DESIGN & ANALYSIS OF CONCRETE MIXTURE DRUM SHAFT

V.Sivasankari
Mechanical Engineering
Sengunthar Engineering College
(Autonomous)
Tiruchengode, Namakkal
18me43@scteng.co.in

D.Logesh kumar
Mechanical Engineering
Sengunthar Engineering College
(Autonomous)
Tiruchengode, Namakkal
18me24@scteng.co.in

R.Thavasiyappan
Mechanical Engineering
Sengunthar Engineering College
(Autonomous)
Tiruchengode, Namakkal
18me49@scteng.co.in

Mr.S.Murugesan,M.E.,
Assistant Professor
Mechanical Engineering
Sengunthar Engineering College
(Autonomous)
Tiruchengode, Namakkal
smurugesan.mech@scteng.co.in

Abstract— ***The investigation, design modification, and analysis of a concrete mixer drum shaft are all included in this work. Concrete mixer machines are commonly used to manufacture concrete mixtures for use in construction and industries, such as concrete blocks, pipes, and sheets. The concrete mixture drum shaft was used in our project. The deformation, stress, strain, and safety factor of several materials (mild steel, carbon steel, and stainless steel) used to examine drum shafts. With the help of the Ansys programme, select the best material for the concrete mixture drum. As a result of the growing human population and the constant demand for housing, the construction and building industries are expanding on a regular basis.***

1. 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 predesigned in order to get the finest 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 machines that aid in the mixing of concrete and concrete paste materials into an useable state. In other terms, the mechanical concrete mixer, or simply the concrete mixer, is the machine that is used to mix concrete.

2. TYPES OF CONCRETE MIXERS

There are two broad types of concrete mixers:

1. Batch mixers

a. Drum Types Mixer
- Tilting drum mixers
- Non-tilting drum mixer
- Reversing drum mixer

b. Pan Type Mixer

2. Continuous mixers

3. OBJECTIVE

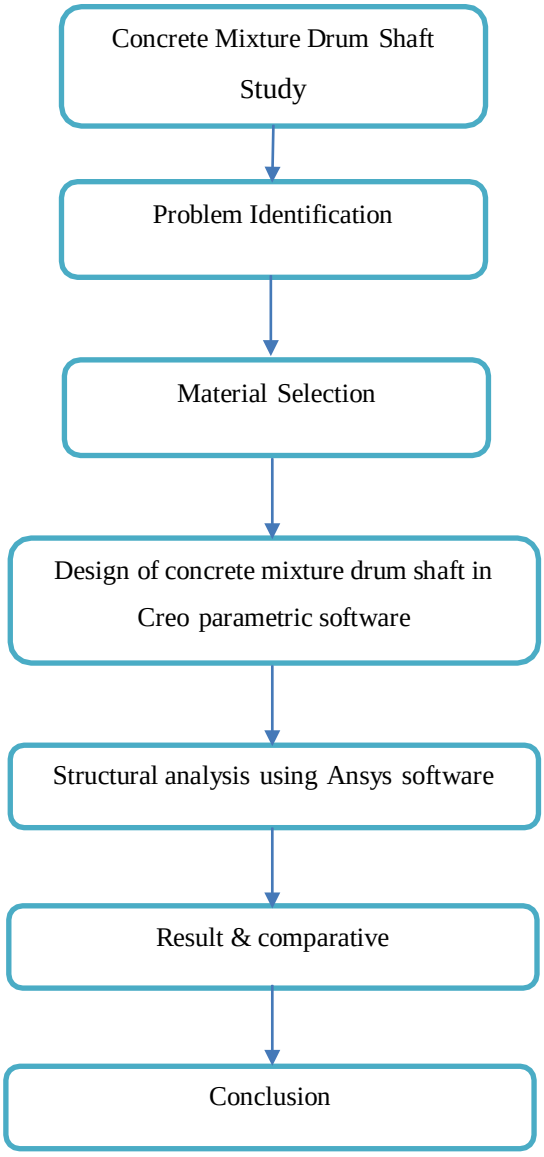
The major goal of this project is to improve the drum shaft's durability and resolve several technical concerns. The mixer drum shaft has been proposed with composite fibre material. For the proposed new material, the present material (mild steel) is replaced by stainless steel and carbon steel materials. The structural analysis of this new mixer drum shaft should be performed using ANSYS software.

4. PROBLEM IDENTIFICATION

Some issues have been observed in mixer drum shafts that have been damaged as a result of variables such as material corrosion, material wear (crack) from prolonged use, and continued load. As a result, the mixer drum shaft has a short lifespan. To solve this

technical challenge, the material option for the drum shaft was revised in this project.

5. WORKING METHODOLOGY



6. 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 improve the designer's efficiency, the quality of the design, communication through documentation, and the creation of a database for manufacturing. Electronic files for printing, machining, and other manufacturing procedures are common CAD outputs. Mechanical design automation is a term used in mechanical design (MDA).

6.1 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. Finite element analysis (FEA) and computer-aided engineering (CAE).

a) a) Computer-aided manufacturing (CAM), which includes computer numerical control (CNC) machine instructions.

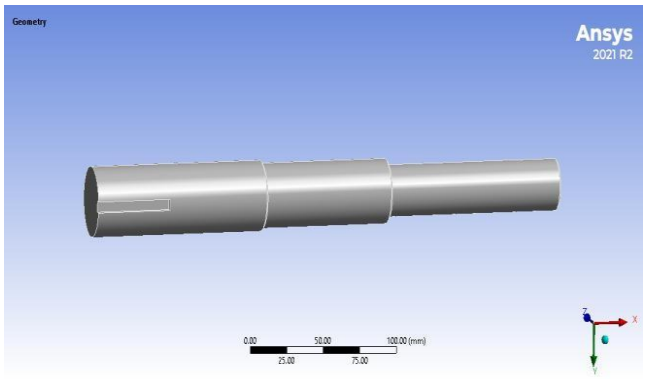
b) Motion simulation and photorealistic rendering.

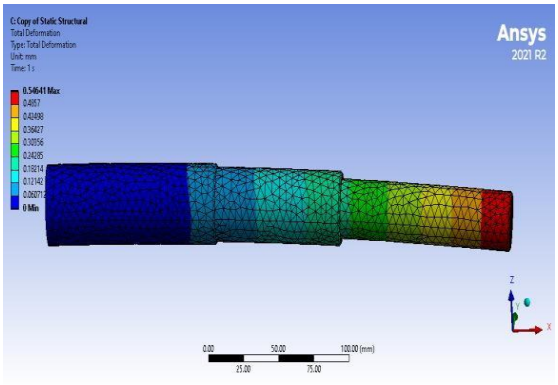
c) Using product data management, document management and revision control (PDM).

6.2 USES OF FEM

The finite element method (FEM) is a numerical technique for solving problems with partial differential equations or issues that can be expressed as functional minimization. An assembly of finite elements represents a domain of interest. In finite elements, approximating functions are defined in terms of nodal values of a physical field that is desired. A discretized finite element problem with uncertain nodal values is created from a continuous physical issue.

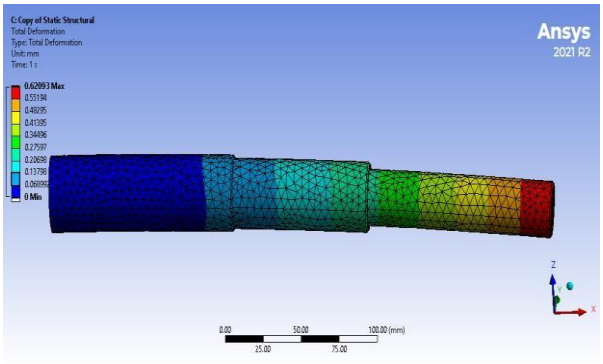
7. STRUCTURAL ANALYSIS MODEL





Total Deformation in Carbon Steel

7.1 MILD STEEL MATERIAL OF CONCRETE MIXTURE DRUM SHAFT TOTAL DEFORMATION



Total Deformation in Mild Steel

7.2 OVERALL RESULT OF MILD STEEL MATERIAL

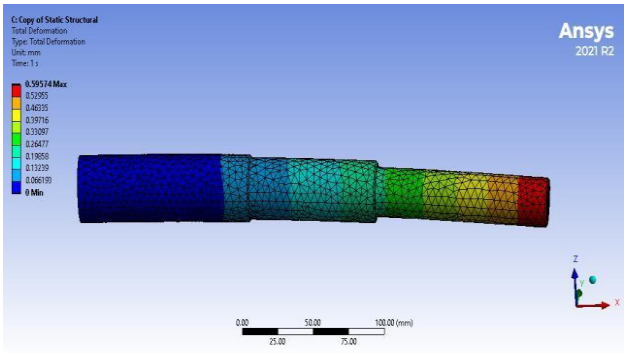
Description	Units	Result
Total Deformation	mm	0.62093
Strain	-	0.00031133
Stress	MPa	64.476
Safety Factor	-	4.3092

7.3 CARBON STEEL MATERIAL OF CONCRETE MIXTURE DRUM SHAFT TOTAL DEFORMATION

7.4 OVERALL RESULT CARBON FIBER MATERIAL

Description	Units	Result
Total Deformation	mm	0.55641
Strain	-	0.00027391
Stress	MPa	57.436
Safety Factor	-	5.11

7.5 STAINLESS STEEL MATERIAL OF CONCRETE MIXTURE DRUM SHAFT TOTAL DEFORMATION



Total Deformation in Stainless Steel

7.6 OVERALL RESULT OF STAINLESS-STEEL MATERIAL

Description	Units	Result

Total Deformation	mm	0.59574
Strain	-	0.00029804
Stress	MPa	57.491
Safety Factor	-	4.385

8. IMPORT & EXPORT

Import and export are important for transferring files from one software to another, and they're generally utilised in two ways. IGES solid IGES solid IGES solid IGES solid IGES solid IGES solid I The Initial Graphics Communicate Specification (IGES) is a vendor-neutral file format that allows computer-aided design (CAD) systems to exchange digital information. A CAD user can communicate product data models in the form of circuit diagrams, wireframes, freeform surfaces, or modelling representations using the IGES standard. Traditional engineering drawings, models for analysis, and other production operations are all supported by IGES.

9. RESULT

Comparison of Overall Result:

	Mild Steel	**Carbon Steel**	**Stainless Steel**
Deformation (mm)	0.55242	0.55641	0.59574
Strain	0.00027713	0.00027391	0.00029804
Stress (MPa)	57.393	57.436	57.491
Safety Factor	4.3092	5.11	4.385

10. CONCLUSION

With the optimization of several materials, the performance of the concrete mixture drum shaft is checked using Ansys software. To calculate the safety factor in the model for various materials in different loading conditions of the mixing drum shaft. According to the results of the structural analysis, stainless steel is better in terms of deflection, whereas carbon steel is better in terms of safety factor. As a result, for this mixer drum shaft use, carbon steel and stainless steel are preferable to mild steel.

11. REFERENCE

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