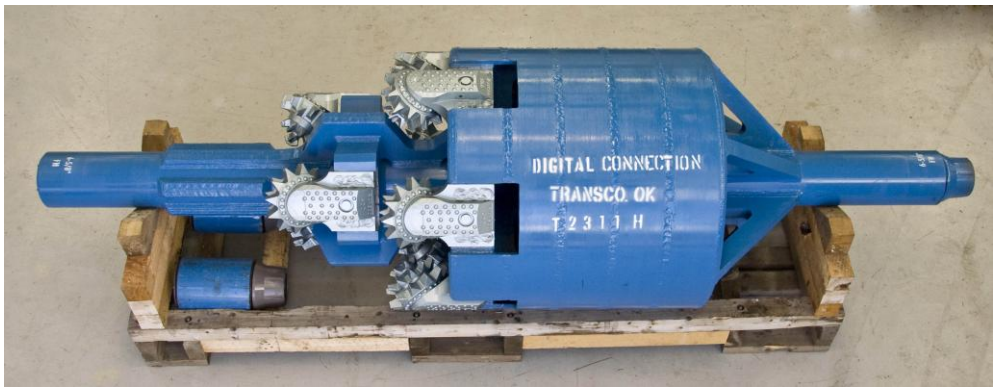
TRANSCO MFG AUSTRALIA PTY. LTD.

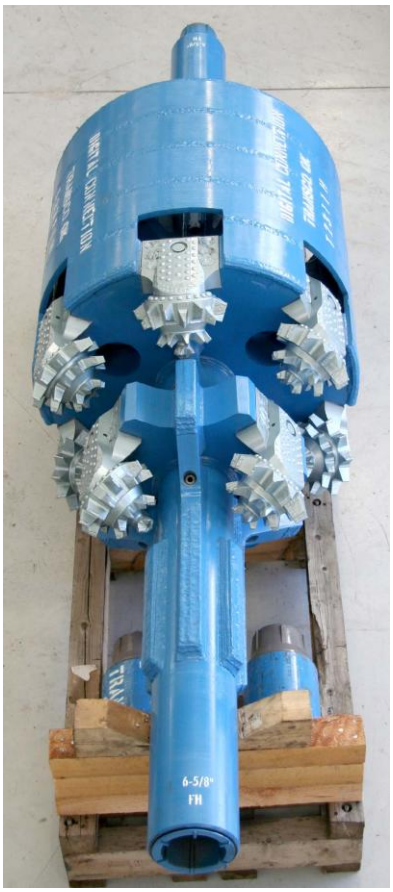
TODAY'S QUALITY IS TOMORROW'S REPUTATION

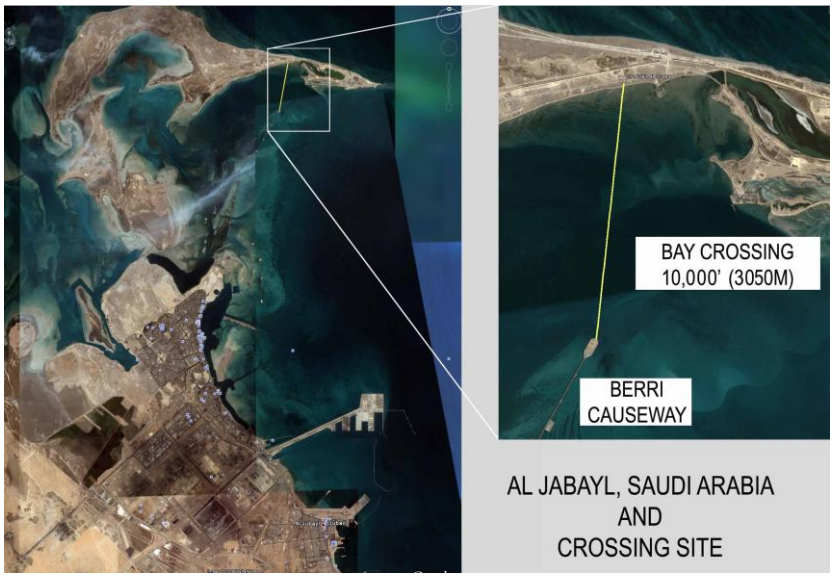
12 ¼" to 28" to 42" M10 Staged Barrel Hole Opener – July '08

This hole opener is dressed with M10 Milled tooth cutters (IADC 115 to 235 – with the same sealed bearings as in the inserted cones). There are 3 cutters on the 28" stage and 6 cutters on the 42" stage.

This body and set of cutters drilled 3,030M at the Berri Causeway Crossing at Jubayl, Saudi Arabia. After this they were used to open 3 more holes for an additional 1,550M. **4,600M total distance.** Allowing 28 rpm and 40 minutes per 30' joint, we estimate the cutters drilled over **330 hours** and the cutters on the 42" stage had over **2.36 million cone revs** over the life of the cutters. The body can be redressed many times.







Project

This hole opener was designed and built for Tatco Boring of Abu Dhabi. They came to us after drilling a 32" x 3,050M first bore for the Berri Causeway Crossing. The next would be 42" x 3,050M bore parallel and 30' to the side of the first bore.

Formation and history

Most of the formation in this area is soft calcareous mudstone, siltstone, and sandstone with streaks of crystalline gypsum and sections of hard calcarenite. The first 22" hole opener was a fixed cutter type. It drilled the soft formation well enough but failed in the harder rock. It was tripped out and replaced with a rolling cone cutter that successfully drilled the hard rock. But, in the soft limestone the rolling cones balled up and could not drill efficiently. It was necessary to trip out and change bit types several times during both enlarging passes and several hole openers were required to complete the bore.

Decisions

Transco Mfg. was included in planning the 42" hole. Drilling data from the first bore led to the choice to use milled tooth rolling cone cutters for both formation types. The cutters chosen had long teeth and wide spacing to prevent balling. A maximum pull force per cutter was selected to prevent tooth breakage in the calcarenite and a controlled rate of penetration was selected to prevent balling in the softer rock. Since the rig had sufficient pull and torque capabilities it was decided to open from 12 ¼" to 42" in one pass. The hole opener was designed with a three cutter 28" first stage and a six cutter 42" second stage. A barrel type body was chosen to give maximum stabilization and to reduce the torque friction. It was agreed to rotate the bit 28 rpm at all times.

The time between completing the first crossing and starting to enlarge the second was short. The 10,000 pound hole opener was fabricated in four weeks and air freighted from Australia to an airport near the site.

Drilling

The primary rig was a Herrenknect HK 400M with a Herrenknect HK 250T on the pipe side to assist rotation. Drilling was interrupted many times while water was trucked in to make the drilling fluid. The pumps had to be rebuilt several times and the main rig head had to be rebuilt once. About 2,100M into the hole the drilling fluid breached into the adjacent hole and the bore had to be completed without returns of the drilling fluid and cuttings. About 2,750M the trailing drill string became stuck while some rig repairs were being made. Several attempts were made over a period of several weeks before it was freed up again. The bit drilled out December 12 with all bearings effective and the cutting structure intact. It was used to drill 3 shorter bores in the next year.

Completion

The 30" steel pipe was a little over 3,150M long and weighed about 1,525 tons. It was built on the Berri Causeway and rested on a series of rollers. After a cleaning run and hole conditioning procedures the pipe was pulled with no problems in a 36 hour operation. The pull was completed January 12, 2009.