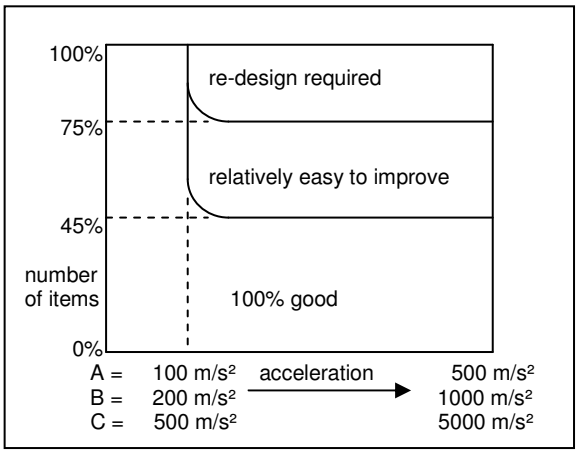
CONSULTANCY

General

The consultancy activities of Sebert Trillingstechniek are dedicated to the shock, noise and vibration area. The emphasis is put on the integration of such requirements in the engineering phase of a product. The rule 'prevention is better than cure' applies also here.
Operational, functional, governmental and environmental requirements are normally considered in the design of a product. However, shock, noise or vibration requirements are frequently an exception on this rule and used to balance the budget. A budget that will be disappointing finally.
Some reasons to delay these aspects might be: it is difficult, expensive or troublesome. However, it appears that cost decrease, with an integral design philosophy, incorporating the shock and vibration requirements directly at the beginning. Particularly for large quantities. The additional cost are only a fraction of the total engineering cost. While the savings on material, service cost, packaging and such can rise to 15%. Transport volume and cost can decrease up to 70% sometimes.

Shock fragility

The operational, functional and environmental requirements determine largely the inherent ('natural') shock fragility level of an equipment. Correct functioning, dependability and application contribute also to the construction of the equipment. Also production methods or desired stiffness contribute, through which e.g. material thicknesses cannot be less than allowed for strength alone.



Overview shock fragility of standard equipment.

Items of equipment frequently have a rather high shock resistant. An analysis of ~450 shocktests with standard, commercially available equipment gave the adjoining overview. The tested equipment is divided in three groups: A (electronics), B (electrical) and C (mechanical).

Below respectively 100, 200 and 500 m/s² none of the items suffer from damage. Approx. 45% of the standard equipment met the maximum required shock level. Approx. 30% could be improved rather easily and 25% required re-design.

The bottom line of 100, 200 and 500 m/s² can be increased relative easy with a factor 2-3 for non-brittle items. Paying attention to the design in the engineering phase pays really off. Not only in a higher dependability and reliability, but also in savings on service, packaging and transport cost.

Integration of requirements in a design

S2T is specialised in the integration of shock, noise and vibration requirements in the design of all kind of products and installations. From simple valves to powerplants, from HVAC-installation to very complex control panels, computers and such. S2T is used to work in and to co-operate closely with the contractors' engineering team.

S2T supports designers, draftsmen and production departments with guidelines and instructions for the integration of these typical requirements in the design. Paying attention to shock, noise and vibration requirements (without ignoring other requirements) is very cost-effective and saves money. Each shock test becomes a non-destructive test and every shock analysis guarantees just enough shock resistance. A vibration analysis of e.g. a control panel prevents fatigue failure or damage during a vibration test. At component level, (prototype) vibration and shock tests are in general more cost-effective than analyses. However, attention shall be paid in the design of components to these aspects. S2T has an extensive test facility for all your dynamic and static tests.

S2T has also many years of experience in the (structureborne) noise reduction of equipment and in ship acoustics. High structureborne noise levels of machinery result in high airborne noise levels in the accommodation and can require extensive and expensive additional measures. Reduction in structureborne noise levels of 15-25 dB has been achieved, resulting in the same gain in airborne noise levels in the accommodation.

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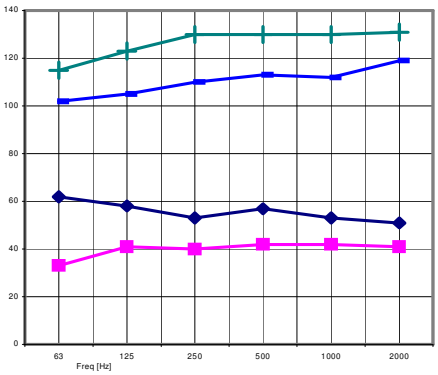
Noise predictions and results

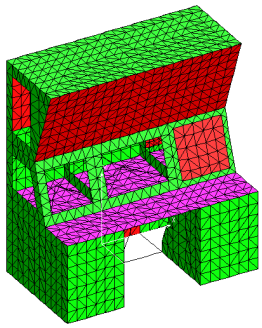
Sebert Trillingstechniek carries out noise predictions for ships. As an example: noise levels were predicted for sleeping cabins due to a chiller and a RO-unit, located directly below these cabins. The RO-unit was decisive, based on previous design information. In the engineering phase S2T was responsible for the shock and noise aspects of the new RO-unit design. The structureborne noise level was improved considerably.



In the diagram (on the left side) the upper line is the measured structureborne noise level (dB re 1µm/s²) of the previous RO-unit. The second line is the measured structureborne noise level of the new design, achieved by S2T. This line is 10-20 dB lower, with similar machinery on the baseframe.

The second line from the bottom is the predicted airborne noise level in the cabins above the RO-unit (total 62 dBA - dB re 20µPa). The bottom line is the airborne noise level in the sleeping cabins. Approximately 45-48 dBA, measured at 3 positions; a gain of ~16 dB. This gain is primarily due to the lower structureborne noise of the RO-unit.
A resilient mounting arrangement realised by S2T, has also contributed significantly, resulting in no additional acoustic measures in all cabins.

The additional engineering cost for noise were approximately 1,7% and for shock 3,5% of the total engineering cost of 8 RO-units. The total engineering cost were approximately 8% of the unit price, i.e. only 6,4‰ of the unit price was dedicated to the shock and noise aspects. The additional measures in the design of the RO-unit for shock and noise did not influence the production cost, due to a more efficient design.



FE-model for the shock analysis of a control panel in an engine control room.

Analyses and optimisation studies

S2T carries out strength, stiffness, shock and vibration analyses for control panels, complex structures and such. Firstly, these analyses are meant for meeting the requirements and secondly, to optimise the design for mass, production and cost.

A good shock design requires an optimal application of material (minimum mass), material properties, strength, stiffness and such. Together with the Contractor, S2T takes also into account the production possibilities and cost, to reduce the total cost of an item to the minimum.

A basic rule in shock design is to avoid all that is superfluously. Components or parts not present do not require to be analysed, to be drawn or produced and hence cost are saved.
Due to lower masses, stresses are less during a shock test. And above all, items not present cannot fail during a shock test.

Service

The customer is number one for S2T. Therefore S2T aims for an optimal customer' service. Do you have questions or shock, vibration and noise problems? Sebert Trillingstechniek can help you. S2T has at your disposal almost 40 years of sound knowledge and experience in the shock, noise and vibration area. S2T has her own test facility for shock, vibration, fatigue and other dynamic and static tests. S2T also carries out field measurements. S2T solves in a professional manner all your shock, vibration and noise problems.

S2T: YOUR DYNAMIC TEST CENTER FOR ALL YOUR TESTS

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