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STRUCTURAL ANALYSIS OF TRANSPORT FRAME

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Abstract –

An Transport structure of frame will go by using high vibration amplitude in operation due to road instability, which will lead to significant changes in structural properties. The vibration of the frame will remove the formation of pressure on certain parts of the larger size. It also causes structural weakness and noise build-up due to loosening of mechanical parts and resulting in the car being uncomfortable. To rectify the above difficulties, This paper evaluates the structural integrity for the Transport Configuration Ancillaries, which contains Transport Frame, Tilting Frame, Locking Pin, Longitudinal Restraint Assembly, Front Spacer Assembly of Longitudinal Restraint, Turnbuckle Assembly of Transport frame, Tie-down Strap Assembly of Transport frame Lifting Pin of Transport frame, Trailer Adapter Plate assembly and Primary longitudinal support plate of Transport Frame. The transport Frame is used to transport the Heavy Vessel, when the frame is attached to the deck of a vehicle trailer

Key Words: Transport Frame, Locking Pin, Turnbuckle Assembly, Finite Element Analysis, Pressure Vessel, etc

1. INTRODUCTION

The transport body structure must be adjusted so as to acquire the security when the transport is running; Frame body must be adequately solid in both the circumstance of supporting typical burdens and mishap loads. The Indian

Standard i.e. the Motor Vehicle Act 1988 deals with vehicle construction qualitatively only. Neither test procedure nor standards have been prescribed for the transport vehicles with regard to occupant's safety.

In recent years a drastic change can be seen in the field of transportation, it is because, in the recent years so many of accidents happened.

The aim of the present work is to analyze the vehicle transport frame body structure.

1.1 METHODOLOGY

The finite element methodology will be used for transport frame, longitudinal restraint assembly and lifting evaluation of empty transport frame.

The finite element model will be constructed from an input CAD model, applying defined transport loads and boundary conditions, and using the results from a static analysis of the model to demonstrate structural integrity.

Strength of materials calculations will be used to supplement the FEA, evaluating lifting pins, strap loads, tie-down strap, turnbuckle, Trailer adapter plate assembly and Primary longitudinal support plates.

Weld calculations are also performed.

2. LITERATURE SURVEY

A brief review of some of the selected references to the various types using the support framework is presented below,

Pandhare et al. [1]: - read the basic draft under the gravitational load of all the included elements i.e.. Compressor, Air Receiver vessel etc during transport. The acceleration loads considered during the analysis phase are similar to actual loading events. Analysis was performed to detect the underlying pressures and deviations in the various areas of the proposed framework. The structure has been improved to reduce weight. The Pressure Vessel Support Frame is a structural entity that combines the beams of various parts of different sizes. The parts used may be the same size as the opposite sections, or the combination may be used for full strength and weight.

Jadhav et al. [2]: You have read the basic compressor framework in which compressor compressors are installed during travel.

Attempts are made primarily to create a basic framework for all types of piston compressors. Also, design desk systems by controlling active vibration, which is able to support the dynamic forces occurring on the compressor and motor. This paper represents the basic study material of the compressor frame in which recirculating compressors are installed.

Attempts are made primarily to create a basic framework for all types of piston compressors. Second, anti vibration mounts can be selected and adjusted as they control the vibration of the motor and compressor. Using the FEA tool

the method is designed for the investigation of critical pressures. Also, to organize the harmonic responses of the basic acceleration framework it vibrates. Finally compare it with normal data.

Joshoshi et al [3] studied the basic design of a compressor unit under load-gravitational force. components such as engine, compressor, radiator, storage container etc. riding on it during travel. The framework was designed with standard design processes and revised. The required volume determines the weights of the parts and their relative shape to the frame. The framework discussed in this report was designed with standard design procedures and re-analyzed statistically by commercial FE software. Analysis was performed to detect the underlying pressures and deviations in the various areas of the proposed framework. The gravitational loads considered during design and the analysis phase are similar to actual loading events. The results obtained from the analysis were confirmed by the results of the physical examination and a positive agreement was observed between them.

Chris Harper et al [4] discussed the problems and mechanisms involved in the development of a vibrant load system similar to compressors and repeater pumps, and discusses industry-leading approaches to self-construction, which includes tailored manufacturing design techniques. Most compressor packages are now mounted on metal frames or base plates. Design a the frame of the new machine package can be challenging due to these features: Frames should be designed to avoid sound and vibration (from the power of dynamic machines and pairs). The industry is looking at low-cost packages. This may prompt suppliers to reduce the cost of frames and related durability, but improperly designed frame will create vibration and reliability issues. In some cases, the frames are considered to be very unsuitable for the required system.

Wang et al [5]: - He studied the high-pressure highway used in the hazardous cargo industry, especially in the oil and gas industry. Also, another design has been proposed for the analysis process using Finite Element Analysis (FEA). Highway vessels, pads, horses or other bases may be designed using the stress analysis methods taken from Appendix 4 of code ASME VIII-2.

Shah et al [6] worked on developing compressor frame with the effects of high shear pressure, uniform pressure and frame deviation under heavy load. This paper represents a sample study of the compressor framework of a Helium Liquefier / Refrigeration (HRL) compressor at IPR (Plasma Research Center) where high-speed injection, oil injection, rotary, single stage gas is installed. By performing the Taguchi test method using sensitivity analysis, we can obtain a higher set of variable values. The maximum pressure produced by the Compressor frame, the total flexibility of the frame and the weight of the Compressor frame can be reduced by using shape modification.

3. ASSUMPTIONS

All analyses will be based on linear elastic behaviour.

Welds will not be modelled in the FEA, and all the components will be assumed to be bonded at weld locations.

The Heavy Vessel is not modelled explicitly; rather, its reactions on the saddle supports are modelled by surface pressures with the requisite total force.

Loading in each direction is based on the maximum values used for road transport.

The supporting transport vehicle is assumed to be a rigid support.

The base of the transporter frame rests on a foundation that can support compression loads. Since this makes the problem non-linear, the conservative assumption is made that the pins and studs that attach the base to the foundation support both tension/compression loads.

4. FLOW CHART OF THE PROCESS

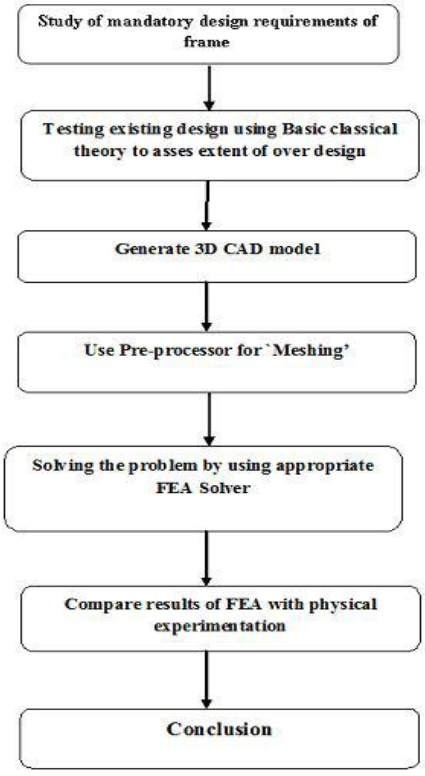

Fig – 1. Flow Chart of the Process

Proposed Process :

4.1. CAD Model Generation:

The proposed CAD Transport Framework model is developed with Auto CAD software.

4.2. Determination of loads or boundary conditions:

Loads on the Transport Frame is the determining factor, using the weight of the framework and the parameters to be used to adjust the Transport Framework.

4.3. Integrating and applying boundary conditions:

The CAD model will import with Hyper mesh and meshing with the appropriate element size and tested for quality standards. Fixed boundary conditions apply.

4.4. Troubleshooting:

We will fix the model and submit it to ANSYS to resolve and Analysis is performed. After that the results of the transfer will be arranged.

4.5. Performance:

The Transport Framework to be constructed with the appropriate measurement element in accordance with the size of the CAD model.

5 ANALYSIS

The following analyses are undertaken:

Strap Load calculation.

Tilting Frame and Locking Pin calculations

Lifting Pin Analysis.

Stress Analysis of Transport frame: Three cases are considered:

Lifting of the frame plus vessel.

Transport under lateral acceleration plus vertical downloading.

Transport under lateral acceleration plus vertical up loading (in this case, the tied own straps are loaded by the net upload on the Vessel).

Stress Analysis of Longitudinal Restraint Assembly: The front Longitudinal Restraint will be analysed for structural integrity under the specified longitudinal transport inertial loads from the Vessel.

Weld Calculation

Mounting plate and weld for road connection.

Tie-down strap and Turnbuckle calculations Trailer adapter plate: Calculations based on the strength of materials are performed for Trailer plate, mounting plate and its weld (for road connection.

Lifting evaluation of empty transport frame

Stress Analysis of Transport frame under tilting condition

6 COMPUTER CODES

ANSYS will be used to perform finite element simulations of transport frame, longitudinal restraint assembly and lifting evaluation of transport frame.

Math cad will be used is used to perform general engineering calculations.

7. Conclusion

Selection of vehicle essentials is the biggest and most important factor in vehicle construction. The large availability of material can be selected in the heavy vehicle transport frame and chassis, but the biggest challenge of its design issues. The most important conditions in which material selection must meet light weight, design safety, commercial efficiency, recycling and longevity considerations. In this paper work structural analysis of transport frame is carried out by using Finite Element analysis tool.

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