

Section 01. Innovations in Engineering

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Deep-Water Mining Open Pits

A number of developed countries are in short supply of ore, mineral fuel, and certain types of building materials. Thus, they are to be imported. However, rather often own mineral sources are available but they are under ocean water sheet.

In spring, 2018 Canadian company Nautilus Minerals will start commercial development of hydrothermal copper-ore deposit Solwara at depth of 1600m in Bismarck Sea.

The deposit covers almost 2.5mln tons of chalcopyrite containing 7.5% of copper, 7.2g/t of gold, and 37g/t of silver. Market price is \$1.5 bln. The deposit is located near New Ireland Island.

Mining of the deposit will be started with the help of preparatory header Auxiliary Cutter equipped with coupled cutterhead mounted on a long rotatable boom to form flat level surface for future open pit. For the retention of stability within sites with heavy slopes, Auxiliary Cutter will be able to use side hydraulic supports. The Auxiliary Cutter will be followed by heavy cutting machine Bulk Cutter which weight is 310 tons with huge cutting drum. Function of the Bulk Cutter is deep opening, grinding, and rock grading into embankments.

The most complicated operation of the cycle is to accumulate and supply water and slurry mass to slurry riser will be performed by means of “vacuum cleaner” Collecting Machine equipped with powerful pump having cutting and suction nozzle; flexible pipe connects it with the riser. SMD engineers has calculated geometry and power of cutting machines in such a way to obtain at the output rounded rock pieces which diameter is almost 5cm. That will help achieve optimum slurry density and lower abrasive wear as well as a risk of plugging. According to SMD experts, Collecting Machine will be able to concentrate up to 70-80% of mined rock.

On a board, the slurry will be stored under decks with following reloading to bulk cargo ships. In this context environmental specialist insists on idea to filter “bottom” slurry water with its following pumping down. Altogether, mining operations performed with the help of Nautilus are as dangerous to ocean nature as trawler fishing. Scientists believe that local deep-water biological systems revive when several years pass after termination of external action. Another situation is with technogenic accidents and notorious human factor. Nevertheless, Nautilus has viable solution. A system being developed by Dutch company Tree C Technology will control every process performed by Solwara 1.