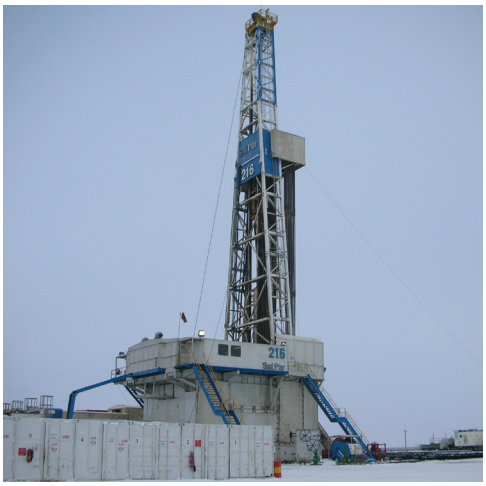
New wireline technique for closing RapidShift® sleeves takes less than half the time of conventional methods using coiled tubing

Modified Welltec® wireline tractor and stroker helps manipulate sleeves and manage reservoir in three wells.

Location: Kazakhstan

Overview: When Karachaganak Petroleum Operating (KPO) was selecting a completion technology for three of their wells in Kazakhstan, they chose Halliburton RapidShift® multistage stimulation and production sleeves along with Swellpacker® systems to provide an interventionless multistage fracturing operation. The sleeves allow efficient completion of multiple zones and can be shifted to the closed position when reservoir management is required. Using coiled tubing to close sleeves could have taken up to *three days* depending on conditions; however, KPO used a wireline tractor and stroker assembly that closed off the problem zones in just *one day* from start to finish. Unlike coiled tubing, the wireline tractor did not require the use of fluids that could have damaged the reservoir or created handling and disposal issues. Thus, wireline shifting also reduced both production and environmental risks. Finally, because the operation took place at just under 6000 m, coiled tubing would have been at its operational limit. However, the wireline tractor and stoker could exert up to 65,000 lb of force at that depth, which was more than sufficient to deliver the 3,600 lb of force required to close the sleeves.



Karachaganak Petroleum Operating (KPO) sought a new way to quickly close RapidShift® sleeves when required.

CHALLENGES	SOLUTIONS	RESULTS
Operational limit of coiled tubing At the depth where the sleeve needed to be closed, coiled tubing could only exert 1,500 lb of force – not enough.	**Use wireline and tractor instead** Instead of coiled tubing, Halliburton used a wireline tractor and stroker that could exert up to 65,000 lb of force.	**Enough force to close sleeve** Once the tractor and stroker assembly was engaged to the casing, it could easily exert the 3,400 lb of force needed to close the sleeve.
First use of new technique This technique had never been used before, creating the possibility of significant, unforeseen technical risks.	**Extensive planning and engineering** Halliburton worked for months with the client and tractor manufacturer to identify and mitigate technical risks.	**Success in one-third the time** The system worked flawlessly in one day compared to the three days coiled tubing would have taken.
Modifying keys to work with sleeve Off the shelf, the shifter keys would not work with Halliburton's sleeves. They required modification to reliably locate and close the RapidShift sleeves.	**International collaboration** Halliburton worked with the manufacturer in Denmark to modify the design, perform a system integration test, and field tests.	**Reliable operation with less risk** The system worked flawlessly with zero NPT, and reduced risk of formation damage associated with coiled tubing and fluids.

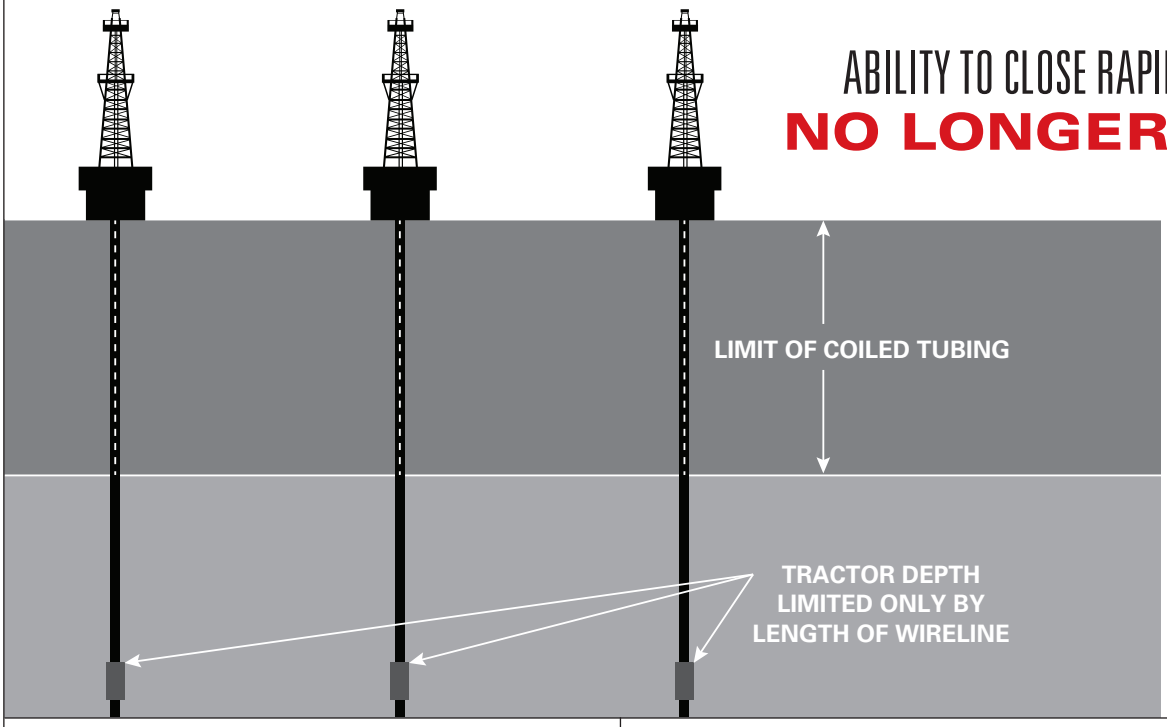
CASE STUDY *Using wireline instead of coiled tubing to shift sleeves*

RESERVOIR MANAGEMENT

In a non-homogeneous reservoir KPO needed to optimize flow contribution from different zones with minimal intervention. Some zones were deeper than 6000 meters.

RISK REDUCED

By eliminating the fluids used with coiled tubing, the new Halliburton technique eliminates the risk of formation damage as well as fluid-handling and disposal issues.



ABILITY TO CLOSE RAPIDSHIFT® SLEEVES NO LONGER LIMITED

The tractor and stroker combination on wireline closed three sleeves at depths greater than 5800 m in three different wells. This depth would have been very difficult to attain with coiled tubing due to the lack of force available at those depths.

66%

TIME SAVINGS

The wireline tractor and stroker closed the RapidShift sleeves in less than half the time of coiled tubing – 1 day vs. 3 days.

A FIRST

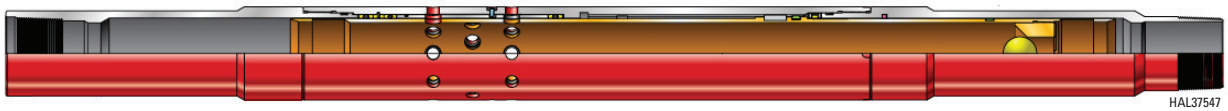
In Kazakhstan, Halliburton shifted RapidShift sleeves with a tractor and stroker deployed on wireline for the first time.

Deep oil wells also prone to producing gas and water call for sliding sleeves

Karachaganak Petroleum Operating (KPO) in Kazakhstan recognized the potential for optimizing the flow contribution from different zones by closing the sleeves in some wells. Therefore, they chose to complete the wells with RapidShift sleeves and Swellpacker isolation systems. After zones had been stimulated with acid and produced, the sleeves could be shifted closed to help isolate the zones.

Sleeves beyond operational limits of coiled tubing

With the wells being more than 6000 m deep, KPO would have exceeded the operational limits of coiled tubing. Accurate depth control would also have become an issue with coiled tubing. So the question immediately arose, "How can we quickly close the sleeves when needed?"



A Welltec® wireline tractor and stroker combination can now open and close RapidShift sleeves in half the time that it used to take coiled tubing, and at depths that were difficult to attain with coiled tubing.

Halliburton works with KPO and Welltec to find new solutions to close sleeves

The answer turned out to be both simple and complex. A tractor, deployed on wireline, could easily exert enough force to shift the sleeves into their closed positions. However, the wells also produced H_2S which could damage most downhole assemblies. The search for an H_2S-safe tractor led to Welltec, and their factory in Denmark. The Welltec tractor and stroker combination could work within KPO's downhole environment, but a special "key" had to be developed that could fit the "profile" on the RapidShift sleeves.

New keys designed

Using the profile drawing supplied by Halliburton, Welltec designed shifting keys that allowed full opening and closing of the RapidShift sleeves – the first time this had ever been done. Without this collaborative design effort, the automatic release on the RapidShift sleeves would never have worked properly.

A specially designed "key "enables the Welltec assembly to engage and shift Halliburton sleeves.

Extensive integration and field testing

Before deploying the system, Halliburton, Welltec and KPO conducted full surface testing trials of the tractor, stroker and key tool combination to open and close RapidShift sleeves. The team assembled two RapidShift sleeves in series with casing above and below in the Welltec test facility in Denmark. The team then opened and closed the sleeves with multiple cycles in both directions. The system performed flawlessly.

Successfully shifting sleeves in Kazakhstan

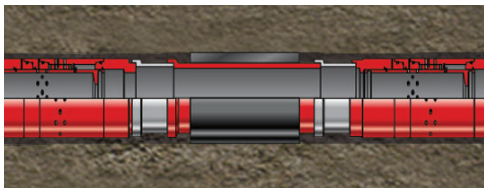
Later, back in Kazakhstan, Halliburton shifted three different sleeves (one in each well) to their closed positions. The system performed flawlessly in each well.

Real-time feedback provided

Part of the success of the operation was due to real-time feedback provided by downhole equipment. Crews at the surface could monitor and measure the forces being applied and the distances moved down hole. They could then apply force as needed from 0 to 65,000 lb depending on requirements. In this case, they needed only 3,600 lb.

Job completed in one day vs. three

Thanks to extensive planning, engineering and collaboration, KPO reduced the time required to close zones by 66 percent compared to using coiled tubing. But the savings didn't stop there. Wireline crews not only took less time to perform the jobs, they were more cost-efficient compared to coiled tubing. Wireline crews are smaller, require less room on location, and need less heavy lifting capacity.



Halliburton has installed more than 100 Swellpacker® systems for KPO without a single failure. Result: reliable zonal isolation.

Production and environmental risks mitigated

In this application, coiled tubing would also have been more troublesome operationally as the fluids used during coil operations need to be circulated, pumped down, flared, and disposed of.

Reliable for zonal isolation and intervention

This reliable new approach has the potential to redefine efficiency during well interventions. The speed, strength and cost-effectiveness of the tractor/wireline combination can now be effectively and reliably used in a wide variety of applications. It is capable of working at virtually any depth without posing the operational and environmental risks associated with coiled tubing.

Ideal applications

The combination of RapidShift sleeves, Swellpacker systems, and Welltec wireline tractor are ideal for:

- Selective stimulations
- Selective production for effective flow contribution in horizontal wells
- Wells that exceed the operational limits of coiled tubing

Back on production sooner

KPO Completion Engineer, "Halliburton's innovative approach allowed us to try something that had never been done before, saving us money, reducing risk and getting us back on production sooner. Based on the initial successes, we plan to continue to deploy this technology in the future."

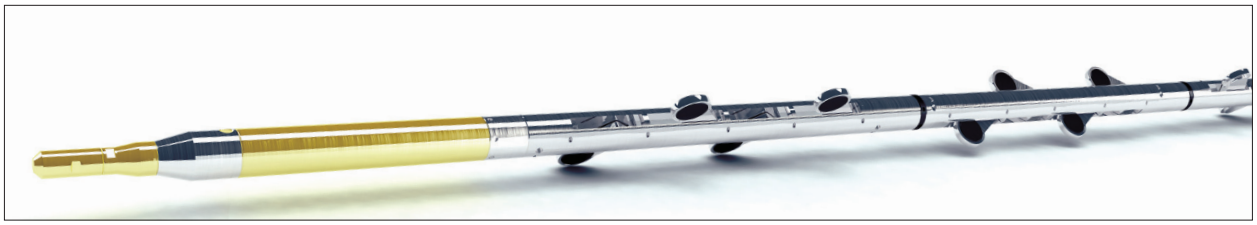


Photo of a Welltec® tractor similar to the one used by Halliburton on wireline to shift RapidShift®sleeves open and closed. The wireline operation took only one day; coiled tubing under similar conditions could have taken up to three. Thus, KPO was able to close the sleeves and return each well to normal operations in a fraction of the time.