Modern offshore oil platform noise consultancy involves more than identifying restricted areas and recommending hearing protection

Written by Chris Anderson, Principal Consultant

In the past it was often accepted that offshore oil platforms were inherently noisy and limited effort and cost was expended on noise control engineering at the design stage. Typically, the only involvement an offshore noise specialist might expect was in predicting noise contours in work areas where equipment had been purchased to inappropriate noise limits, and in delineating the majority of the platform a ‘Hearing Protection Zone’.

However, an ever increasing awareness of the importance of the working environment has lead to a recognition of the role of the oil platform noise consultant.

The following brief descriptions show how the different acoustic design disciplines have been employed on offshore projects undertaken by Spectrum.

Specification of Equipment Noise Limits

Preliminary equipment noise limits will normally be developed during the front end engineering design (FEED) stage so that cost, space and weight allowances can be made for equipment noise enclosures and piping insulation. The offshore noise specialist will later formalise these noise limits as part of the Detailed Engineering Design Phase, taking into consideration any changes since the FEED, and will issue the limits to potential suppliers on an Equipment Noise Data Sheet.

EQUIPMENT DESIGN DATA

Equipment size (l x w x h)	m	Calculated Δ L=SWL - SPL	dB (Note 1)							
Power	kW	Efficiency	%							
Capacity		Driver type								
Pressure disch.		Driver speed	rpm							
Pressure suction		Equipment speed	rpm							
Equipment weight	kg	Gear tooth contact rate	Hz							
		Blades/vanes pass frequency								
		Number of stator/number of rotor blade ratio								

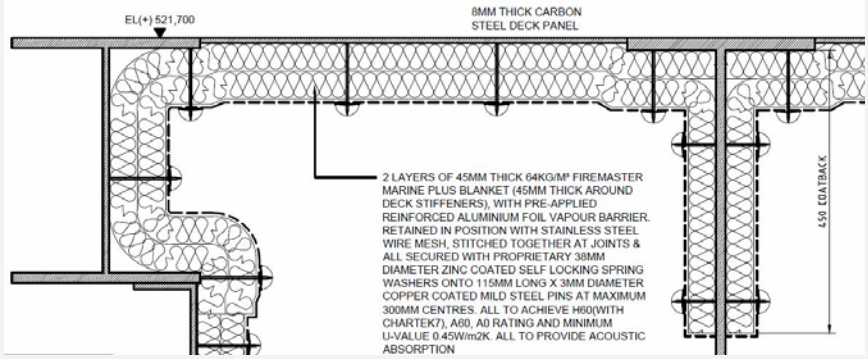
COMPANY SPECIFIED DATA		Octave band centre frequency, Hz								
Noise Level Limits (Note 1)	dBA	31.5	63	125	250	500	1000	2000	4000	8000

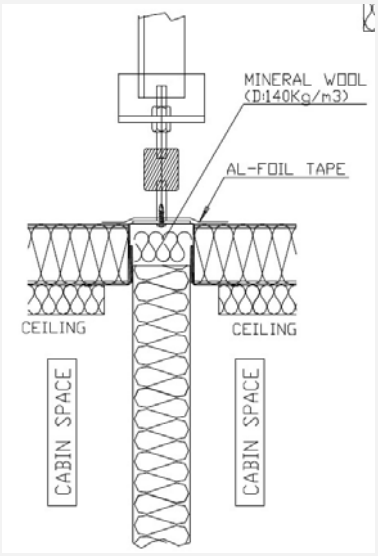
Special requirement:

A common misconception where a noise expert is not involved is that all equipment can be purchased to a general limit of 85 dB(A) at 1m, with the aim of achieving an overall limit of 85 dB(A) in the work area. In practice, noise build up from multiple noise sources and reflections means that a free-field sound pressure level limit of 72-75 dB(A) at 1m from each noise source is more likely to be required if an overall limit of 85 dB(A) is to be achieved.

Room Acoustic Design

Control of reverberant noise levels in all areas of the oil and gas platform is important not only as a means of reducing the total noise level but also in improving the audibility of Public Address and General Alarm (PAGA) systems. The noise control engineer may implement this in work areas via deckhead and wall construction acoustic insulation, and in office or relaxation areas via the use of acoustically absorptive wall and ceiling tiles.





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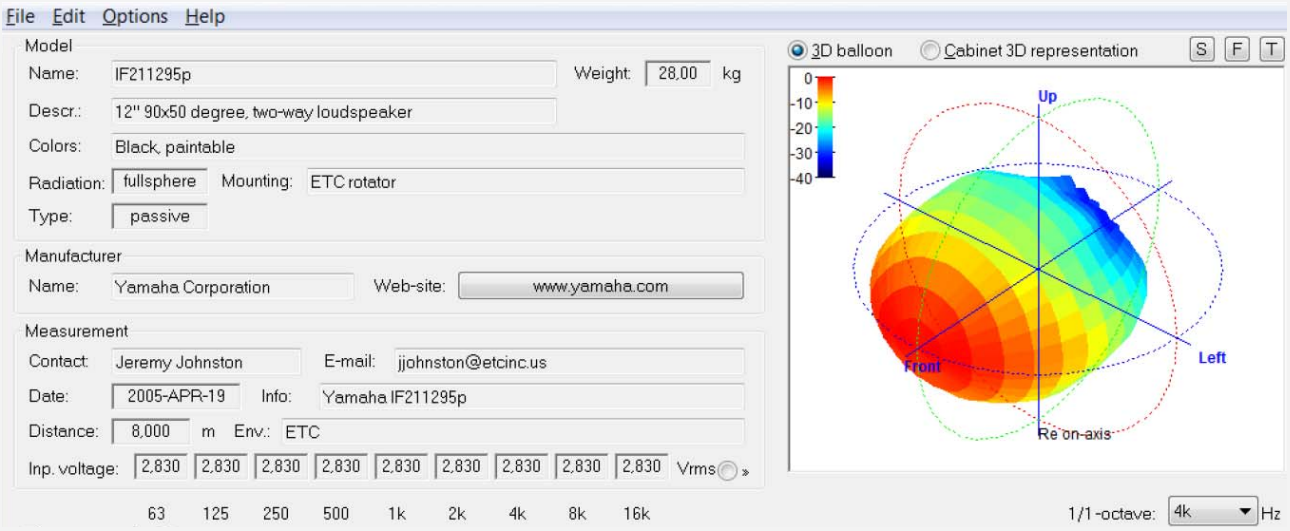
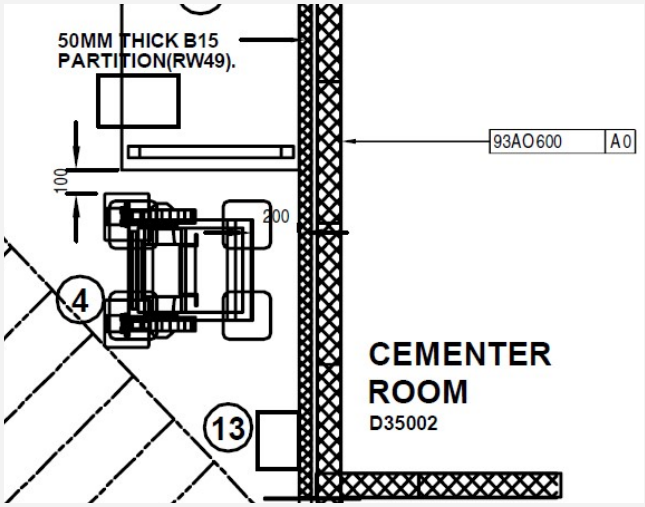
Speech Intelligibility

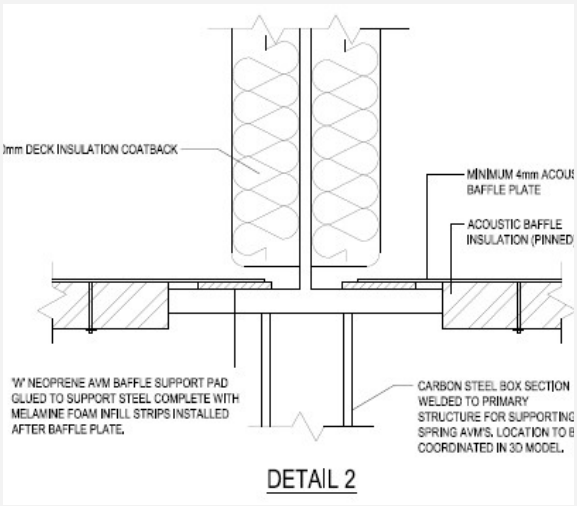
Speech intelligibility for the PAGA system is vital for safety and effective communications on a platform and a Speech Intelligibility Design Study will typically include an analysis of the predicted audibility of the PAGA system in all areas of the platform. The initial placing, number and power of the loudspeaker units will be assessed by the oil or gas platform noise consultant, taking into consideration the acoustic characteristics of each area in order to ensure appropriate Speech Transmission Index (STI) values are achieved. Where the design criteria are not met, the loudspeaker placing, number or room acoustics will be adjusted as necessary in order to achieve the required criterion.



Sound Insulation

An offshore platform includes noisy Work Areas, critical noise sensitive platform Control Rooms and Living Quarters, all in relatively close proximity. This places a high design requirement on the sound insulation properties of partitions between such areas, and these must be specified by the oil platform noise consultant appropriately taking into consideration both the frequency content of the noise and the octave band sound insulation provided by the partitions.





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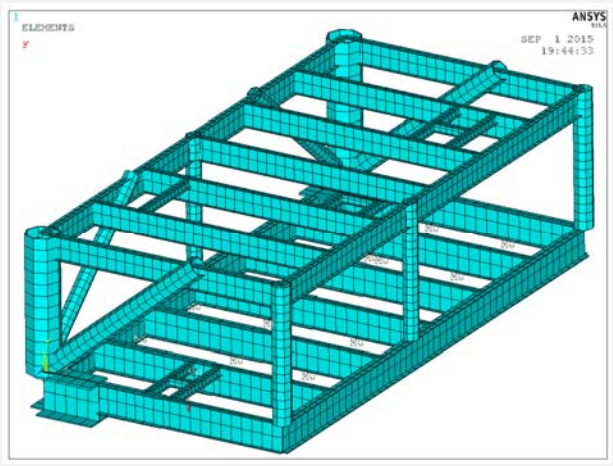
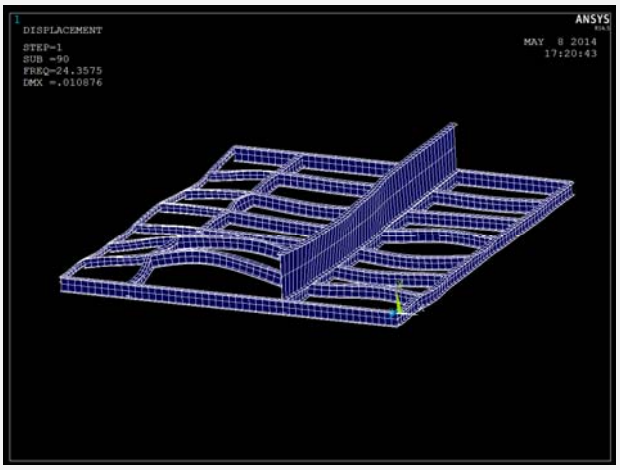
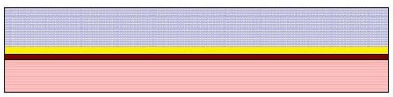
Control of Structureborne Noise and Vibration

Vibration isolation is used extensively to prevent the transmission of vibration from rotating and reciprocating machinery into support structures, and the offshore oil or gas platform noise consultant will be responsible for ensuring appropriate vibration control is purchased with equipment. Deckheads, bulkheads and hulls are comprised of large areas of sheet steel and support beams, and these are prone to acoustic resonances and the transmission of acoustic energy in the form of structureborne noise. Modern offshore platforms, spars, ships and FPSOs make use of viscous damping materials to control the radiation of structureborne noise, and finite element modelling of support beams can be utilised by the offshore noise specialist to help ensure that machinery excitation frequencies and beam resonances do not coincide.





8 mm steel plate + 1 mm TEFROTEX® VISCOELASTIC
+ 1,5 mm steel plate
+ 10 mm TEFROTEX® SF
Predicted acoustic properties



Noise Modelling

In order to protect personnel from high noise levels when the facility is operational, it is vital that area noise limits are met. A noise model of the entire platform is therefore developed and updated as the project progresses in order that the noise control engineer will be aware of any potential problem areas. Typically, the model will be revised several times by the platform noise consultant as the equipment noise data develops from initial design criteria through supplier guaranteed levels to finally ‘As Built’ noise levels, obtained during Factory Acceptance Tests (FAT) or during commissioning at the shipyard.

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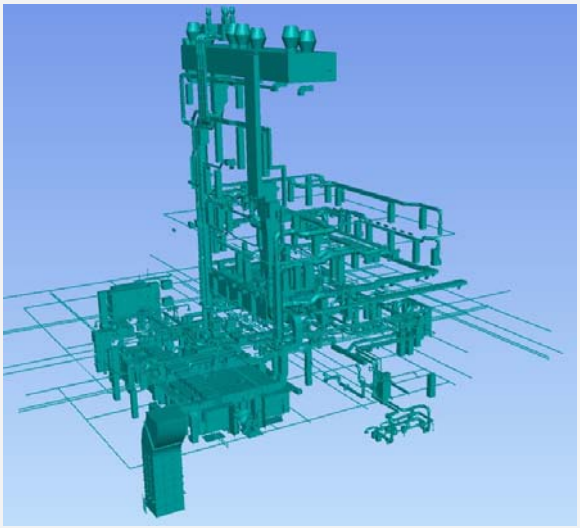
HVAC Noise Studies

The offshore oil platform noise consultant may be asked to undertake or audit HVAC noise calculations in order to check that sufficient attenuation is provided for the air handling units (AHU) and extract fans serving the platform.



The large number of enclosed office and machinery areas means that there will be an extensive and complex arrangement of ducting throughout the platform, and this may be subject to several revisions of layout as the design is finalised. When combined with very limited space for attenuators, this requires a flexible approach from the noise expert and a software prediction model will typically be required so that the impact of design changes can be quickly assessed.

'As built' Factory Acceptance (FAT) Noise Testing

Most equipment will be subject to an as built FAT noise test so that actual noise levels can be compared with guaranteed or predicted noise levels and mitigation measures allowed for where necessary. The offshore oil or gas platform noise consultant will often be called upon to witness or assist with the FAT noise tests in order to ensure that the measurements are undertaken to recognised industry standards (eg. ISO 3744 or ISO 9614).

Increasingly, sound intensity measurement to ISO standard 9614-2 is becoming the preferred methodology, since it minimises the negative influence of the non-ideal factory environments in which the FAT noise tests are usually performed.