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Design of fixture for floor grid of Asphalt Paver

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ABSTRACT

A fixture is the most effective tool used to maintain the tolerance and precision in manufacturing industries. This project revolves around the development of fixture to manufacture the chassis of asphalt paver vehicle from L&T construction equipment ltd. The design of the fixture is optimized to provide the company to build the chassis more effective and precise with the knowledge acquired during the literature survey. The fixture is set up on the dowel-pin platform. The project will give an overall development of a fixture from the design process till the scaled prototype going under multiple iterations of analysis through Finite Element Analysis Method. The parameter or the constraints in the design are studied thoroughly such that no failure of the fixture occurs during high volume manufacturing in the company. The end product will be designed considering parameter which could be affected by various shop floor activities. Also carried out tolerance stack-up analysis to find out whether the introduced precision tolerance at the component level is meeting the assembly level functional requirement. The material selected for fabricating the fixture is specified for frequent periodic usage and open environment. The final product will meet all the requirements for large volume manufacturing in L&T construction equipment ltd.

Keywords: *Finite Element Analysis Method, Fixture design, Scaled Prototype.*

1. INTRODUCTION

In today's world of the automobile the chassis design and fabrication plays an important role in the overall outcome of an automobile. The chassis provides stability to the car from the variety of forces and impacts, which it has to sustain throughout its life. It is extremely important that the chassis design should be sturdy, reliable and durable. The design engineers should equipped with skills to optimize the weight and size of the chassis, capable of not only manufacturing and testing the product after designing it, but designing and making the tooling for increased production rate. While manufacturing a chassis, welding is the important factor in the assembly of automobile component. If proper welding is not done it will directly affect the strength of the component. Manufacturers rely on product development to deliver products that add value to their portfolios. Efficient designs reduce material and manufacturing labour costs. Welding fixture allows conducting proper welding of sub-component. In welding to achieve the target values and obtain repeatability, fixtures are used as in some other manufacturing methods.

In most of the automotive industries fixtures have a direct impact on the productivity of an industry. Having a good welding practice and an effective fixture will reduce the cycle time of the product as well as maintains the quality of the product. Many

fixtures were developed over the years in order to increase the production rate. But most of the work is related to their work and are not of generalised in nature which can be adopted to any kind of work. This wok aims to generalize the fixture for all king]d of chasis welding. Based on this we aim to

- To design the fixture for floor grid of asphalt paver considering the basic design constrains.
- To statically design the fixtures design with a good factor of safety.
- To fabricate the fixture with good engineering practices.

Asphalt Paver

The asphalt is added from a dump truck or a material transfer unit into the paver's hopper. The conveyor then carries the asphalt from the hopper to the auger. The auger places a stockpile of material in front of the screed. The screed takes the stockpile of material and spreads it over the width of the road and provides initial compaction.

The paver should provide a smooth uniform surface behind the screed. In order to provide a smooth surface, a free-floating screed is used. It is towed at the end of a long arm which reduces the base topology effect on the final surface. The height of the screed is controlled by a number of factors including the attack angle of the screed, weight and vibration of the screed, the material head and the towing force. To conform to the elevation changes for the final grade of the road modern pavers use automatic screed controls, which generally control the screed's angle of attack from information gathered from a grade sensor. Additional controls are used to correct the slope, crown or super elevation of the finished pavement.

In order to provide a smooth surface, the paver should proceed at a constant speed and have a consistent stockpile of material in front of the screed. Increase in material stockpile or paver speed will cause the screed to rise resulting in more asphalt being placed therefore a thicker mat of asphalt and an uneven final surface. Alternatively, a decrease in material or a drop in speed will cause the screed to fall and the mat to be thinner.

The need for constant speed and material supply is one of the reasons for using a material transfer unit in combination with a paver. A material transfer unit allows for constant material feed to the paver without contact, providing a better end surface. When a dump truck is used to fill the hopper of the paver, it can make contact with the paver or cause it to change speed and affect the screed height.

Floor Grid

A vehicle frame is also known as chassis, it is the main supporting structure of the vehicle to which all other components are attached, comparable to the skeleton of an organism. It encloses the front part of the paver container, auger, and screed.

2. METHODOLOGY

A. Proposed Methodology

The organization will look for ways to continuously improve their process, production, and quality of output produced. This requires various techniques and tools to be utilized for reduction of cost and increase their productivity. Following are the variously proposed methodology followed for the work flow.

B. Conceptual Design

The given 2D diagram from the industry is studied and a 3D model of the given diagram is designed and using the designed 3D model of the center rib the fixture initial design concept is proposed and basic requirements for the design is studied and analyzed.

The fixture design consists of the following parts:

Bed: It is a supporting unit for the entire fixture

Clamping system: A clamping system is a fastening device used to hold or secure objects tightly together to prevent movement or separation through the application of inward pressure. There are many types of clamps available for many different purposes. Some are temporary, as used to position components while fixing them together, others are intended to be permanent.

C. Catia V5 Model

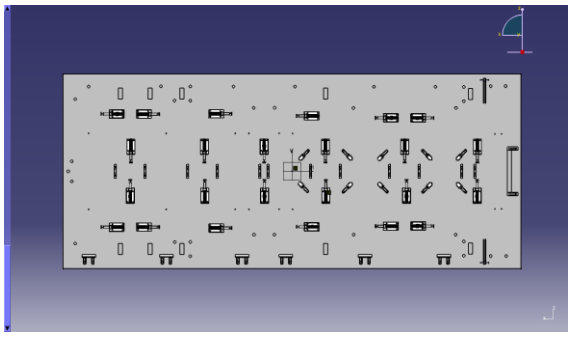

Fig 1. Top view of the final fixture

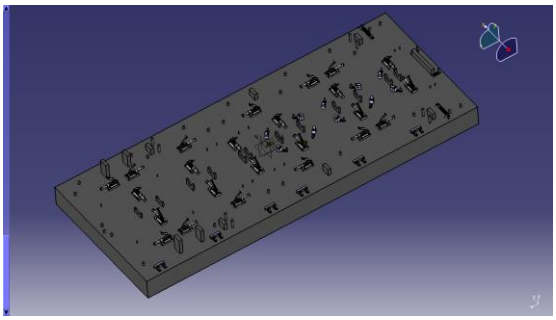

Fig 2. Isometric view of the final fixture

3. ACKNOWLEDGEMENT

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