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WEIGHT OPTIMIZATION OF ROLLER CONVEYOR SYSTEM BY USING COMPOSITE GLASS FIBER MATERIAL

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ABSTRACT -In this paper I studied problem in existing conveyor system and optimized critical part of roller conveyor system like Roller Modern roller transport having MS rollers because of this hanging is instigated in roller support. Subsequently Company required upgrading weight of roller to abstain from hanging. Paper contains mathematical displaying and limited component examination of existing plan and improves plan. Geometrical modeling is done Using CATIA V5R20 and FEA was done with the help of ANSYS 14.5.

I. INTRODUCTION

A conveyor system is a common piece of mechanical handling equipment that moves materials from one location to another. Conveyors are especially useful in applications involving the transportation of weighty or massive materials. Transport frameworks permit speedy and productive transportation for a wide assortment of materials, which make them exceptionally famous in the material taking care of and bundling ventures. Numerous sorts of conveying frameworks are accessible, and are utilized by the different requirements of various ventures. There are chain transports (floor and upward) also. Chain transports comprise of encased tracks, I-Beam, towline, power and free, and hand pushed streetcars. Transport systems are used widespread across a range of industries due to the numerous benefits they provide.

A conveyor system is a common piece of mechanical handling equipment that moves materials from one location to another. Conveyors are especially useful in applications involving the transportation of heavy or bulky materials. Conveyor systems allow quick and efficient transportation for a wide variety of materials, which make them very popular in the material handling and packaging industries. Many kinds of conveying systems are available, and are used according to the various needs of different industries. There are chain conveyors (floor and overhead) as well. Chain conveyors consist of enclosed tracks, I-Beam, towline, power & free, and hand pushed trolleys. Conveyor systems are used widespread across a range of industries due to the numerous benefits they provide.

1.1 Scope of Present Study

1. Check design of existing conveyor system.
2. ANSYS APDL codes or CATIA V5R19 for drawing of existing system.
3. ANSYS is used for linear static and optimization analysis.
4. Optimization of conveyor assembly for weight reduction.
5. Comparison between existing and optimized design.
6. By using the “UNIVERSAL TESTING MACHINE” finds out the maximum loading and maximum deformations of the both rollers.

II. DESIGN

E =2.10*105 Mpa, ρ= 7860 Kg/m3,
Maximum Stress Calculation for given condition
W= 12.5kg
D1= Outer diameter of roller = 46 mm
D2 = Inner diameter of roller = 40 mm
w = Width of roller = 370 mm
y = Distance from neutral axis = 0.046/2 = 0.023
Considering uniformly distributed load,
Maximum Moment (Mmax) = W*L/8

= (36*9.81*.33)/8
Mmax = 5.671Nm
Moment of Inertia (I) =Π (D14-D24)/64
= Π (0.0464–0.0404)/64
I = 9.4122*10-8m4
Maximum bending stress σb
= Mmax * y/ I
= 5.6714* 0.023/ 9.4122*10-8
σb= 1.24 Mpa
Ymax = 5*W*L3/384*E*I
= 0.00409

2.1 Design of Composite Roller Material

GF
E = 43000 Mpa, ρ= 2600Kg/m3,
Maximum Stress Calculation for given condition
W= 12.5kg
D1= Outer diameter of roller = 50 mm
D2 = Inner diameter of roller = 40 mm
w = Width of roller = 370 mm

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y = Distance from neutral axis
= 0.050/2 = 0.025
Considering uniformly distributed load,
Maximum Moment (Mmax) = W*L/8
= (12.5*9.81*.37)/8
Mmax = 5.67 Nm
Moment of Inertia (I) =Π (D14-D24)/64
= Π (0.0504–0.0404)/64
I = 1.81*10-7m4
Maximum bending stress σb
= Mmax * y/ I
= 5.67 * 0.025/ 1.81*10-7
σb = 0.782 Mpa
Ymax = 5*W*L3/384*E*I
= 0.01038

III. ANALYSIS

Fitting is a fundamental piece of the PC helped designing reproduction process. The lattice impacts the exactness, assembly and speed of the arrangement. Moreover, the time it takes to make and work a model is in many cases a critical part of the time it takes to come by results from a CAE arrangement. Therefore, the better and more automated the meshing tools, the better the solution.

From easy, automatic meshing to a highly crafted mesh, ANSYS provides the ultimate solution.

Powerful automation capabilities ease the initial meshing of a new geometry by keying off physics preferences and using smart defaults so a mesh can be obtained upon first try. Additionally, a user can update immediately to a parameter change, making the handoff from CAD to CAE seamless and aiding in upfront design.

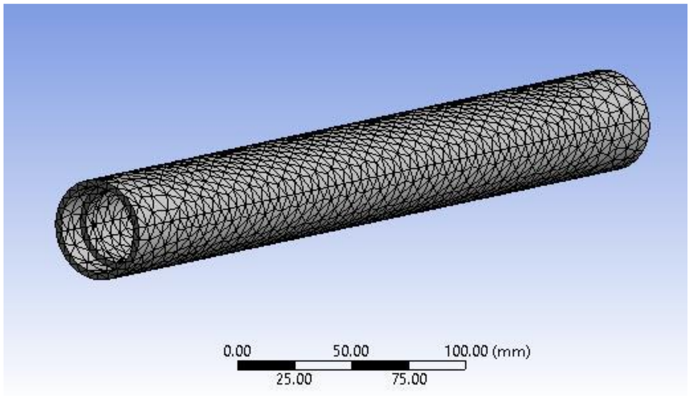

Fig1. Meshing of Original MS Roller

Boundary Condition

To define a problem that results in a unique solution, you must specify information on the dependent (flow) variables at the domain

Boundaries Specify fluxes of mass, momentum, energy, etc. into the domain.‹

Defining boundary conditions involves:

Identifying the location of the boundaries (e.g., inlets, walls, symmetry) Supplying information at the boundaries

‹ The data required at a boundary depends upon the boundary condition type and the physical models employed.

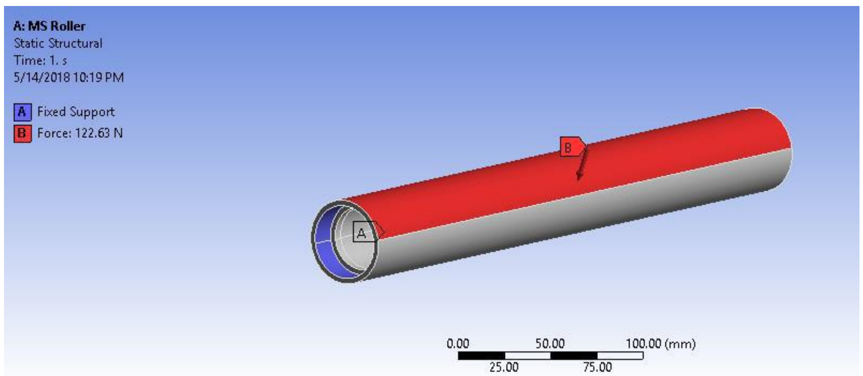

Fig.2 Boundary Condition of MS Roller

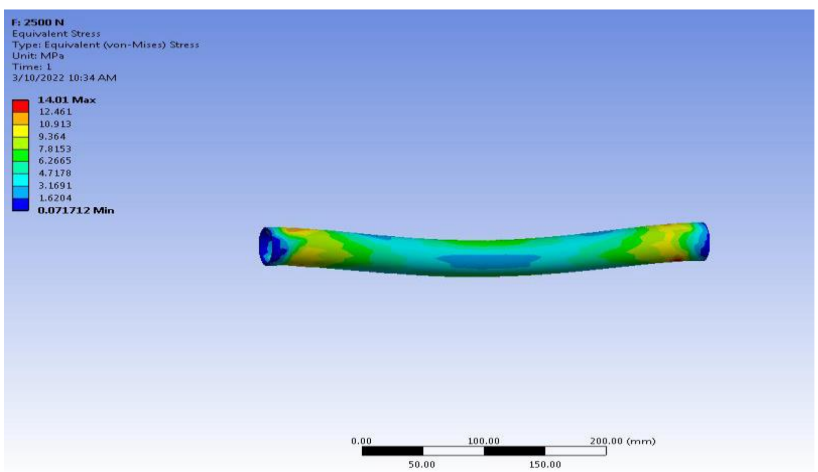

Fig.3 Stress in MS Roller

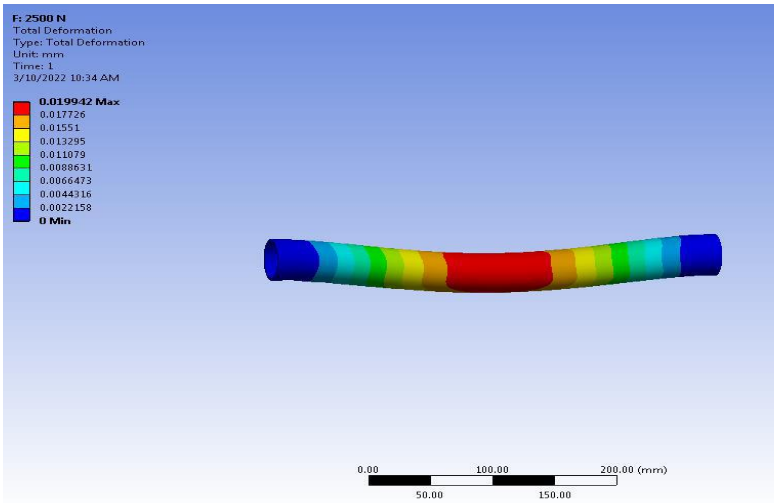

Fig.4 Total Deformation in MS Roller

IV. RESULT OF GLASS FIBER ROLLER

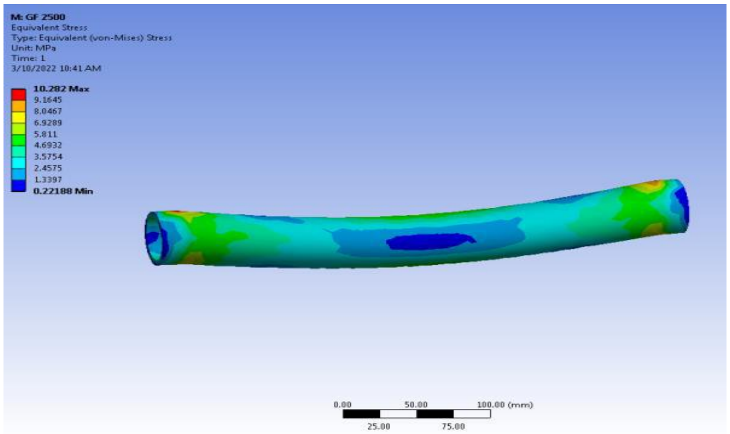

Fig. 5 Stress in Glass Fiber Roller

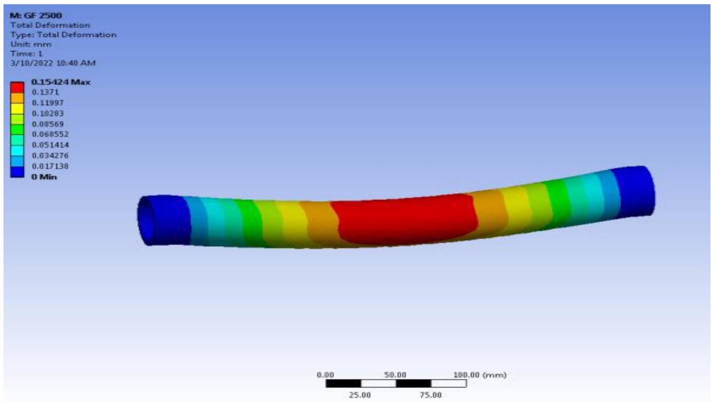

Fig. 6 Total Deformation in Glass Fiber Roller

RESULT TABLE

Sr. No.			FEA	Theoretical
1	Deflection (mm)	Steel	0.002	0.00409
2		E-Glass	0.012	0.01038
1	Bending stress (Mpa)	Steel	1.27	1.24
2		E-Glass	0.71	0.782

V. CONCLUSION

Maximum weight of conveyor is due to roller; existing MS roller conveyor shows maximum weight so there is scope of optimization. Geography advancement procedure gives ideal plan results for new upgraded roller. Expanding strength and evoking weight of items are high examination requests in the advanced innovation. Composite materials are becoming sufficient of satisfying these requests. Composite roller conveyor has high strength to weight ratio for the same load carrying capacity with same dimensions as that of MS rollers. When MS material is used, stress is more as compared to GF composite material.

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