

Revolver with eMotion

Intelligent Shallow-Set Well Barrier

INTRODUCTION

The following application demonstrates one practical situation where a Revolver with eMotion can be used to increase operational efficiency. Here, the Revolver with eMotion is deployed just below the tubing hanger providing remote open/close well bore isolation without the need for any control lines from surface or intervention runs.

THE APPLICATION

A Revolver with eMotion assembly is permanently deployed as part of the tubing string just below the tubing hanger. The valve operates on a closed-loop hydraulic circuit that is powered and controlled by the integrated eMotion unit. There are no connections to surface and no interventions are required to operate or communicate with it.

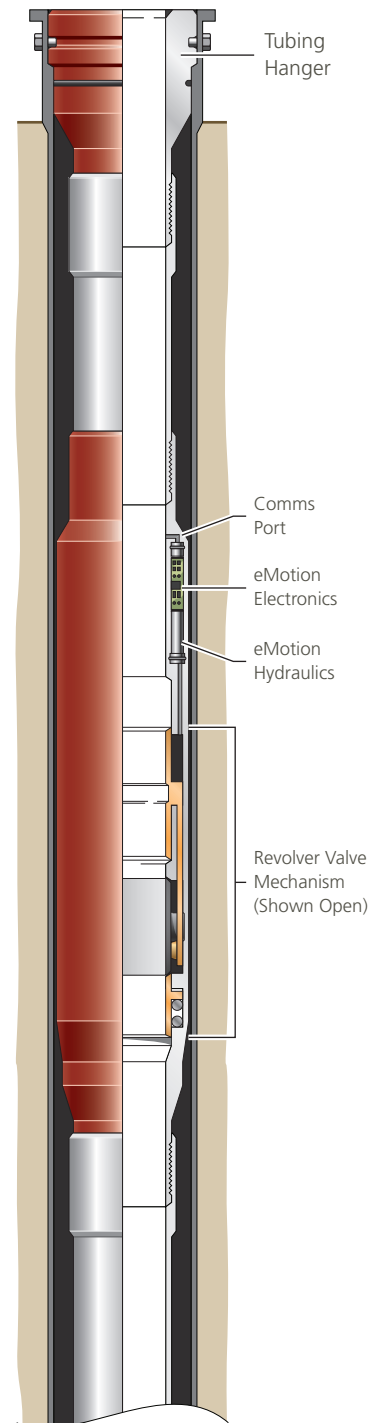
Prior to deployment, the eMotion is programmed with its planned functions and possible override contingencies. These instructions tell eMotion when to open and close the attached Revolver valve, and the pressure/time signals that represent commands from surface and the actions to take when those signals are received.

The assembly is deployed with the Revolver open to allow the completion to self-fill. The production packer is then set and the tubing tested against a deep-set barrier. After a pre-determined time, the eMotion unit closes the Revolver providing a shallow barrier capable of retaining pressure of up to 5,000 psi from above and below.

The isolated upper section of the completion can now be safely worked on. For example, the drilling BOPs can be removed and the christmas tree installed and tested.

Once all operations and tests are successfully completed, the Revolver can be re-opened. This is controlled by the eMotion unit, following its pre-programmed instructions. Typically, the eMotion would be waiting for a signal from surface in the form of applied pressure held for a specific time such as 1,500 psi held for 10 minutes. The deep-set barrier can now be accessed and the well brought back on-line.

The Revolver with eMotion is left downhole, the open valve providing maximum flow-through to maximise production or injection rates and giving full bore access to equipment further down the well. When the batteries are exhausted the Revolver can still be used as a downhole barrier operated by standard intervention methods.



CONTROL OPTIONS

The eMotion control system, can be set to open or close the Revolver on a host of different parameters giving maximum operational flexibility, mitigating unforeseen problems. If the operation is delayed, a signal can be sent to the eMotion to extend the timer, or if the operation is ahead of schedule, the Revolver can be opened sooner. Multiple pressure tests can also be applied to the closed-in tubing without inadvertently operating the valve.

In this case, the eMotion could have been set to re-open on a time delay instead of the pressure/time signal from surface. At any time the timer on the eMotion can be overridden, cancelled or reset.

CONVENTIONAL vs REVOLVER WITH eMOTION OPERATIONS

The following table compares the operational steps involved in a typical conventional operation versus the same operation undertaken using a Revolver with eMotion.

CONVENTIONAL OPERATION		REVOLVER WITH eMOTION OPERATION		TIME SAVED*
	Make up and run completion		Make up and run completion (Revolver open)	-
	Set production packer		Set production packer	-
Run 1	Rig up and test PCE and wireline	-		6 hrs
	Run plug in production bore	-		2 hrs
Run 2	Run prong in production bore		Close Revolver using timer	2 hrs
	Rig down PCE and wireline	-		3 hrs
	Recover BOP and riser		Recover BOP and riser	-
	Install tree, EDP/LRP and dual bore riser		Install tree, EDP/LRP and dual bore riser	-
Run 3	Rig up and test PCE and wireline	-		6 hrs
	Retrieve production prong		Apply command to open Revolver	1 hr
Run 4	Retrieve production plug	-		2 hrs
	Rig down PCE and wireline	-		3 hrs
	Recover LRP/EDP and dual bore riser		Recover LRP/EDP and dual bore riser	-
Total FOUR wireline runs		Total ZERO wireline runs		25 hrs

* The time saved estimate is based on Red Spider experience in the North Sea and an assumed water depth of 1,000 ft and well depth of 8,000 ft. Time allowed for single eMotion operation = 1 hour.

THE RED SPIDER ADVANTAGE

In this case, a Revolver with eMotion eliminated four wireline interventions plus all the associated costs and risks, providing an estimated saving of \$500,000.

Typical cost saving based on a daily rig rate of \$500,000 (approx 20,000 per hour) = 25 x 20,000 =	\$500,000
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Also, the flexibility of the eMotion unit allows the Revolver to be opened and closed many times; this helps mitigate any unforeseen operation problems, potentially saving many more hours of rig time. Finally, the reduction in rig time reduces the potential of bad weather effecting the operation.

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