



Mechanics and Machines, CAE STR 1

Stress Analysis



Types of problems

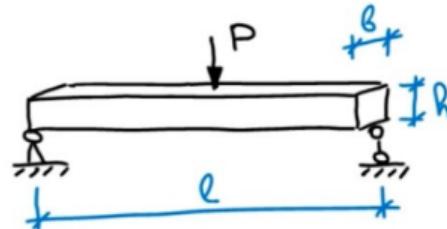
- 1. Design calculations.** You know kinematics and load. You should choose material and sizes of parts.
- 2. Checking calculation.** You know loads, materials, sizes. You should check the possibility to resist the such loads in current configuration
- 3. Determining the maximum load limit**



Basics of calculations

Video

Расчеты на прочность



Условие прочности:

$$[\text{расч. напр.}] \leq [\text{доп. напр.}] \quad (P, g, \mu) \quad [M, Q, N, M_k]$$

$$\sigma_p \leq [\sigma]$$

$$\tau_p \leq [\tau]$$

$$[\text{расч. напр.}] = \frac{[\text{внедр. сс.}]}{[\text{геом. хар. попер. сеч.}]} \quad [F, W, S]$$

Параметры:

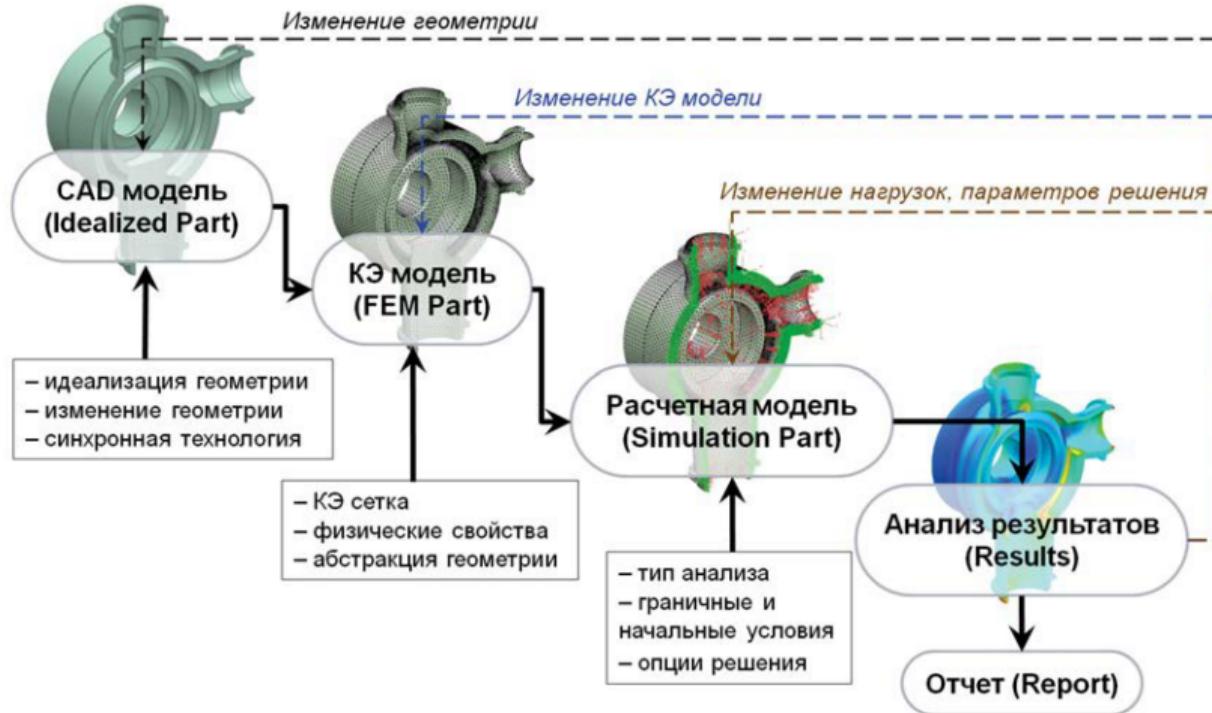
- размеры конструкции
(l, b, h)

- материал конструкции
($E, [\sigma], [\tau]$)

- внешние нагрузки

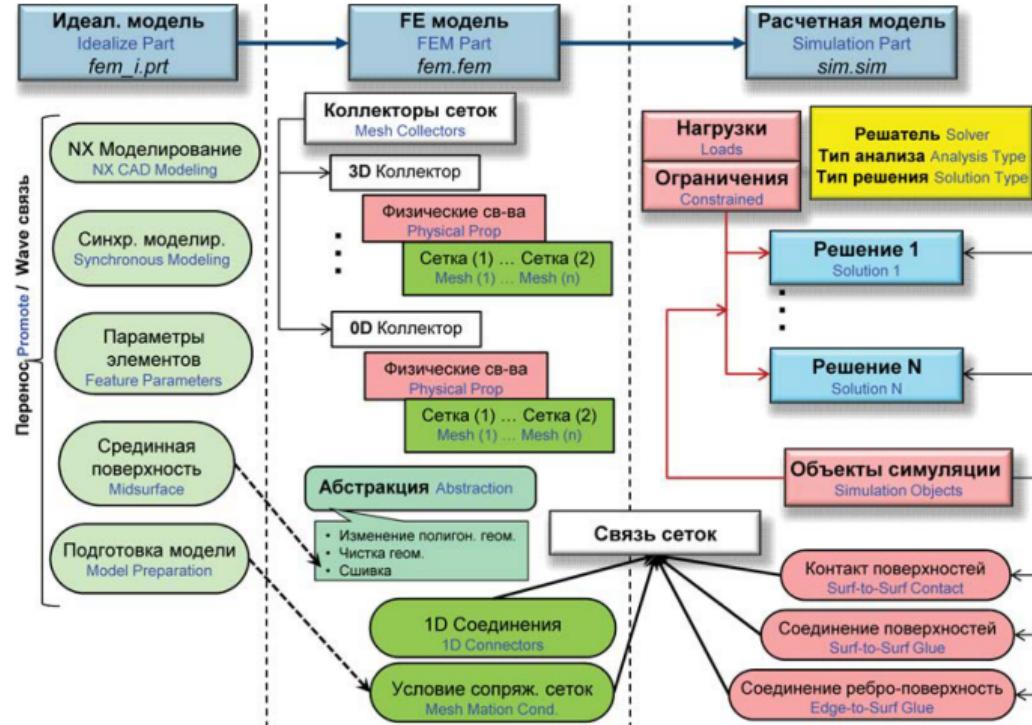


CAE workflow





CAE designing scheme



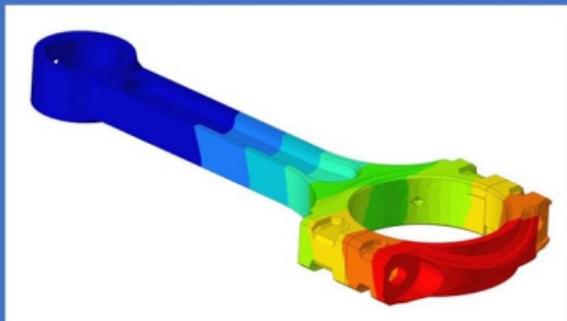


Types of Analysis in CAE

Video

Different Types of Analysis in CAE

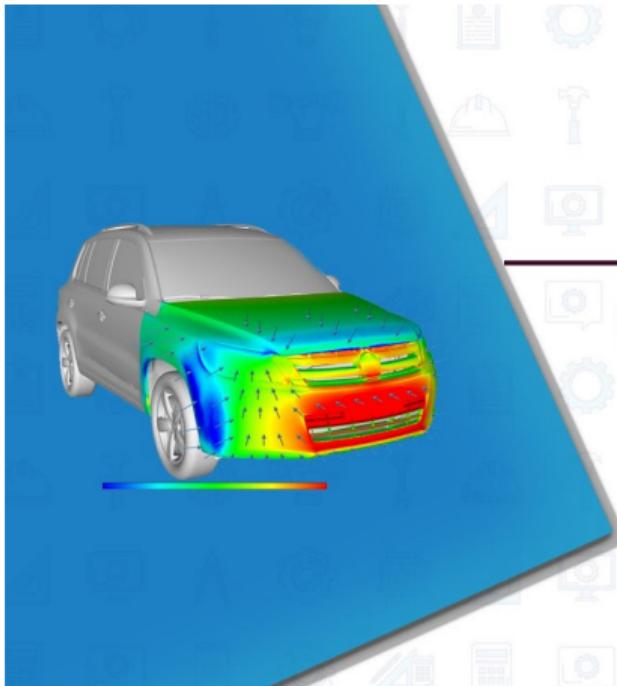
- CAE
- CFD
- CRASH
- NVH





Some real life case studies

Video



SKILL^oLYNC

CAE Durability

PART - 2



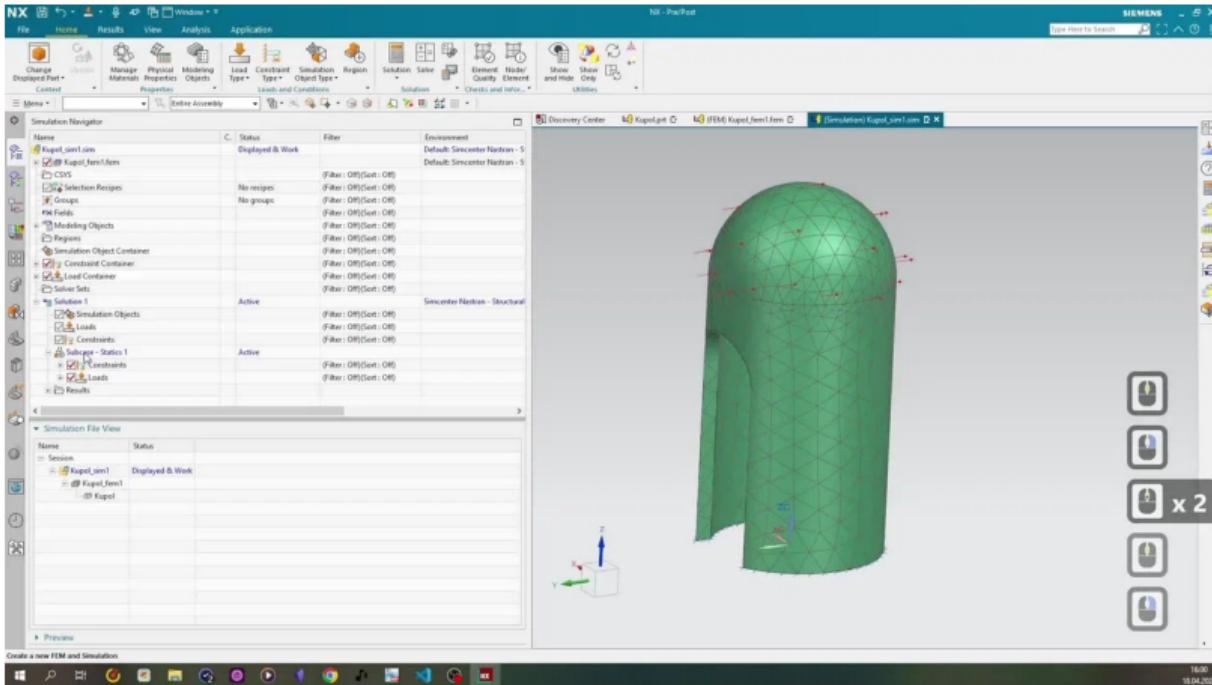
Recomendations for creating meshes

- Analyze beams, cables — 1D mesh
- Sheet or shell component — 2D mesh
- You should have more vertices in stress concentrator and large changes
- Try to eliminate chamfers, bendings, small holes



First steps in CAE (Task 1, 2)

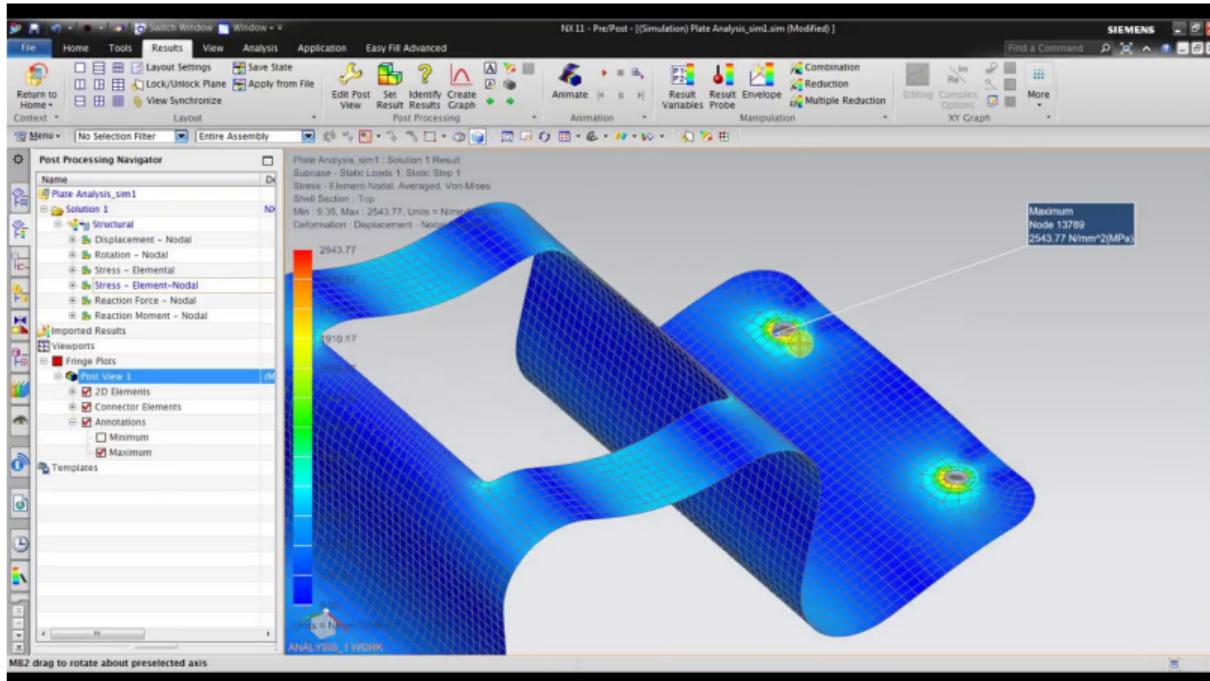
Video





2D mesh for sheet material + 1D for bolts (Task 1)

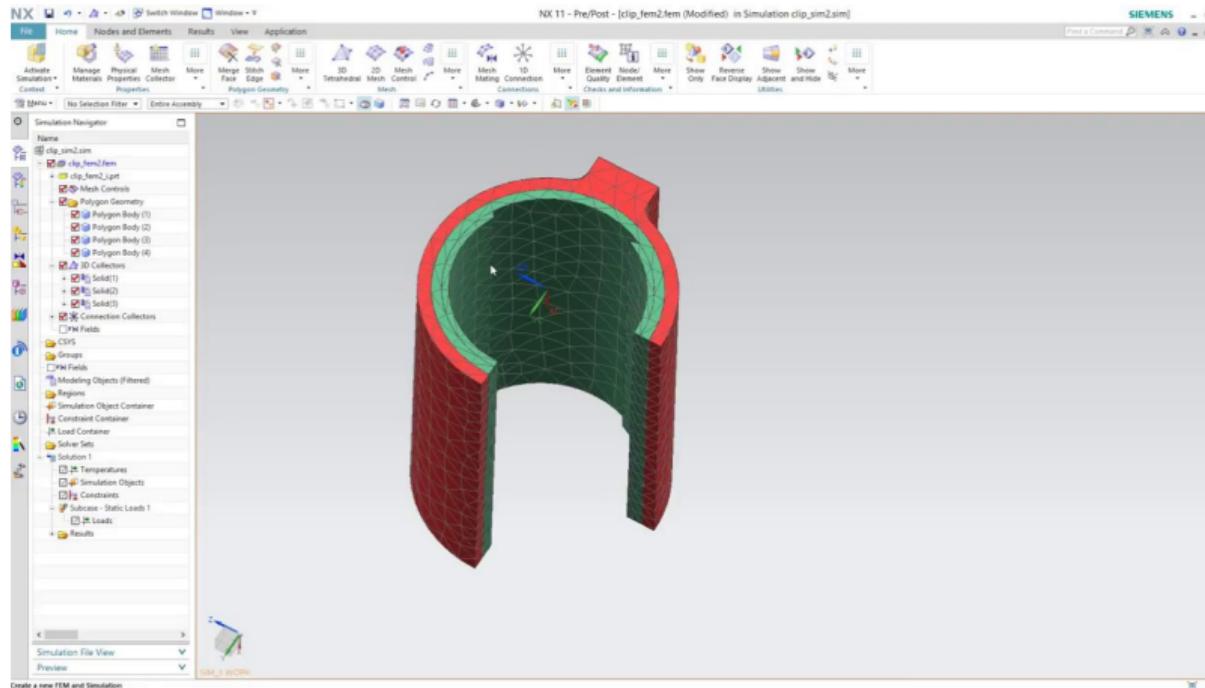
Video





Mesh Mating (optional)

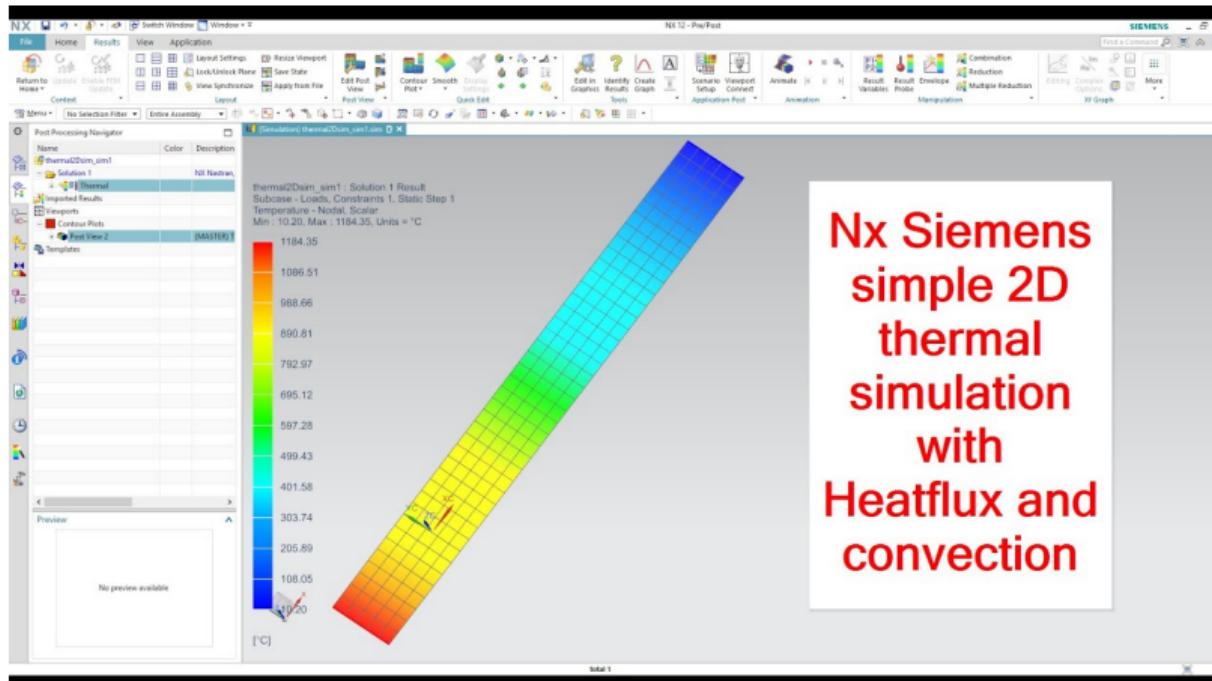
Video





Thermal simulation (Task 2)

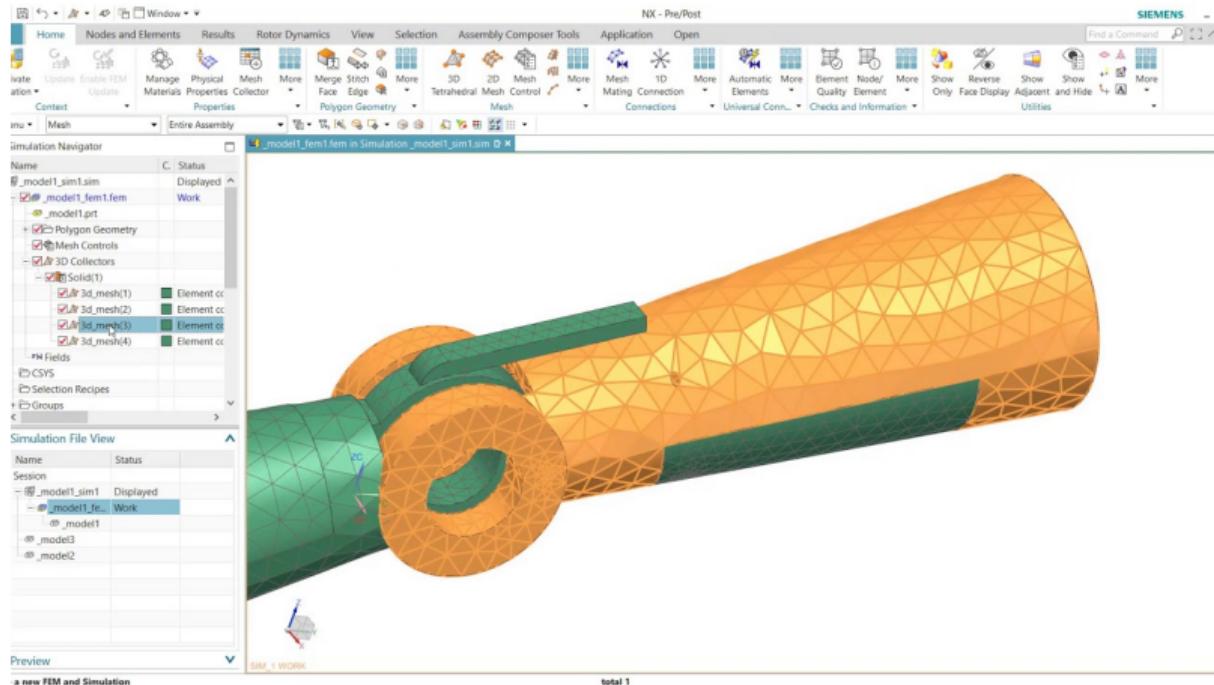
Video





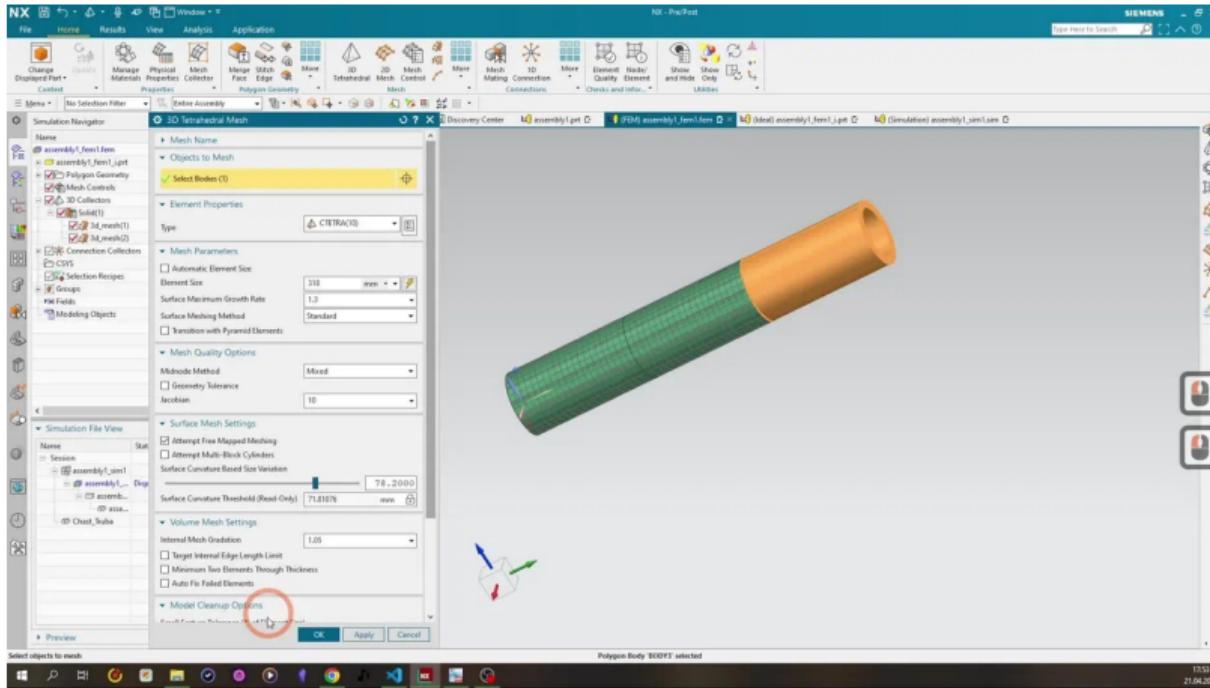
Contact (Task 3)

Video



Contact, Assembly (Task 3, 4)

Video



Oleg Bulichev

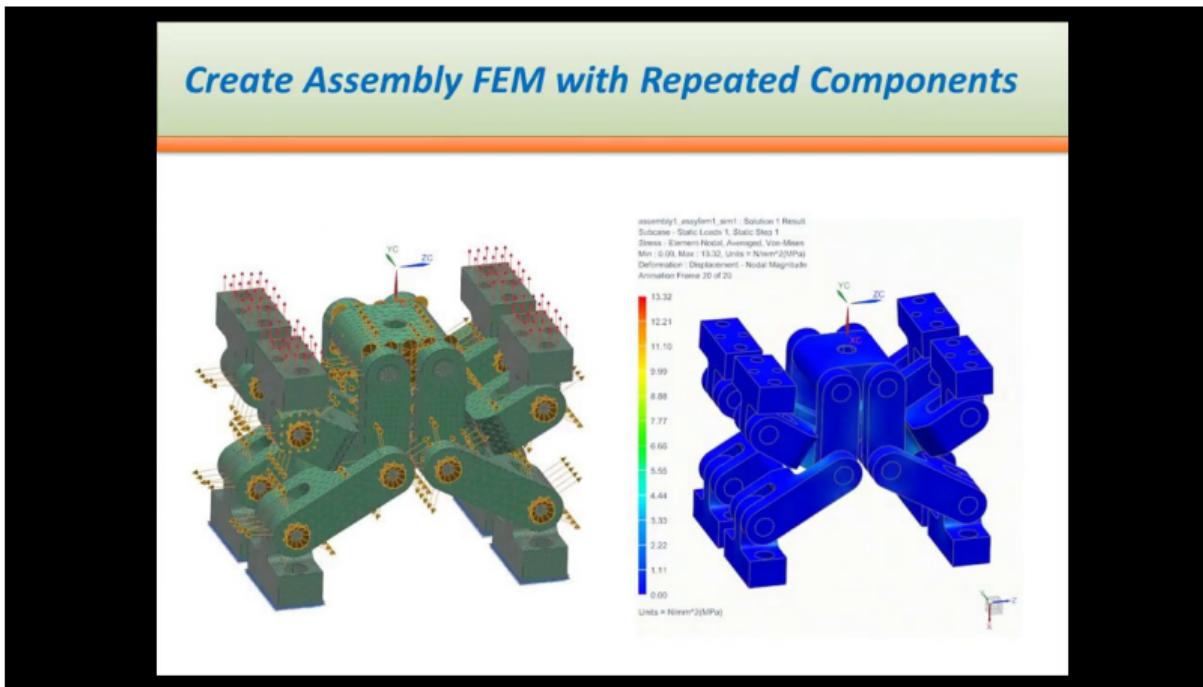
MaM

13



Assembly Meshing (Multiple repeated parts) (Task 4)

Video





Reference Material

1. Link to all needed books (IMPORTANT)
2. 1D Bolt Simulation Double Plate Bolted Together
3. PK6 видео
4. Introduction of Basic Simulation in NX CAE
5. How to add new material (rus)
6. NX CAE. Основы расчетов на прочность в NX
7. CAE Durability, PART-1

Deserve “A” grade!

– Oleg Bulichev

✉ o.bulichev@innopolis.ru

↗ @Lupasic

🚪 Room 105 (Underground robotics lab)