AMMONIA AS FUEL

GOOD FOR THE ENVIRONMENT BUT WHAT ARE THE RISKS FOR THE CREW?

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THE DECARBONISATION OF SHIPPING IS PROBABLY THE BIGGEST CHALLENGE THE INDUSTRY HAS EVER FACED. MANY ALTERNATIVE FUELS ARE BEING DEVELOPED AND ARE STARTING TO BE TESTED AND USED. WHILE THE ENVIRONMENTAL BENEFITS OF USING NON-FOSSIL FUELS ARE OBVIOUS, THERE ARE ALSO SAFETY RISKS ASSOCIATED WITH HANDLING SOME OF THE ALTERNATIVE FUELS.

IN THIS ARTICLE WE LOOK AT SOME OF THE RISKS ASSOCIATED WITH THE USE OF AMMONIA.

- **AMMONIA (NH_3) IS A COLOURLESS GAS WHICH IS A COMPOUND OF NITROGEN AND HYDROGEN.**
- **IT IS LIGHTER THAN AIR AT NORMAL ROOM TEMPERATURE AND HAS A BOILING POINT OF AROUND -33.3°C.**
- **IT HAS A VERY DISTINCTIVE ODOUR WHICH IS SIMILAR TO THE SMELL OF HUMAN SWEAT.**

RISKS

Ammonia is highly toxic: 2500 ppm will be fatal in about 30 minutes, and 5000 ppm (about 0.5%) will result in rapid respiratory arrest. At 500-700 ppm, unprotected exposure may result in burns to skin, throat, lungs and eyes (potentially causing blindness). To understand the nature of the health risk, it should be borne in mind that ammonia is attracted to moisture and mucous membranes.

When using ammonia as fuel, when compared to carrying it as a cargo, the main difference is that the gas installation will enter the engine room rather than being isolated in the cargo area. There will, therefore, be a greater chance of contact between the ammonia and the crew. Various class societies are investigating the risks and looking at how best to handle ammonia both in the engine room and also on deck during the bunkering process. They have identified possible problems with the storage of ammonia and also highlighted safety implications in cases of accidental damage to the storage areas or if the heat exchange fails. Another potential problem is the release of toxic vapour when ammonia is vented. The design of the fuel system will have to be adjusted to prevent any such toxic discharges or a recovery system should be installed in the vent line.

Another element to consider is that ammonia is corrosive to materials like copper, copper alloys and zinc. Therefore, utmost care must be taken in the selection of materials chosen to contain ammonia.


DECARBONISATION

PROGRESS SO FAR AND FUTURE DEVELOPMENTS

IN RECENT YEARS DECARBONISATION HAS PROBABLY BECOME ONE OF THE MOST COMMON WORDS IN THE SHIPPING NEWS MEDIA. THE UNITED NATIONS PARIS AGREEMENT ON CLIMATE CHANGE IN 2015 MADE A COMMITMENT TO KEEP THE GLOBAL MEAN TEMPERATURE INCREASE AT BELOW 2°C OF PRE-INDUSTRIAL LEVELS BY 2100, WHILE MAKING EFFORTS TO LIMIT WARMING TO 1.5°C.

IN APRIL 2018, THE INTERNATIONAL MARITIME ORGANISATION (IMO) ADOPTED ITS INITIAL STRATEGY ON THE REDUCTION OF GREENHOUSE GAS (GHG) EMISSIONS FROM SHIPS, WHICH SETS OUT THE AMBITION TO REDUCE CARBON INTENSITY BY AT LEAST 40% BY 2030, MOVING TOWARDS 70% BY 2050, AND TO REDUCE GHG EMISSIONS BY AT LEAST 50% BY 2050. THERE IS ALSO A STRONG DESIRE FROM MANY COUNTRIES AND WITHIN THE SHIPPING INDUSTRY TO REDUCE EMISSIONS BY 100% BY 2050.

TRAINING

To ensure safe operation and prevent incidents, it is essential that the crew undergo additional training and the ship's safety management system (SMS) will need to reflect the additional risks involved. This will include issues such as making sure that ammonia systems are gas free before they are dismantled or before any maintenance work is carried out. And of course, the applicable enclosed space requirements must always be followed.

CONCLUSION

Ammonia does have a distinctive odour and this will often reveal its presence. However, the sense of smell must not be relied on to give a warning of any problems as people can become 'noseblind' to the odour (known as olfactory fatigue) which means they can no longer smell the ammonia and so are not aware of any problem. This is why it is always important to put the appropriate precautions in place before any work is started, in order to provide the crew with as much protection as possible.

In the last edition of Risk Watch, Jacob wrote a longer article on decarbonisation with details of all the alternative fuels currently available. https://bit.ly/3CsNzVL