

**Case study: Egypt**

# MAX-LOCK eliminated severe fluid losses to drill well to total depth

An operator in Egypt's Western Desert contacted Baker Hughes to help address challenges with severe losses while drilling the 8½-in. production section through the fractured Alamein dolomite formation.

Traditional solutions have included using particulate or fibrous lost circulation material (LCM) products such as ground or flaked calcium carbonate, or natural cellulosic fibers. In severe cases, multiple cement plugs have been used to heal a thief zone before drilling through reactive shale streaks to the target depth.

While common, combating severe or total losses by using cement plugs has also caused problems such as increased nonproductive time (NPT), difficulty obtaining the desired thixotropic fluids behavior, and poor cement bond.

While drilling the 8½-in. section with a competitor's water-based mud at 8,060 ft (2457 m) the operator experienced dynamic losses of 60 to 70 bbl/hr. Drilling continued cautiously to 8,200 ft (2499 m) with a reduced pump rate from 500 to 350 gal/min; however, dynamic losses continued at 60 to 70 bbl/hr across the entire dolomite section.

While performing a short trip to ream and circulate the hole clean, the customer experienced some tightness at 7,878 ft and 7,852 ft (2401 and 2393 m). Dynamic losses increased to more than 150 bbl/hr at 500 gal/min, 120 bbl/hr at 420 gal/min, and 80 bbl/hr at 350 gal/min.

Baker Hughes proposed **MAX-LOCK™ LCM** as a solution to combat the severe losses. They quickly mobilized a crew and products to perform the job.

The MAX-LOCK LCM is a magnesia-based material designed to mitigate severe or total loss of circulation. The phase-transforming fluid technology is easy to spot downhole across the loss zone and has thixotropic characteristics in downhole conditions. MAX-LOCK LCM is customized to set and form a high compressive strength plug specific to each well's conditions to combat various severe loss circulation incidents.

A MAX-LOCK LCM treatment was formulated and lab-tested to have a setting time of 2 hours 30 minutes to allow for rapid setting at the bottomhole temperature of 170°F (77°C). The pill was mixed, pumped downhole, and spotted through the circulating sub across the thief zone.

After spotting the pill and allowing time to cure, the dynamic losses were reduced to under 10 bbl/hr at 420 GPM and static losses of under 2 bbl/hr.

## Challenges

- Fractured dolomitic zone
- Frequent losses due to natural fractures
- Reactive shale streaks creating losses

## Results

- Decreased dynamic losses from 150 bbl/hr to under 10
- Avoided multiple LCM and cement squeezes
- Saved on tripping time to run cement stringer
- Reduced losses and NPT
- Drilled successfully to total depth