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CRYOSTAT FOR SUPERCONDUCTING MAGNETS

The paper describes the construction of a nitrogen-helium cryostat used for cryomagnetic separation in the course of mineral processing.

The construction of the cryostat is as follows: three superconducting magnets with warm vertical channels are placed in a helium vessel at the minimum distance, with a device that compensates interaction of their magnetic fields. Helium and nitrogen vessels have fiberglass supports near the upper flanges at the necks. The supports provide the work of the inclined cryostat: when the cryostat is horizontal, the necks are loaded; when the cryostat is inclined, the fiberglass supports work. To minimize the expenditure of liquid nitrogen and helium at the inclination of the cryostat, additional elements are mounted within the vessels: a local vessel is placed within the helium vessel and leak-proof walls are placed within the nitrogen vessel. These construction elements prevent the total leak of nitrogen and helium from the inclined cryostat, so the results are:

– reduction of the loss of liquid cryoagents in the down-dropped necks of the vessels;

– eliminated temperature gradient at the bottom of the nitrogen vessel;

– prevented movement of the center of mass of the vessels and dynamical loadings provoking increased evaporation of liquid helium.

All radiation shields have incisions. They are sewed by isolating material and secured from Foucault currents.

The technical result is: the projected cryostat with the established design decisions replaces three conventional cryostats. This fact permitted reduction of the size of the device, cost saving in the course of production, reduced expenditure of cryogenic liquids at the operation and provided reliability of the operation of superconducting magnets.

Keywords: cryostat, superconducting magnets, helium tank, nitrogen tank, radiation shield, vertical warm channel

Fig. Nitrogen-helium cryostat for superconducting magnets: *а* – external appearance of the cryostat in the course of filling by liquid helium; *б* – construction of the cryostat in the longitudinal cross-section; *в* – top view: *1* – helium tank, *2* – superconducting magnets, *3* – nitrogen tank, *4* – radiation shield, *5* – vacuum cover, *6* – helium filler, *7* – collector, *8* – pressure converter, *9* – vacuum valve, *10* – nitrogen filler, *11* – the top flange of the cryostat, *12* – cap, *13* – partition wall, *14* – screw eye, *15* – fiberglass strut, *16* – vertical warm feeds, *17* – compensation device, *18* – local capacity, *19* – outlet