Computer Controlled Air Isolation System

An Advanced Shock and Vibration Mitigation System for Diesel Generators Onboard Luxury Watercrafts

An ideal mounting system for luxury yacht diesel generators should be

1. soft while the yacht is not moving, i.e., the propulsion engines are off and calm and quiet are expected. This will prevent the transmission of vibration and noise, through the hull, to the living quarters of the yacht.
2. stiff when the yacht is moving or in rough waters

No one passive solution quite satisfies both requirements listed above. Even the popular double mounting, using two sets of elastomeric (rubber) mounts at each mounting location with a massive inertia in between, while effective at high frequencies deteriorates the low-frequency isolation effectiveness of the mounting system. Shock isolation of double mounting is also inferior to that of single mounting. In addition, double mounting imposes unfavorable weight, cost, and space penalties. The complexity and difficulties of converting an existing mounting system to double mounting does not help the appeal of double mounting in retrofit applications.

When sailing, gensets' noise and vibration are normally masked by the noise and vibration created by the propulsion engines, propellers induced turbulence, etc. Thus, noise and vibration isolation attributes of gensets mounting system have a lower priority than its shock isolation attributes requiring mounts with *large stiffness and damping*. On the other hand, while the vessel is docked (and not on shore power) or anchored, gensets are the main source of noise and vibration, which if not isolated by *soft, low damping* mounts, will transmit their noise and vibration through the hull to the living quarters, disturbing the occupants.

DEICON's ***Computer Controlled Air Isolation System*** is an adjustable mounting system capable of meeting the conflicting requirements stated above. This is a hydraulic/pneumatic system using two sets of 'main' and 'lateral' air mounts. The main air mounts supporting the weight of the diesel generator provide soft mounting when the yacht is at port (or anchored) and water is calm. The reputation of air mounts for providing the highest degree of isolation of any type vibration isolator while being able to hold the weight of a massive machine is legendary. Figure 1, compares the effectiveness of rubber and air mounts in isolating a 175 KVA diesel generator. Clear from the figure, the isolation effectiveness of air mounts by far exceeds that of rubber mounts.

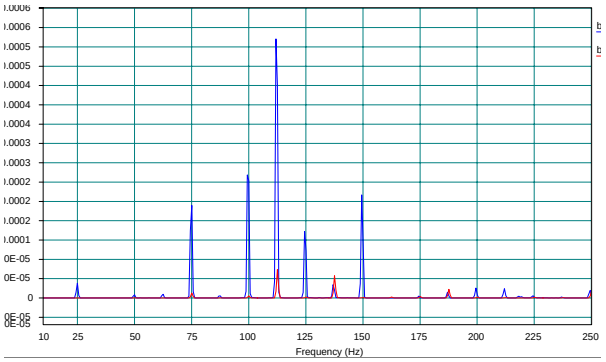

Figure 1 Power spectrum of acceleration at a location on the engine room floor, with diesel generator mounted on rubber (blue) and air (red) mounts.

Considering that air mounts do not provide sufficient lateral stiffness needed to secure the diesel generator while the boat is in motion, additional lateral support is provided by a set of smaller mounts which will be engaged, when needed. These mounts in addition to providing lateral stiffness, also increase the heave stiffness of the mounting system. Even more heave stiffness is realized by replacing part of the air in the main mounts with liquid. Thus, by selecting any of the three states, via a selector switch or automatically, the mounting system under the control of a programmable logic controller, PLC, changes from soft with small lateral stiffness (providing excellent noise and vibration isolation), to somewhat stiff with lateral stiffness, and stiff with lateral stiffness (providing excellent shock isolation). Figure 2 shows a mounting feet of an air-mounted diesel generator on-board a luxury yacht isolated,.

Figure 2. One mounting foot of a diesel generator isolated by DEICON's Computer Controlled Air Isolation System

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