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MODELING AND FINITE ELEMENT ANALYSIS OF WATER FETCHING AID

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ABSTRACT

Water fetching aid a device is important for fetching water in rural area. It is designed to with stand stresses from the fetching 50liters water at one time. The purpose of a water fetching aid is to reduce the burden of rural women while fetching the water. The most effective feature of a water fetching aid is that it should be easy for handling and lighter in weight. The main purpose of this paper is to analyse the stresses developed in water fetching aid under static loading conditions with different angle of inclination. And thenlookforwardforweightreductionofwaterfetchingalongwithmaterial optimization. The model of the water fetching aid is developed using CATIAV5 and ANSYS is used for stresses analysis by simulation (this method is also known as Finite Element Analysis by simulation). This is the cost and time effective method of analysis. Mild steel are is a material considered as the optimizing material.

Keywords: ANSYS, CATIAV5, FEA, water fetching aid.

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1. INTRODUCTION

Water scarcity is one of the greatest issues in many parts of the earth. Due to this problem, women from rural areas are taking water 2-3 km away from home for domestic purposes, for drinking purposes, for bathing purposes [1]. Maximum time's rural women use traditional methods of water fetching. Every day, the maximum number of women and children from rural areas is increased, so that water fetching is considered to be a job for women and children. This information of water fetcher collected through the survey in the draught area and assessment of different postures of water fetching is made [2, 7]. For reducing the reducing [8] the burden of rural water fetching women, water fetching aid is a device which is made. This device is useful to collect 50litre water at one time so that stresses and pain produces in rural women will beget reduces. Also the time required for fetching the water also reduces so rural women can use her time for the other work. Sometimes small children also help their mother of etch water by the methods of tradition like on head mode; hand mode so it will be becomes very difficult to collect water from long distance [4]. By considering all the issue of rural women about fetching the water new water fetching device is made which is helpful to rural women having light in weight and less in cost. This device can use the small children also, it is based on the concept like the pulling, pushing the device instead of carrying on head, carrying in hand. Figure-1 shows the water fetching device with the drum having the capacity to collect water is about the 50litre which is made of plastic.



Figure-1.

2. METHOD

This water fetching device is made with a different component like a handle, adjustable rod, clamping screw, water drum with capacity of 50kg water and wheels. While making the device of water fetching aid attention is taken towards optimization and reducing the cost of product [6]. The geometry of water fetching aid is prepared in CATIA V5 software [5]. After making Geometry in CATIA V5 software it will be imported in the ANSYS software for the analysis. Figure-2 shows the geometry made in the CATIA V5software.

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The CATIA V5 file is imported in the ANSYS software for analysis of water fetching device by considering the women carrying water at different inclination angle like a 30° , 60° , and 90° . At different inclination angle the analysis of water fetching aid is made with the stresses, strains and deformation produces in the water fetching aid. Table-1 shows the properties of the material used for making device of water fetching aid.

Table-1.	Properties	of the	materials.

Properties of materials	Mild Steel	Polyurethane
Young's modulus (E)	210GPa	6MPa
Poisson' sratio	0.303	0.39
Density	7860Kg/m ³	1250Kg/m ³
Tensile strength	440MPa	29.6MPa

The basic mild steel is used for making the water fetching aids with properties are shown in the Table-1. Mild steel is used for making the water fetching Aid except the wheel. Water fetching wheels are made up of plastic material. Figure-3 shows the water fetching device is imported in ANSYS software and after that the meshing has been done in ANSYS workbench.





After importing the Water fetching device in the ANSYS software loading conditions are applied on the water fetching device. Total load of approximately700N load applied on the water fetching device. It is a statics

analysis of water fetching device so that fixed support is applied at the wheel. Figure-4 shows load acting on the water fetching device with a fixed support at wheels.



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FIGURE 3 Model (C4) > Static Structural (C5) > Fixed Support > Figure

Figure-4.

Importing the geometry in ANSYS workbench and applying the boundary condition and loading condition the analysis have been made with a different inclination angle 30^{0} , 60^{0} , 90^{0} .

3. RESULT

The water fetching device is analysed by the ANSYS work bench through this software get the results about the stresses, strains and deformation with different inclination angle.





ANSYS workbench gives the result about the stresses which is shown in Figure-5 it is observed that stress developed at the inclination of 30^0 is more as compared to other two inclinations. Maximum stress

developed in the water fetching aid is 230.14 MPa with the inclination of 30° . The stress developed in 90° is less because at this stage the total load is on the supporting plate to the ground. So stress will be less at the 90° .

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Figure-6.

Total deformation is produced in the water fetching device is maximum with 30^{0} inclination which is11.58mm. Total deformation producedin60⁰ inclination of water fetching aidis7.00mm and inclination of 90⁰ is 2.07mm. As per result for ANSYS workbench total maximum stress and total maximum deformation produced in water fetching aid with handling in 30^{0} inclinations is maximum.

Table-2.	Properties	of the	materials.
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Water fetching with inclination (Angle)	Stress	Deformation
30^{0}	230.14MPa	11.58mm
60^{0}	188.33MPa	7.00mm
900	107.22MPa	2.07mm

4. CONCLUSIONS

The water fetching aid is device used for the water fetching from long distance. It will result in variation in stresses for while handling the water fetching aid with different inclination. Water fetching is at 90^{0} gives less stress and deformation as compared with other. At 90^{0} Water fetching device come at rest position so that stresses will reduce device total load is transfer towards the ground with the help of supporting plates in the device. The stresses and deformation produced in the equipment are Yield strength of Mild steel is 370 Mpa. Stress Generated is 230.14 Mpa from this results we conclude that Design is safe.

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