Design and Analysis of Concrete Mixer Drum

V.Jeevanandham
Mechanical Engineering
Sengunthar Engineering College
(Autonomous)
Tiruchengode, Namakkal
18me17@scteng.co.in

M.S.Sabesan
Mechanical Engineering
Sengunthar Engineering College
(Autonomous)
Tiruchengode, Namakkal
18me39@scteng.co.in

R.Saran
Mechanical Engineering
Sengunthar Engineering College
(Autonomous)
Tiruchengode, Namakkal
18me41@scteng.co.in

Mr.C.Ramesh Kumar,M.E..,
Assistant Professor
Mechanical Engineering
Sengunthar Engineering College
(Autonomous)
Tiruchengode, Namakkal
crameshkumar.mech@scteng.co.in

ABSTRACT— Drum type concrete mixers are important part of the concrete mixers available today. They are most suited for small to large capacity machines. The ingredients for concrete (aggregates, sand, cement, and water) are combined inside the rotating drum. But it's not as simple as it appears; inside the drum, there are specially built flights that aid in mixing and unloading the contents. In our project is concrete mixture drum with blade optimization design creating in Creo parametric software and structural analysis using in Ansys software. The different material check drum based on deformation and safety factor. To choose the better material of concrete mixture drum with help of Ansys software

INTRODUCTION:

Concrete, which is formed of cement, aggregates (gravel, sand, or rock), water, and admixtures, is one of the most demanding construction materials. Concrete ingredients are pre-designed in order to achieve the highest possible quality. There is a risk of receiving very poor quality concrete if the elements are not combined properly or in the pre-determined proportions. Concrete mixers are equipment that aid in the mixing of concrete materials and the creation of a workable concrete paste. In other terms, the mechanical concrete mixer, or simply the concrete mixer, is the machine that is used to mix concrete.

EXISTING SYSTEM:

The mild steel material is used in concrete mixer drum. The mixer blade is placed in some length and radius at inside of drum. The efficiency is less in drum and blade.

PROPOSED SYSTEM:

Some excess of concrete as waste at rotating time. The carbon fiber material is used in concrete mixer drum. Change in length and radius of mixer blade. To improve high efficiency. To shortage the excess of concrete.

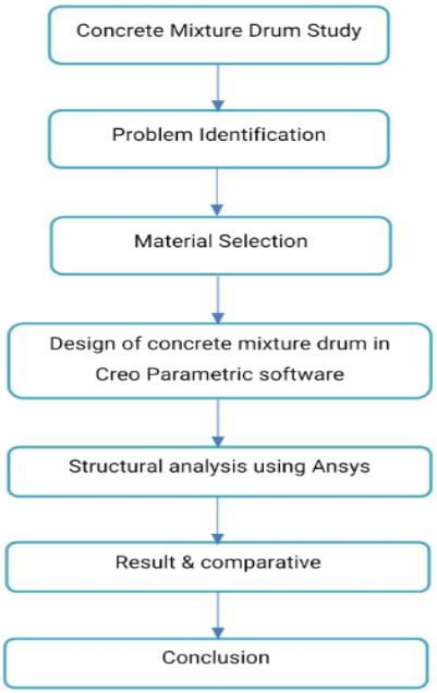
METHODOLOGY:

The main objective of this project work is to improve durability of drum and overcome some technical issues. The composite fibre material has proposed to the mixer drum. The material CFRP is chosen as raw material for proposed new material. This new mixer drum should be analysed structurally by using ANSYS software.

CARBON FIBRE:

Carbon Fiber, often known as graphite fibre, is a polymer. It is an extremely robust and lightweight material. Carbon fibre is five times stronger and two times stiffer than steel. Carbon fibre is stronger and stiffer than steel, but it is also lighter, making it a perfect production material for a variety of items. These are just a handful of the reasons why engineers and designers prefer carbon fibre for manufacturing. Carbon fibre is a material made up of tiny, strong crystalline carbon filaments that are used to reinforce it. Carbon fibre can be as thin as a strand of human hair and is twisted together like yarn to give it strength. The carbon

fibre can then be woven into cloth, and if a permanent shape is required, it can be stretched over a mould and coated in resin or plastic.



INTRODUCTION TO CAD:

The use of computers (or workstations) to assist in the creation, revision, analysis, or optimization of a design is known as computer-aided design (CAD). CAD software is used to increase the efficiency of designers, improve design quality, communicate through documentation, and create a database for manufacturing. CAD outputs include electronic files for printing, machining, and other industrial processes. Another name for it is CADD (Computer Aided Design and Drafting). The term "electronic design automation" refers to its use in the creation of electronic systems (EDA). In mechanical design it is known as mechanical design automation (MDA) or computer-aided drafting (CAD), which includes the process of creating a technical drawing with the use of computer software.

CAD software for mechanical design uses either vector-based graphics to depict the objects of traditional drafting, or may also produce raster graphics showing the overall appearance of designed objects. However, it involves more than just shapes. As in the manual drafting of technical and engineering drawings, the output of CAD must convey information, such as materials, processes, dimensions, and tolerances, according application-specific conventions.

USES OF CAD:

CAD software is used to increase the efficiency of designers, improve design quality, communicate through documentation, and create a database for manufacturing. CAD outputs include electronic files for printing, machining, and other industrial processes.

- Computer-aided engineering (CAE) and finite element analysis (FEA)
- Computer-aided manufacturing (CAM) including instructions to computer numerical control (CNC) machines
- Photorealistic rendering and motion simulation.
- Document management and revision control using product data management (PDM).

CAD is also used to create accurate photo simulations, which are frequently required in the development of environmental impact studies and include superimposing computer-aided designs of proposed buildings onto images of existing structures.

FINITE ELEMENT METHOD:

FEA is one of numerical methods to attain approximate solution of governing equation by dividing a large region into small sub-regions. The sub-regions are called finite elements. The process of dividing is called meshing.

FEA WORKS

- FEA uses a system of points called nodes that make a grid called a mesh.
- This mesh contains both the material and structural properties which define how the structure will react to certain loading conditions.
- Node density could be high in a particular area, or points of interest
    - ✓ fracture point
    - ✓ Corners
    - ✓ high stress areas

Comprehensive result sets, generating the system's physical response at any site, even some that could have been overlooked in a traditional analytical approach. Simulate load circumstances and failure modes that are potentially harmful, destructive, or unworkable in a safe manner. The best way to use a model. Several failure modes or physical events can frequently be examined in a single model. Simultaneous calculation and visual depiction of a large number of physical factors, such as stress or temperature, allowing the designer to quickly assess performance and make changes.

GENERAL PROCEDURE TO CONDUCT FINITE ANALYSIS:

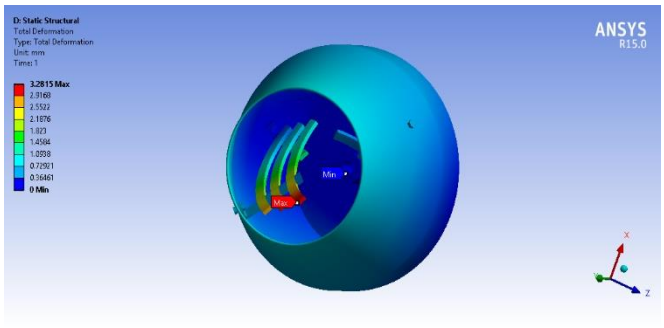
- Set the type of analysis to be used.
- Create model.
- Define the element type.
- Divide the given geometry into nodes & elements (mesh the model).
- Apply material properties & boundary conditions.
- Derive element matrices & equations.
- Assemble element equations.
- Solve the unknown parameters at nodes.
- Interpret the results.

ADVANTAGES OF FEA

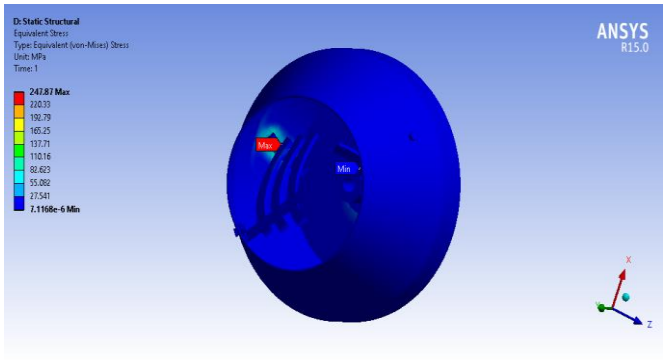
- Problems can be Solved even there is no prototype or Product is available. Which means the Problems can be solved in the Conceptual Phase from CAD model itself.
- Car Crash test, pedestrian safety test can carry out without a car produced. It can be done by FEA.
- Predict the Stress Concentrations, Strains and displacement (Static analysis) for complicated structures.
- Increased accuracy of Solutions to the Complex real time Problems. Like Car crash, Mobile drop test…
- Enhanced designs in the Market.
- Optimized Structures(Light weight structures, Slimmest Products like Mobile, Laptop, Cars).
- Better insight into critical design parameters (Weight, Strength, Cost).
- Fewer hardware prototypes (Physical prototypes) required in the testing phase to correlate the FEA results.
- Faster and less expensive design cycle (R&D, Design, CAE, Production, Testing).
- Increased productivity.

STEEL MATERIAL IN EXISTING MODEL:

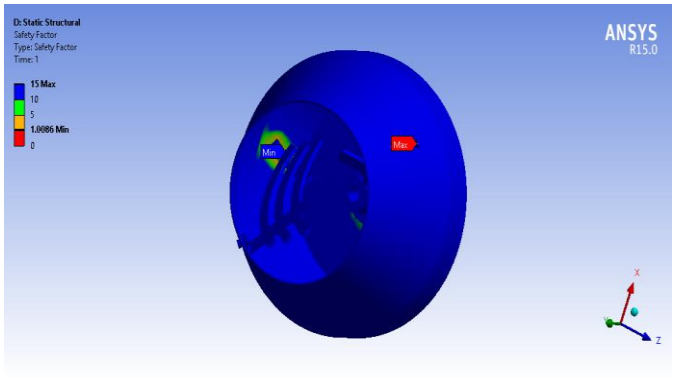
TOTAL DEFORMATION:



Total Deformation in Steel



Stress in Steel



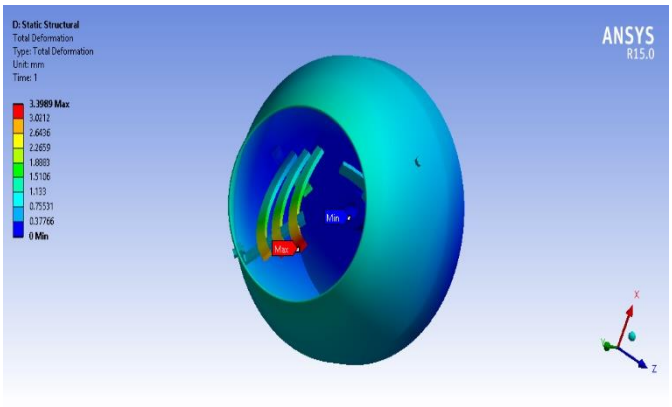
Safety Factor in Steel

Overall Result Steel Material:

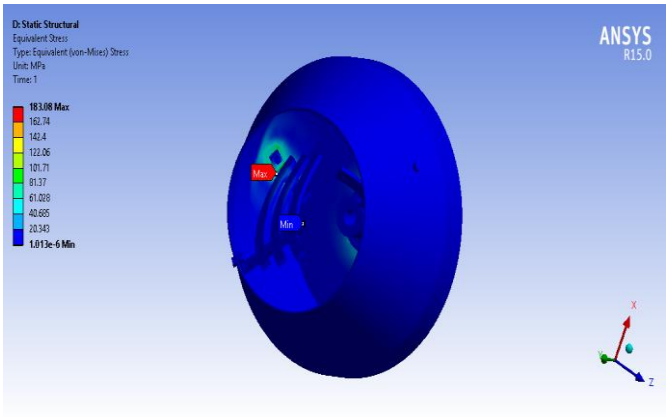
Description	Units	Result
TotalDeformation	Mm	3.2815
Stress	MPa	247.87
Safety Factor		1.0086

Description	Units	Result
Total Deformation	Mm	3.3989
Stress	MPa	183.08
Safety Factor		2.1601

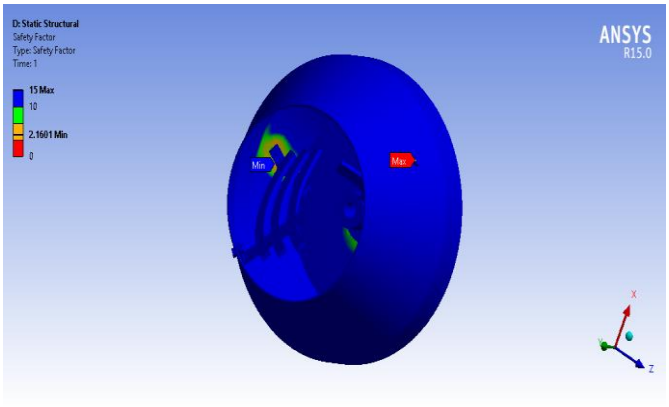
CARBON FIBRE IN PROPOSED SYSTEM:



Total Deformation in Carbon fibre



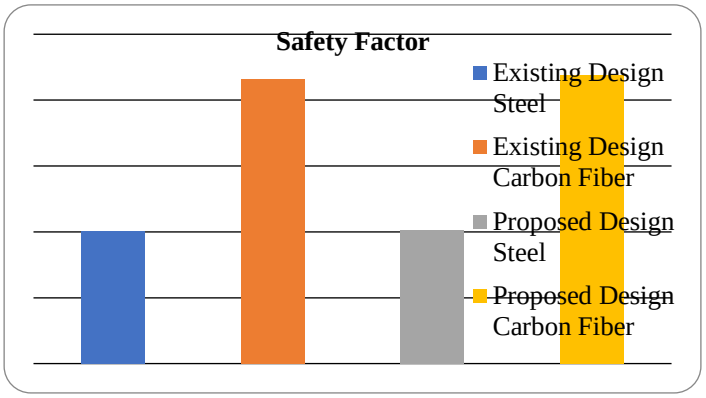
Stress in Carbon fibre



Safety Factor in Carbon fibre

Overall Result Carbon Fibre Material:

RESULT:



CONCLUSION:

The concrete mixture drum with blade optimization of different material check the performance based on structural analysis using Ansys software. To predict the safety factor in both the model at different material in 25RPM rotation of mixing drum.To choose the best material of carbon fiber blade is long life compare to the steel material.

REFERENCES:

1. Amruta Wankhede, Sahu, Gulhane (December 2016) "Design, Modification and Analysis of Shaft of Concrete Mixer Machine" International Journal for Research in Applied Science & Engineering Technology, Volume 4 Issue XII, pp. 33 to 46.
2. AamodGurao, Ajinkya Keskar, Mangesh Jadhav, Pranav Jadhav, Ranjeet Mithari (March 2017) "Horizontal Axis Electric Operated Concrete Mixer" International Journal of Innovative Research in Science, Engineering and Technology, Vol. 6, Issue 3, pp. 3813 to 3820.
3. SalisuSule, Oyejideoluwayomi Joe, EgunbambiMudathir Wale, OlorunrokanOluwale Clement, (2018) "Design and Development of a

Foundry Sand Mixer" Journal of Scientific and Engineering Research, pp. 165 to 170.

4. Timur ChobanKhidir (November 2018) "Designing, Remodelling and Analysing the Blades of Portable Concrete Mixture" International Journal of Mechanical Engineering and Robotics Research, Vol. 7, No. 6, pp. 674 to 678.