

## Engineering Bulletin

### Synthetic Drilling Fluid Effects On Typical Oil Tool Elastomers

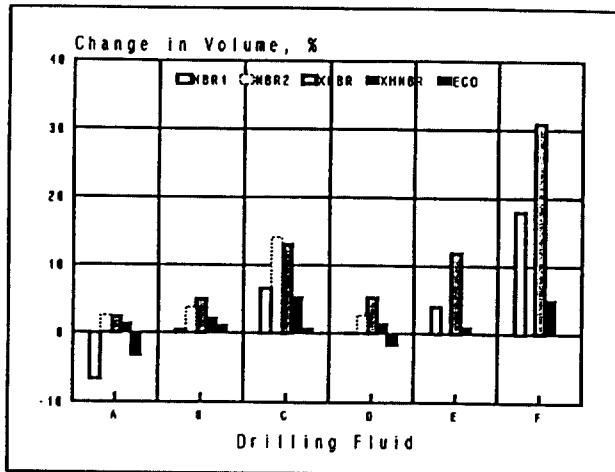


Figure 1: Change in Volume

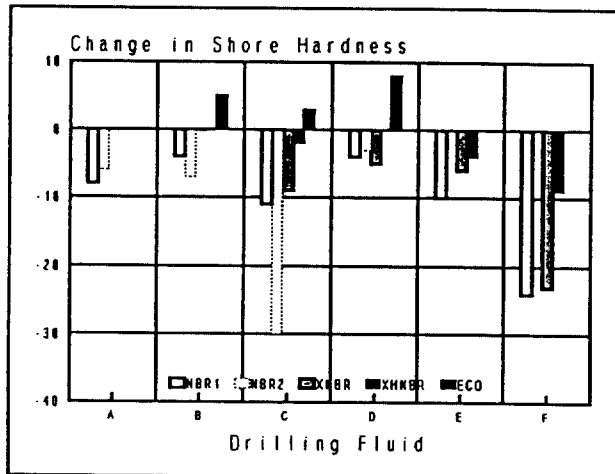


Figure 2: Change in Hardness

Historically, drilling fluids have been either water or oil (petroleum) based and their effects on oil tool elastomers have been known and documented. In the past few years, interest in synthetic drilling fluids has been increasing in an ongoing effort to enhance drilling while avoiding the environmental problems associated with oil based drilling fluids. Some of the new synthetic drilling fluids alter the performance of oil tool elastomers.

Experience has revealed problems with reduced seal life due to exposure to these drilling fluids. Because of this, Hydril has investigated the effects of many commercially available and experimental synthetic oil based drilling fluids on its elastomers. Typically, rubber products in synthetic oil fluids soften to varying degrees with corresponding swelling and reduction of mechanical properties.

The drilling fluids examined have included those based upon esters, ethers, terpenes, and polyalphaolefins. Various elastomers have been examined including natural rubber, nitriles (sulfur cured, peroxide cured, carboxylated, hydrogenated and hydrogenated carboxylated), and epichlorohydrin.

Figures 1 and 2 illustrate the changes in volume and hardness respectively of five different nitriles after only 1 week in 7 drilling fluids at 85°C.

These Figures show major undesirable property changes as a result of immersion in these newer drilling fluids. The property changes vary with respect to the specific elastomer and the specific drilling fluid. For example, drilling fluids "C" and "F" clearly renders most of the elastomers tested unsuitable for their intended functions. Typically, the useable life of elastomers is reduced by synthetic drilling muds.

Exercise caution prior to using any of the synthetic drilling fluid. Determine the effects of the specific drilling fluid on the specific oil tool elastomers involved. The use of some synthetic drilling fluids requires increased inspection and increased replacement frequencies.