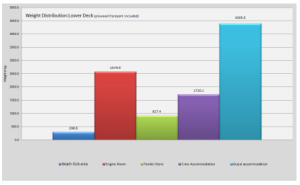
SERVICES

- ✓ Engineering
- ✓ Inspection
- ✓ Trouble Shooting

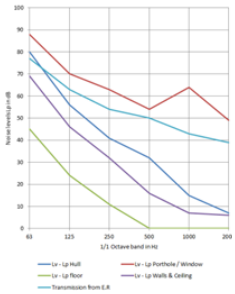
TECHNIC
ACOUSTIC-NOISE-VIBRATION
Creates "SILENCE" in your world...

Noise and Vibration Engineering Steps



I. Preliminary Insulation Plan and Weight Calculation

- ✓ In the beginning of the project, insulation plan is done based on general arrangement plan
- ✓ Preliminary insulation plan is shared with customer
- ✓ By means of above mentioned information, we also provide weight distribution per cabin / deck / area. And, budget and space required for insulation is also shared at this stage
- ✓ After all these steps, preliminary insulation plan is done as final insulation plan

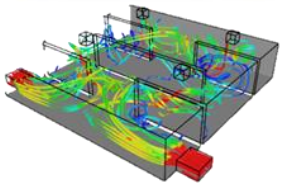


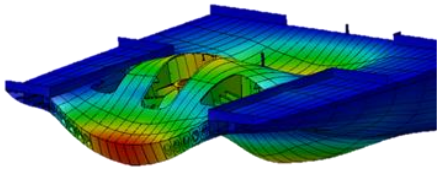
II. Predicted Noise Calculation

- ✓ Based on computer model, noise prediction is done in accordance with final insulation plan
- ✓ Preliminary noise calculation comprehensive report is provided to customer, report gives dB(A) noise levels
- ✓ Noise calculations are carried out for:
  - Anchor / In-port condition
  - Cruising speed condition
  - Any other conditions required by the client

III. AC Noise Control

- ✓ This is an important issue especially related to at anchor or in-port condition
- ✓ Important parameters are:
  - Type of system (FCU or Duct system)
  - Position of the unit(s)
  - Design of the grill(s)
  - Speed of air at the grill(s)
- ✓ By means of checking all above-mentioned parameters, simulations are done to achieve noise levels below 30 dB(A) emitted by air conditioning noise



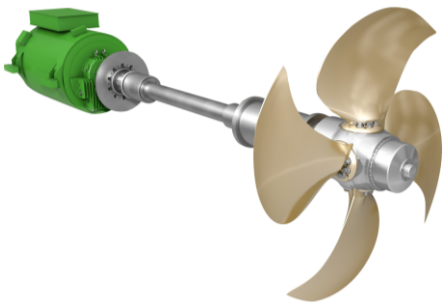


IV. Structural Optimization and Analyses

- ✓ By using FEA method related to naturel frequency analysis, structural is being analyzed and optimized to achieve comfort class vibration levels
- ✓ To avoid resonance and annoying vibrations **Finite Element Analysis are essential to be carried out** prior to the construction stage

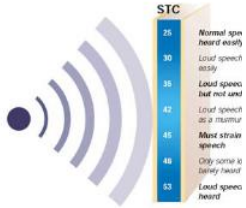
V. Propulsion System Studies

- ✓ Main Sound and Vibration sources;
  - Main Diesel Engines
  - Gearboxes
  - Propulsion propellers
  - Generator sets
  - Main engine and generator set's exhausts
- ✓ To achieve low noise and vibration levels, above mentioned main sources are studied from noise and vibration point of view
- ✓ The studies are done also considered by structural optimization result



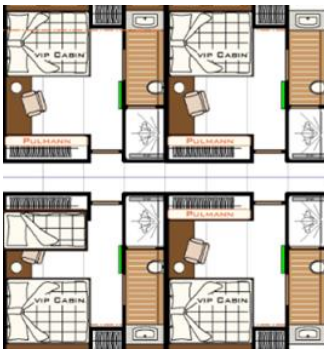
VI. Secondary Machinery System Studies

- ✓ All secondary machineries are checked noise and vibration point of view
  - Vibration mounts
  - Flexible pipe connections
  - Sound shields (in case of need), et.
- ✓ This topic is especially important at anchor/port condition
- ✓ These studies take into consideration



VII. Cabin to Cabin Noise

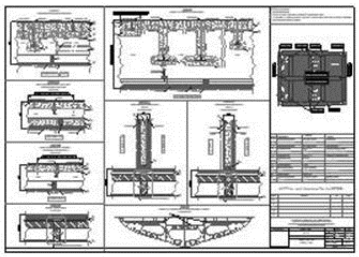
- ✓ Study must be done related to cabin wall STC (Sound Transmission Class) related to cabin privacy
- ✓ This is another important topic especially related to at anchor or in-port condition
- ✓ Ones we achieved very low noise levels at anchor or in-port condition [30 dB(A) or less] noise coming from other cabins or voices can become annoying



STC	What can be heard
25	Normal speech can be understood quite easily and distinctly through wall
30	Loud speech can be understood well, normal speech heard but not understood
35	Loud speech audible but not intelligible
40	Onset of "privacy"
42	Loud speech audibles as a murmur
45	Loud speech not audible; 90% of statistical population not annoyed
50	Very loud sounds such as musical instruments or a stereo can be faintly heard; 99% of population not annoyed.
60+	Superior soundproofing; most sounds inaudible

VIII. Final Insulation Plan and Application Drawings

- ✓ At this stage, all engineering studies are done
- ✓ We provide application detail drawings as two sets (Set1: General Details, Set:2 Connection Details)



IX. Noise and Vibration Measurement

In addition to our standard services, we also assist shipyards and owners with various other noise and vibration related issues. This could range from writing the noise and vibration specifications of a new build or refit project to providing a second opinion in a critical vibro-acoustic case.

We are continuously looking for new solutions to reduce noise and vibrations on board yachts. Material suppliers and manufacturers often turn to us to seek new market potential in the nautical industry, asking us for an independent review of their product. Innovations and critical evaluation of new methods will help our customers achieve their targets within their weight and budgetary limits.

Evliya Çelebi Mah. Tersaneler Cd.
Gani Sk. No:37/11
Tuzla-Istanbul / TURKEY
Phone : +90 216 395 07 18
E-mail : contact@anvteknik.com.tr
Web : www.anvteknik.com