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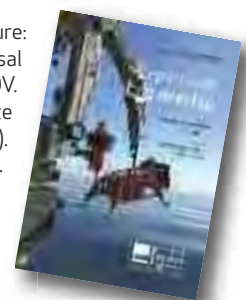
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 **Institute of
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VOICE OF THE EXPLOSIVES INDUSTRIES



Professional Affiliate of ECUK

The Institute of Explosives Engineers

Ground Floor, Unit 1, Greyfriars Business Park,
Frank Foley Way, Stafford, ST16 2ST

Telephone: 01785 594 136

Email: vickihall@iexpe.org

www.iexpe.org

Institute of Explosives Engineers Registered Office

Ground Floor, Unit 1, Greyfriars Business Park,
Frank Foley Way, Stafford, ST16 2ST

Company No. 07905911

Company limited by guarantee

Editor

Diane Hall

Telephone: +44 (0)1729 840 334

Mobile: +44 (0)7778 063373

Email: dianehall@iexpe.org

DianeTHall@aol.com

Design and Print/Production and Advertising Manager

Gordon Hunt

Gordon Hunt Design

Telephone: +44 (0)1726 832594

Email: design@gordon-hunt.co.uk



MV Geosund, DP Vessel.



WWII contact mine located in the Baltic.



Cobra placement on a WWII Russian contact mine.

Underwater EOD in the Baltic Sea

By **Auke Van der Velde** MIExpE

It was reported at a HELCOM (Baltic Marine Environment Protection Commission – Helsinki Commission) in Bonn, April 2015 that 180,000 sea mines were laid in 2,200 mine fields between 1848 and 1945. Since World War II, the Baltic Sea has been exposed to extensive explosive contamination, from chemical weapons to land service ammunition, torpedoes, sea mines and other hazardous items of UXO. In 1994, a HELCOM maritime working group reported that 40,000 tons of chemical weapons were dumped in the Baltic Sea.

In the years since World War II, the sea region has been used for extensive military activity, such as weapons and ammunition practice by many of the neighbouring Baltic states. This has resulted in extensive explosive contamination in the Baltic Sea which has impacted upon the planned lines of subsea pipeline infrastructure, hence the requirement for an efficient and effective Explosive Ordnance Disposal (EOD) process.

BODAC B.V. ("Bodem Activiteiten" (Soil Activities)) is an Unexploded Ordnance (UXO) services company specialising in UXO risk management, historical research, archaeology, survey and detection on land and underwater. In the subsea sphere they routinely conduct geophysical survey, diving and detection activities and have recently been active in the Baltic Sea with the Dutch offshore service provider N-Sea, having been engaged on the Nord Stream 2 project, preparing for the installation of pipelines in the Finnish sector of the Baltic Sea. This forms part of the Nord Stream 2 planned route for the subsea pipelines which will cross the territorial waters and exclusive economic zones of Russia, Finland, Sweden, Denmark and Germany.

N-Sea is an integrated subsea service provider in survey and IMR (Inspection, Maintenance, Repair). They have routinely delivered cost effective solutions for subsea infrastructures and assets in support of the international oil, gas and renewable sectors with their survey, identification and UXO removal capabilities. BODAC helps augment the delivery of these services and together in this project, N-Sea and BODAC have conducted pre-detonation survey, target investigation and identification, using magnetometer array, and hi-resolution sonars, specially equipped Remote Operated Vehicles (ROV) and removed positively identified UXO objects through an Explosive Ordnance Disposal (EOD) process that utilises the Cobra Mine Disposal System (MDS).

Method

BODAC and N-Sea developed an EOD solution and technical approach to clear and dispose of the historic UXO that was encountered by incorporating the Cobra MDS, ensuring that UXO was disposed of in a safe and controlled manner and minimised the impact upon the environment with particular focus on monitoring and preserving marine life in the vicinity. Environmental mitigation included the use of a marine mammal observer, passive acoustic monitoring of fish- and cetaceans, acoustic deterrence devices (for seals) and a big bubble curtain. Bubble curtain equipment is deployed and operated by the support vessel and is designed to be laid around the UXO target. Compressors carried onboard are activated, feeding compressed air into the bubble curtain hose, creating a wall of bubbles which significantly dampens the acoustic shock during destruction activities.



Bodac bubble curtain aircompressors mammal mitigation.



Preparing mine disposal system.

The target positions were investigated by the Work Class ROV which was specially equipped with a number of sensors, spot lasers for accurate measurement and high definition, wide angle colour cameras for planned operations between 40m to 80m depth of water. In total, over seventy potential targets were investigated, which were either removed, neutralised or destroyed by the EOD engineers, having positively confirmed that the targets were UXO, in line with the sequence of events set out in the pre-prepared disposal plans, each of which was approved by the client. Destruction of the targets was achieved using a controlled means of initiation, carried out whilst ensuring that adjacent shipping had been warned of the nature of the explosive operations and they remained at a safe distance throughout.

The Cobra MDS was prepared on the deck of the MV Geosund once the explosive charges had been put together for UXO disposal operations. The Cobra apparatus was attached to the ROV so that when launched, the ROV could carry the donor charge to the target, using the Cobra placement unit to achieve the best angle of projection, so that the UXO could be either neutralised and/or disposed of. After placing the explosive charge with the unit, a float was released to the surface which had an antenna attached for a controlled and secure RF initiation that would be conducted from the MV Geosund at a safe distance from the explosive hazard, having already recovered the ROV out of the water. Thereafter, the area would be re-surveyed to confirm the success of the operation and remove any items of debris.

Conclusion

The key to achieving project success was to ensure that underwater geophysical survey data before and after underwater disposal operations was accurate, so that targets of interest could be correctly identified and UXO hazards removed along planned pipeline routes. Project integration between N-Sea, BODAC and the other implementing partners was also an essential requirement. The teams had prepared a risk-based methodology and applied best-practice in terms of ensuring relevant levels of qualification and competence.

References

- HELCOM report on chemical munitions dumped in the Baltic Sea, January 1994 (see: www.hecom.fi).
- HELCOM submerged meeting, Bonn, 22-23 April 2015 (see: www.hecom.fi).
- Nordstream 2 (see: www.nord-stream2.com).

Auke van der Velde is a former Royal Netherlands Navy Mine Clearance Dive Team leader with a 18-year career engaged as Navy Petty officer and MCM Dive Supervisor at the Defence Diving Group. He is EOD Manager responsible for maritime UXO clearance scopes at BODAC B.V.

Further information: a.vandervelde@bodac.nl