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A Review Analysis of Screws under Different Types of Loading

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Abstract- Screw failures can have catastrophic consequences and significant financial losses. Common screw failure modes are failures due to the load being applied axially, a torsional load, or the combination of both loads may result. Insufficient design considerations, material problems, insufficient preload and excessive loads all can contribute to the failure of the screw. Various screw studies are reviewed and it is found that the impact of axial, torsion, combined loading and fatigue on screw joints together are rare. The defects of screw fatigue failure in instrumentation of solid works. From the past work we understand models of finite elements with comprehensive solid element meshes to simulate the behavior of a flow-drill screw link under various quasi-static loadings.

Keywords- Screw, SOLIDWORKS, Axial Loading, Torsion Loading, Combined Loading.

I. INTRODUCTION

Screw play a fundamental role in engineering structures as a non-permanent bonding method for the aerospace, infrastructure, civil, automotive, energy production / distribution industries and many other industries. Screw failures can have catastrophic consequences and significant financial losses. Common screw failure modes are failures due to the load being applied axially, a torsional load, or the combination of both loads may result. Insufficient design considerations, material problems, insufficient preload and excessive loads all can contribute to the failure of the screw.

In this study, the stress calculations of the screw are studied when it is subjected to different types of loading. The maximum stress that the screw can bear is calculated theoretically using the standard equations. In this chapter, the basic functions of screw, its advantages and disadvantages are discussed in detail.

Screw failures can have catastrophic consequences and significant financial losses. Common screw failure modes are failures due to the load being applied axially, a torsional load, or the combination of both loads may result. It is discussed why design of screw is important. The fundamentals of fracture the basic theory about stress concentration factor and fatigue is also discussed and the forces acting on the screw under different conditions, and the design process for a screw is studied.

II. LITERATURE REVIEW

Zhao, Jiajiaet al. (2021) presented a new contact load model for ball screws configured with combined axial and radial loads in mind to study elastic deformation displacement and positioning accuracy. To obtain the effect of load conditions on the accurate stability of the ball screw, investigate the deviation and variation of axial elastic deformation due to dimensional errors of all balls. Considering the load distribution of all balls, examine the position accuracy including movement deviation and fluctuation under various load conditions.

Cui, Haipo et al.(2021) presented the biomechanical differences between the three internal fixation configurations for the analysis of Powell's type II and type III femoral neck fractures. Finite element analysis was used to obtain femoral displacement and stress distribution of internal fixation devices and fractures for a variety of patients and exercise conditions. This result suggests that patients with osteoporosis are more prone to femoral virus and femoral neck

shortening and are more likely to fracture the device in these patients.

Li, Jiantaoet al. (2020) evaluated the mechanical effect of various configurations formed by screws consisting of only partial screws (PTS) or PTS and full-thread screws (FTS) in the treatment of unstable fractures of the femoral neck.

Zeng, Weiet al. (2020) evaluated biomechanical performance of several internal fixation implants for Pauwels type III FNFs under physiological loading conditions using FEA, as well as to assess the biomechanical contribution of medial buttress plate (MBP) augmentation.

Wang, Gang et al. (2020) developed a new plate for the treatment of Powell's type III femoral neck fractures and analyzed its biomechanical stability by the finite element method. Using 3-Matic and UG-NX software, a model was constructed at the angle of a Powell's Type III femoral neck fracture. 50°, 60° and 70°. In addition, a new femoral neck plate (NFNP) fixation model and Powell screw fixation model have been developed. Von Mises stress (Vms) of screws under axial loads of 1400N and 2100N.

Grotmannet al. (2019) Presentation of a double-stain shredder consisting of a top part and a cutting section, a top part consisting of a corrosion-resistant material and a shaft component, and a cutting part consisting of a material which is hard to use, with a top part attached permanently to the cutting part in a shank portion field by means of an impact extrusion.

Basiaga et al. (2019) presenting a series of screw attachment connections designed to test cold-shaped steel moment attachment behavior. The research experiments contained hot-rolling parallel flange channels, cold-formed lip C-Channels and auto fastening boils. In this study we used two different C-Channels and several different screws.

Sønstabø et al. (2018) used models of finite elements with comprehensive solid element meshes to simulate the behavior of a flow-drill screw link under various quasi-static loadings. The numerical models have been developed using a model of isotropic hypo elastic-plastic material that is independent of the rate.

Peng et al. (2019) introduced dislocation movement that links atomic deformation events with crystalline metal macro scope strength and ductility. The Burgers vector, of which the line is parallel, plays a crucial role in the flow of plastics.

Jalalian et al. (2019) Presented the effect on removal torque value (RTV) of two abutment attachment types with and without cyclic loading as, Retaining the primary torque of the abutment screw is a common problem related to implant-supported restorations; failure in this respect often leads to loosening of the screws.

He et al. (2019) Self-drilling Screw connections Cold-formed steel (CFS) that are common due to fast attachment and easy installation.

Šimečková et al. (2018) Medium Density Fiberboard (MDF) selected as connection component and orthogonally tested were used in order to investigate the effect on MDF portion screw holding capability of vent size, hole diameter and screw penetration depth.

Xu et al. (2019) proposed a fixative implant intended for minimally invasive osteo synthesis of the 5th metatarsus, namely a headless (Herbert) screw. An original experiment is carried out in which the axial compressive forces applied to the headless screw are measured and evaluated during bone fragment osteo synthesis in the laboratory.

Meram et al. (2019) Screwed junctions for carbon fiber enhanced polymer composite laminates (CFRPs) tested by torsion and compression tests were provided for the load carrying capabilities. Of this reason, M6, M8, M10, and M12 internal metric threads have been specifically tapped to the CFRP laminates.

Bardak et al. (2018) The results on the particleboard failure load of the spin-off joints were seen by the thickness, the duration of the screw and the angle between the screws. In addition, the algorithm was developed to predict joint failure loads based on experimental data based on an artificial neural network model (ANN).

An et al. (2019) In the background of a series of 30 test tensile of 10 standard configurations of tensioned joints (3 instances for every tested

configuration) used in the conventional 500-KW steel transmission line towers of China, the influence of tensile-powered joint slipping results was discussed.

Liu et al .(2018) Testing of 15 joints of steel sphere and 15 aluminum alloy screw joints submitted, influencing the rules of type of material, high temperature and cooling on tensile characteristics of post-fire screw-sphere joints and the modes of failure of joints.

Borowiecki et al. (2018) presented an experimental and empirical analysis of blind nut rivet relations. The classification and related validation method of the screw connections is defined. The effect on the relation power of the intensity of the linked elements is addressed.

Jianget al. (2017) The structural conduct of TCC floors or bridges has been described during construction. This paper explores the early-age efficiency of lag screw shear connections in lightweight concrete for a minimum of 18 concrete-age push-outs of 12 to 28 days.

Epifantsev et al. (2018) Presented Study defects of screw fatigue failure in instrumentation of solid works. The design and regulation of the role of an egg, the main working factor involved in grinding, heating and molding a plastic substance, are given considerable importance when modeling the waste manufacturing extruder.

Sohn et al.(2018) implemented biomechanical properties of the adapted iliac screw fastening system in contrast to classic iliac screw fastening with the S2 alar iliac screw (S2AI) fixation using a FEM.

III. CONCLUSION

Various screw studies are reviewed and it is found that the impact of axial, torsion, combined loading and fatigue on screw joints together are rare. From the past work we understand models of finite elements with comprehensive solid element meshes to simulate the behavior of a flow-drill screw link under various quasi-static loadings. Got idea about Self-drilling Screw connections Cold-formed steel (CFS) that are common due to fast attachment and easy installation. Understand the defects of screw fatigue failure in instrumentation of solid works.

Further, the work can be focused on calculating the maximum stress a screw can bear under axial, torsion, combined loading with the validation of obtained results with analysis done on SOLIDWORKS could be done to deepen the knowledge and understanding about screws.

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