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Review on Design Fixtures for Wheel House of Car

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***Abstract:** A fixture is a work-holding device used in the manufacturing industry. Fixture's primary purpose is to create a secure mounting point for a work piece, allowing for support during operation and increased accuracy, precision, reliability, and interchange ability in the finished parts. This paper present Review on Design of fixture for wheel house of car. This component is a part of Four wheeler Car. The operation to be performed is Spot welding. The evaluated fixture uses Mylar, Riser, Clamp arm ,Plate, Base plate, welding part used for work support for holding the work piece driven by Pneumatic Air. This is Multipale used new fixture achieves automatic clamping of parts in same fixture.*

I. INTRODUCTION

A fixture is a device for locating, holding and supporting a work piece during a manufacturing operation. It is a production tool that locates, holds, and supports the work securely so the required machining operations can be performed. Fixtures have a much-wider scope of application than jigs. These work holders are designed for applications where the cutting tools cannot be guided as easily as a drill. With fixtures, an edge finder, centre finder, or gage blocks position the cutter. Examples of the more-common fixtures include milling fixtures, lathe fixtures, sawing fixtures, and grinding fixtures. Moreover, a fixture can be used in almost any operation that requires a precise relationship in the position of a tool to a work piece.

Fixtures are essential elements of production processes as they are required in most of the automated manufacturing, inspection, and assembly operations. Fixtures must correctly locate a work piece in a given orientation with respect to a cutting tool or measuring device, or with respect to another component, as for instance in assembly or welding. Such location must be invariant in the sense that the devices must clamp and secure the work piece in that location for the particular processing operation. There are many standard work holding devices such as jaw chucks, machine vises, drill chucks, collets, etc. which are widely used in workshops andare usually kept in stock for general applications. Fixtures are normally designed for a definite operation to process a specific work piece and are designed and manufactured individually. These work holding devices are collectively known as jigs and fixture. A fixture should be securely fastened to the table of the machine upon which the work is done. Though largely used on milling machines, fixtures are also designed to hold work for various operations on most of the standard machine tools. Fixtures vary in design from relatively simple tools to expensive, complicated devices. Fixtures also help to simplify metalworking operations performed on special equipment. In the Automotive Industry BIW (Body in White) is the common terminology used to mention the car sheet metal welded structure (body shell).In today's situation, automotive BIW is made of steel (various steel grade material -DP, DD, HDP etc.) as well as made of aluminum alloy (e.g. AUDI A8),Sub-assemblies like Under body, Body side Left Hand Side/ Right Hand Side, Front End, Roof etc. gets welded together by various metal joining process e.g. resistance spot welding, Laser welding, MIG welding to make welded metal shell (Without Door, Trunk-lid / Tailgate) , Fender, Bonnet Center) called Body in White Automotive car shell made before painting is called Body in White.BIW joinery decides the exterior and interior look of any car. All the Interior Parts (Commonly used in Automotive) e.g. Dashboard, Trim (Door Trim, Pillar Trims, Roof liner, Seats are mounted on the BIW shell with the help of various brackets or nuts mounted on the BIW.Exterior (Commonly used term in car industry) components e.g. Front Bumper, Rear Bumper, Fender LH/RH, Side Mirrors are mounted on the BIW shell with the help of various brackets or mounting systems. In car industry outer look defines the style. BIW sheet metal part shell defines overall car style.

II. LITERATURE REVIEW

Mr. Shadashiv Narayanan (2018) research that a flexible spot welding cell - which is flexible both at fixture and work cell level is developed to handle multiple Body-In-White (BIW) part varieties. The work-cell is a human-robot cooperative cell where the operator loads/unloads the parts on one side, whereas the robot concurrently performs welding operation on other side. The fixture is made modular and is reconfigured for change in part varieties. The flexibility of proposed work cell and fixture are investigated and validated by considering two different BIW spot weld assemblies. The performance of robot, cycle time estimation for the process, checking of fixtures, collision detection between weld gun and fixtures are evaluated in virtual environment.

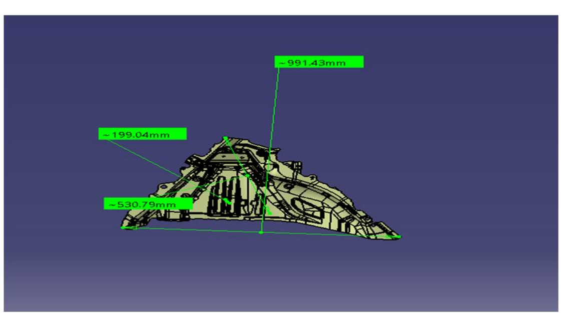
The flexible weld cell is proved to be compatible for both the BIW assemblies considered for study. The proposed concept shorten the design & fabrication time of fixture - squeezing the investment cost, assembly cost and floor space; besides reducing the cycle time and improving the robot utilization by 30% - 40% when compared to the conventional method.

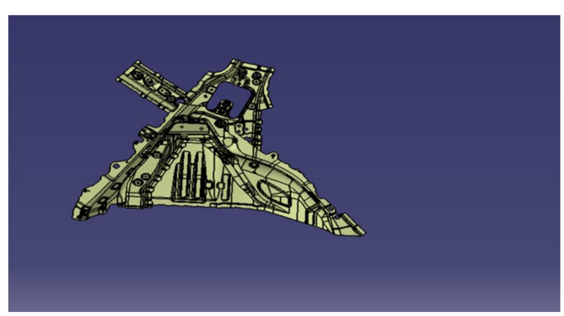
A Das, P Franciosa, D Ceglarek- Procecedia Manufacturing (2015)Fixures control the position and orientation of parts in an assembly process and thus significantly contribute to process capability that determines production yield and product quality. As a result, a number of approaches were developed to optimise a single- and multi-fixture assembly system with rigid (3-2-1 fixture layout) to deformable parts (3-2-1 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 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) '3-2-1' 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

JuGuang Lin, De Chao Shi, Lei Liu (September 2013) Welding had always been paid attention to by the automobile manufacturers as one of the four technologies. This paper does process plan and simulation validate for BIW welding line using the virtual simulation technology based on DELMIA, including calculate the mainline beats and to determine the station number and function, simulate according to the layout, and output offline program at last. Practice had proved that this method can greatly improve production efficiency, reduce production costs, avoid delaying the progress of the project due to the pre-design problems

Kevayni Ali (2009) The unchangeable need of securing and locating parts during different manufacturing processes turned the fixtures to key elements in many part production industries. The iterations between design engineers and manufacturing planners because of late collision detection of the part/fixtures with robots cost a lot of time and money. The lead-time can be reduced by developing tools and/or methods for early verification of the fixtures during the simultaneous engineering phase. Different aspects of fixture designing, modeling and simulating is investigated as a base step to recognize the best practice work to do fixture planning in Process Simulate integrated PLM environment. The aim of the project is to use Process Simulate to design and validate modular fixtures at the same time and in a single environment. It also aims to investigate the possibility of adding kinematics, sensors, and actuating signals to the fixtures and utilize them to model the fixture behavior in a larger simulation study. The project narrows down its focus on the fixtures designed for robotic applications specifically in Automotive Body in White lines without losing generality. The document type stated at the title page and in the header of this page is master thesis workDuring the assembly process of sheet metal parts, a lot of factors affect the final geometrical quality. It is important to have knowledge about the characteristics of as many as possible of those factors, not only to be able to reduce their effect, but also to be able to include those factors in variation simulations. Those tolerance simulations are crucial tools in early stages in automotive industry in order to predict the outcome in critical dimensions and it is of course important to have as good accuracy as possible in the simulations. One of the factors affecting the final geometry is the spot welding sequence. In this paper it is shown how the spot welding sequence affects the amount of geometrical variation in a sheet metal assembly. A method for including the welding sequence in tolerance simulations is described. Of course, it is desirable to find an optimal sequence, i.e. a sequence that minimizes the geometrical variation in the final assembly. Since this is a fast growing problem - the number of possible sequences for N welding points is N!, it is not practicable to test all possible sequences. In this work some different strategies for finding an optimal sequence are tested on several industrial case studies. The tested strategies are based on general guidelines, on minimizing variation in each welding step respectively calculations of the movements in unwelded points in each step. The strategies based on general guidelines was not successful, neither was the one based on minimization of the variation in each step. The strategy based on movements in the un welded points seems however promising. It resulted in the best or one of the better sequences for all of the eight tested industrial case studies.

III.DESIGN CALCULATION OF FIXTURE COMPANENT





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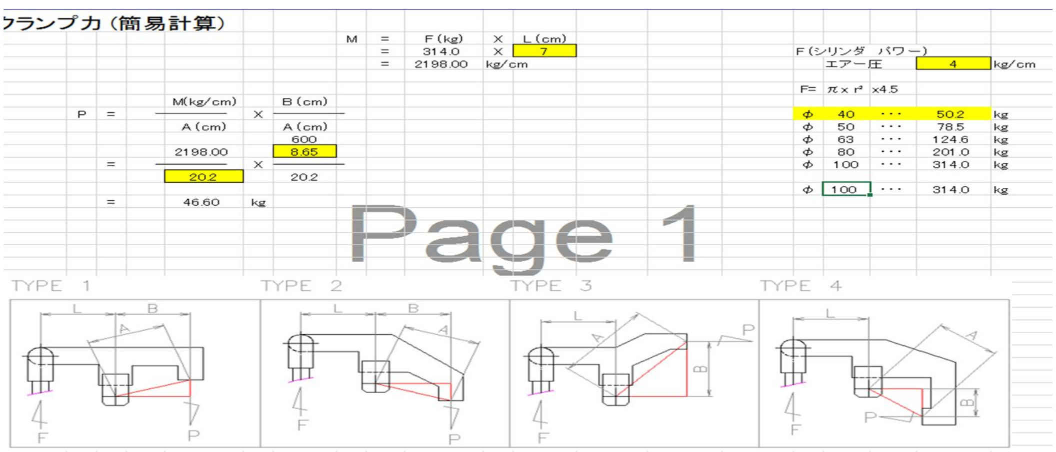
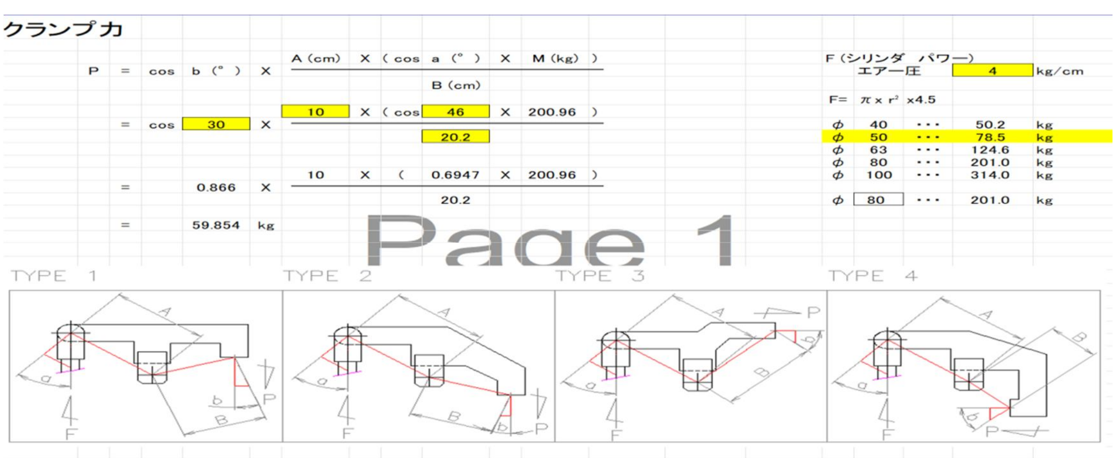
According to the Newton's 2^{nd} Law of motion, the rate of change of linear momentum of a body is directly proportional to the applied external force and in the direction of force.
It means that the linear momentum will change faster when a bigger force is applied.
Consider a body of mass 'm' moving with velocity v.
The linear momentum of a body is given by:
p = mv

Now According to Newton's 2^{nd} Law of Motion:
Force is directly proportional to rate of change of momnetum, that is
F α dp/dt
F = k dp/dt
F = k d(mv)/dt
F = k md(v)/dt
F = k ma
Experimentally k =1
F = k ma
Which is the required equation of force

A. Calculation of Clamping Force for Hand.



B. Calculation of Clamping force for cylinder for Holding tha Panel



From above selection of clamp and hand for wheel house of car for holding the panel .
So design was safe .

1) we calculate the actual value of hand is 46.60 kg.
we selected cylinder was ø 40 and his capacity was 50.2 kg, as show in above calculation.
So our design was safe.

2) we calculate the actual value of cylinder is 59.845 kg.
we selected cylinder was ø 50 and his capacity was 78.5 kg, as show in above calculation .
So our design was safe.

IV. CONCLUSION

From the above result and discussion the design parameters of welding fixture for wheel house of car have been investigated. The design parameters such as maximum compressive stress and maximum holding force were presented. It is found that the clamping and holding the work piece securely during Spot welding process. The proposed design safe for manufacturing of welding fixture.

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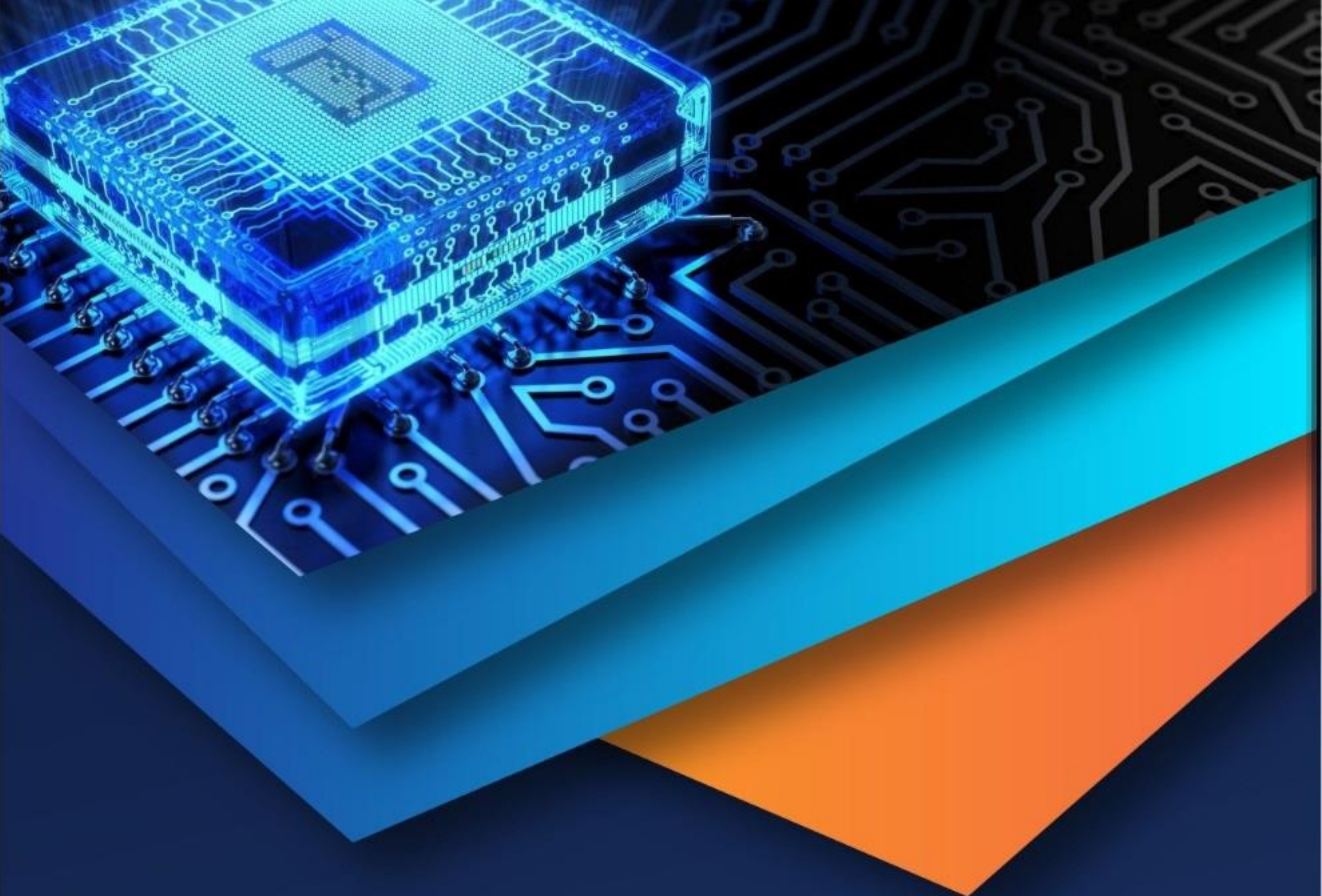

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