Presentation Title: "Automatic Structural Verification according to DNV, ABS, API, ISO, Eurocodes, BV, and other industry rules with the help of FEA."
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Focus: Finite element analysis and structural verification according to different industry Standards in Offshore and Maritime, Machinery, Heavy Lifting, Oil & Gas, Equipment, and other industries. Case study of code-checking with the help of FEA.

Finite element analysis is a proven method that enhances engineers with outstanding simulation possibilities. But how to know that the calculation results are OK? How to get the results verified and certified? For this, engineers need to follow the Design Rules and Industry Standards, which already contain industry best procedures and recommended practices to ensure that the verified structure can withstand multiple failure modes. Static stress check, fatigue, beam buckling, plate buckling, weld strength, bolted and riveted connections strength, joints verification, and other checks are included in Industry Standards.

Besides building the FEA models, to perform a structural verification according to Standards, at preprocessing and postprocessing steps, engineers have to ensure that:

- Loads are applied and combined in a way prescribed by the Standard.
- Structural members are defined or detected on a model.
- The complete procedure of the check is followed precisely.
- Results are analyzed, explained, and presented to the customer.

Every Standard defines the loading conditions and combinations to represent the behavior of the structure. Verification according to the rules is usually performed for each of the loading conditions to make sure that the structure is safe under operational, environmental, exceptional, testing and other conditions.

Structural checks are done on members and not on finite elements. To run the checks, an engineer must model the structural elements, or define them on the FEA model. In the design stage, the first option requires the double modeling or sub-modeling of the important nodes in the separate programs and multiple interactions between the two databases. This drastically increases the engineering time and adds extra routine tasks to the design verification process. Manual definition of the structural members is usually time-consuming or incomplete, especially for the big models. This case study provides a new workflow with an automatic, mesh-independent recognition of structural members like joints, beam members, welds, stiffened plates, etc.

With the presented method, it is possible to perform code checking analysis for multiple loading conditions and on multiple structural members according to Eurocodes, AISC, ABS, DNV, Norsok, API, DIN, FEM, DVS, FKM, ISO, ASME, and other codes directly in general FEA program. The verification process is completely open and allows one to see all characteristics, formulas, and even intermediate results. Moreover, it's possible to modify the formulas or write your own.

Presented use case of automatic code checking with the help of FEA saves up to 40% of the time on repetitive engineering routine, simplifies the design process, and reduces the deadline pressure. It allows an engineer to use a single model for multiple design problems. This is faster, more effective, and helps to avoid errors, remove the boring routines, focus on engineering, and get things done.