DESIGN AND MANUFACTURING OF GAUGES AND FIXTURES FOR CNG COMPONENTS OF MAHINDRA & MAHINDRA LTD

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Abstract : We have been given a task to make the design and manufacture gauges and fixtures for the Mahindra & Mahindra new CNG vehicle. Few parts of that vehicle needed three new fixtures and four gauges out of those we already had one of the fixtures but it was unstable during the production. So we are going to construct the gauges and fixtures in such a way that it should be light in weight, very easy to operate and it should be less time consuming and we improvised that one fixture in which they had problems during the production and make them too easy in handling and increased the production rate. The design is the basic step for manufacturing the gauges and fixtures. If the design is proper and safe the manufacturing and production goes smooth.

KEYWORDS:
CC- Center To Center Distance,
CNG- Compressed Natural Gas,
TRIMOS- Vertical Dimensions Measurement Instrument

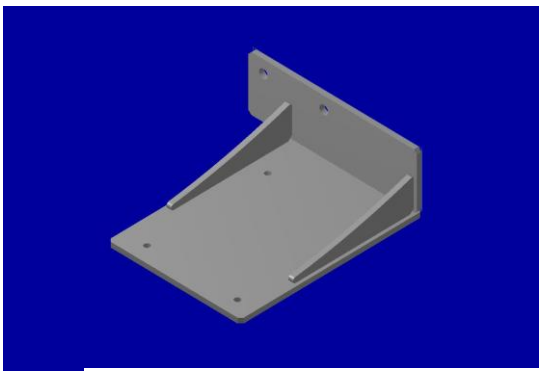
I. INTRODUCTION

The Project work presented is based on design and manufacturing of fixtures and gauges for project few components of Mahindra & Mahindra CNG vehicle. The Company selected to accomplish this project is Prince Metal work which is located at Burma shell petrol pump, Sativali road, Vasai (E). The Prince Metal Work Company established in 1971 and it makes the oil sump for engine parts. Now this Company have got few components of CNG vehicle of Mahindra & Mahindra. The fixture is used to securely locate and support the work piece ensuring that all parts produced using the fixture will maintain conformity and interchangeability. The gauges are devices for confirming its dimensions to start the production of those parts. like "to determine thickness, gap in space, diameter of materials, and to check the center to center distance of the manufactured components

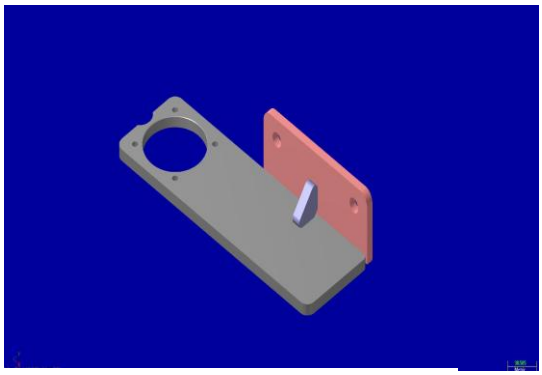
II. PROBLEM STATEMENT

1. Mahindra and Mahindra starting a new CNG vehicle so we are supposed to design and manufacture three welding fixtures and four gauges corresponding to the CNG components.
2. From three fixtures we already had one fixture for Bracket Ignition Coil but the fixture was having stability issue during the operation and that was time consuming. So we were supposed to make the new fixture but we been asked to improvise that fixture.
3. For other two components we been asked to design and manufacture two new fixtures which will be reliable, easy in handling and increase the production rate etc.
4. We been asked to design and manufacture four gauges which will be less time consuming, less dependence on operator skill and economical etc.

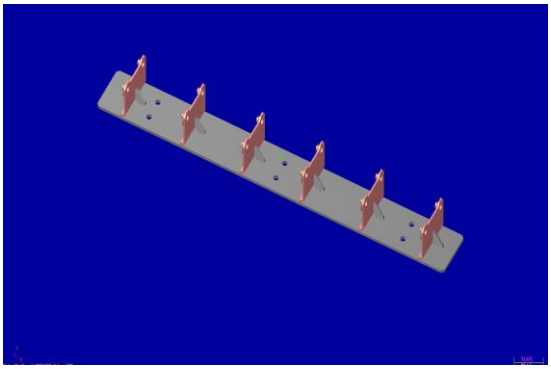
Below is the diagram of four CNG components:



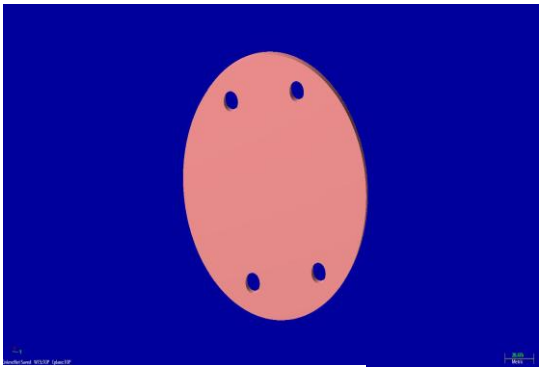
Air Cleaner Mounting Bracket



Bracket Gas Air Mixer Mounting

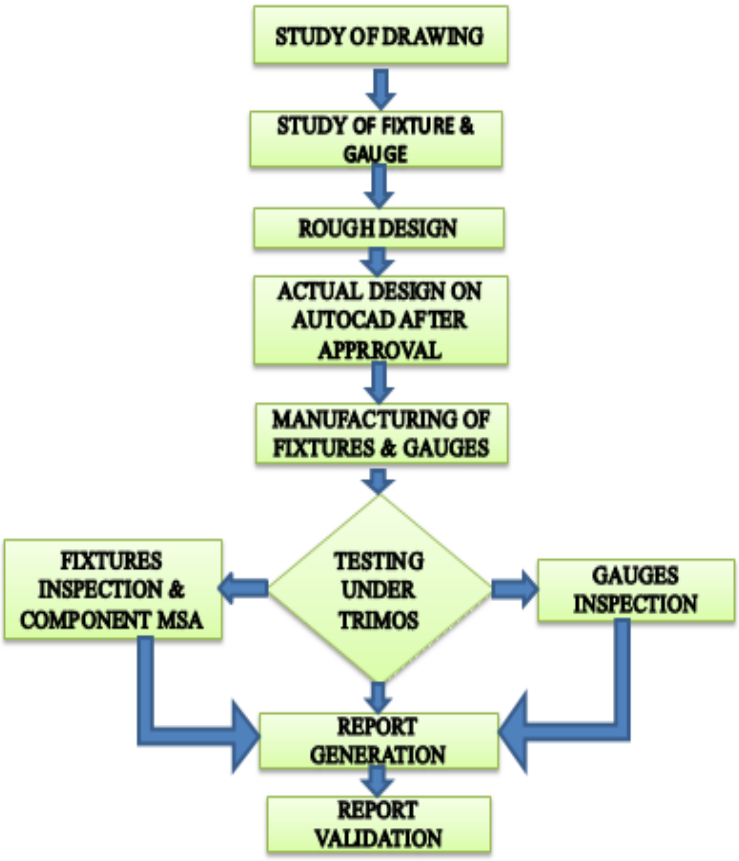


Bracket Ignition Coil



Flip Closer Plate

III. RESEARCH METHODOLOGY



Nine step methodology for designing and manufacturing of Gauges and Fixtures of CNG parts.
Fixtures and Gauges can be design and manufacture using nine step methodology in order to obtain.

Step 1: We studied the 2D drawing of components.

Step 2: a. We studied the fixtures and gauges.

b. Read the technical paper listed in the report so as to gather information.

Step 3: We had drawn the rough sketch as per rough idea of application on paper.

Step 4: a. We did 2D draw on auto cad approval from the design head of company Mr. Sameer Sheikh.

b. 2D drawing was corrected and then it was need final with help of Mr. Vyankatesh Rajkonda.

Step 5: The manufacturing phase will start where in we have to select the material for the fixtures and gauges.

Step 6: After manufacturing those fixtures and gauges will be tested under TRIOMS.

Step 7:Two processes followed parallel

a. Fixtures inspection and components MAS (measurement analysis system)

MSA: It is an experimental and mathematical method of determining how much the variation within the measurement Process contributes to overall process variability.

b. components inspection.

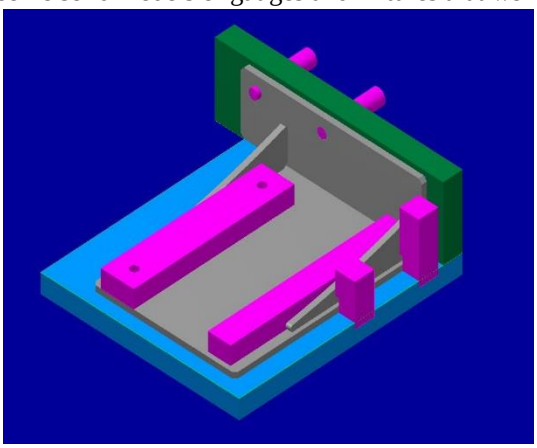
Step 8: Reports are generated for tests and inspection.

Step 9: Those reports are validated by Mr. Vyankatesh Raikonda (Manager).

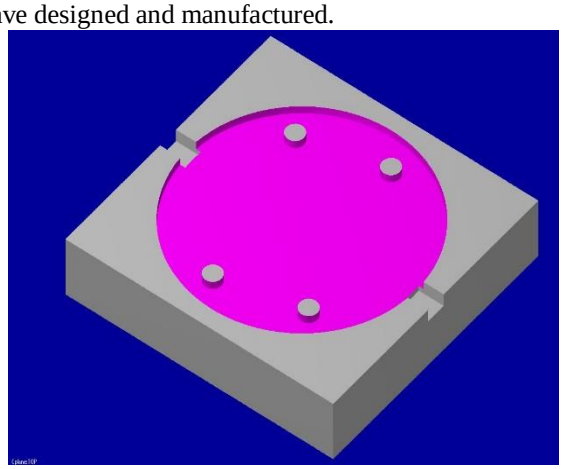
Production starts

IV. RESULTS

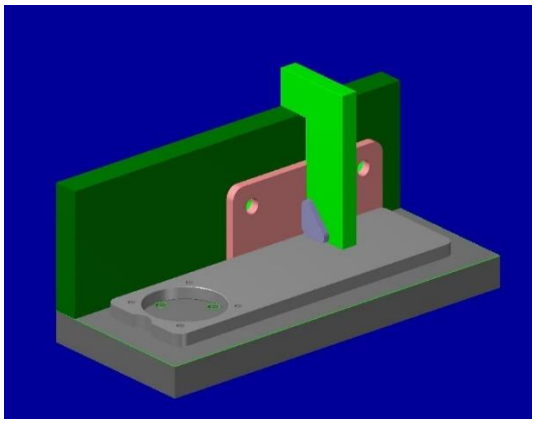
Here are some solid models of gauges and fixtures that we have designed and manufactured.



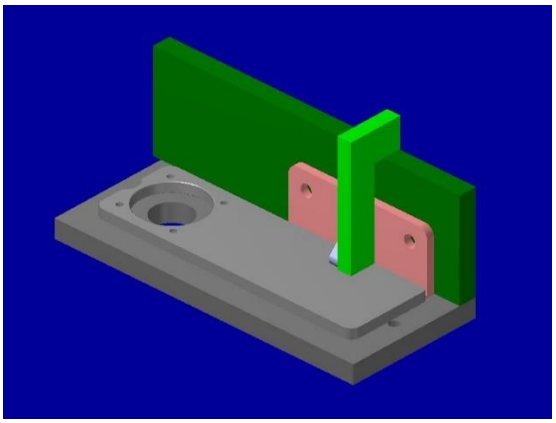
Air Cleaner Mounting Bracket(Fixture)



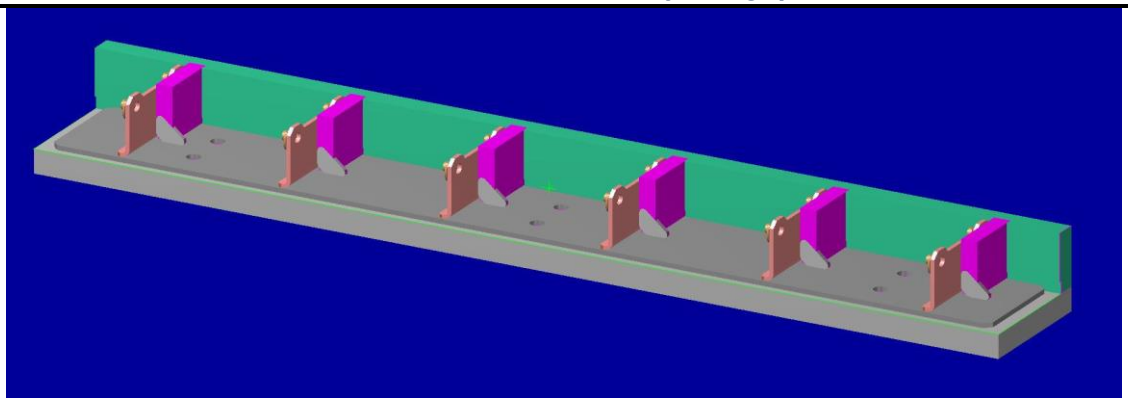
Flip Closer Plate(Gauge)



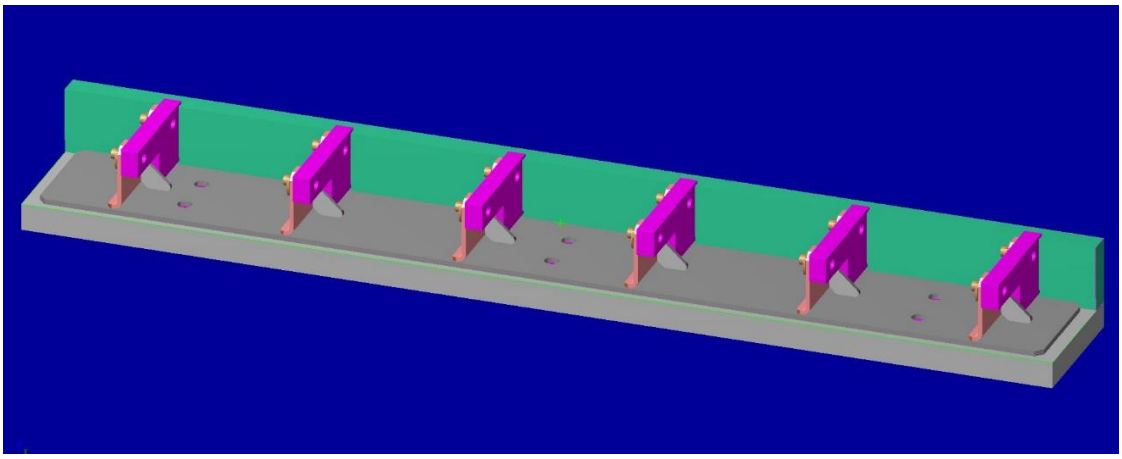
Bracket Gas Air Mixer Mounting(Fixture)



Bracket Gas Air Mixer Mounting(Gauge)



Bracket Ignition Coil(Fixture)



Bracket Ignition Coil(Gauge)

V. CONCLUSION

In this project, we have been given the task of design and manufacturing few fixtures and gauges required for Mahindra and Mahindra's upcoming new CNG vehicle.

Fixtures should be reliable, easy in handling and increase the production rate etc. and gauges should be less time consuming, less dependence on operator skill and economical etc.

After testing of the fixture and gauges the production of components will start.

VI. REFERENCES

[1].Shailesh S.Pachbhai1, LaukikP.Raut2 "A Review on Design of Fixtures "in the International Journal of Engineering Research and General Science Volume 2, Issue 2, Feb-Mar 2014.

[2].Naveen A M , V A Girisha, Pruthvi H M "Design And Analysis Of Welding Fixture For Motor Case Assembly " in the International journal of mechanical and production engineering ISSN:2320-2092, VOLUME-2, Pg no 54-59, 2014.

[3].Hui Wang, Yiming (Kevin) Rong, Hua Li and Price Shaun, "Computer aided fixture design: Recent research and trends", Journal of Computer Aided Design, Vol. 42, pp. 1085-1094, 2010.

[4]. M. Krsulja, B. Barisic & J. Kudlacek, "Assembly Setup For Modular Fixture Machining Process", Journal of Advanced Engineering, Vol. 3, pp. 1, 2009.

[5].Nirav P. Maniar, D. P. Vakharia and Chetan M. Patel, "Design & Manufacturing With Modeling, Dynamic Balancing & Finite Element Analysis Of Rotary Fixture For CNC Turning Centre To Function As HMC", ASME Early Career Technical Journal, Vol. 8, pp. 86-93, 2009.

[6].Nirav P. Maniar, D. P. Vakharia and Chetan M. Patel, "Design & Manufacturing With Modeling Of Multi Component– Single Hydraulic Fixture With 10 Cylinders & Expandable Uniforce Clamp For Machining Earthing Terminal Block on CNC - VMC 430", ASME Early Career Technical Journal, Vol. 8, pp. 118-123, 2009.

[7]. Y. Wang, A. Hodgson, X. Chen and N. Gindy, "A methodology for the development of machining fixtures for components with complicated geometry", International Journal of Computer Integrated Manufacturing, Vol. 21, pp. 448-456, 2008.M. Krsulja, B. Barisic & J. Kudlacek, "Assembly Setup For Modular Fixture Machining Process", Journal of Advanced Engineering, Vol. 3, pp. 1, 2009.

[8]. Edward G. Hoffman, "Jigs and Fixture Design". Thomson Delmar Learning, USA, 2004.

[9]. Utpai Roy and Pei-Liang Sun, "Selection of preliminary locating and clamping positions on a workpiece for an automatic fixture design system", Journal of computer Integrated Manufacturing Systems, Vol. 7, pp. 161-172, 1994.