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THE DEVELOPMENT OF WIRELINE-TRACTOR TECHNOLOGY

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The development of wireline-tractor technology has greatlyimproved the way operatorscan intervene in high-angleand horizontal oil and gas wells. Theuse of downhole tractors continues toexpand the opportunities for planningand executing interventions, which arean important means of sustaining andincreasing production. Furthermore,the technology significantly reducesthe personnel safety risks andenvironmental footprint associatedwith other intervention methods.

By the 1990s, horizontal anddeviated wells had become an importantstep change in the development oflow-permeability oil and gas reservesand reservoirs produced by means ofextended-reach (ER) wells. The increasedcost and risks placed on the existingtechnology for every phase of thewell—drilling, completion, production,and abandonment—challengedthe industry to find new methods,including those for interventions.[1].

In 1994, JorgenHallundbak decidedto bring to market an idea developed as apart of his graduate thesis while a studentat the Technical University of Denmark.The project he had been working onsince 1987 involved the engineeringof a precision robotic tool that wouldanswer the industry’s need for a moreeconomic means of intervention in high-angle and horizontal wells. At the time,access to horizontal boreholes for dataacquisition and services was only possiblethrough pipe-conveyance methods thatrequired a rig or coiled-tubing (CT)unit. Consequently, interventions toincrease production were performed onlywhen production had suffered a majordecline and not as a means of achievingthe incremental improvements that arepart of good production management.The tool developed as a result ofHallundbak’s initiative, the Well Tractor,was introduced to address these needs.

The tractor is a wireline-deployed,self-propelled robotic device that pusheswireline tool strings out to the end ofthe wellbore. Before the invention of thewireline tractor, the only feasible ways toreach the end of a horizontal wellbore wereby means of snubbing with threaded tubingor through the use of CT methods. Withthe wireline tractor—intervention tools areable to reach the end of the horizontal orhighly deviated wells without mobilizingand deploying pipe-conveyance methods.Further, any job that was previously doneon slickline, in vertical wells, can now bedone in a horizontal or deviated well, withthe use of wireline tractors—resulting insafer, faster, and more cost-efficient jobs.[2].

The wireline tractor is powered byan electric/hydraulic system.The control panels, communications, andinternal power source are electric, whilethe remaining parts and functions arehydraulic. When activated, the wheels arehydraulically deployed out of the tool bodyand automatically start to rotate. Each wheelcontains

its own independent hydraulicmotor, which facilitates the forward motionin the well. The tool centralizes itself inthe wellbore, once contact with casinghas been established, and then deploysintervention tools into the well, taking thestring beyond its original hangup point.

To provide good communication withthe winch driver, the surface control panelsthat control the tractor's progress in the wellnormally are positioned inside the wirelineunit. Diagnostic data are relayed back tothe surface to the engineer's computer.[3].

For ER wells, a CT tractor also hasbeen developed for pumping operations.This version extends the reach of CT inhighly deviated or tortuous wells, whereconventional intervention techniquescannot pass. The fluid-driven CT tractorextends the CT's lateral reach in bothhorizontal and deviated wells by severalthousand feet beyond that achieved byany other method. The tractor pulls theCT out into the wellbore, overcomingthe tendency of the coil to buckle andlock up. This allows for the use of asmaller-diameter coil, with less wallthickness, or composite CT, which reducesreel weight and eliminates problems related to crane lifting limitations.

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