

OPTIMAL NUMERICAL ANALYSIS ON 3D BRACKET

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REZUMAT. Pe timpul exploatării navelor și motoarelor navale apar adesea probleme legate de fixarea și realizarea suporturilor de fixare. Datorită complexității geometrice a suporturilor de fixare, analiza cu element finit este necesară pentru a determina toate încărcările și eforturile la care suporturile sunt supuși în timpul exploatării. Lucrarea prezintă o analiză statică pe suportul motorului naval, pe baza rezultatelor software Solidworks. Discretizarea prezentată este una detaliată pentru modelul 3D utilizat în simulările SOLIDWORKS.

Cuvinte cheie: suport motor naval, static structural, Analiză navală , soft Solidworks.

ABSTRACT. During the operation of ships and naval engines, problems are often encountered in fastening and brackets. Due to the geometric complexity of the fastening brackets, finite element analysis is required to determine all the loads and efforts during operation. The paper presents a static analysis on the naval engine support based on Solidworks software results. The mesh presented is a detailed one for the 3D model used in SOLIDWORKS simulations.

Keywords: naval engine bracket, static structural, Analysis on naval application ,Solidworks software.

1. INTRODUCTION

Model presented in figure 1. is usual find in engine mountings onboard ships. The present paper will show stress and displacement during Solidwork study.

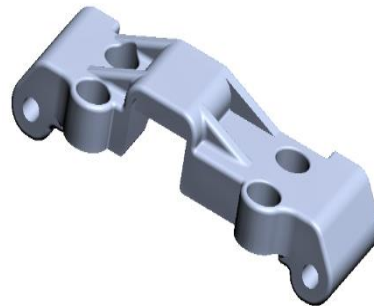


Fig. 1. 3D model of engine bracket.

2. PROBLEM DESCRIPTION

The main idea of Solidworks numerical analysis is to determine static structural values using Solidworks. Solidworks software is widely used in industry and manufacturing process via geometry modeler and static and dynamic load calculation while other sources cause failure during operation. In naval sector, there are many old vessels fitted with brackets.

The Solid body analysis presented by comercial software is presented below.

Document name and reference, Type of analysis
Volumetric properties, Date of document modification.

Fillet5

Solid Mass: 17.3129 kg

Volume: 0.00653319 m³

Density: 2650 kg / m³

Weight: 169.667 N

3. ANALYSIS SETTINGS AND NUMERICAL SOLUTION

First we will present model information and material properties.

Part name in analisys: Engine bracket

Configuration for intial test is presented in figure 1. The material used is 3.3549 (EN-AW 5182).

The main fixture is presented in the central area of the bracket.

The load considered in the Solidworks study is calculated as in initial specifications:14861 N.

4.MATERIAL PROPERTIES

Reference Model Property Components

Name: 3.3549 (EN-AW 5182)

Model type: Linear Elastic Isotropic

Error of the nitial criterion: Unknown

Elastic pressure: 3.2e + 008 N / m²

Tensile strength: 3.8e + 008 N / m²

Coefficient of elasticity: 6.96e + 010 N / m²

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Poisson's report: 0.33
 Density of material: 2650 kg / m ^ 3
 Coefficient of shear: 2.6e + 010 N / m ^ 2
 Thermal expansion coefficient: 2.4e-005 / Kelvin
 SolidBody 1 (Suspension Support)

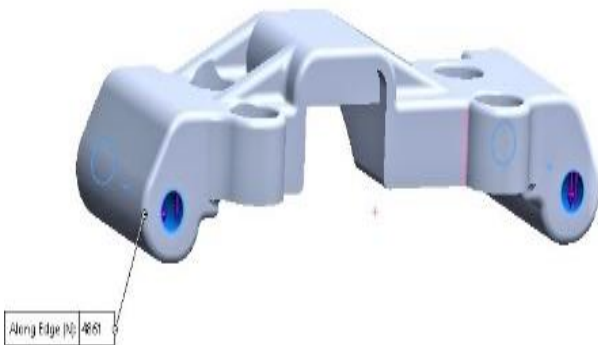


Fig. 2. 3D bracket on Solidworks software

Mesh Quality

| Nume | Tipul | Min | Max |
|--------------|--------|-----------------------------|-----------------------------|
| Mesh Quality | Aspect | 1.04628 Element: 6347 | 1327.22 Element: 3110 |

Detailed forces and fixtures

Mesh information in details

| | |
|-------------------------------------|----------|
| Nodes | 30417 |
| Elements | 18862 |
| Maximum value for element size | 1327.2 |
| % elemente cu raport de aspect < 3 | 97.1 |
| % elemente cu raport de aspect > 10 | 0.435 |
| % element (Jacobian) | 0 |
| Mesh time | 00:00:16 |

Accessory name, Accessory detail, Accessory details.

Fixed-1 Entities: 4 males
 Type: Fixed geometry

Resulting forces

Components X Y Z Resultant

Reaction force (N) 0.0393066 9721.87 0.164658 9721.87

Moment of reaction (N.m) 0 0 0 0

Name of the request Image of the request Details of the request

Pressure-1 Entities: 2 Girls
 Type: Normal direction
 Value: 14861 N

Mesh information

Type of meshing Solid discoloration
 Elements used Tetrahedra and polyhedra
 Jacobian Points 4 points
 Maximum element size 50.483 mm
 Minimum element size 10.0966 mm
 Maximal mesh quality

Bracket presented in Solidworks Study

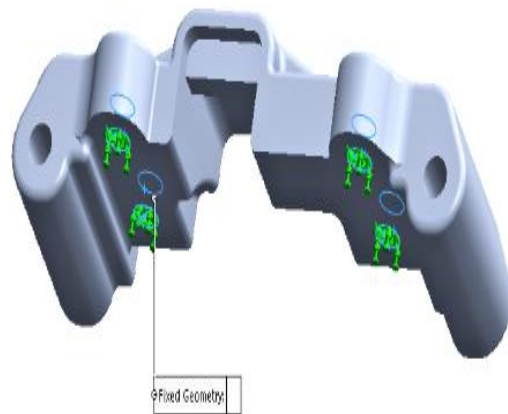


Fig. 3. 3D bracket on Solidworks software.

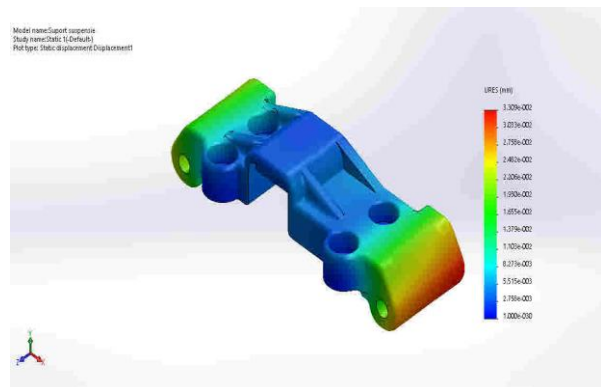


Fig. 4. Suport suspensie-studiul 1-Deplasare -Deplasare 1

Mesh information

| | |
|------------------------------|-----------------------|
| Tipul discretizarii | Discretizare solida |
| Elemente folosite | Tetraedre si poliedre |
| Puncte Jacobiene | 4 puncte |
| Marimea maxima a elementului | 50.483 mm |
| Marimea minima a elementului | 10.0966 mm |
| Calitatea discretizarii | Maxima |

CERCETARE ȘI EXPERTIZĂ INGINEREASCĂ LA CONSTANȚA

| Modelul de referința | Proprietati | Componente |
|----------------------|--|------------|
| | Nume: 3.3549 (EN-AW 5182) | |
| | Tipul modelului: Linear Elastic Isotropic | |
| | Eroarea criteriului nițial: Unknown | |
| | Presiunea elastică: 3.2e+008 N/m² | |
| | Rezistență la tracțiune: 3.8e+008 N/m² | |
| | Coeficientul de elasticitate: 6.96e+010 N/m² | |
| | Raportul lui Poisson: 0.33 | |
| | Densitatea materialului: 2650 kg/m³ | |
| | Coeficientul de forfecare: 2.6e+010 N/m² | |
| | Coeficientul termic de expansiune: 2.4e-005 /Kelvin | |

Information about mesh-details

Total number of nodes 30417
 Total number of items 18862
 Maximum ratio between elements 1327.2
 % elements with aspect ratio <3 97.1
 % elements with aspect ratio > 10 0.435
 % deformed elements (Jacobian) 0
 End of meshing (hh; mm; ss): 00:00:16

Quality discretization

Name Type Min Max
 Mesh Quality 1 Aspect 1.04628
 Element: 6347 1327.22
 Element: 3110

Resulting forces

| Setul de selectie | Unitati | Suma X | Suma Y | Suma Z | Resultanta |
|-------------------|---------|-----------|---------|----------|------------|
| Intreg modelul | N | 0.0393066 | 9721.87 | 0.164658 | 9721.87 |

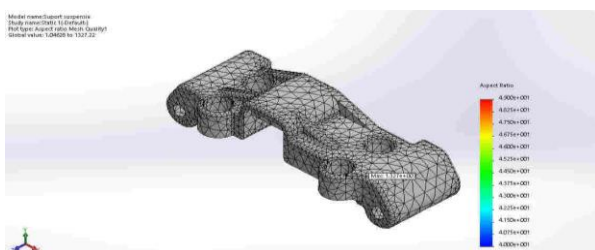


Fig. 5. Suspension support-study 1-Mesh quality - High quality 1

5.RESULTING MOMENTS IN SOFTWARE

| Setul de selectie | Unitati | Suma X | Suma Y | Suma Z | Resultanta |
|-------------------|---------|--------|--------|--------|------------|
| model | N.m | 0 | 0 | 0 | 0 |

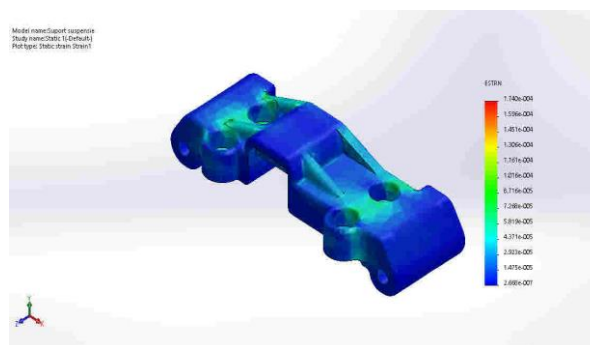
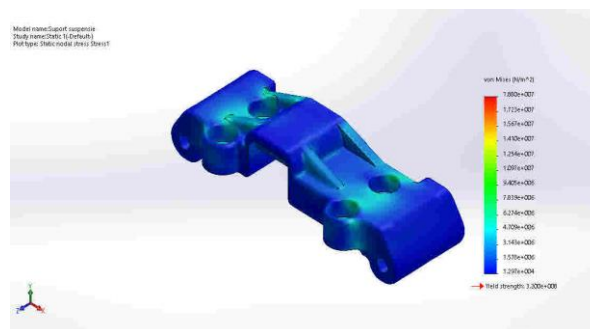


Fig.6. Bracket -study 1-stress

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