The Concept of the Instrumental and Technological Support of the Mining and Processing of Polymetallic Nodules Produced from the Russian Exploration Area

The development of polymetallic nodules in the Russian Exploration Area is based on the concept of mining operations involving three mining complexes, each with a productivity of 1 million dry nodules per year with subsequent transportation and processing of the ore mass in one of the metallurgical plants of Russia.

The technological solutions that were developed as a result of the engineering design imply that each mining complex consists of three elements: a mining vessel, a self-propelled collecting device and an air-lift system. The capital investments made in the creation of each mining complex were evaluated at the level of $750M.

The planned offshore stage for the transportation of the produced ore mass will be performed with the use of 5 or 6 bulk-carrier vessels. The annual operating costs for the use of such vessels, is calculated as not more than $45M.

For the metallurgical processing of raw ore material, one of two potential technologies was provided: pyro-metallurgical and hydro-metallurgical. Development of both technologies passed the relevant R & D laboratory tests. The results of these tests demonstrated the following possibilities for the recovery of metals as commodity products: 1) using the pyrometallurgical technology (in percent): Ni -90; Cu -88;Co -86; Mn -74, 2) using the hydrometallurgical technology (in percent): Ni -94.6; Cu-83.6; Co -92.1; Mn -82.3.

The estimated value of capital investments and the annual operating costs for the processing of ore raw material are $1000M and $400M respectively, and proved that the most expensive proportion in the total costs of the project for the production of polymetallic nodules of the Russian Exploration Area is related to the metallurgical processing of the ore mass. In this respect it is obvious that a reduction of the expenditures for ore processing is the key element in the reduction of the total costs of the project.

Collaboration in this sphere with other contractors is vital. Another important sphere of collaboration is connected with the provision of environmental safety during mining.