WELLCLEAN II
Engineering Solution
Removing mud—key to complete zonal isolation
WELLCLEAN II Engineering Solution

APPLICATIONS
- Mud removal in oil and gas wells, including deviated, extended-reach, horizontal, and injection wellbores

ADVANTAGES
- Eliminates production of unwanted downhole fluids
- Ensures zonal isolation
- Reduces occurrence of sustained casing pressure
- Minimizes casing corrosion through improved cement bonding
- Reduces costs associated with remedial operations

FEATURES
- Specialized tools
- Ability to witness the effect of all relevant parameters on the mud removal process
- Wide range of flexible preflush systems for all types of applications
- Proven results in the field
- Environmentally friendly spacers

MUD REMOVAL—THE FIRST STEP IN ACHIEVING LONG-TERM ZONAL ISOLATION
Effective mud removal is considered the most basic requirement for cementing success. When efforts to remove mud prove ineffective and result in chronic issues of sustained casing pressure and gas migration, additional costs and efforts are incurred.

Gas migration and sustained casing pressure are linked to failure of the set-cement sheath due to changing downhole stresses, the inability of the fluids in the annulus to transmit a hydrostatic head capable of balancing the pore pressure, poor cementing coverage incurred by losses, and incomplete mud removal during cement placement. While operators worldwide often are capable of identifying such causes and implementing advanced cementing operations, complete zonal isolation cannot be guaranteed without effective mud removal.

CHANGING CEMENT JOB DESIGN
Because effective mud removal cannot be achieved without considering the effect of all relevant parameters, the WELLCLEAN II engineering solution utilizes innovative products and tools to improve cement placement. These products and tools include

- optimized chemical wash systems
- wide range of custom spacers for all applications
- WELLCLEAN II simulator, CemCADE® software, and WELLCLEAN II Advisor as engineering tools
- a testing method focused on evaluating the effectiveness of preflushes in displacing drilling fluids.

IMPROVING MUD REMOVAL
Pipe centralization
Because fluids in the annulus tend to flow more freely on the wider side, casing centralization is critical to ensure continuous flow all around the annulus. Schlumberger design engineers use the centralization module of CemCADE software to guide them through the process.

Displacement regimes
Complete mud removal can be achieved in laminar or turbulent flow regimes. Selecting between the two regimes depends on several parameters and conditions, including well geometry and fluids properties. The design engineer must analyze all the relevant parameters to make the right choice. The WELLCLEAN II Simulator is a powerful tool for showing critical results such as the percentage of cement coverage, the risk of having a mud film or channel at the end of the cement job, and the turbulent contact time—all as a function of depth and step-time.

Fluids design
Knowledge of cement and spacer fluid properties is essential to ensure proper zonal isolation. The effectiveness of each fluid in displacing the fluid ahead of it can be checked with the WELLCLEAN II Simulator. Output will clearly predict channeling types that exist between the different fluids. Based on WELLCLEAN II Simulator output, the design engineer is guided to improve mud displacement through spacer and cement design. These changes may include the use of a spacer such as MUDPUSH® II spacer, which offers flexibility in rheology.

Number of wells with sustained casing pressure in the Gulf of Mexico, according to a survey prepared for the US Minerals Management Service. Poor mud removal is one of the causes of well leaks.