MASTER'S DISSERTATION AT STRUCTURAL MECHANICS

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THE WORK IS PERFORMED AT
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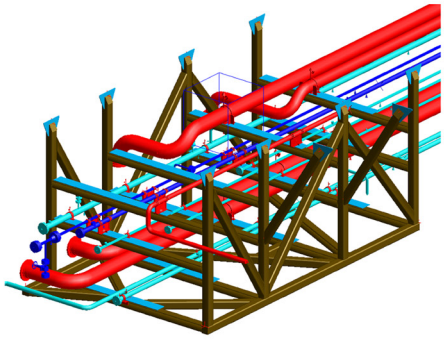
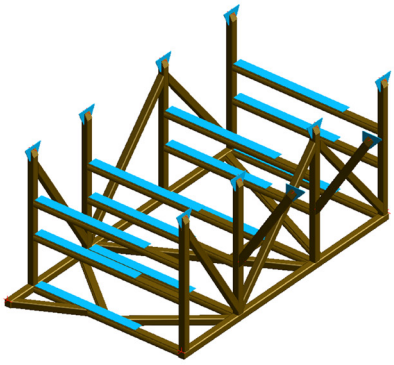
INELASTIC CAPACITY OF STEEL FRAME SUBJECTED TO BLAST LOADING





BACKGROUND

Steel structures on offshore gas and oil processing topsides/plants shall be designed for an accidental explosion event. The structures are normally checked for explosion by performing a linear static analysis where the drag pressure is applied as a static wind load multiplied by a shape factor and dynamic amplification factor. This linear-elastic approach implies that explosion loading is the governing design condition for a large portion of steel structures on a topside, thus driving the weight and cost.

OBJECTIVE

The objective of the master thesis is to demonstrate that a typical steel structure has a significant spare capacity when utilizing its inelastic capacity and study how much plastic strain that can be allowed considering the hydrocarbon lines and its supports.

METHOD

A pipe rack is studied in a full non-linear analysis, with a given blast load in one or more locations, in order to investigate the capacity of the pipe rack. The deflection and stress of the piping containing hydrocarbons is critical and will be given special attention.

The full analysis could be compared with simplified models, possibly using beams and plastic hinges in a step wise linear analysis or non-linear push-over analysis.

OUTCOME

Verification and documentation of a design utilizing the pipe rack's inelastic capacity is the desired outcome. Potential savings in weight shall be demonstrated by evaluating and comparing the conventional linear elastic design to the inelastic design verified by the full non-linear analysis.

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