

Project Outline

Shock and Structure Borne Noise Analysis

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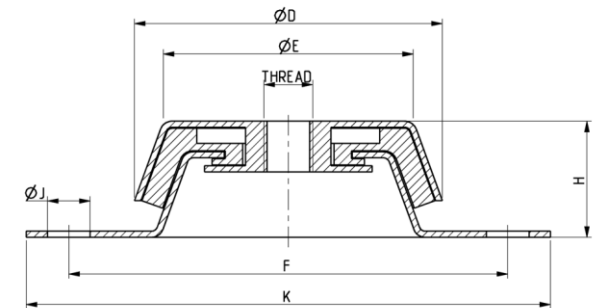
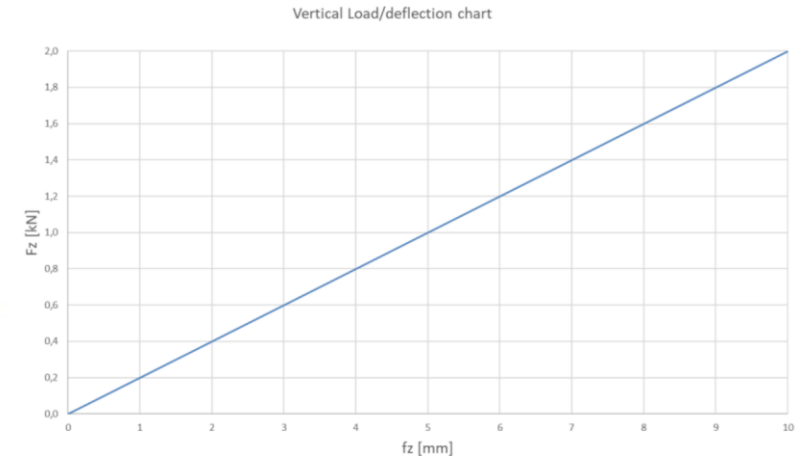
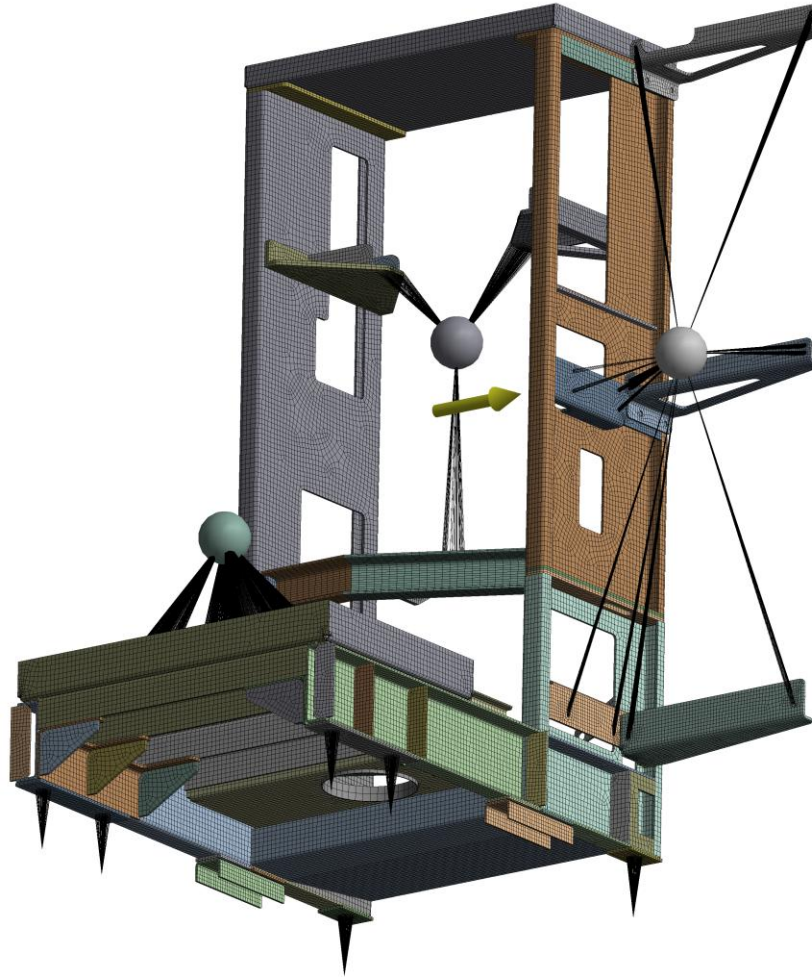
Shock Analysis

Challenge

- Designed structure must meet requirements from MIL-S-901D standard
- The design must withstand accelerations in all directions without yielding

Approach

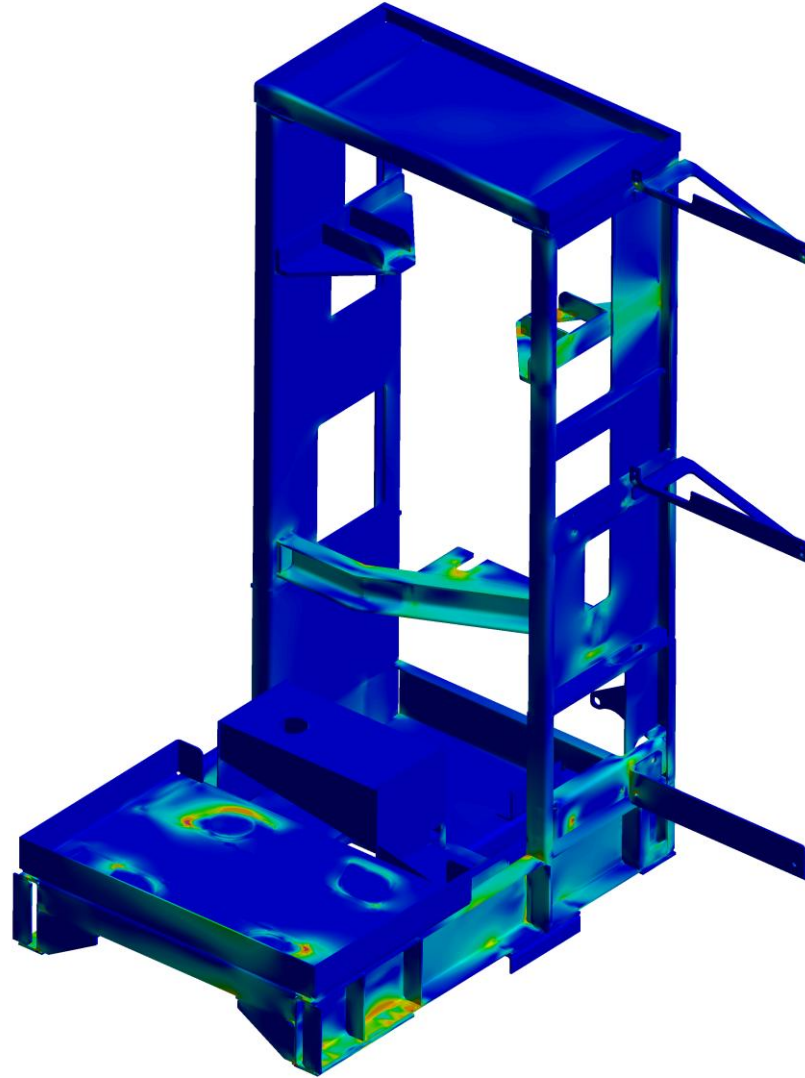
- FE analysis (ANSYS) of the design under quasi-static shock conditions
- Iterative design reviews and optimization based on results
- Assessment of the full structures and components with simplification of non-structural elements



Shock Analysis

Outcome

- Rapid design refinement through to the final iteration
- No expensive and time-consuming testing to arrive at a final design
- Assessment of all relevant components and connections as well as the main structure
- Compliant structure and components



Welded joints partial factor		
γ_{M2}	1.25	-
Weld safety margins		
Case	S_F	Assessment
1	6.4	Passed
2	5.7	Passed

M10 Bolts verification		
$F_{v,Rd}$	1.2	kN
$F_{t,Rd}$	2.8	kN
Combined 1	0.08	<1
Combined 2	0.14	<1

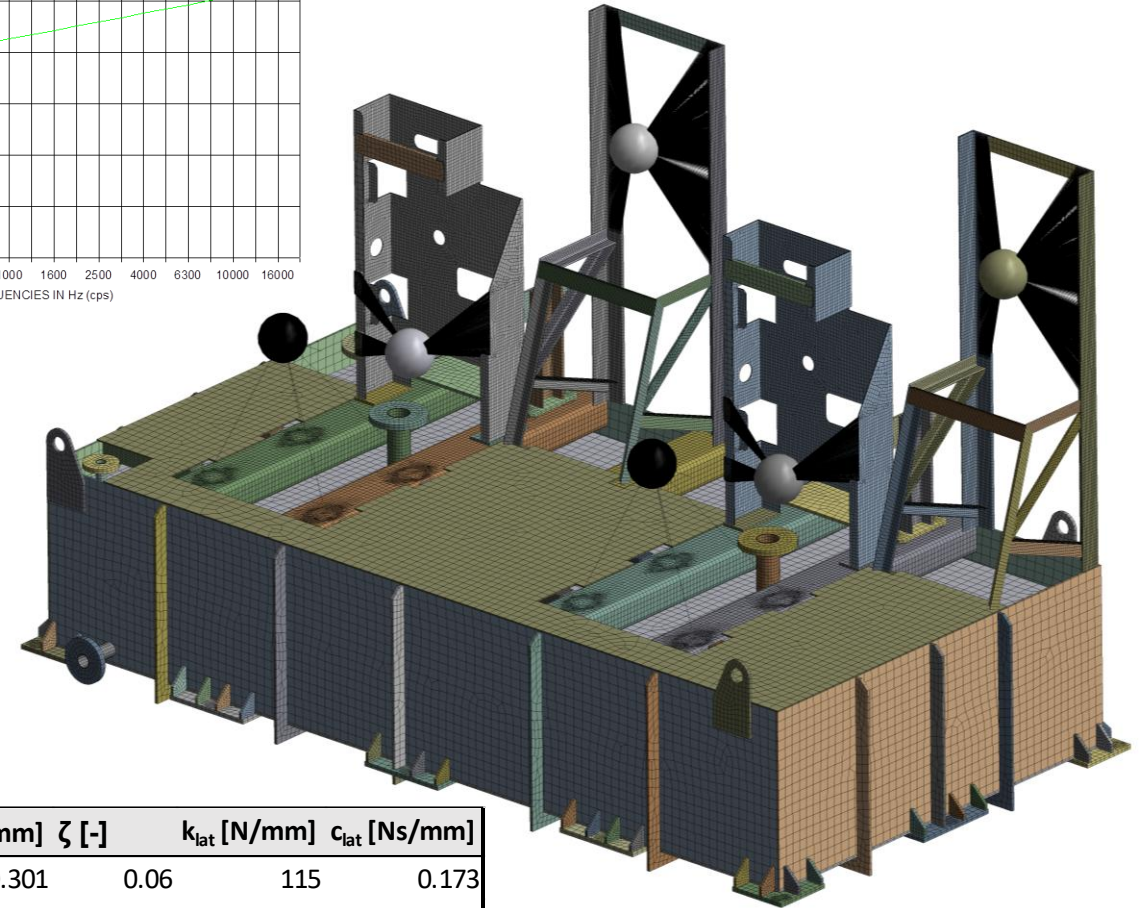
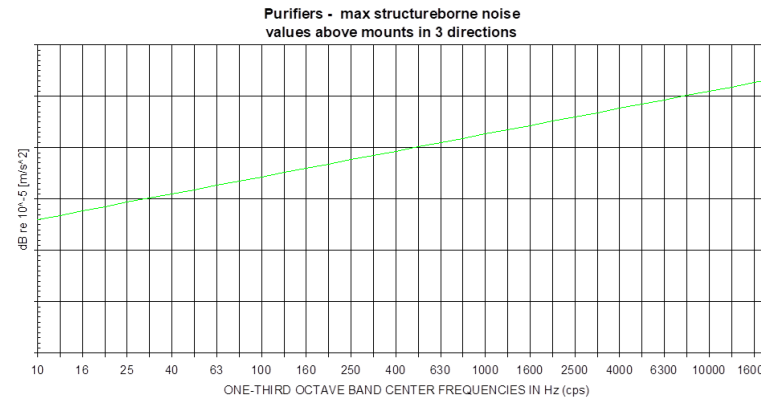
Structure Borne Noise Analysis

Challenge

- Designed structure must meet requirements for maximum level of structure borne noise above mounts
- The structure must not transmit excessive vibration to the hull

Approach

- Harmonic response analysis (ANSYS) of the design under rotating loads produced by machinery
- Assessment of the vibration level above the mounts
- Simplification of mounts and non-structural elements with consideration of mass, elastic, damping and inertia properties



Mount	k [N/mm]	c [Ns/mm]	ζ [-]	k_{lat} [N/mm]	c_{lat} [Ns/mm]
Type 1	348	0.301	0.06	115	0.173
Type 2	1794	1.885	0.06	4485	2.980
Type 3	463	1.578	0.06	926	2.232

Structure Borne Noise Analysis

Outcome

- Assessment of the frequency response of the structure under machinery loading during operation
- Identification of complex response patterns (coupled elastic deformation – rigid body tilting)
- Evaluation of the critical areas and mounts for vibration transmission
- Recommendations for isolation improvements and noise mitigation based on the results of the analysis

