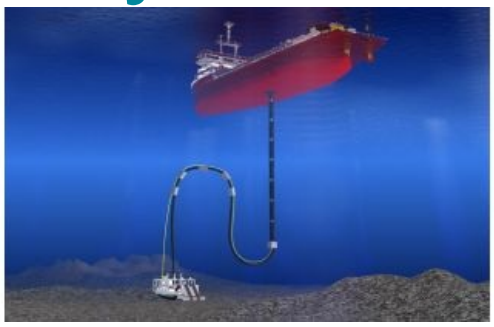
RODNEY NORMAN, ROYAL IHC, PROJECT COORDINATOR BLUE NODULES

Hydrographic Surveyors Key to Defining Mining Resources through Survey Work



On 1 February 2016 a European consortium launched a new Horizon 2020 project: Blue Nodules. This project addresses the challenge of creating a viable and sustainable value chain to retrieve polymetallic nodules from the ocean floor. It will develop and test new, highly automated and sustainable technologies for deep-sea mining that exert minimal pressure on the environment. The project presents economical potential but also involves various challenges from a technological, environmental and professional perspective. Find out more in this interview with Blue Nodules project coordinator Rodney Norman, director marine mining of Royal IHC.

What is the significance of deep-sea mining for your organisation?

Royal IHC has a long history in dredging and mining. Indeed the name IHC came about because of a joint venture formed by six shipyards to build large dredgers for tin mining in the mid-1900s, since the project was too large for one shipyard to handle alone. Today, IHC has the strategic vision to be the supplier of choice for deep-sea mining equipment in this emerging new industry, particularly for the mining of polymetallic nodules.

What is the economic potential of deep-sea mining activities?

Deep-sea mining activities offer large economic potential, particularly with regards to polymetallic nodules. In 2009 the International Seabed Authority (ISA) published a comprehensive assessment of polymetallic nodule resources found in the Clarion Clipperton Zone (CCZ), which is a roughly 7,240km-long submarine fracture zone situated in the Pacific Ocean. According to that assessment, the CCZ may host more than 27 billion tonnes of nodules, possibly containing 7 billion tonnes of manganese, 340 million tonnes of nickel, 290 million tonnes of copper and 58 million tonnes of cobalt. Deep-sea mining requires the development of innovative technologies and operations creating a complete high-tech value chain for the new sea-based mining industry, from the design and supply of high-tech equipment to new metallurgical extraction. The innovative nature of this industry will very likely create spin-offs in other industry sectors as well.

Why is the EU funding a consortium for deep-sea mining?

To quote the EU Raw Materials website: "Securing a sustainable supply of raw materials is a key priority for the EU. Raw materials, such as metals and minerals or forest-based materials, have become increasingly important to the EU’s economy, growth and competitiveness. More than 30 million jobs in the EU and many key economic sectors such as automotive, aerospace and renewable energy are dependent on a sustainable supply of raw materials. Raw materials are particularly crucial for the development of modern environmentally friendly technologies and a strong European industrial base. Without them, there wouldn’t be any smartphones, laptops or cars".

Which minerals are of immediate interest?

The minerals of immediate interest are nickel, copper, cobalt and rare earth elements.

How will they be extracted and exported?

Polymetallic nodules are round to elongated concretions measuring 1 to 15cm in diameter and occur on the surface of the sea floor. A sea floor vehicle and collector system will harvest the nodules and convey them via a flexible connection to a rigid riser system. The rigid riser system with its pumps in series will then transport the nodules over a vertical height of 5,000m to the surface vessel. On board the surface vessel the nodules will be dewatered and stored prior to being transported to the land-based processing plant via bulk carriers.

Where is the first emphasis for mining, geographically speaking?

The most promising polymetallic nodule deposit, with respect to nodule abundance and metal concentration, occurs in the Clarion Clipperton Zone (CCZ) of the eastern equatorial Pacific between Hawaii and Central America.

What is the biggest technological challenge for deep-sea mining?

There are a number of challenges, but the most important one is determining the best technology for harvesting the nodules from the sea floor and developing a suitable mechanism that ensures a high pick-up efficiency while exerting minimum pressure on the environment.

What expertise already exists and where are the gaps in knowledge and skills?

Expertise exists in all fields, drawing on the technological developments of the dredging industry and the deep-sea oil & gas industry. A real challenge will be to integrate and align all interfaces creating an efficient, productive and reliable system.

Which impact assessment studies will be conducted and which hydrographic surveys will be done to monitor the environmental impact?

The Blue Nodules project will use new insight to direct the development of new technological and operational solutions to reduce the mining impact. To that end, environmental terms of reference will be involved right from the start of the technology development process. During the first offshore cruises, measuring and monitoring methodologies for plumes, noise and seabed alteration will be an integral part of the research. An innovative element will be the use of realistic field data, from a licence area within the CCZ, to feed the Environmental Impact Assessment (EIA) of the developed deep-sea mining system.
The EIA in Blue Nodules will be based on quantified environmental pressures such as alteration of the seabed, plume forming, underwater noise, dissolved metals release and CO_2 footprint.

What can hydrographic surveyors and oceanographic scientists contribute to deep-sea mining?

Mining polymetallic nodules requires an economic resource to be identified. Hydrographic surveyors will be key to defining that resource through survey work which is required to ascertain the concentration of nodules and likely mining sites that can be economically harvested within the limitations of the technology. On the other hand, oceanographic scientists are key to balancing this resource identification and targeting mining sites with mitigating mechanisms to reduce the impact of mining.

Can we expect a common international approach for licensing, requirements for baseline surveys and studies with ongoing monitoring?

The legislative part is the domain of the ISA, not Blue Nodules. However the ocean science community and several national institutes for ocean research are joining forces to align the research for baseline studies and monitoring through programmes like the Midas project (funded by EU through FP7) and JPI Oceans (joint programming initiative). Royal IHC is a partner in Midas and closely connected to several national institutes through Blue Nodules.

Where are there clashes of interest and how will these be resolved?

Within the consortium there are no clashes of interest foreseen but, should any occur, the consortium agreement entered into between the partners provides a mechanism for resolution.

There is criticism of the potential environmental impact of deep-sea mining. What is the impact and how can this be managed?

All mining activities have an impact, whether on land or at sea. The impact of deep-sea mining in the CCZ is still being quantified by various concession holders who undertake annual environmental cruises to their licence areas as well as by programmes like Midas and JPI Oceans. Blue Nodules aims to use data from at least one such concession holder to reduce the mining impact. It is also recognised that only a small part of the concession areas will be actually mined. By having a strong focus on minimising far-field impacts, large parts of a concession can be considered untouched.

How many jobs can be created in this field and what kind of additional education would be needed?

Well, the industry is still in its infancy so that is a difficult question to answer as it depends on the eventual scale of the operation. However, looking at the economic potential, it could be similar to that of a large mining operation on land. Potentially it can create a complete high-tech value chain throughout Europe
for which continuous innovation and improvement will be required. This technology can also create spin-offs in other sectors. Indirectly the access to raw materials is of strategic importance for many other innovative industries, thus potentially stimulating new European industries.

What is the consortium's first set of actions?

The first action of the consortium is to establish the terms of reference for the project consisting of the environmental impact model,

technical requirements, relevant rules and regulations, and economic requirements. This document will provide the basis on which all technology is developed with a focus on mitigating environmental pressures.

How will the results be used after the project concludes in 2020?

The results of the project will be used to pursue the market entry phase, which is not covered by Blue Nodules. The intention is that market entry will be preceded by a pilot deep-sea mining project before full-scale implementation. The scale and scope of the research and market entry agendas for developing and deploying technologies goes beyond the capacity of single companies or research institutions in terms of financial commitment, resources and capability. Therefore the industry needs to create critical mass through long-term cooperation and commitment. In this respect, a public-private partnership is potentially an efficient mechanism for the European Union to guide and financially support the area of exploration and exploitation of deep-sea mineral resources such as polymetallic nodules.
