Double Mounting, Controlled Air Mounting, and Weight Penalty

Two stage mounting, also known as 'double mounting' is the scheme commonly used for isolating gen-sets and other machinery onboard superyachts. Although very effective in lowering the transmission of vibration from the machine to the hull, double mounting, as with any other isolation technique, has its own drawbacks. Paramount among these drawbacks is the weight penalty associated with the added deadweight which depending on the design, weighs between 30 to 50% of the weight of the isolated machine. *In a large superyachts with a number of gen-sets and other machinery, the added weight would be measured in tons.* With so much emphasis on weight reduction in superyachts, an alternative isolation strategy with no weight penalty that matches or exceeds the effectiveness of the double mounting, over the frequency range of interest, is DEICON's "Computer Controlled Air Isolation System' which uses air as the isolation medium. Under the supervision of a computer, semi-active and active control are used to keep the desirable attributes of air mounting, i.e., unsurpassed isolation, and address the undesirable attributes, i.e., lack of damping, low lateral stiffness, etc.

Figure 1 depicts the transmissibilites (a) and motion (b) of a 2000 Kg gen-set mounted at 4 corners, using 3 different isolation arrangements of 1) single elastomeric mounting (black/dotted line), 2) double elastomeric mounting (blue/dashed line) with m2=500 Kg (m2/m1=0.25 providing the 2nd natural frequency 4.2 times higher than the first one i.e., wn2/wn1=4.2), and 3) air mounting under the control of a computer (red/solid line). Comparison of single and double mounting (black/dotted line and blue/dashed line) clearly shows the advantage of double mounting at higher frequencies. On the other hand, the vibration isolation effectiveness (judged by the transmissibility traces of Figure 1(a))of air mounting system is almost as good as double mounting at high frequencies, it is by far superior to double mounting at low frequencies. The lack of damping in air mounts has already been addressed by active damping incorporated into the system; note that the peakiness of the air mounted resonance is milder than that of the elastomeric mounted resonance, indicating the existence of more damping.

The higher motion of the machine at low frequencies can also been addressed by the active and semi-active stiffness control.

All in all, compared to double mounting, air mounting under the control of the computer provides superior isolation with no weight penalty.

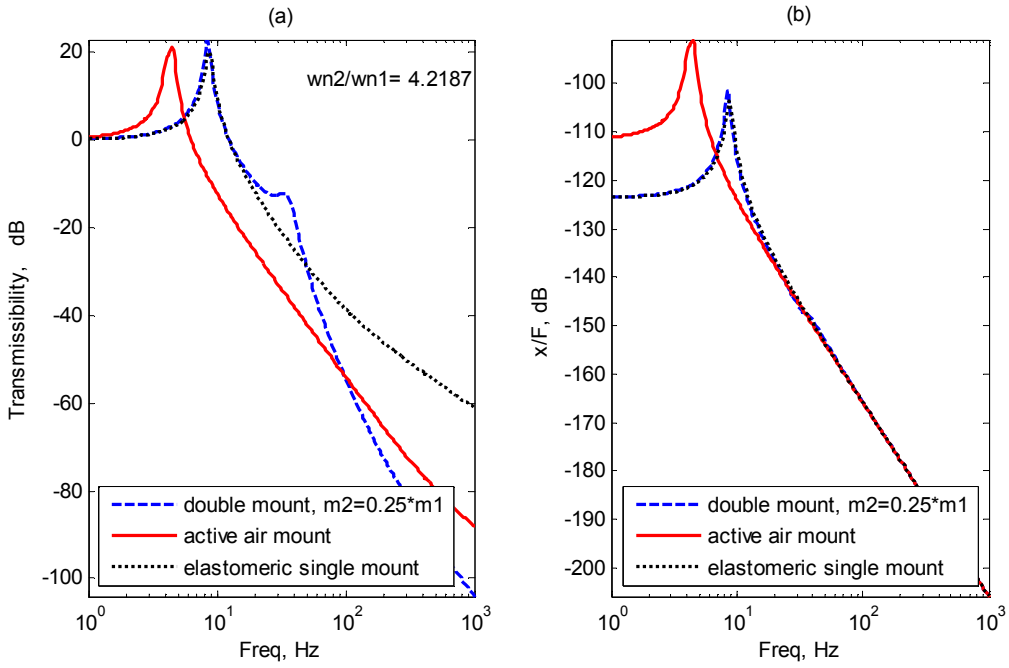

Figure 1 Comparison of transmissibilities (a) and motion of the machine (b) using single mounting (black/dotted line), double mounting (blue/dashed line) and active air mounting