SEAHEALTH

Less noise and vibration is good for the working environment

High levels of noise can ruin your hearing if you are exposed to it for a long time. Constant low level noise and vibration can also have a major impact on your working life because it means poorer quality sleep, lack of rest and stress. For example, if a fire door bangs or the hinges creak every time it is opened and your cabin is right alongside, it affects your periods of rest.

Noise and vibration require special attention on a ship because the crew are on board every day around the clock and are surrounded by noisy machinery and metal which transmits noise well. There are mandatory requirements for noise reduction on ships, and Danish flagged vessels have to comply with maximum limits for individuals (EU legislation) and special values for different locations in the ship (International Maritime Organisation legislation). This is to protect crew from long-term work-related impacts that in the worst case can lead to reduced ability to work and poor health.

On a ship, crew are to a greater or lesser extent exposed to vibration and noise practically all the time. The ship is their workplace and unlike workplaces ashore, they cannot leave the ship and have peace and quiet at night without noise and vibration. This is why it is extra important for shipowners to prevent noise and vibration. Ships are made of steel and so there will always be noise and vibration on board so noise reduction is essential. Noise reduction is good but noise prevention is even better. In this article, we meet a Danish shipowner, ESVAGT. In their latest newbuilding, they significantly reduced noise already in the design phase of the ship. But first some facts about noise and vibration.

Noise and vibration impacts

Noise is not just noise. There is airborne noise from the engine in the engine room and structural noise transmitted through materials. The threshold value for noise for crewmembers is 85 dB(A) for an 8 hour working day. The impact of noise depends on its level and the time you are subject to it - see the box for the relationship between noise level and time.

85 dB(A) for an 8 hour working day corresponds to:
91 dB(A) for 2 hours
97 dB(A) for 30 minutes
102 dB(A) for 10 minutes
105 dB(A) for 5 minutes
112 dB(A) for 1 minute
The level to which a crewmember is exposed (EU threshold values). The best solution is to prevent these impacts or alternatively to wear hearing protection to avoid them.

You must always wear hearing protection if noise exceeds 80 dB(A). Experience has shown that 4% of people working in noisy environments for 8 hours a day for 10 years will suffer hearing damage at 80 dB(A) and 24% will suffer hearing damage at 95 dB(A).

Vibration is a special problem for hands and arms when using vibrating tools for lengthy periods. Whole body vibration comes from constant small vibrations in the ship's hull caused by engines, ventilation, etc. The threshold value for using vibrating tools, for example, to avoid "white finger" and damage to the motoric system is 5 m/s^2 for 8 hours, but already at 2.5 m/s^2 preventive action must be taken for lengthy exposure, for example if chipping rust on board with a needle gun. With respect to whole body

vibrations, the limit is 1.15 m/s^2 for 8 hours, but already at 0.5 m/s^2 something must be done about the cause.

Using needle guns can be especially harmful because they can have a high level of vibration. Some needle guns operate at right up to 15.6 m/s^2 which means they can only be used for a short time. You can only use tools operating at 15.6 m/s^2 for 12 minutes a day. Prevention is first and foremost about acquiring low-vibration tools, limiting their use and as an emergency solution, using anti-vibration gloves. Wearing anti-vibration gloves means you can at most work for 49 minutes a day without putting your body at risk. Try seeing for yourself how long you can use your needle gun by entering the level of vibration given in the user manual for your tool in the table on our website. Schedule for calculating the impact of vibrating tools on hands and arms (http://www.seahealth.dk/side/vibrationer)

Noise and vibration are preventable

Prevention is different from PPE. Effective prevention is much more about identifying the source and eliminating the cause. If you are on an older ship, it is important to prevent noise and vibration by:

- Planning work on the basis of risk assessments
- Checking whether there are alternative working methods, equipment and/or other ways of working, for example by avoiding the use of vibrating tools in the cold
- Improving ancillary equipment, for example by way of anti-vibration seats and levers
- Undertaking regular maintenance so that working time can be reduced, for example
- Encapsulating the source, such as generators, and by insulating rooms against noise
- Using noise limiters for ventilation, for example
- Keeping work space and accommodation separate
- Thorough training and instruction

The final solution when everything else has been tried is to use PPE, for example approved hearing protection and anti-vibration gloves. Here, it is very important to display signs in places where PPE is required.

Risk assessments are a method of identifying where crew need to protect themselves on the ship and where action needs to be taken on prevention. Ship's management and crew should work together in drawing up risk assessments. They must always assess where there is the risk of exposure to impacts from noise and whole-body vibration on the ship and should be supplemented with an assessment of impacts from noise and airborne vibration in specific work processes and where felt relevant.

Be especially aware of the following when doing risk assessments:

- The strength, type and duration of impacts
- Action and threshold figures
- Effects on especially exposed crew
- Any indirect impact of noise/vibration on safety, for example when operating controls or reading instruments
- Data from suppliers
- The possibility of using less noisy and/or less vibrating equipment
- The impacts from (transmitted) noise and whole-body vibration on board ships after the working day, namely in crew accommodation/cabins.

ESVAGT AURORA – effective prevention

Built in August 2012, the ESVAGT AURORA is Danish shipowner ESVAGT's newest vessel. She has a special bow designed by Ulstein Design & Solutions, Norway, and was built by Zamakona Shipyard in Bilbao (Spain). She is specially designed for sea rescue operations in hard weather conditions and is on 24/7 stand-by by drilling rigs, typically in Arctic waters. Ships such as the ESVAGT AURORA and ESVAGT's other ships are on stand-by round the clock in the oil /gas sector.

BOX

About ESVAGT

In addition to being on stand-by, ESVAGT AURORA is also able to:

- Retrieve oil from the sea (NOFO oil spill response operations).
- Carry out underwater investigations using special ROV gear.
- Fight potential fires or the like with fire fighting equipment capable of delivering 2 x 3600 m^3 seawater/hr.
- Undertake supply operations.
- Carry out towing operations.
- Rescue capacity for 320 survivors.

The most important reason for preventing noise on the ESVAGT AURORA was to reduce the impact of noise and vibration on the crew's working environment. ESVAGT decided to reduce noise and vibration, by especially minimising structural noise. ESVAGT wanted to build as good a ship is possible which would also be a really good workplace for their shipmates at sea. A good workplace is a reflection of many things but one of the most important is a good working environment. That is why already in the design stage, ESVAGT focused on noise and vibration and maintained this focus throughout the whole construction phase until the ship was completed.

ESVAGT made a conscious choice to do something extra for the working environment. They identified and calculated potential sources of noise in the design stage with experts from the classification company DNV and designers from Ulstein Design & Solutions and on the basis of being Danish flagged and the higher legislative requirements this entails, the level of noise and vibration on the ESVAGT AURORA was reduced by:

- Extra special insulation (Sicolastic) on all steel cladding, bulkheads and decking associated with the bow and retractable azimuth thrusters in the bows.
- Extra special insulation (Sicolastic) in the accommodation and steel cladding on all decks.
- Noise absorbent flooring solutions arranged as special cassettes consisting of "boxes" of noise-absorbent material covered by a flexible compound layer.
- Large diameter propellers for the propulsion azimuth thrusters to minimize propeller noise.
- Bow and retractable azimuth thrusters are fitted with converters and adjustable pitch which make it possible to adjust pitch and revolutions simultaneously. The reduction in revolutions has a major significance for noise from these units.
- Special shock absorbers were installed under all diesel engines to minimize noise and vibration together with rubber suspension exhaust systems fitted with noise reducers.

The results have been good. The noise is minimal and reports from seagoing crew say: One of the best ships in the fleet to serve on.

BOX: Glossary
Bow thruster: Propeller units (x 2) installed in the bow of the ship and used to move it sideways and as part of the ship's positioning equipment. Thrusters are used to maintain the ship in a given position (governed by the ship's DP system) and are also used when manoeuvring in harbour, for example when laying alongside the quay or departing.
Retractable azimuth thruster: Rotatable thruster that is retracted into the hull when not in use but extended below the hull when in operation. Used when sailing up to a few knots (6 knot max.) when the ship is for example on standby and as part of the ship's positioning system for maintaining it at a given position.

Read more about Health and Safety at

www.seahealth.dk and

about state-of-the-art sea resque 24/7 stand-by vessels at

www.esvagt.com

About SEAHEALTH
Established in 1993, SEAHEALTH is a private company with a board of 12 members, with six from shipowners and six from employee unions. SEAHEALTH works with the Danish merchant fleet to promote health and safety for seafarers regardless of rank. We provide consultancy services to shipowners and ships in order to prevent occupational injury, including industrial accidents, occupational disease and wear and tear. All Danish registered merchant ships over 20 GT are members of SEAHEALTH.