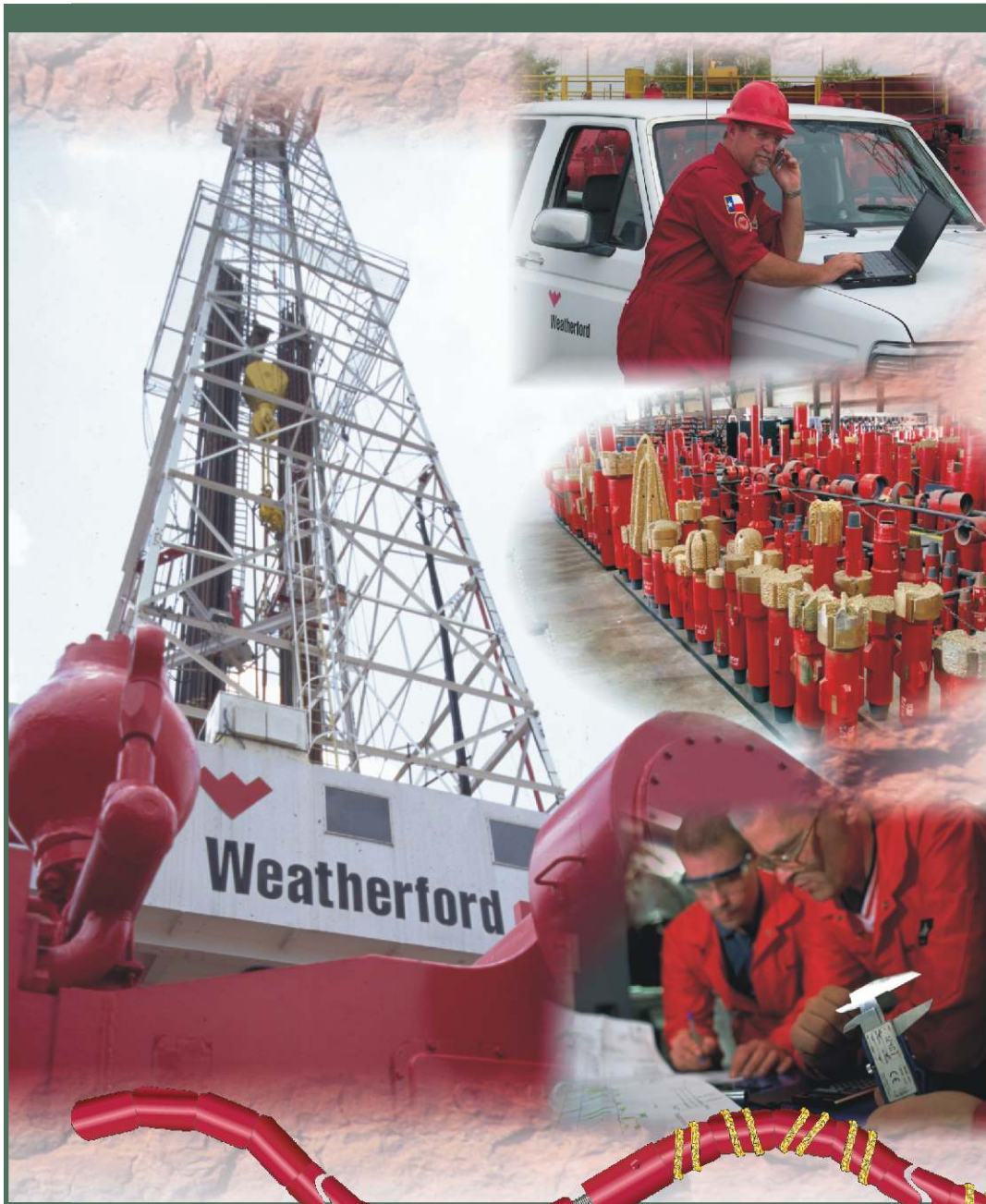




Weatherford®

PowerStroke™ Milling System

Flexing our muscles to give your well the shape it needs to be productive once again



PowerStroke™ Milling System

The Weatherford *PowerStroke* milling system offers an innovative, cost-saving solution for straightening or aligning shifted casing sections in a single run. Weatherford has developed the engineered broach mill procedure for application with this system to relieve side-load stresses before rotational milling begins. The *PowerStroke* milling system is designed to reduce the fatigue stresses of the mill assembly by reducing the dogleg severity of the shifted wellbore path. The next-generation technology behind the *PowerStroke* milling system takes remediation of subsidence-shifted casing to a level of success beyond the capabilities of traditional milling assemblies.

Advantages and Benefits

- Prevents sidetracking by maintaining communication between upper and lower wellbore during milling
- Greatly reduces dogleg severity of shifted wellbores
- Simplifies installation procedure
- Broaching considerably reduces milling time compared to conventional milling
- Minimizes fatigue of milling assembly components
- Conforms wellbore to maximum inside diameter (ID)
- Assembly designed for single-run remediation
- Saves rig time and workover costs
- Optimizes multiple casing liner design solutions

Features

- Reciprocating, highly flexible broach milling capability
- Variable-length broaching mill assembly for long or short casing shift requirements
- Flexible weighted sections for optimized milling time
- Engineered, free-rotation, 10° articulation swivel tool between flexible broaching section and milling assembly for 360° movement
- Flexible weights/broaching section also acts as internal guide
- 30-ft flexible weight sections for easy modular installation
- Combination right-hand/left-hand carbide helix for quick cutting action
- Left-hand lay cable for facilitating right-hand rotation
- Integral stinger and mill assembly designed for reduced fatigue stress failure on tool joint connection during milling operation

Applications

- Subsidence casing shift problems
- Collapsed and buckled casing
- Severe scale corrosion



Formation subsidence, combined with shifting, causes severe deformation in casing wellbores. Mechanical failures created by extreme dogleg offsets in short distances cause casing to shift so severely that production is restricted or lost altogether.

Various solutions have been attempted, but success has been limited for two main reasons: Either severe side load stresses cause assembly connections to fail, or the inability to maintain alignment or communication with the wellbore below a subsided shifted section causes unintentional sidetracking. Traditional milling assemblies and underreamer procedures usually leave wells inaccessible. Current practices involve sidetracking above the shifted casing and re-drilling the well, which is costly. Many wells are abandoned and considered not economically repairable.

In response to clients' requests and the unique technical challenge, Weatherford has developed the PowerStroke™ milling system. The *PowerStroke* system is designed with flexible, weighted sections, available in 30-ft. lengths and capable of supplying sufficient weight to the broaching sections. The broaching sections are available in 34-ft. lengths; they are highly flexible and are dressed with a tungsten carbide cutting surface.

The broaching procedure allows for reciprocating the assembly to mill a slot in a severely shifted or offset casing section. Once sufficient offset stresses have been relieved, the *PowerStroke* integral stinger can be lowered through the milled slot into the wellbore, below the shifted casing section, with minimal side load stresses to the integral stinger. In this way, the *PowerStroke* mill can continually open and align the shifted casing without side load fatigue failure to the assembly. With the subsided shifted casing opened, a liner or expandable product solution can be installed to re-complete the well for production.



PowerStroke™ Milling System

Sequence of Operation



1. Broach assembly installed in shifted casing



2. Severe dogleg broached



3. *PowerStroke* mill opens shifted casing to drift



4. Shifted casing ready for repair



5. Repair liner installed, ready for cement productions



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