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High-technology reels and hoses for deep hot-water drilling in ice

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The hot-water deep-drilling project at Amery Ice Shelf, East Antarctica, employs a multidisciplinary approach to the study of the region. It has been planned to drill 10–12 holes from the edge of the ice shelf to the grounding zone up to a depth of 2100 m at intervals of nearly 50 km. All equipment are installed in 20 standard shipping containers and will be transported from site to site using tracked vehicles. The main reel has an electromechanical drive system and holds a 2200-m-long single-length hose. The maximum hose lifting/lowering rate at full winding on the drum is 30 m/min, and drilling rate can be controlled in the range of 0–120 m/h. The main hose (ID/OD: 38/60.5 mm) with a Thermoelastoplast outer jacket has incorporated 8 × 1 mm2 electrical signal lines for communication with the downhole drill nozzle. A return winch with hose was designed for pumping water out from the subsurface reservoir with maximum depth of 250 m. The return hose (ID/OD: 38/70 mm) has Thermoelastoplast water channel and outer cladding. The hose is reinforced by Kevlar lines and has incorporated power lines to provide electric supply 6 × 16 mm2, signal lines 8 × 1 mm2 and four heating copper lines. The general concept of this hot-water drilling system was tested at an experimental site of Jilin University in Changchun, Northeast China.

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