

Proper cementing technique is key to zonal isolation

SWELLING ELASTOMERS

SWELLING ELASTOMERS HAVE been a major cost saver through risk mitigation as well as elimination of cementation and conventional ECPs. In Shell E&P, swelling elastomers have been implemented in a number of different uses. These include establishing zonal isolation in open hole completions, as a production separation packer, and as an open hole clad. In these applications, the elastomers have been run in a variety of open hole and casing/tubing sizes.

Approximately 80 deployments have been recorded by Shell, all of which were successful. Case examples of each of the three applications will be presented from Shell operations in the North Sea, the Middle East, and the Far East.

Deployment of Swelling Elastomers in Shell E&P (SPE/IADC 92346) **M Kleverlaan, A Vos, Shell.**

REMOTE CONTROL CEMENTING

Driven by industry trends to deliver real time solutions as well as the high costs to produce hydrocarbons from the mature North Sea fields, an operator and a service company worked together to successfully complete the first fully remote controlled offshore cement operation from onshore. By combining proven technology with a specific vision for future operations, this next step in propelling the industry towards the possibility of remote-driven operations was completed on April 27, 2004.

The authors will detail the vision and business cases behind the onshore operation center, remote controlled cement equipment and movement of cement operations to the onshore location. It will also present the benefits of controlling cement operations remotely and onshore as it pertains to the working environment in the Norwegian sector of the North Sea.

Controlling Cement Operations from an Onshore Operation Center (SPE/IADC 92344) **B L Allen, J Helgesen, Halliburton; P Tyberoe, BP.**

ACID GAS INJECTION

Two high rate acid gas injection wells were drilled in the LaBarge area of Wyoming. These wells were designed for injection of up to 65 million scf/d of a mix-

ture of 65% H₂S and 35% CO₂. The technical challenges in well design, casing selection and cementing of the injection strings, along with common challenges and operational practices for both wells, will be discussed. Key drivers influencing zonal isolation, salt zone loading, casing and centralizer selection will be presented.



The benefits of controlling cement operations remotely and onshore as it pertains to the working environment in the Norwegian North Sea will be presented. SPE/IADC 92344.

The authors will also detail the casing running, cement jobs, location problems encountered, and the steps taken to resolve those problems.

Meeting the Challenges in Design and Execution of Two High Rate Acid Gas Injection Wells (SPE/IADC 91861) **G Benge, E G Dew, ExxonMobil.**

UNDERBALANCED CEMENTING

The authors will describe unique model development, design and operational lessons with relevance for underbalanced primary cementing of a 7-in. liner at the North Sea Gullfaks field.

Due to very small margins it was desirable to avoid pressure changes in the open hole section while circulating the cement.

This was obtained by circulating fluids out through a choke that was accurately regulated to maintain constant bottom hole pressure throughout the circulation phase. The fluids in front of the cement had relatively low density to compensate for the high density of the cement, and choke regulation was crucial before the cement was in place.

A new transient computer model for cement displacement with dynamic choke regulation was developed to make

it possible to design choke operations accurately. No real time downhole pressure measurement was performed during the cementing operation.

The authors will describe the operation in detail with special focus on any unexpected events. Measured and predicted pressure curves will be shown and analyzed to come up with recommendations on how to carry out similar operations and how to best carry the technology further.

Managing Pressures During Underbalanced Cementing by Choking the Return Flow: Innovative Design and Operational Modeling as Well as Operational Lessons (SPE/IADC 92568) **K S Bjorkevoll, SINTEF; R Rommetveit, RF Rogaland Research; J Eck Olsen, A Roenneberg, Statoil.**

FOAMED CEMENT

One globally used technology in deepwater, foamed cement, has become readily available in Angola. Its use in deepwater applications has been shown to simplify well planning and logistics and has resulted in increased success and cost savings on current wells.

The authors will discuss the introduction and use of foamed cement in deepwater cementing in Angola, including a discussion of logistics associated with foamed cementing, mobilization of crews and equipment, and a comparison of this technology against alternate lightweight cement slurries.

The logistics for specialty blended cements including the need to import specialty cement materials or blends, excess inventories required to cover large contingencies and uncertainties, and associated delivery times will also be discussed.

An analysis of the introduction of foamed cement to Angola will be presented along with the associated risks of the use of both the foamed cement and alternate specialty slurries.

On location operational considerations for foamed cement and comparisons with mixing of specialty lightweight slurries will be outlined.

Use of Foamed Cement in Deep Water Angola (SPE/IADC 91662-Alternate) **G Benge, ExxonMobil.** ■