based on desired functionality of the part having as natural consequence the definition of a new method for fixtures design.

Abhishek Das, Pasquale Franciosa and Darek Ceglarek [3] studied on "**Fixture Design Optimisation Considering Production Batch of Compliant Non-Ideal Sheet Metal Parts**". He told that Fixtures control the position and orientation of parts in an assembly process and thus significantly contribute to process capability that determines production yield and product quality. As a result, a number of approaches were developed to optimise a single- and multi-fixture assembly system with rigid (3-2-1 fixture layout) to deformable parts (N-2-1 fixture layout). These approaches aim at fixture layout optimisation of single ideal parts (as define by CAD model). However, as production yield and product quality are determined based on a production volume of real (non-ideal) parts. Thus, major

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challenges involving the design of a fixture layout for assembly of sheet metal parts can be enumerated into three categories:

(1) non-ideal part consideration to emulate real part;

(2) 'N-2-1' locating scheme due to compliant nature of sheet metal parts; and,

(3) batch of non-ideal parts to consider the production process error at design stage. He presents a new approach to improve the probability of joining feasibility index by determining an N-2-1 fixture layout optimised for a production batch of non-ideal sheet metal parts.

The proposed methodology is based on:

(i) generation of composite parts to model shape variationwithin given production batch;

(ii) selection of composite assembly representing production batch;

(iii) parameterisation of fixture locators; and

(iv) calculation of analytical surrogate model linking composite assembly model and fixture locators to probability of joining feasibility index. The analytical surrogate model is, then, utilized to maximize the probability of joining feasibility index starting from initial fixture locator layout. An industrial case study involving assembly process of remote laser welded door assembly illustrates and validates the proposed methodology.

R. Förstmann; J.Wagner; K. Kreisköther; A. Kampker; D. Busch [4] represented the Design for Automation: The Rapid Fixture Approach. Agile product development and prototyping requires tools and methods for the agile provision of production equipment such as load carriers, simple handling or assembly fixtures. Also assembly lines with a high number of variants ask for production equipment which either can be used by all product variants or can be reconfigured in regard to the actual assembly task. Automation of design processes and additive manufacturing are two enablers which allow to quickly generate the regarded design documents and to setup a piece of equipment immediately. For an assembly line this allows a constant reconfiguration of production equipment and tools depending on the product sequence. Therefore, general production equipment design rules were established, which enable an automation of the underlying design processes in order to quickly redesign the equipment. These designs rules where then implemented into a Solid Works Add-in which is now used to automatically design load carriers and simple assembly fixtures. With this software tool, the Rapid Fixture concept is tested using the example of the Street Scooter variant line inside the RWTH Aachen Ramp-up Factory. In the current application load carriers for the front seat and a letter box are designed using the software tool. The applied design rules allow to quickly reconfigure load carriers as needed in regard to the design output of the software tool when new vehicle type derivates are integrated into the line. They presents the underlying design rules, the general concept of the automation algorithms and first results of the application at the variant line.

Jigar D Suthar [5] published a paper on **Design and analysis of fixture for welding an exhaust impeller**. Drum mix plant used for mixing of concrete and other raw materials used in road construction. Impeller is used in the exhaust system of drum mix plant to remove dust particles. Fixture is used in manufacturing of impeller during welding to hold the different parts of the impeller assembly like blades (vanes), upper and lower plates. This paper shows an innovative way to use impeller structure itself as fixture and which has been resulted in the reduction of distortion produced during welding. In this paper modelling work has been done using AutoCAD, Pro-e, Solid Works software, and analysis part has been done using ANSYS workbench. Hence the design and analysis of the fixture has been presented in this paper. Unbalance mass for the impeller has been reduced to 44g for the new design from100g for the existing design.

Fixture has direct impact upon welding quality, productivity and cost. Welding fixtures are used for holding different parts that have to be welded together. Other use of purpose of fixture is to reduce distortion that is generated during welding. It helps in reduction of production loss and also manufacturing lead time for welding, positioning and holding parts. Variety of residual stresses produced while welding are responsible for the distortion.. There are many ways to control the residual stresses namely preheating, peening, post weld heat treatment, stress relief by natural ageing, vibratory stress relief or. The aim of this project is to reduce the distortion in the various parts of impeller namely vanes and upper and lower plates. This ultimately helps in reducing the balancing weight.

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Welding residual stresses have an effect on many aspects of the integrity of structures but are normally one of the largest unknown stresses. Residual stresses are difficult to measure and to estimate theoretically but are often significant when compared with the service stresses on which they superimpose. High tensile residual stresses can lead to loss of performance in corrosion, fatigue and fracture.
Impeller used in drum- mix plant for removing dust particles that are produced during mixing of different materials. These particles are necessary to remove from the plant for maintaining proper mixing of materials. Quality of an impeller depends on the fixture used for welding. Thus proper fixture is necessary to manufacture quality impeller.

K.Youcef-Toumi and et. all [6] has presents an automated manufacturing system for drilling sheet metal parts. All stand-alone systems such as the robot, a set of reconfigurable fixtures and the CAD/CAM workstation have been integrated into a flexible manufacturing system. This system analyzes and evaluates a given fixturing layout and assembles the reconfigurable fixtures automatically using a robot manipulator. An optimum fixturing layout and assembly are achieved by examining the workpart from a stress-strain point of view. In addition, issues such as geometric constraints, yielding and buckling, database design, collision detection, fixturing sequential control and the automatic assembly of fixture elements are considered. The computational and analytical concepts for the reconfigurable fixturing and drilling system are also presented in this paper.

IV. CONCLUSION

The study of literature or research paper, it has come out that the fixture design is mainly depends on which kind of object will be holded by the fixture and which kind of test or operation are to be conducted through it. While observe literature many concepts of fixture design are come in front of us which includes development of fixture as well as testing through CAE software so that if any dificency was found in design it would be short out before actual manufacture and save money as well as time.

So, this paper express methodology to design test rig for test water stop logs before installation:

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