Abstract 18:

Improved Drill Bits

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Varel International was founded in Texas in 1947. Between 1947 and 1998, Varel developed its product line of three cone drill bits for oil field and mining applications. Included in Varel's product line are carbide insert bits, air circulation bits, journal bearing bits and long life sealed bearing bits. The bits are offered in sizes of from 3 ½" to 36" diameter.

In 1998, its current owners purchased Varel. Varel is owned by private investment banks from the UK and US and the current management. In 1998, Varel purchased Oil Tool Specialties, a PDC bit manufacturing company active in the US. In 1999, Varel purchased Crystal Profor, a PDC and diamond bit company active in Europe, the Middle East, and Africa. All three companies now operate as one company, Varel International.

Varel International currently produces revenues of ~75 million US$. Its headquarters is in Dallas, Texas. There are four manufacturing sites, one each in Dallas, Mexico, France and Houston. Current production is 55,000 roller cone bits and 400 PDC and diamond bits per year. Varel employs approximately 950 people worldwide. Varel has sales representation in most oilfield and mining locations. Among the PDC and diamond bits we make are core bits. The core bits are sold to third party coring service companies. Should the applications in Iceland require core bits, we have extensive experience making core bits.

The technology that would likely apply to the geothermal drilling projects is Varel's ability to drill harder formations with PDC bits. Varel has the ability to calculate cutting forces on the PDC cutters and from that, the overall cutting forces on the drill bits. The Paris School of Mines and Crystal Profor developed the algorithm and software Varel uses to calculate cutting forces. It has been extensively tested in the laboratory and the field to ensure its accuracy.

The ability to calculate cutting forces, combined with extensive mechanical stability features, enable us to drill with less vibration. Lessening drill bit vibration is the key to drilling hard formations with PDC bits. Volcanic formations many times will have hardnesses exceeding those that are normally drilled with PDC bits. Combining hardness with higher temperatures is the challenge I believe we will face in Iceland. If the applications require it, Varel can also manufacture diamond bits. Dennis Tool is a manufacturer of PDC and carbide inserts. I believe that the advantage that Dennis Tool brings is the ability to sinter carbide by microwave rather than typical furnaces. Microwave sintering provides improved properties over conventional tungsten carbide. Also, composites of diamond and carbide can be made.