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"Ansys Analysis On Screw Conveyor Employing Diverse Coating Materials"

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ABSTRACT :Screw conveying system can be used in various type construction work and in various industries across the globe where the goods and products are hauled or pushed with the Screw's rotational effect. The perpetual undertaking of the screw sometimes governs to the failure which is extensively fatal for the industries, as per the production point of *view.*

In auger mostly the flight of the screw get eroded due to continual operation and mostly in the industries where the abrasive material bring conveying with the help of screw conveyor. This encourage to more evolution in the screw conveying system in order to expand the vitality of the equipment. Numerous enforcement are heading to reduce the shortcoming in the auger unit under different operating conditions. Many publication proposed to change the unit's material of the finished screw, which is ample expensive hence it is essential to acquire such method which can reinforce the vitality of the conveyor with low expense and in limited time. The main purpose of the model is to evaluate the torque, Axial force and Power required for the scroll to haul the material. The model is presented in a non-dimensional form and the process for implementing the model is involved. The model is distinguished to test data from an exist publication; there was good agreement between the model and data. Outcomes are presented in the form of graphs to illustrate the significance of key parameters. The 3D model is created in CATIA software and this model is imported for simulation in ANSYS. There are four type of material used Titanium Nrtride (TIN), Zinc SS440,and Zirkonium Nrtride. Comparable inspection is conducted for all the four materials for total deformation, directional deformation and equivalent stress. Moreover the results calculated in this research work are analyzed with the outcomes of researches obtained in the prior years are examined for further use in future.

Keywords- Conveyorsystem; Screwconveying, ANSYS, CATIA, SS440, Tin, Zinc, Zrn.

I. INTRODUCTION

Conveyors are defines as equipment which can transport material or goods from one plane to another place without any effort allying to it. The structure of the conveyors are mostly based on frame, supporting roller or conveying roller or belt and the driven . The conveyors are used for transmitting the gravel material other aggregate, cement concrete paste, and cement slurry, for building construction work and also used for conveying solid or semi-solid waste during the raw water as well as waste water treatment. In industries it is largely used to substitute the coal, fly ash and the output product to the final destination of the plant. There are various category of conveyors utilize as the area and the type of work such as belt conveyor, roller conveyor, vibratory conveyor, bucket conveyor etc.

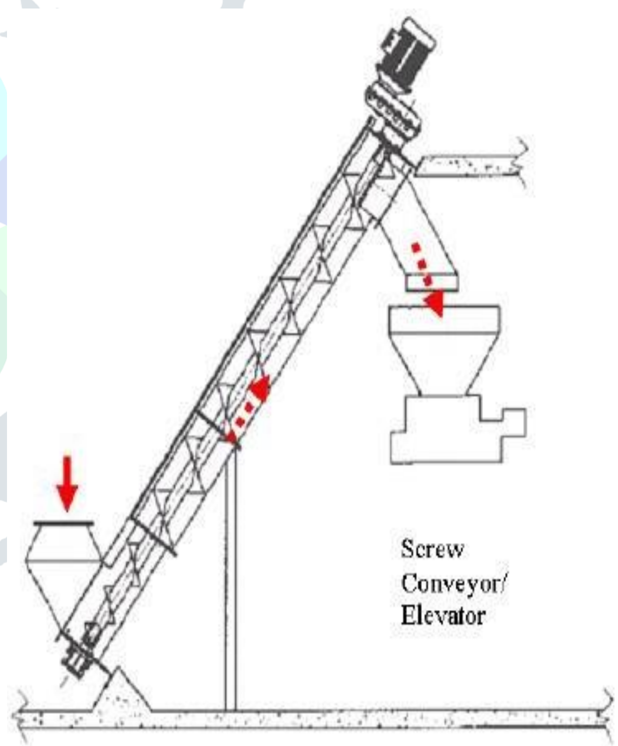


Fig.1-Screwconveyor

A.Components of screw conveyor

1) *Screw:*

   Based on rotation- Left and Right Hand Screws, A transport screw is either anti clock or clock side delegation be contingent upon the type of the helix. The hand of the screw is skillfully enacted by taking a gander toward the finish of the screw. The screw imagined to one side has the flight helix folded over the pipe in a counterclockwise bearing, or to one side. Same as left hand strings on a jolt. This is subjectively called a LEFT hand screw.

The screw deemed to the privilege has the flight helix folded over the pipe a clockwise path, or on your right side. Similar as right hand strings on a jolt. This is named a RIGHT hand screw. A transport screw saw from either end will illustrate a similar design. In the event that the end of the transport screw isn't shortly unmistakable, at that point by simply anticipating that the flighting has been chop, with the chopped end located, the handof the screw might be effectively determined.

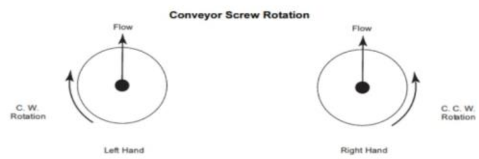


Fig.2 Screw

2) *MassFlow:*

It is the combination of both variable diameter of the centre pipe and the pitch of the flight such that as the pitch increase volume of the material also increase. It is mainly utilized in screw feeders for uniform flow of bulk material from the silos hoppers etc.

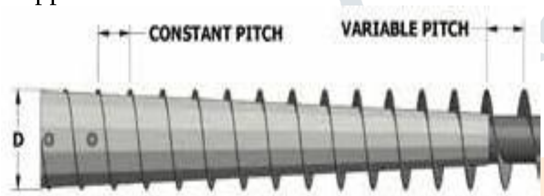


Fig.3 Mass flow Screw

3) *Tubular Housings:*

In this type of trough tube type structure provided such that it helps to reduce the condition of fall back and overcome the effect of gravity when used in the more inclination angle.

Fig.4 Tubular Housings trough

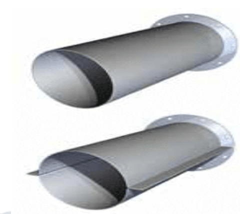
4) *BEARINGS*

Both types of bearings support the screw at the end and middle of the shaft. Block bearing support the screw at the end the of the shaft while hanger bearing support the screw at the middle in order to avoid the sagging.

Figure.5 Screw conveyor block bearing and hanger bearing

II. LITRETUREREVIEW

BepariyaKeyur et al 2018 performed investigation on new machine rather than old machine for material handling purpose.The main purpose of the author in the present study is to utilize the land and its space in such a way that it can fullfill theallrequirementof the manufacturing process in which the material such as soaps biscuits wafers can be transfer from manufacturing area to storage area at higher level with efficient out by using the screw conveyor as a material handling system.



Panchal Pritetal 2017 Investigated about the present scenario of the industries and its drainage system such that it is the major problem which cause the pollution and leads to bad impact on biological life and which results in global warming. Author also explained the drawbacks of drainage pipe as it sometimes result as loss of human life. To overcome all the related problem author investigated the automated system using screw conveyor which can clean the waste named as "Automatic waste Cleaning System by screw conveyor" and also constructed the prototype of the present suggested system.

Amudha.K 2017 Represented analysis of screw conveyor experimentally and performed a review on the screw conveyor's performance under various operating conditions. In the investigation the author found variation in flow rates and feed rate there was no change in mass flow of the material. Nodule output about 8.6 kg/rotation was also observed. In the study screw feeder operation took place for 150meter depth with mass loss of 14% due wash away of finer particles. Conclusion drawn with respect to design was validated in trials in sea for higher depth about 6000 meter depth.

Olanrewaju T. O. et al 2017 performed experimental analysis on inclination of 0°, 30° and 45° respectively for grains on a screw conveyor. On analysing experimentally, he found that for maize, screw conveyor's average capacity was 407.05, 282.4 and 263.1 kg h-1 for case in gari, screw conveyors capacity was 460.0, 365.3, 310.0 kg h-1 and average capacity for sorghum was 450.2, 350.5, 263.0 kg h-1.With al, the output author concluded that screw conveyor with inclination provided 99.95% efficiency when handling the granules.

Michael Rackl 2016 investigated the design parametersofthescrewconveyormassflowanddrivingtorquefor threegrades of wood chips and two blends of wood chips. As aresult it was found that one of the chip grade recoded hightorque rate ie twice of the another and one get jammed. Theresult concluded that the blending of the wood chips canreducethejammingtodesirablerate.

MariannaTomašková 2014 explained the complete working of the screw conveyor and the various design of thesystem which are utilized across the world for getting thebest efficiency in material handling purpose. In the research paper also discussed about the various risks and drawbacks associated with use of screw conveyor for material handling purpose.

Jigar N. Patel 2013 represented the modification of theAuger in order to attain same output with small size and less power consumption. In the investigation author proposed thescrew conveyor without shaft for conveying the cement withcapacityof2t/h.Asaresultitwasfoundthatscrewconveyor are capable of conveying the material in inclination but itscapacitydecreasewithincreaseininclinationangle.

III. OBJECTIVE

The objectives of the thesis are as follows:

$$\omega = \frac{2\pi \cdot n}{60} = \frac{2 \times 3.14 \times 3000}{60} = 314 \text{ rad/s}$$

(1) Reduction in the deformation in auger under various operating conditions through analysis of stresses and modification in the design.

(2) Minimizing stress generation under the above operated condition in order toincrease the production as well as life of the equipment.

(3) To increase the life of conveyor blades by surface coating treatment.

IV. METHODOLOGY

A. SOFTWAREUSEDFORTHESTUDY

1) CATIAV5

In the present study CATIA V5 software isused for CAD modeing. CATIA offer the various stages of the product

$$F_k = 2m\omega V_r$$

development which include computer aided design(CAD), computer aided engineering (CAE) computeraided manufacturing (CAM). It also provide the platform for performing various design modules such as wireframe and surface and shape design, mechanical and electrical system design etc.

2) ANSYS

It is the software used for modeling as well as for testingthe products durability, temperature distribution in product and the movement of fluid under various boundary conditions. It make possible to analyze the condition of themodel under various operating environment and also helped to simulate the effect on model of an object.The basic module of the ANSYS software is

$$p_c = \rho\omega^2 \int_{r_1}^{R} r dr = \frac{1}{2}\rho\omega^2 \left(R^2 - r_1^2\right)$$

FEA, CFD.

B. GOVERNINGEQUATIONS

It is simple to use software to analyze the result undervarious load conditions. The theoretical calculation of thevarious result under loading conditions can be calculate byusing governing equations and the relation between different parameters and formulae

When working with stability, the loads of screw conveyor include:

1. Centrifugal force as result of high rpm . Centrifugal load on the screw body applied as angular velocity. The angular velocity ω is calculated as:

Where n is the rotating speed of screw conveyor, in this article, n=3000r/min.

(2) Force of Coriolis: The Coriolis force arise when the centrifugal force act on the body. As per the theory of mechanics when the rotation takes place on the fixed axis then acceleration due to Coriolis is given by

$$\alpha_k = 2\omega V_r$$

Where, Vr is the radial velocity of particle relative to drum. Coriolis force is defined as:

In theoretical condition the Coriolis force does not sustain for centrifuge hence it can be ignored during the calculation

(3) Centrifugal hydraulic pressure. During the working of centrifuge the combination of liquid and sediment exerts a force on the inner surface of the bode body and it is only the centrifugal hydraulic pressure. The formula is given as follows

where;
pc is the hydraulic pressure,
φ is the density of material,
u is the rotating velocity of drum,
R is the radius ofdrum,
r is the inner radius of drum.

C. MATERIALPROPERTIES

Mild steel is use to design analysis of hydraulic plate duetoheightstrengthproperty.

Table.1 Material properties

Material	Density(Kg/m3)	Youngm oduls (MPa)	Poisson's ratio
SS440	7800	2x10^5	0.3
TiN	5220	6x10^5	0.25
ZrN	7090	4.2x10^5	0.29
Zinc	7140	1.08x10^05	0.25

D. STEPS OF WORKING

1) Collecting information and data related to screw conveyor.
2) A fully parametric model of the Screw conveyor is generated using Catia V5.
3) Model obtained in Step 2 is analyzed using ANSYS 15.
4) Manual calculations are done.
5) Finally, we compare the results obtained from ANSYS

E. STEPS OF ANSYS ANALYSIS

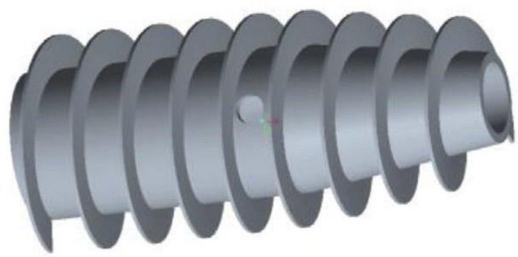
The different analysis steps involved in ANSYS are mentioned below.

1). Pre-process

Pre-process include initial stage of the analysis in which first the model of the geometry created with different geometrical parameter.In the study CATIA is used to design the model of the screw conveyor and imported into the work bench of the ANSYS.

Table2-Geometricaldimensions

Parameter	Value
Cylinder inner radius	152mm
Scroll pitch	108mm
Taper angle	Degree
Spiral angle	7.59Degree
Length of conical section	418mm
Length ofcylindricalsection	582mm
Druminnerradius	225mm



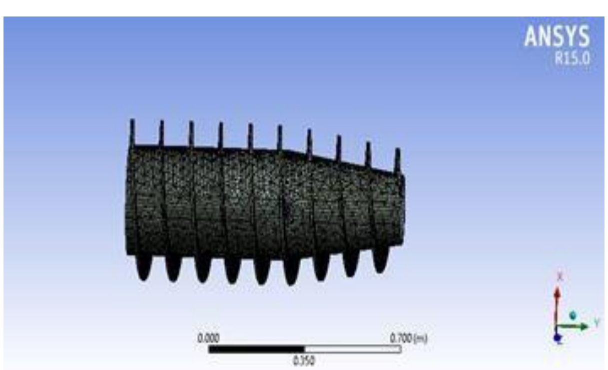
2). Screw conveyor design

In the research analysis screw conveyor is analyzed under various load conditions for deformation and equivalent stress on it under various load conditions. The model is prepared using the CATIA V5 R20 software using the base paper dimension data.

Figure:3.2CADmodelofscrewconveyor

3). Meshing

This is the step before applying the boundary conditionsin this step the mesh is generated such that the whole body get divided into nodes and element for accuracy of the result.The meshing helps to analyse the result of the given body under various boundary condition more accurately and precisely. It is practically observed that the fine mesh take much time due to large number of nodes and elements as compared to the coarsebmesh.



Meshing of screw conveyor model

ThemeshcreatedinthisworkisshowninfigureNo.Thetotal Node is generated & Total No. of Elements is for screwconveyormodel.

Table.3 Nodes & Element

NumberofNodes	Number of Element
44277	34158

4). Defining material properties

This is the step in which material properties of the basepaper applied in ANSYS workbench. So many properties ofthe material is given in the library of the ANSYS and it ispossible to add other material properties also such that addnew material option is given in which desired properties ofthematerialcanbedefineaspertherequirementforanalysis.In the following analysis SS440 TiN, ZrN, Zinc materialpropertiesaredefined.

5). Boundarycondition

In this present case 23568N of centrifugal force 1350000 Pa hydraulic pressure and the combined load of both centrifugal for and hydraulic pressure is applied. The screw conveyor is fixed from both side of the screw conveyor.

A. Fixed support

After applying meshing use fixed support command, the fixed support for the screw conveyor given in figure 3.4

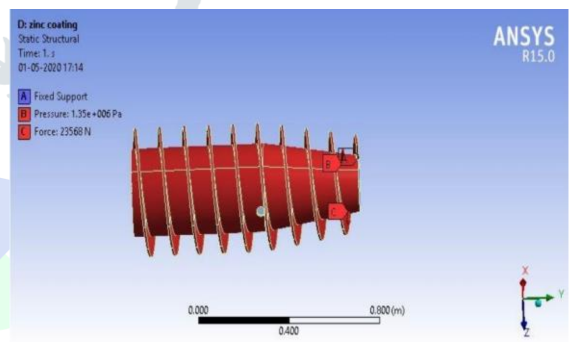


Fig 4.4 fixed support of screw conveyor

1) Force

In the present analysis three load conditions applied forbothvalidatingthebasepaperandduringimplementation.

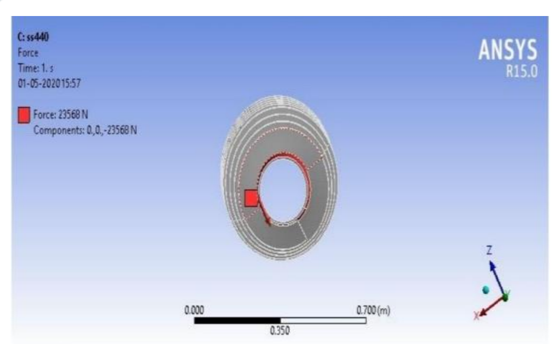


Fig 4.5 Applying centrifugal force

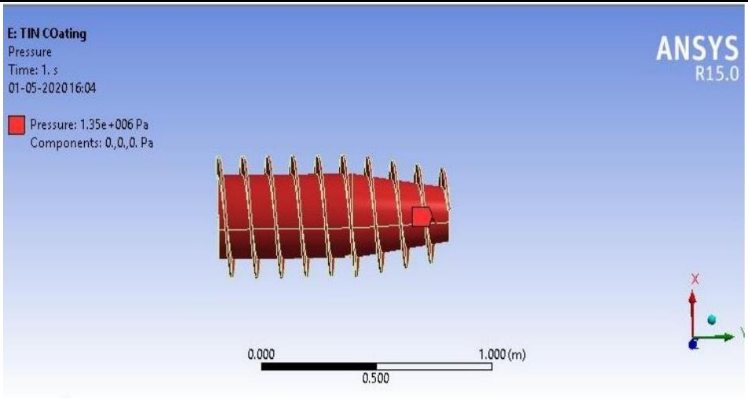


Fig 4.6 Applying hydraulic pressure

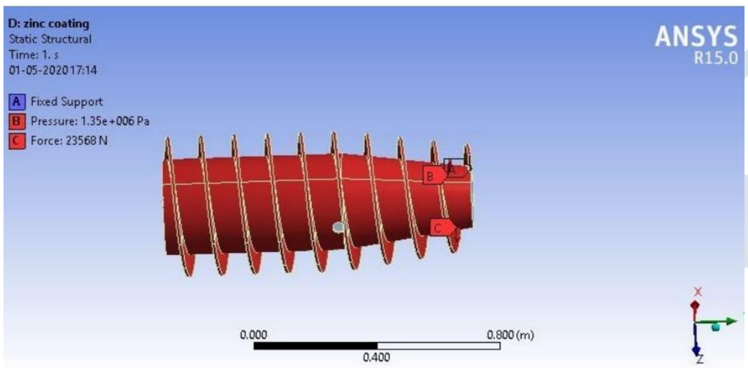


Fig 4.7 boundary condition (hydraulic pressure and centrifugal force)

The analysis of screw conveyor in the software was carries out using the different boundary

conditions. The complete analysis was carried out using three different loading conditions.

(a) Centrifugal force
(b) Hydraulic pressure
(c) (hydraulic pressure+ centrifugal force)

Case – 1:- Result for Applying Hydraulic pressure

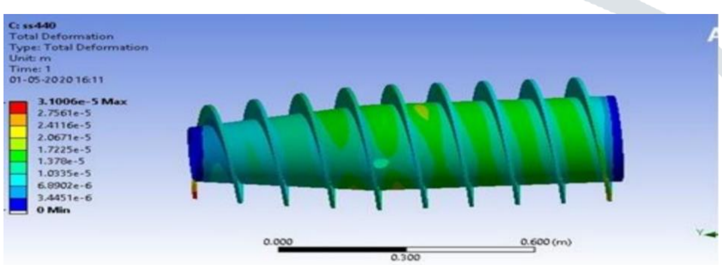


Fig. 4.8.Total Deformation of SS440 in applying hydraulic pressure

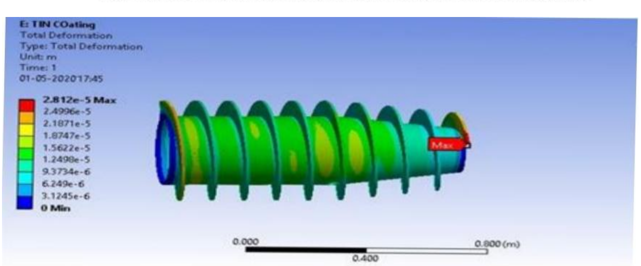


Fig.4.11.Total Deformation of TITANIUM NRTRIDE(TIN) in applying hydraulic pressure

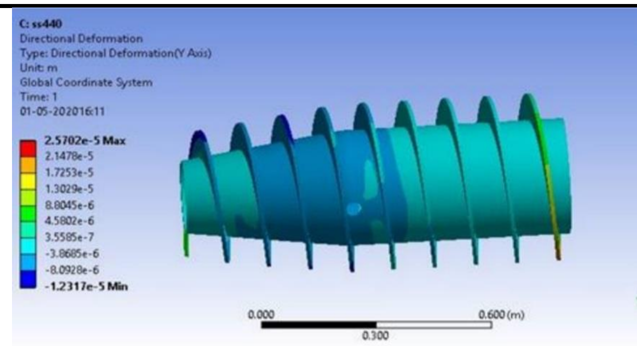


Fig. 4.9.Directional deformation of SS440 in applying hydraulic pressure

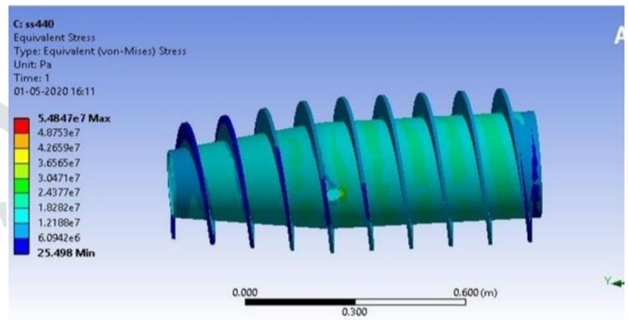


Fig. 4.10.Equivalent stress of SS440 in applying hydraulic pressure

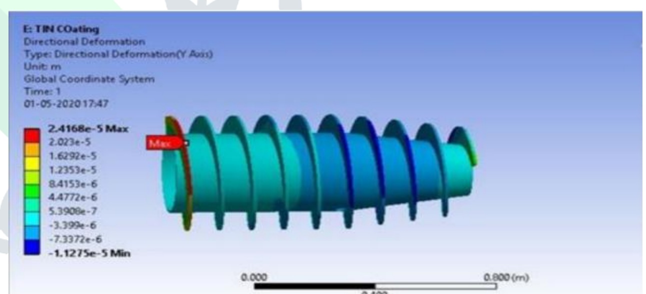


Fig. 4.12.Directional Deformation of TITANIUM NRTRIDE(TIN) in applying hydraulic pressure

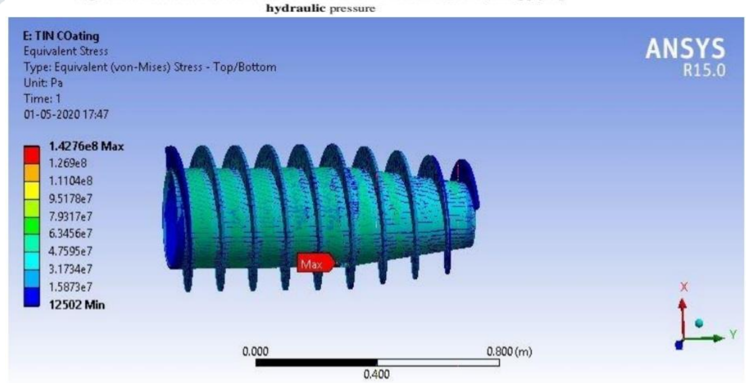


Fig. 4.13.Equivalent stress of TITANIUM NRTRIDE(TIN) in applying hydraulic pressure

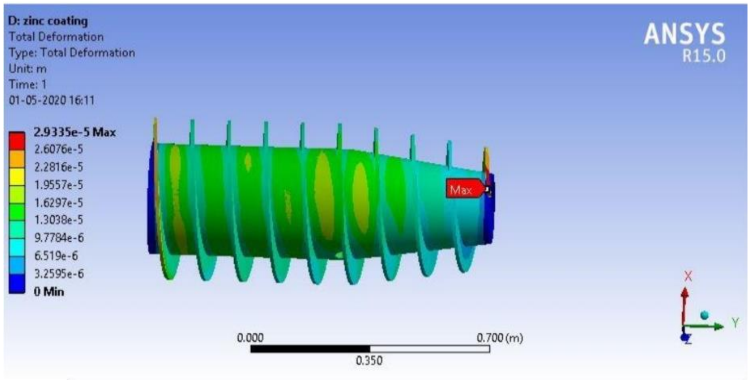


Fig. 4.14.Total Deformation of ZINC in applying hydraulic pressure

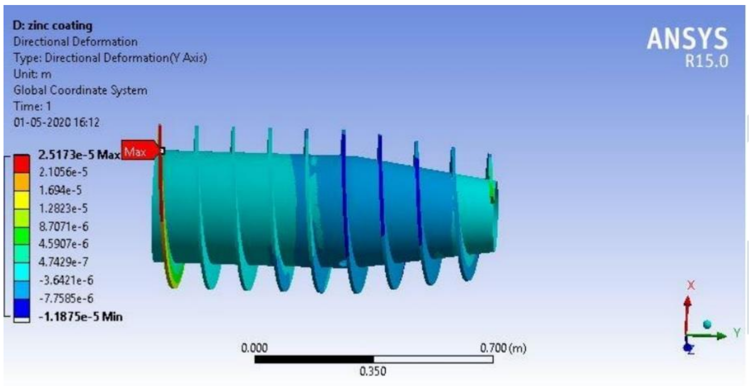


Fig.4.15.DirectionalDeformation of ZINCin applying hydraulic pressure

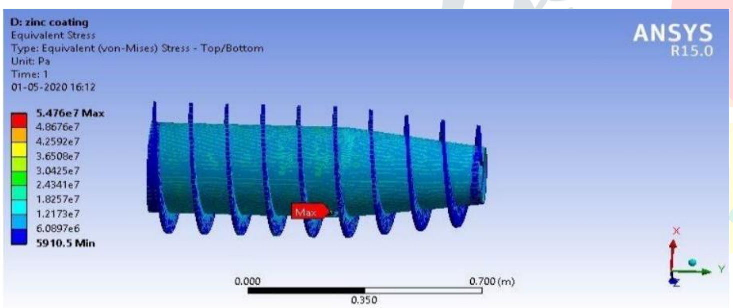


Fig.4.16.Equivalent stress of ZINC in applying hydraulic pressure

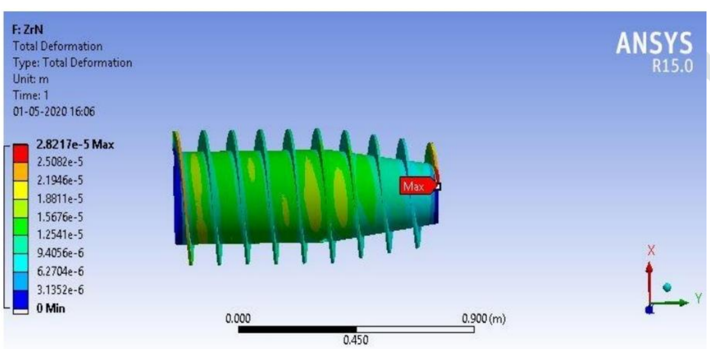


Fig.4.17.Total Deformation of ZirkoniumNrtride in applying hydraulic pressure

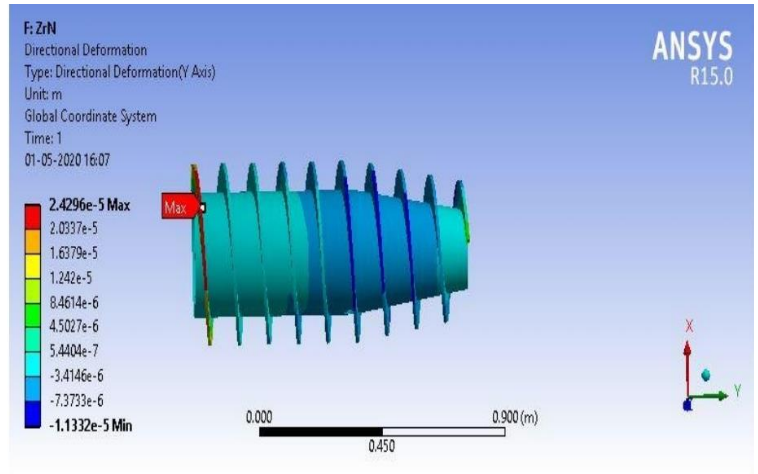


Fig.4.18.Directional deformation of ZirkoniumNrtride in applying hydraulic pressure

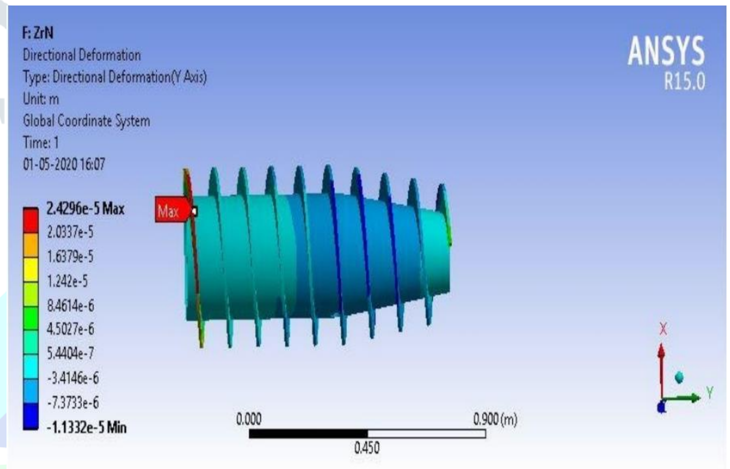


Fig.4.19. Equivalent Stress of ZirkoniumNrtride in applying hydraulic pressure

Case –2 :- Result for Applying Centrifugal Force

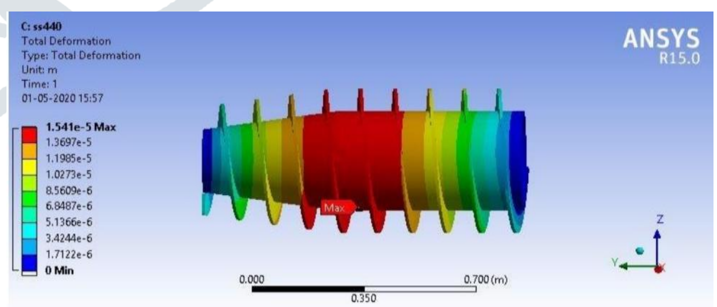


Fig.4.20 Total Deformation of SS440forApplying Centrifugal Force

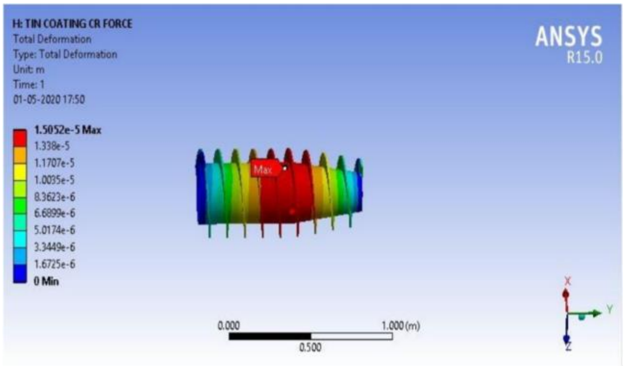


Fig. 4.24 Directional deformation for Applying Centrifugal Force

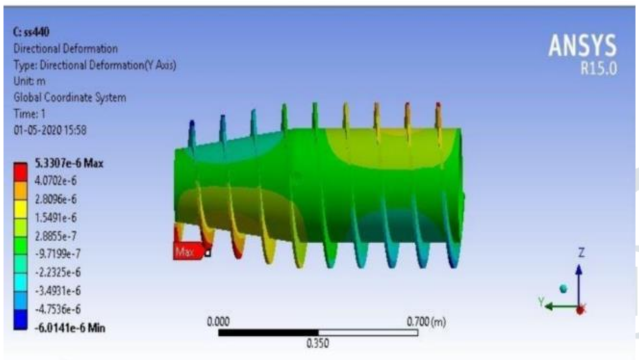


Fig.4.21 Directional deformation for Applying Centrifugal Force

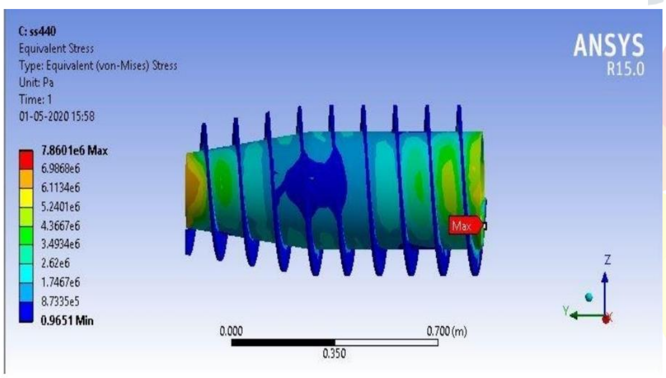


Fig. 4.22 Equivalent stress for Applying Centrifugal Force

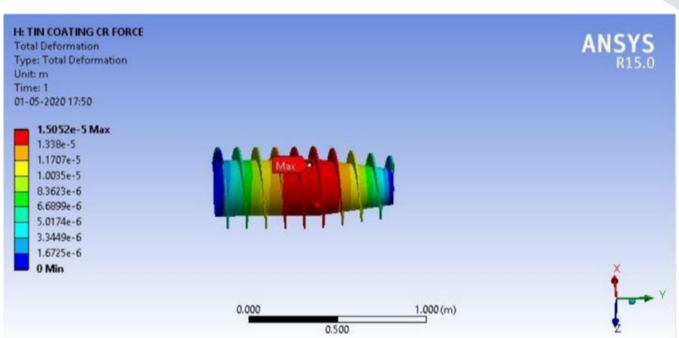


Fig. 4.24 Directional deformation for Applying Centrifugal Force

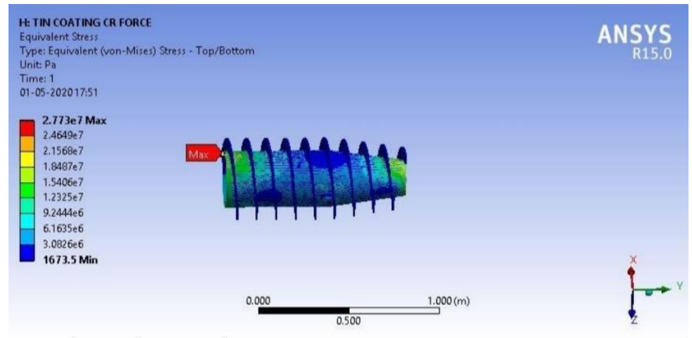


Fig. 4.25 Equivalent stress for Applying Centrifugal Force

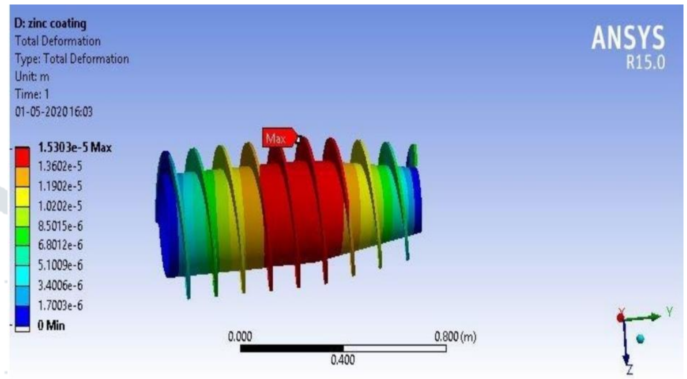


Fig. 4.26 Total Deformation of Zinc for Applying Centrifugal Force

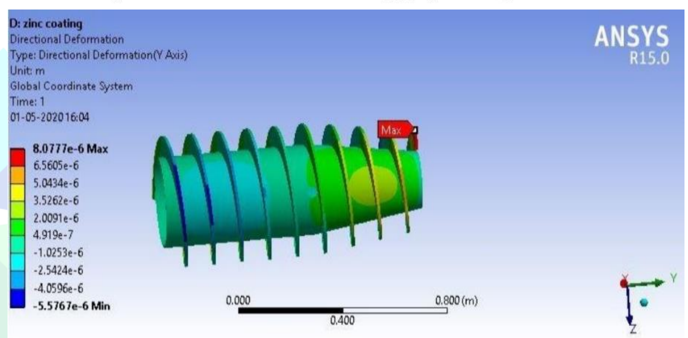


Fig. 4.27 Directional deformation for Applying Centrifug

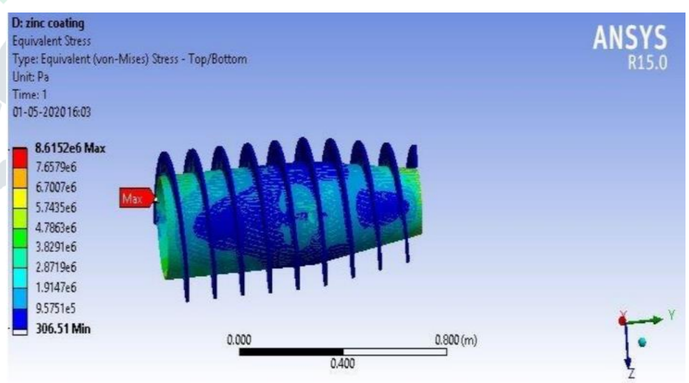


Fig.4.28Equivalent stress for Applying Centrifugal Force

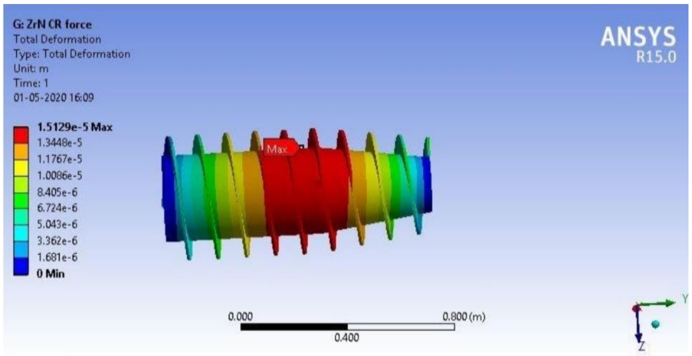


Fig. 4.29 Total Deformation of ZirkoniumNrtride for Applying Centrifugal Force

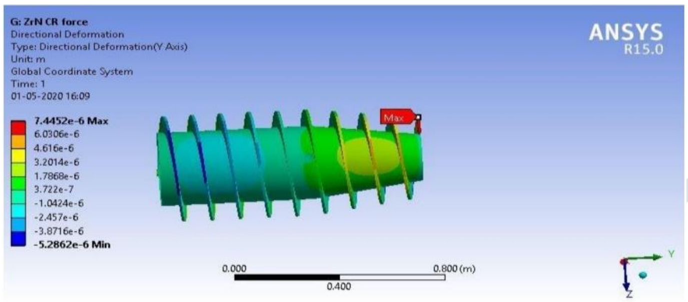


Fig. 4.30Directional deformation Of ZirkoniumNrtride for Applying Centrifugal Force

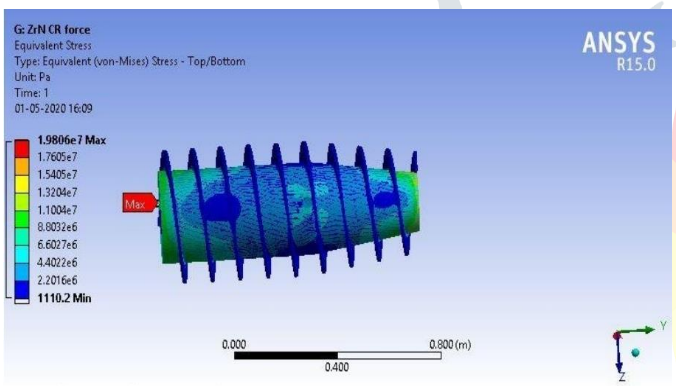


Fig. 4.31 Equivalent stress of ZirkoniumNrtride for Applying Centrifugal Force

Case – 3:- Result for Applying Combine Loading

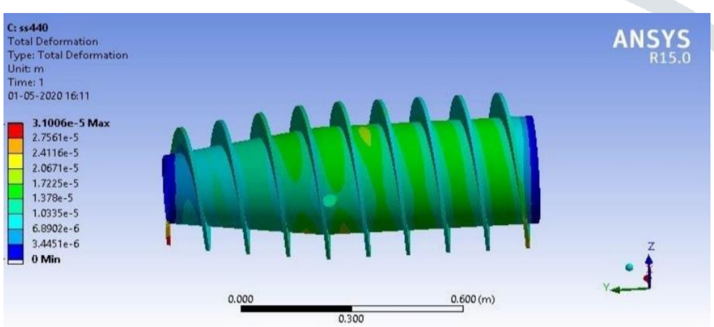


Fig. 4.32 Total Deformation of SS440 for applying combine loading

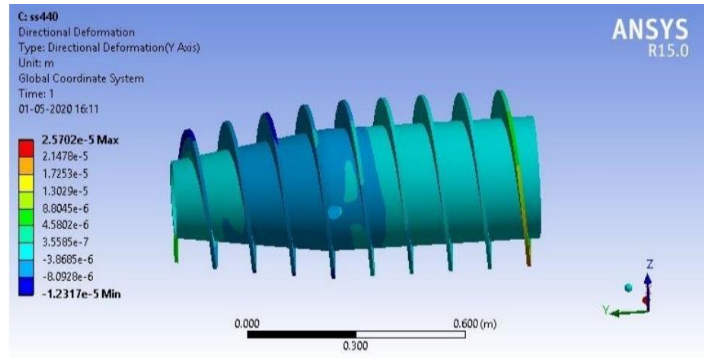


Fig. 4.33 Directional deformation of SS440 for applying combine loading

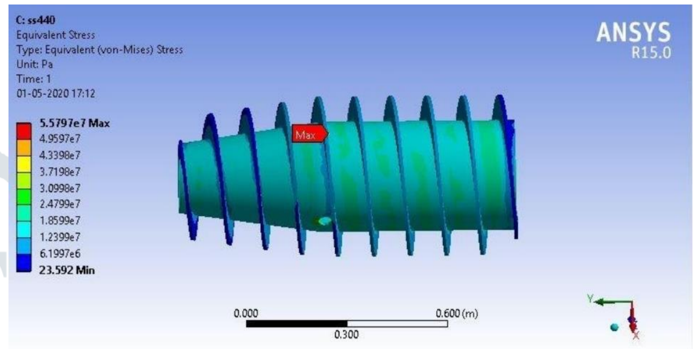


Fig. 4.34 Equivalent stress for SS440 for applying combine loading

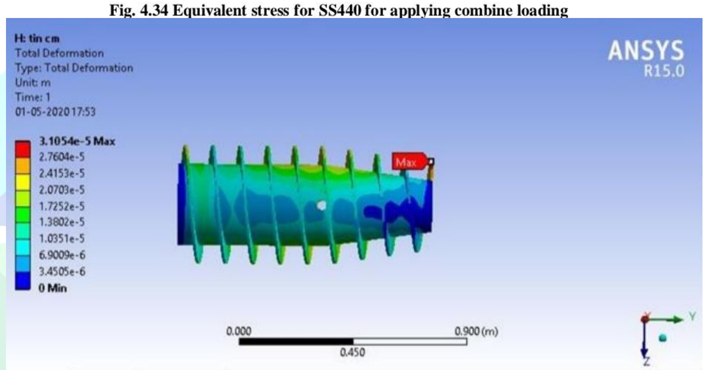


Fig. 4.35 Total Deformation for TITANIUM NRTRIDE(TIN) for applying combine loading

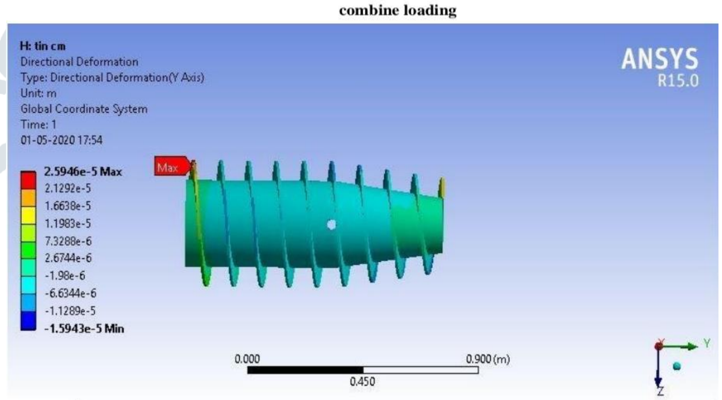


Fig. 4.36 Directional deformation for TITANIUM NRTRIDE(TIN) for applying combine loading

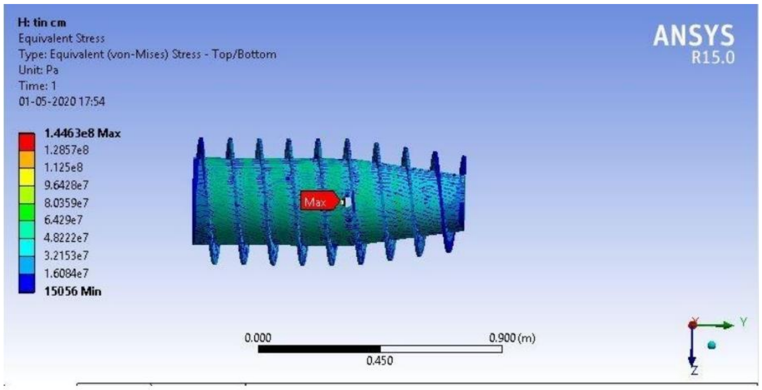


Fig. 4.37 Equivalent stress for TITANIUM NRTRIDE(TIN) for applying combine loading

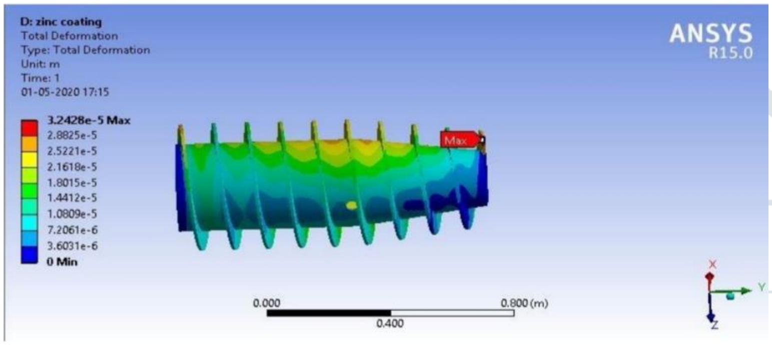


Fig.4.38 Total Deformation for ZINC for applying combine loading

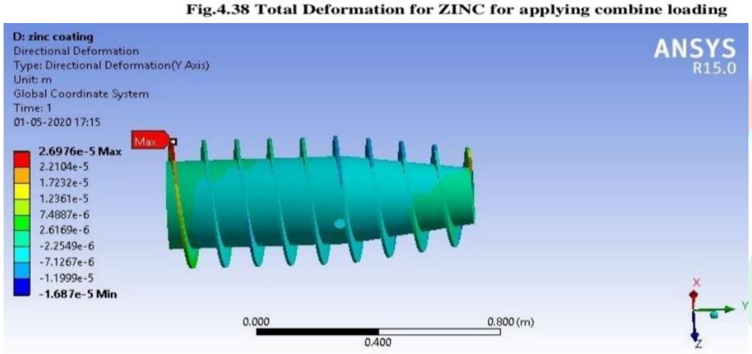


Fig. 4.39Directional deformation for ZINC for applying combine loading

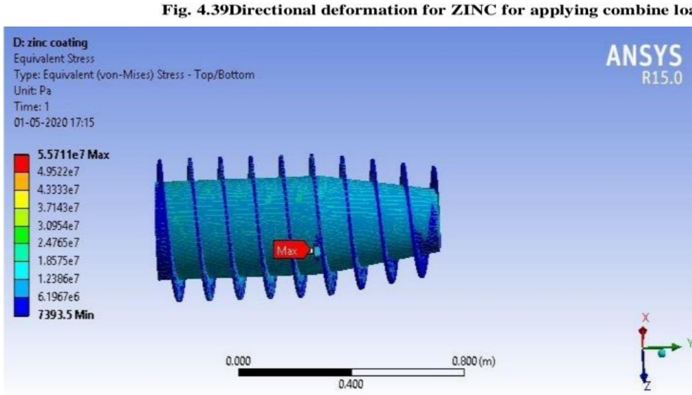


Fig. 4.40 Equivalent stress for ZINC for applying combine loading

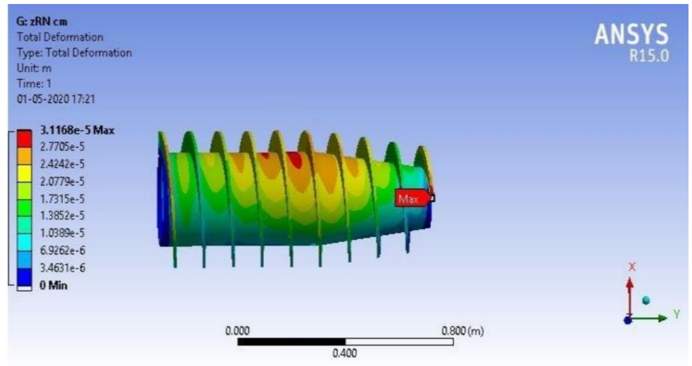


Fig. 4.41 Total Deformation for ZirkoniumNrtride for applying combine loading

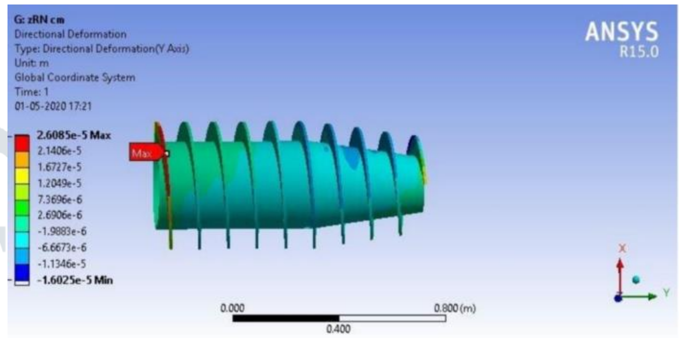


Fig. 4.42 Directional deformation for ZirkoniumNrtride for applying combine loading

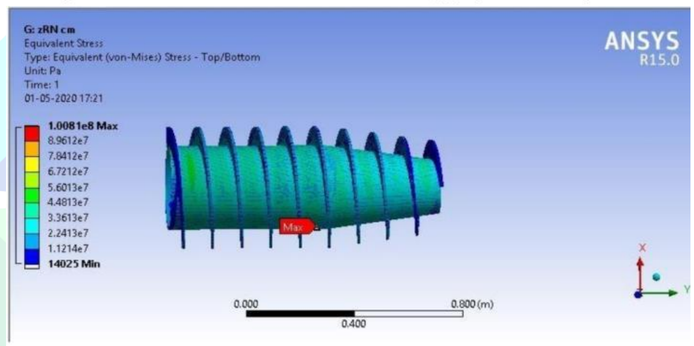


Fig. 4.43 Equivalent stress for ZirkoniumNrtride for applying combine loading

RESULT

The above material analysis is giving valuable results. All the solutions after loading the screw conveyor are analyzed for material SS440, TITANIUM NRTRIDE(TIN), Zirkonium Nrtride, Zinc. The result of the screw conveyor is categorized under three loading conditions ie Hydraulic pressure, centrifugal force and combined force for three results ie Total deformation, directional deformation, equivalent stress

TIN	2.4168×10^{-5}
Zinc	2.5173×10^{-5}

CASE : 1 HYDRAULIC PRESSURE RESULT

1. Comparison Deformation

Table.4 comparison of deformation for applying hydraulic pressure

Material	**Deformation(m)**
SS440	3.1006×10^{-5}
TIN	2.812×10^{-5}
Zinc	2.9335×10^{-5}
ZrN	2.8217×10^{-5}

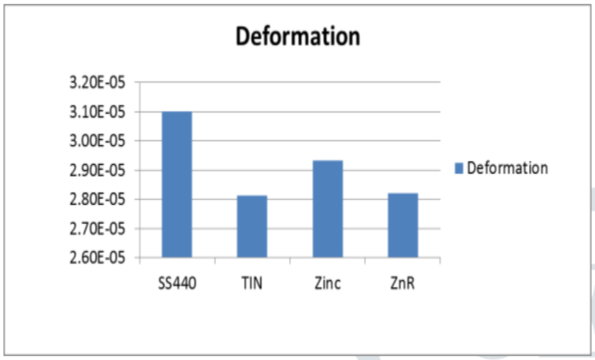


Figure 5.1: Result comparison in deformation for applying hydraulic pressure

From the above graph it is concluded that the screw conveyor under given hydraulic pressure for material TITANIUM NRTRIDE(TIN) giving good result for total deformation of 2.813 x 10^{-5} meter as compared to other materials selected for analysis and SS440 of 3.1005×10^{-5}given worst result with highest deformation for same loading condition.

2. Comparison Directional Deformation

Table. 5 Comparison of directional deformation for hydraulic pressure

Material	Directional deformation
SS440	2.5706×10^{-5}
TIN	2.4169×10^{-5}
Zinc	2.5174×10^{-5}
ZrN	2.4297×10^{-5}

Case:2 Centrifugal Force result

1. Comparison Deformation

Table. 7 Comparison of deformation

Material	**Deformation(m)**
SS440	1.541×10^{-5}
TIN	1.5052×10^{-5}
Zinc	1.5303×10^{-5}
ZrN	1.5129×10^{-5}

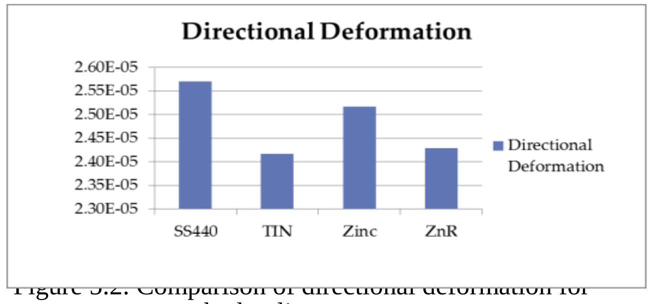


Figure 5.2: Comparison of directional deformation for hydraulic pressure

From the above graph it is concluded that the screw conveyor under given hydraulic pressure for material TITANIUM NRTRIDE(TIN) giving good result for directional deformation of 2.4169x meter as compared to other materials selected for analysis and SS440 of 2.5706x given worst result with highest directional deformation for same loading condition.

3. Comparison Equivalent stress

Table 6. Comparison of equivalent stress for hydraulic pressure

Material	Equivalentstress(Pa)
SS440	5.487×10^{7}
TIN	4.8898×10^{7}
Zinc	5.476×10^{7}
ZrN	4.9463×10^{7}

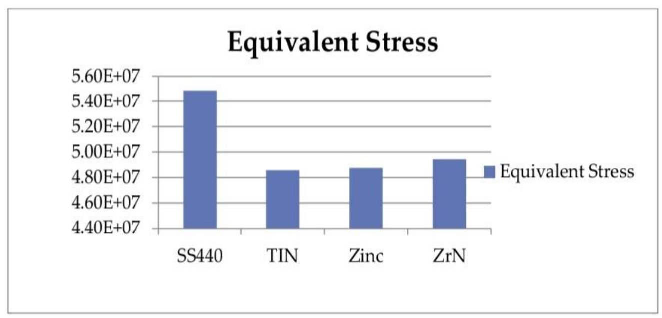


Figure 5.3.Comparison of equivalent stress for hydraulic pressure

From the above graph it is concluded that the screw conveyor under given hydraulic pressure for material TITANIUM NRTRIDE (TIN) giving good result for equivalent stress of 4.8896 x 10^{7} Pa as compared to other materials selected for analysis and SS440 of 5.4879 x 10^{7}Pa given worst result with highest equivalent stress for same loading condition.

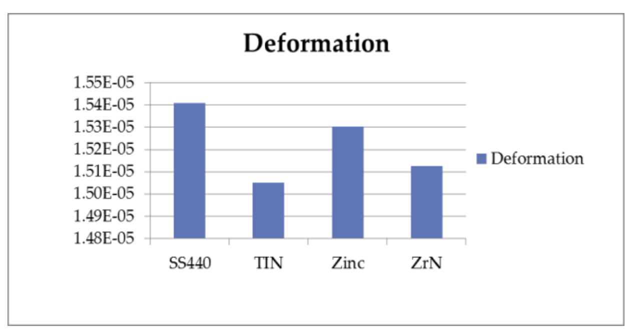


Figure 5.4.Comparison of deformation

From the above graph it is concluded that the screw conveyor under given centrifugal force of 23568 N for material TITANIUM NRTRIDE(TIN) giving good result for total deformation of 1.5053 x 10^{-5} meter as compared to other materials selected for analysis and SS440 of 1.542 x 10^{-5}meter given worst result with highest total deformation for same loading condition.

3. Comparison Directional Deformation

Table. 8 Comparison of directional deformation

Material	DirectionalDeformation(m)
SS440	5.3307x10^{-6}
TIN	7.4088x10^{-6}
Zinc	8.0777x10^{-6}
ZrN	7.4452x10^{-6}

Figured5.5 Comparison of directional deformation

From the above graph it is concluded that the screw conveyor under given centrifugal force of 23568 N for material SS440 giving good result for total deformation of 5.3308 x 10^{-6}meter as compared to other materials selected for analysis and Zinc of 8.0777 x 10^{-6}meter given worst result with highest total deformation for same loading condition

3. Comparis on Equivalent Stress

Table. 9 Comparison of equivalent stress for Centrifugal Force

Material	EquivalentStress(Pa)
SS440	7.8601x10^{6}
TIN	2.773x10^{6}
Zinc	8.6152x10^{6}
ZrN	1.986x10^{6}

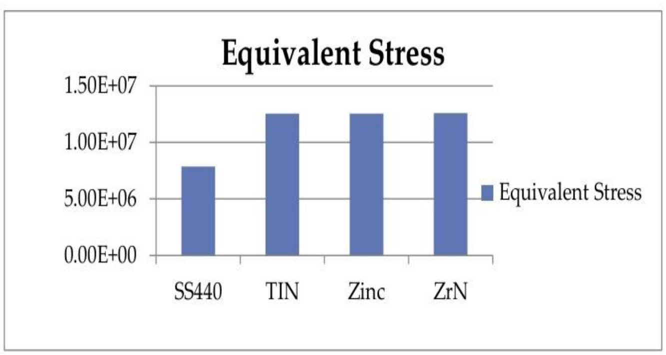


Figure5.6.Comparison of equivalent stress

For the centrifugal force of 23568 N on screw conveyor of four different materials SS440 given best result with 7.8602x10^{6} Pa while TITANIUM NRTRIDE(TIN) given worst result with highest stress of 2.774 x 10^{6} Pa.

Case:3 Combine Loading result

1. **Comparison Deformation**

Table 10.Comparison of deformation for Combine Loading

Material	Deformation(m)
SS440	3.4368x10^{-5}
TIN	3.1054x10^{-5}
Zinc	3.2428x10^{-5}
ZrN	3.1168x10^{-5}

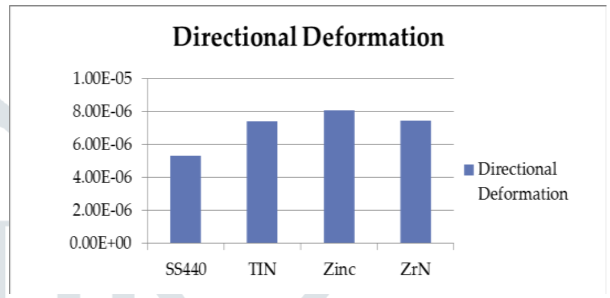


Figure 5.7 Result comparison in deformation for combine

of four different materials TIN given best result with $3.1054x10^{-5}$meter while SS440 given worst result with highest total deformation of 3.4368 $x10^{-5}$meter.

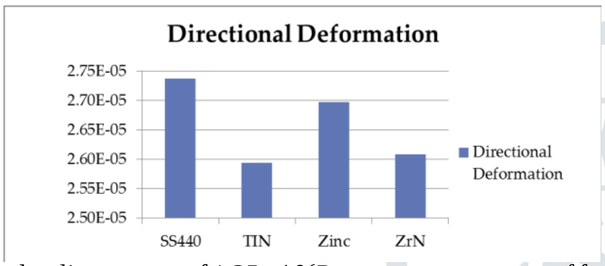
2. Comparison Directional Deformation

Table11.Comparison of Directional deformation for Combine Loading

Material	DirectionalDeformation(m)
SS440	$2.7388x10^{-5}$
TIN	$2.5946x10^{-5}$
Zinc	$2.6976x10^{-5}$
ZrN	$2.6085x10^{-5}$

Figure5.8.Comparison of Directional deformation for Combine Loading

For the combined loading of centrifugal force of 23568N and hydraulic pressure of 1.35 $x10^{6}$Paon screw conveyor of four different materials TIN given best result with $2.5946x10^{-5}$meterwhile SS440 given worst result with highest total deformation of 2.7388 x 10^{-5}meter.

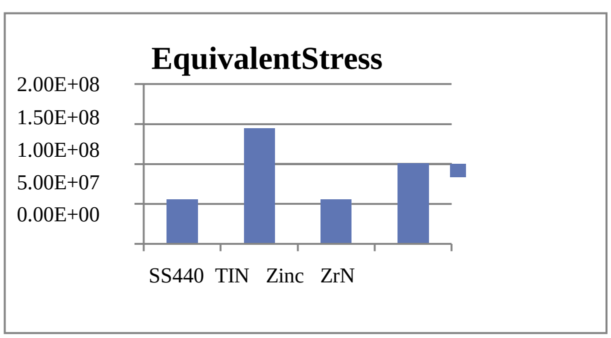


3. Comparison Equivalent stress

Table12.Comparison of equivalent stress

Material	EquivalentStress(Pa)
SS440	$5.5797x10^{7}$
TIN	$1.4463x10^{8}$
Zinc	$5.5711x10^{7}$
ZrN	$1.0081x10^{8}$

Figure4.9.Comparison of equivalent stress



For the combined loading of centrifugal force of 23568N and hydraulic pressure of $1.35x10^{6}$Pa on screw conveyor of four different materials SS440 given best result with $5.5797x10^{7}$Pa while TIN given worst result with highest equivalent stress of $1.4463x10^{8}$Pa

V. COUNCLUSION

In the following analysis screw conveyor is analysed for three different types of loading for four different materials ie TIN, SS440, Zr N and Zinc.During the static structural analysis in ANSYS various results are evaluated.

In three loading condition hydraulic pressure, centrifugalforce and combined loading of both centrifugal force andhydraulic pressure is applied. As a result it is concluded that during the hydraulic pressure of $1.35x10^{6}$Pa the total deflection for TIN is less as compared to the other materials ie2.812x 10^{-5}meter and the SS 440 material get higher deflection of 3.1006x 10^{5}meter,the same condition also followed in directional deformation and equivalent stress.

For centrifugal force of 23568 N the total deformation for TIN is less ie 1.5052x $10^{-5}$and for SS440 material it obtained higher value of 5.487x 10^{7}but in case of directional deformation SS440 provided better result of 5.330x 10^{-6}meter and ZINC given worst result of $8.0777x10^{-6}$and for equivalent stress for material SS440given better result of $7.8601x10^{6}$Pa and TIN given worst result of $2.773x10^{7}$Pa.

In combined loading condition for total deformation TIN given better result of $3.1024x10^{-5}$meter and SS440 given worst result with higher deformation of $3.486x10^{-5}$meterand for directional deformation TIN given better result of $2.5946x10^{-5}$meter and SS440 given higher deformation of$2.7375x10^{-5}$while in case of Equivalent SS440 performed better with lower stress of 5.5759x 10^{-7}Pa and TIN performed with higher stress of $1.4463x10^{8}$Pa.

From the overall results it is concluded that in most ofthe cases TIN performed better as compared to the othermaterials and due to which the life of the equipment can been hanced which can reduce the production loss as well as the maintenance cost for the equipment.

VI. REFRENCES

1. Meiqiu Li, Jingbo Luo, Bangxiong Wu, Jian Hua(2018)"Experimental research of the mechanism and particle flow in screw conveyer" International Journal of Heat and Technology Vol.36, pp.173-181

2. Amudha.K, RameshN.R., Sundaramoorthi.V, Dishkumar.D, Muthuswamy.V, Rethnaraj.T, G.A.Ram das (2017). "Performance tests on Screw Feeder Conveyor for Nodule Transfer Deep Sea Applications", International Journal of Advanced Engineering Research and Science (IJAERS)Vol-4, Issue- 3

3. OlanrewajuT.O., Jeremiah I. M., Onyeanula P.E(2017). "Design and fabrication of a screw conveyor" AgricEngInt: CIGR Journal Open access Vol.19, No.3

4. Sanket Patil, Shashank Saoji, Ajinkya Shahane, Pratik Phadatare (2017)."Design and Analysis of Twin Screw Conveyor" International Conference on Ideas, Impact and Innovation in Mechanical Engineering ISSN: 2321-8169 Volume:5 Issue:6

5. Prasanna, Sharanabasappa,Vishwanath BR, Kishore (2016)."Design and Fabrication of Cam Operated Coveyor for Spherical Components Transporation" IJSRSET| Volume 2 | Issue 6 | Print ISSN: 2395-1990 | Online ISSN:2394-4099

6. Mohammad Zahed Raza, Prof. K.R.Sontakke, Prof. I.A.Quazi (2016). "A review and design of spiral aerator for earthen making process "International Journal of Research in Advent Technology (IJRAT) (E-ISSN:2321-9637

7. Evstratov V.A., Rud A.V., Belousov K.Y (2015) “Process modelling vertical screw transport of bulk material flow” Scienceq Direct, Procedia Engineering 129 P.no. 397 –402

8. Patil. S. S., Jadhav S. M (2015): “Design of Screw Feeding System with Shaft less Fights Bending Analysis in Earthen Pot Making Equipment”, International Engineering Research Journal (IERJ),1(2), pp.972-975.

9. Vijay M. Patil1 Niteshkumar A. Vidya Roshan L.Katkar, Piyush S.Pande (2015). “Type of Conveyor System: A Review” International Journal for Scientific Research & Development |Vol.2, Issue12, |ISSN(online): 2321-0613

10. AhmadS.,J.R.Shapour, F.M.Seyed, B.P.Mojtaba, and E. Ebrahim. (2014). “Design and developmentof a conveyor belt lift with tractor P.T.O. as prime mover”.Journal of Applied Science and Agriculture, 9(3): 1193–1200.

11. Santanu Chakarborthy, Anshuman Mehta(2014) “Product Design of Semi Flexible Screw Conveyor” IOSRJournal of Mechanical and Civil Engineering (IOSR-JMCE)e-ISSN: 2278-1684,p-ISSN: 2320-334X, Volume 11, Issue5,PP01-13

12. Daniyan, I. A., A. O. Adeodu, and O. M.Dada.(2014).“Designofmaterialhandlingequipment:beltconveyor systems for crushed limestone using 3 roll idlers”.Journal of Advancement in Engineering and Technology,1(1):2348–2931.

13. Kishor Dhananjay Dixit, Prof. A. S. Rao, Prof. 8P.Vasudevan(2014) “Effect of Percent Trough Load on Horizontal Screw Conveyor” International Journal of Engineering Development and Research, Volume 2, Issue 1 |ISSN:2321-9939

14.WangDuanyi(2013).“Multi-objective optimization design of Screw conveyor using Genetic Algorithm” Advanced Materials Research ISSN: 1662-8985, Vols. 732-733,pp.402-406

15. LiuC.(2013).Model test similarity design and numericals imulation of the spiral sand conveyor. China Petroleum Machinery 1:55-58. https://doi:10.3969/j.issn.1001-4578.2013.01.014

16.K.Mahadevan, K.Balaveer Reddy, (2013) “Design data handbook for mechanical engineers in SI and Metric units ”CBS Publishers and Distributers, Fourth Edition.

17.Balami, A.A., D.Adgidzi, and A. Mua’zu. (2013). “Development and testing of animal feed mixing machine”. International Journal of Basics and Applied Sciences, 1(3):491–503.

18. Jigar Patel, Sumant Patel, Snehal Patel (2012) “Areviewonnumericalandexperimentalstudyofscrewconveyor” International Journal of Advanced EngineeringResearchandStudiesE-ISSN2249–8974/Vol.I/IssueIV

19.Deng BQ, Chen H. (2011). Study on the development trend of the mixed sand truck. China Petroleum and Chemical Standards and Quality 07:193.https://doi:10.3969/j.issn.16734076.2011.07.161

20. X.H. Li, Q.Y. Li, Y. H (2010) “Parameter optimization of spiral conveyor for coal auger based on GAAA algorithm”. Journal of China Coal Society, 35(3):498-502.

21. Hemad, Z., H. K. Mohammad, and R. A. Mohammad. (2010). “Performance evaluation of a 15.5 cm screw conveyor during handling process of rough rice (Oriza Sativa L.)Grains”. Nature and Science Journal, 8(6): 66–74.

22. Amudha, K, Rajesh, S, Ramesh, N R, Muthu krishna Babu, Raju Abraham, Deepak.C R, Atmanand, M.A (2009). “Development and TesTitaniumNrtride(TIN)g of Remotely Operated Artificial Nodule Laying System at 500 m water depth” Proc. 8th ISOPE Ocean Mining Symposium,Chennai, India, ISOPE, pp 233-238.

23. Owen, P. J., and P. W. Cleary. (2009). “Screw conveyor performance: comparison of discrete element modelling with laboratory experiments”.In Seventh International Conference on CFD in the Minerals and Process Industries CSIRO, 9-11. Melbourne, Australia,

24. Philip O.J., Paul W.C. (2009):“Screw Conveyor Performance: Comparison of Discrete Element Modelling with Laboratory Experiments”,Seventh International Conference on CFD in the Minerals and Process Industries CSIRO, Melbourne, Australia, December, pp. 9-11

25. Don McGlinchey (2008) “Bulk Solids Handling: Equipment Selection and Operation” Page No. 197-219 Blackwell Publishing Ltd. ISBN: 978-1405-15825-1