



COSC-1 technical operations: drilling and borehole completion

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COSC-1, the first out of the two planned fully cored boreholes within the COSC-project, was completed in late August 2014. Drilling was performed using the national scientific drilling infrastructure, the so called Riksrigen, operated by Lund University, and resulted in a 2495.8 m deep borehole with almost 100 % core recovery. The rig is an Atlas Copco CT20C diamond core-drill rig, a rig type commonly used for mineral exploration. A major advantage with this type of drill rig compared to conventional rotary rigs is that it can operate on very small drill sites. Thus, it leaves a small environmental footprint, in this case around 1000 m². The rig was operated by 3 persons over 12 hour shifts. Before the core drilling started a local drilling company installed a conductor casing down to 103 m, which was required for the installation of a Blow Out Preventer (BOP). The core drilling operation started using H-size and a triple tube core barrel (HQ3), resulting in a hole diameter of 96 mm and a core diameter of 61.1 mm down to 1616 m. In general, the drilling using HQ3 was successful with 100 % core recovery and core was acquired at rate on the order 30-60 m/day when the drilling wasn't interrupted by other activities, such as bit change, servicing or testing. The HRQ-drill string was installed as a temporary casing from surface down to 1616 m. Subsequently, drilling was conducted down to 1709 m with N-size and a triple tube core barrel (NQ3), resulting in a hole diameter of 75.7 mm and a core diameter of 45 mm. At 1709 m the coring assembly was changed to N-size double tube core barrel (NQ), resulting in a hole diameter of 75.7 mm and a core diameter of 47.6 mm and the core barrel extended to 6 m. In this way precious time was saved and the good rock quality ensured high core recovery even with the double tube. In general, the drilling using NQ3 and NQ was successful with 100 % core recovery at around 36 m/day by the end of the drilling operation. The main problem during the drilling operation was caused by brand new drill rods that were bent beyond tolerance. These bent drill rods caused increased friction during drilling, resulting in an increased torque and consequently a too low RPM. Thus, drill bits wore out faster than normal. Despite of this, the target depth was reached, but later than planned to the drill bits being replaced more frequently. However, it can be concluded that the drilling operation was successful as evidenced by drilling almost 2400 m with full core recovery of top quality cores and no drilling crew accidents. The COSC-borehole is the deepest drilled hole in Sweden using H- and N-size and the deepest hole ever drilled by an Atlas Copco CT20C. The present borehole is cased down to 103 m and the rest of the hole, around 2400 m, is left as an open-hole completion.