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MODELING AND ANALYSIS OF SIDE GRIP CONVEYOR FOR BOTTLE INSPECTION MACHINE

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ABSTRACT

A conveyor is a device used to transfer any type of material or product from one place to another place. In transportation of heavy and bulky materials conveyors are especially useful. Conveyor systems allow quick and efficient transportation for a wide variety of materials, which make them very popular in the Material handling. In bottle manufacturing industry the base of the bottle has to inspect for detectecting defects. The base of the bottle will be placed on the conveyor and it is conveyed to required place. To identify the defects in the base of the bottle, which is not possible if the bottle is placed on the conveyor. At this point we use the side grip conveyors to hold the bottle for sideways allowing to its base to expose the inspection camera. In the present work modeling of side grip conveyor frame for bottle inspection machine is carried out. The frame of the conveyor is modeled in such way that all the components should placed on frame and complete surface of bottle should be exposed to inception camera. The frame strength also considered as an important parameter. In the present work structure optimization is done using parametric software CREO 2.0.And analysis of structure is done using FEA.

KEY WORDS:- Side grip conveyor, Frame, structure, inspection, analysis, modeling

LITERATURE REVIEW

1.INTRODUCTION

Primitive conveyor belt were used since the 19thcentury. In 1892 thomas robins started a series of inventions which led to the development of a conveyor used for carrying objects from one place to other. In 1901, Sandvik started the production of steel conveyor. In 1905 Richard invented the first conveyor for coal mines. In 1913, Henry ford introduced conveyor assembly line at ford motor industry. In 1972 French society REI created in new Caledonia then longest liner conveyor in world a size of 13.8 km.in1957 the B.F.good rich company invented a conveyor and produce as the turnover conveyor. Half twist will have a longer life and expose of its surface area to wear and tear. In 1970 Intralox a Louisiana based company registered the first patent for belt. In United States the occupational safety and health department has given regulation for conveyor safety. Siemens was installed baggage handling system at 63 km in Dubai international airport. It considered a less expense labor saving system. A conveyor is combination with computer controlled pallet handling system. Most commonly used belt conveyor material is polyester nylon etc.Primitive conveyors with belts were first used in industry in the second half of the 18thcentury in England. The belt was operation in 1804 by the British navy to produces ships biscuits. In 1907 conveyor belt were used in Germany in a coffee company in Bremen. Phoenix conveyor belt solutions company manufacture of the first conveyor belt in 1904 with fabic made from cotton and nayon staple. Arvind pratesh[1] discussed about the failure anlsys of belt conveyor system in thermal power plant. He analyzed technical characteristics of relevant machinery and he discussed maintenance method of prevention and elimination failure to ensure the smooth operation of belt conveyor in 2012. Ramlu[2] 1996,as belt conveyor consist of several components selected and design of belt conveyor influence on capital and operating cost. Robert [3]2011 stated that belt conveyor design is based on calculation and experiments. Ogedengbe[4]2010T.L the design of efficient and effectiveness increased productivity and minimize cost. He consider factors like available capacity, available skill , type of production layout of plant and equipment safety , production cost maintenance requirements Vanamane S S [5] 2011discussed about the continuous motion includes conveyor, transport means ect. In this work vanamane has deal with intermittent motion and continuous motion generally continuous motion includes conveyors. Conveyors speed control was discussed by H.Lauhoff[6] Germany 2005.inthis belt conveyor with establishing the fictitious resistance coefficient. Conveyor safety was discussed by Larry Gold beck [7] Martin

Engineering Neponset,IL USA he given some key word to safty lockout, tagout , blockout. This word will given safety commend in training time. To reduces accidents by conveyor. For conveyor adjustment of height and major equipment (pulley, motor, etc) was discussed by R.K Bhoyar, Dr C.C.Handa[8]2013. In this paper the supports were keeping to the conveyor and height is adjusted in conveyor for this work a structural frame is modeled and done FEM on it. To find conveyor model safe or not. H.N.chauhan and M.P Bambhannia[9] 2013 this two research scholar were conducted analysis following on a machine frame they are stress concentration ,FEM, numerical and experimental analysis. In work they have modeled a support component as c-plate to machine to reduce failure in structure. Mihir kumar sutar[10] 2012was describes the finite element analysis of a cantilever and he analyzed the relation between the crack and natural frequencies. Gao Yang [11] 2014 he done research on dynamics analysis of conveyor and he gone through displacement, velocity, acceleration ect. For dynamic performance optimization. Hirak Patel [12] 2013 he has discussed that a frame should support the body and different part of the mechanical component. It should withstand the shock, twist, vibration and other stress. Humphry Davy [13] identified the existence of a metal base of alum as aluminum and it has good mechanical properties that why it is wide use in industries application. In the earth crust aluminum is the most abundant 8.3% by weight. less in cost. In 1912 Harry Brearley[14] of the brown-firth research laboratory in Sheffield England while seeking a corrosion resistant alloy for gun barrels discovered stainless steel alloy. The discovery was announced two years later and in January 1915 news paper article in the New York Times. Widely use in industries application.

2. MODELING OF THE SIDE GRIP CONVEYOR COMPONETS AND FRAME IN CREO 2.0

Cero is a family or suite of design software. creo is developed by PTC.PTC creo is a scalable interoperable suite of product design software that delivers fast time to value. It helps creating, analyzing of component. It can design utilizing 2DCAD, 3DCAD parametric and direct modeling. The software also lets us perform analysis create renderings and animation and optimize productivity across a full range of other mechanical design task. Cero is higher quality products faster and allow us to communicate more efficient. In this work we model the side grip conveyor component figure (2.1To 2.9). As side conveyor left top plate, pulleys assembly, ball bearing, 3-phase motor, assembly of side grip conveyor, ect.

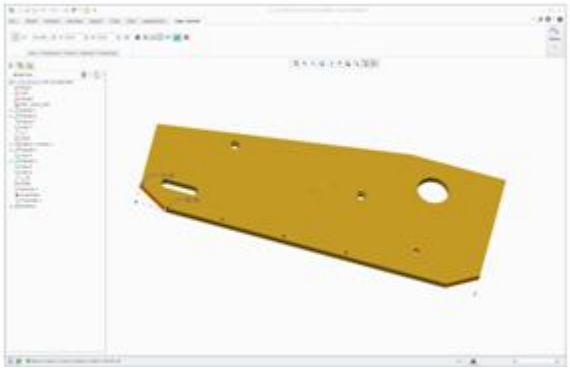

Figure-2.1 SIDE CONVEYOR PLATE

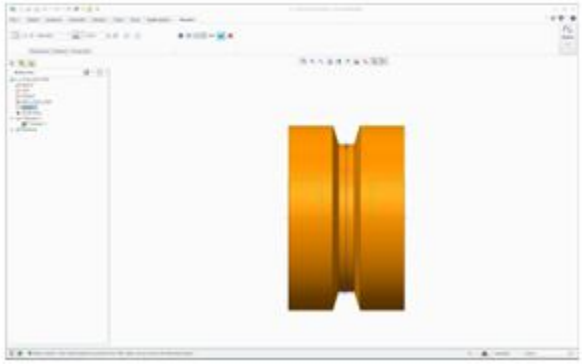

Figure-2.2 PULLEYS ASSEMBLY

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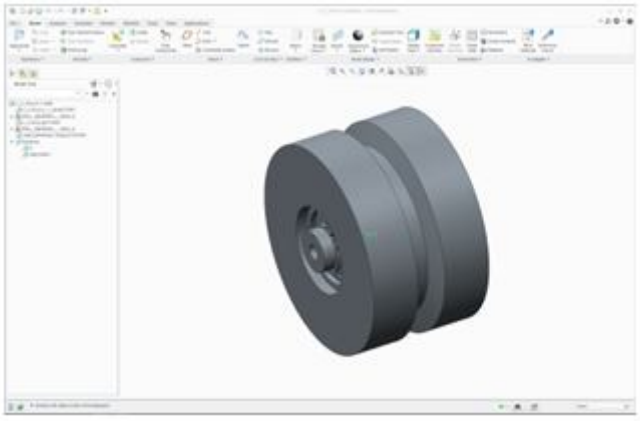

Figure-2.3 BALL BEARING

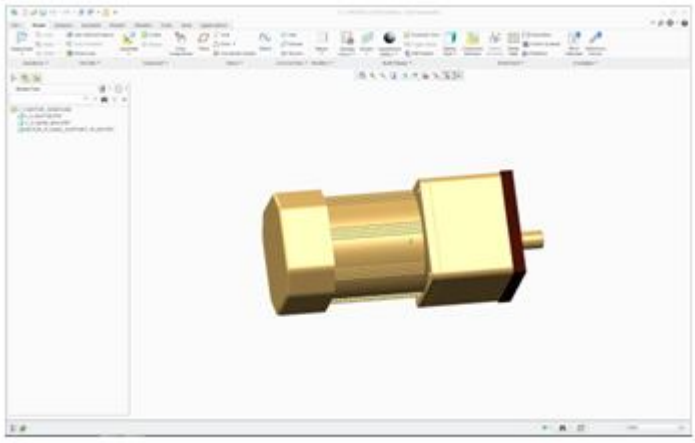

Figure-2.4 3-PHASE MOTOR

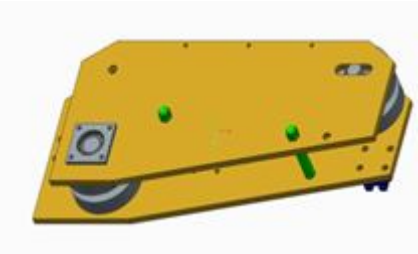

Figure-2.5 SIDE GRIP CONVEYOR LEFT PLATES ASSEMBLY

Figure-2.6 FRAME STRUCTURE

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Figure-2.7 SIDEGRIP CONVEYOR ON FRAME STRUCTURE

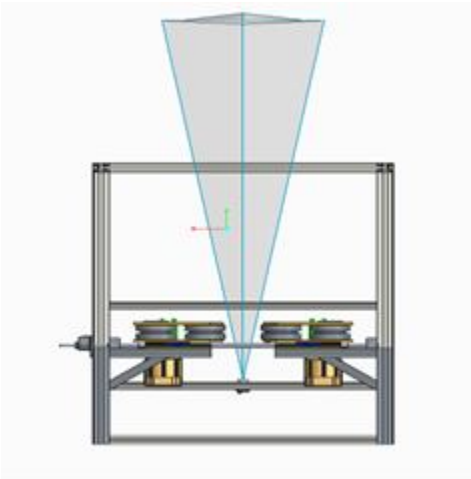

Figure-2.8 SIDE GRIP CONVEYOR WITH BOTTOM CAMERA

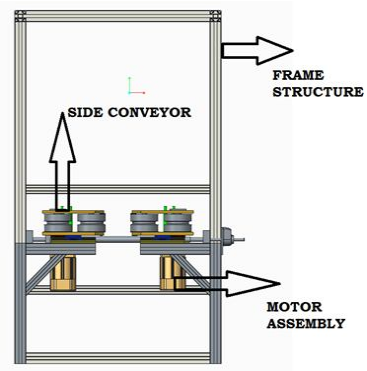

Figure-2.9 FRONT VIEW OF SIDE CONVEYOR ASSEMBLY

3.ANALYSIS ON SIDE GRIP CONVEYOR FRAME

Finite element analysis (FEM) was first developed in 1943 by R courant. FEM consists of a computer model of a material or design that is stressed and analyzed for specific results.FEM uses a complex system of point called nodes which make a grid called a mech. Ansys is general purpose finite element analysis (FEM) software package. Ansys work bench plat form allows users to create new faster processes and to efficiently interact with other tools like CAD system. By using ansys work bench the uses can save time in many of the task performed during simulation We have imported frame structure is 40mm×40mm and the dimensions of the side conveyor structure is 580mm×1200mm material of the side conveyor structure is stainless steel and material of the frame structure is aluminum.

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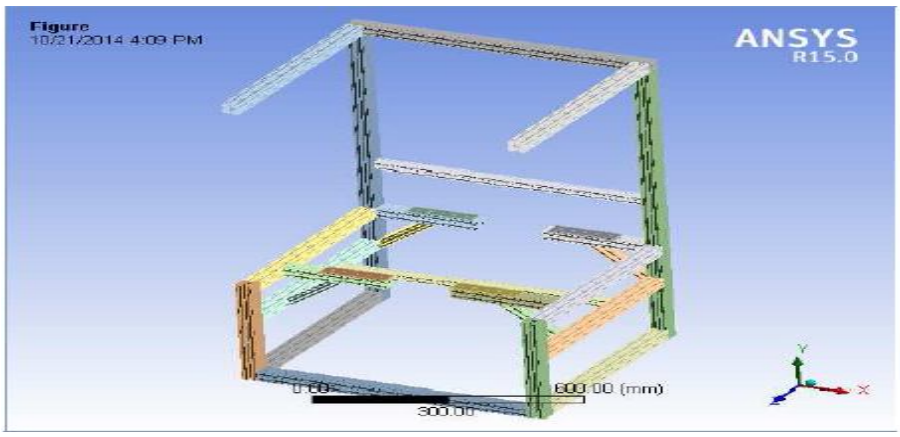

Figure-3.1GEOMETRY FRAME

The above figure shows the geometry model after the cad files imported in to the ansys software.

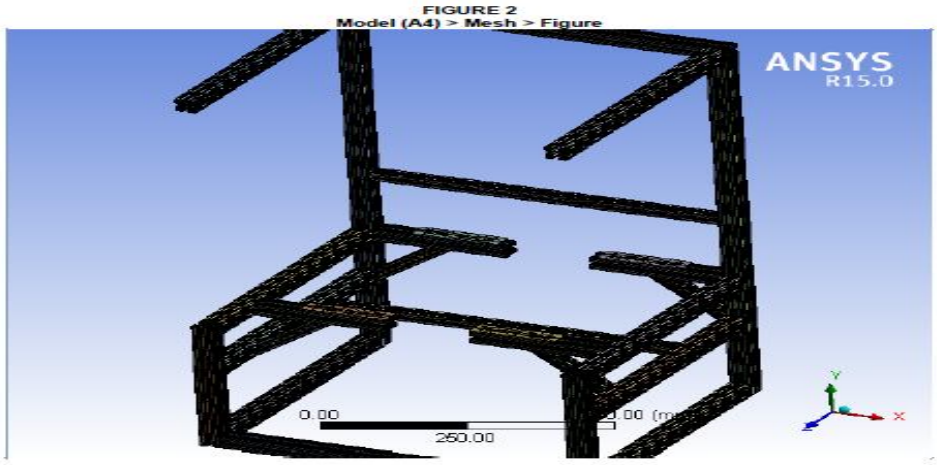

Figure-3.2 MESH APPLICATION ON FRAME

The above figure shows the generation of mesh application to the structure to get the accurate results in ansys software.

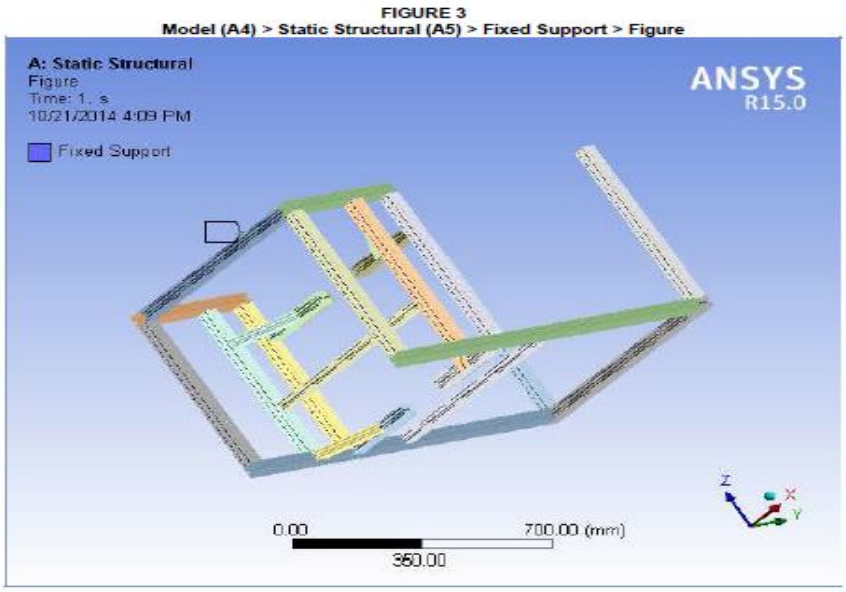

Figure: 3.3 APPLICATION OF BOUNDRY CONDITION

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In the above figure shows boundary conditions for the frame structure using the ansys software.

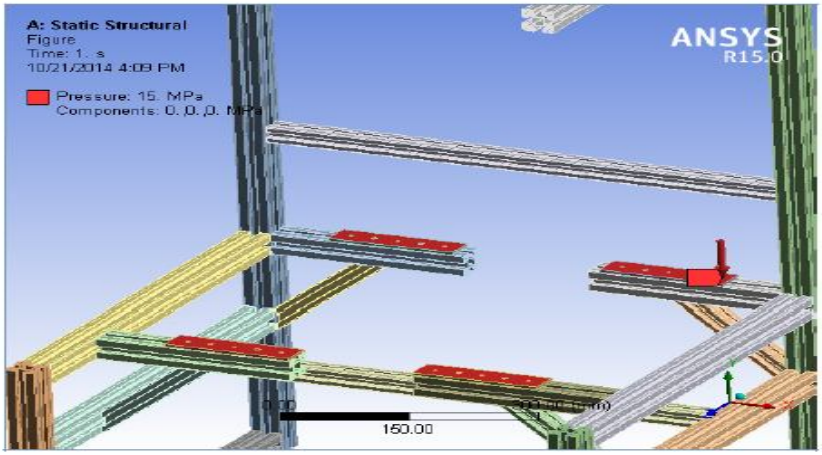

Figure: 3.4 PRESSURES APPLIED ON FRAME

The above figure shows the pressure applied on the conveyor supports by using ansys software. Applied pressure is 15 MPa

FIGURE 7
Model (A4) > Static Structural (A5) > Solution (A6) > Total Deformation > Figure

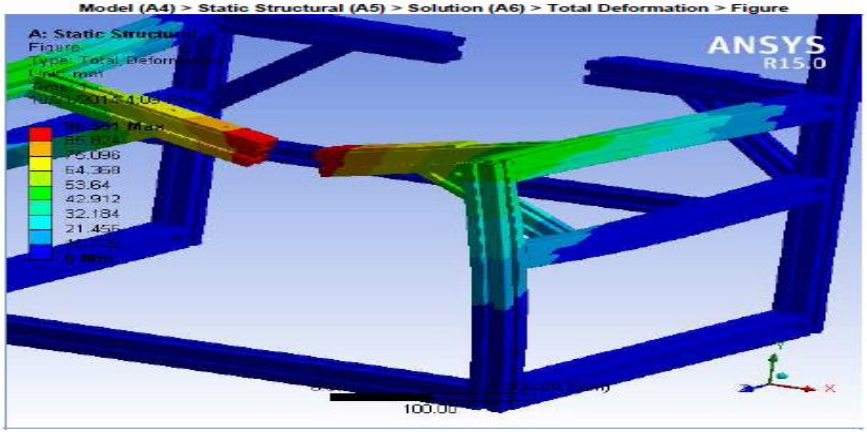

Figure: 3.5 THE TOTAL DEFORMATION ON THE FRAME

The above figure shows the maximum deformation on the structure. Maximum deformation on structure is 96.551 mm

MODIFYING THE FRAME

Adding any other supports from the ground is not possible because of the inspection device and other supporting devices for side conveyor mechanism located at the bottom of the conveyor. Hence the frame structure is modified by adding two more frames element to the structure without any support from the ground which reduces the high deflection and stresses observed on the frame structure. This gives more strength to the structure. Applied pressure can be seen in figure 3.4 Hence the modified structures get the deformation 0.01

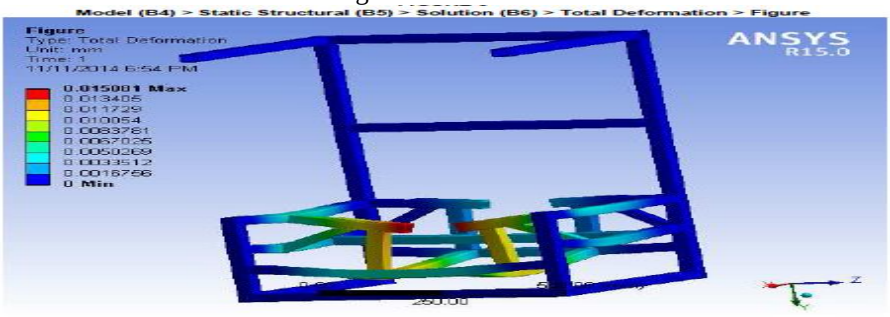

Figure: 3.6 TOTAL DEFORMATIONS ON THE FRAME

The above figure shows the total deformation on the structure after applying the pressure on the supporting frames of the side conveyor. Maximum deformation on the structure is 0.015081 mm

Deformation table

S. No	Initial deformation on the structure is	Modified deformation on the structure is
1	96.55 mm	0.0150mm

4. CONCLUSION

Side conveyor components side conveyor left top plate, pulleys assembly, ball bearing, 3-phase motor, side conveyor assembly, frame structure were model in cero 2.0. Such a way that the bottle total surface is to be inspected. Structural analysis for frame was carried out and the deflation obtained is less than 0.01mm for modified structure .

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