

Remote Open Close Technology



Introduction

Halliburton Remote Open Close Technology (ROCT) products are designed to simplify well operations by removing wireline runs — making the operation more efficient. The field-proven technology replaces traditional wireline plug and prong equipment, thus dramatically reducing, or in some cases eliminating, wireline runs from an operation. Consequently, the technology helps reduce risk and saves time by reducing the need to rig up wireline and the associated pressure control equipment.

The battery-powered valves contain onboard decisionmaking electronics with integrated pressure and temperature sensors, which are used to monitor the well conditions and are programmed to open or close whenever a specific condition (known as a trigger) is detected. The triggers use a variety of well parameters including absolute pressure, temperature, time, or surface-applied pressure, which eliminates the need for running hydraulic or electrical control lines back to surface. The valves are preprogrammed via laptop before running in hole using a unique trigger set for each specific application. The trigger setup must consider the sequence of events that will occur while the valve is in the well, such as pressure test values, pressure test durations, and circulation rates. Three main trigger signals can be used and combined:

- » Applied pressure: Apply and hold pressure in a predetermined window for a predetermined duration.
- » Absolute pressure: Looking for an absolute pressure value to be exceeded.
- » Timer: The valve can be opened and closed using a defined time period.

Triggers can be sequentially set up in series, but there can also be parallel triggers. This means the valve can be looking for up to five different triggers at one time, each with a different consequence once satisfied. This allows the operator to plan for contingencies and unplanned events.

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Completion Tools

eRED[®] Valve

The eRED® valve is a retrievable, computer-controlled ball valve that can be repeatedly opened and closed by remote command. Neither connections to the surface nor interventions are required to communicate with and operate the valve.

The valve is deployed below either a lock or bridge plug and can be used as a downhole barrier or flow control device. With each use of the eRED valve, an intervention is eliminated from the operation — dramatically reducing rig time and associated risks.

Applications

Any application in which a wireline plug is used can be replaced by an eRED valve, achieving the same results but without repeated interventions. This saves rig time and associated costs and risks. Often, more than one eRED valve is deployed during a single operation, which multiplies the benefits.

- » Packer setting device
- » Deep-set barrier in extended-reach or horizontal wells
- » Shallow set for tree testing and change out
- » Completion deployment as the annulus short string plug
- » Liner deployment with external swellable elastomer
- » Barrier in temporary abandonments or light well intervention operations
- » Barrier in tubing-conveyed perforating gun firing and stimulation operations
- » Self-actuating flow control device
- » Shut-in tool for pressure buildup tests with reduced interventions
- » Replace ball drop in hydraulic packer setting tools

Benefits

- » Removes multiple wireline runs from operations, saving time, costs, and helping reduce risks
- » Operational for up to 10 months based on one battery; extra batteries can be added for increased life
- » Provides flexible deployment options and well control
- » Extremely reliable, field-proven technology used by the world's major oil producers
- » Reduces the number of operations personnel, saving costs and helping reduce risks
- » Records several months of downhole pressure and temperature data that can be downloaded when the tool is retrieved from the well





Operation

The eRED[®] valve has integrated pressure and temperature sensors to monitor the well conditions and is preprogrammed to either open or close whenever a specified condition (trigger) is detected.

The triggers use various well parameters, including ambient pressure, temperature, time, or surface-applied pressure.

Each time a trigger is detected, the eRED valve reacts by either opening or closing according to its instructions. This process can be repeated time-and-time again without any form of intervention.

eRED[®] Valve

Available Sizes (OD)	Maximum Differential Across Ball		Tempe Rai	erature nge	Maximum Differential Pressure While Opening		
in.	psi	bar	۴F	°C	psi	bar	
2.250	10,000	689	32 to 284	0 to 140	5,000	345	
3.250	10,000	689	32 to 284	0 to 140	5,000	345	
4.250	5,000	345	32 to 284	0 to 140	1,500	103	

The eRED[®] valve is available in a range of sizes and specifications. Because of the high number of design variables, the information provided is for guidance only.



Evo-RED[®] Bridge Plug

The Evo-RED® bridge plug provides a unique and highly efficient method of deploying and retrieving a downhole barrier. What makes it unique is that it incorporates a computer-controlled ball valve that can be remotely opened and closed multiple times without the need for any control lines or interventions.

Each time the ball valve is activated, an intervention is eliminated from the operation, saving a significant amount of rig time, while helping reduce risks to both the operation and personnel.

The Evo-RED bridge plug can be used in a wide range of well operations and is particularly effective as a downhole barrier during workovers or completion operations, thus keeping interventions and on-site personnel to a minimum.

Applications

Any application in which a wireline plug is used can be replaced by the Evo-RED bridge plug. Here, the exact same results can be achieved but without repeated interventions, reducing personnel onboard, while saving rig time and the associated costs and risks. Multiple assemblies can be used in a single operation, thus multiplying the benefits.

- » Packer setting device
- » Deep-set barrier in extended-reach or horizontal wells
- » Shallow set for tree testing and change out
- » Liner deployment with external swellable elastomer
- » Barrier in temporary abandonments or light well intervention operations
- » Barrier in tubing-conveyed perforating gun firing and stimulation operations
- » Self-actuating flow control device
- » Shut-in tool for pressure buildup tests with reduced interventions

Benefits

- » Remote activation minimizes the number of interventions for a wide range of operations.
- » A large flow area allows well fluids to wash through the assembly, aiding deployment and retrieval.
- » A minimized OD, retained packing element, anti-preset and anti-reset features aid deployment and retrieval.
- » A large ID and an element positioned above the slips helps reduce the effects of debris.
- » Built-in backup mechanical equalization aids retrieval.
- » It can be pre-installed onshore for completion operations. During workover operations, it can be retrieved with the tubing. In both cases, this reduces the number of interventions for each operation to one.
- » When pre-installed onshore, no dedicated offshore personnel are required during the operation.





Typical Operation

The Evo-RED[®] bridge plug is run in hole with the ball valve normally in the open position and the slips and element relaxed. Typically, the assembly is deployed on the Halliburton electronically controlled DPU[®] downhole power unit, which mechanically sets the bridge plug when the target depth is reached.

At this stage, the ball valve remains open, and flow of the well is unrestricted. This can be commanded to close at any time using one of the preprogrammed triggers, such as applying between 1,000 and 1,500 psi for 10 minutes.

The well can be equalized at any time by commanding the Evo-RED bridge plug to open using another preprogrammed trigger. This process can be repeated multiple times in a single operation, thus providing significant operational flexibility and eliminating an intervention each time.

The assembly is retrieved in a single run using a standard GS pulling tool with PX0 anti-preshear adapter. This latches into the top of the Evo-RED bridge plug, activating the internal equalizing mechanism. The slips and element retract and are secured in place by the anti-reset mechanism.

The large flow ports on the ball valve and extensive bypass features aid recovery by allowing significant fluid to flow through the assembly, while the minimized OD helps prevent them from fouling on other equipment during retrieval.

Available Sizes (To Suit Casing Size)		Maximum Differential Across Closed Assembly		Temperature Range		Maximum Differential Pressure While Opening	
in.	lb/ft	psi	bar	۴	ଂମ	psi	bar
3 1/2	9.2	7,500	516	39 to 275	4 to 135	5,000	345
4 1/2	11.6	7,500	516	39 to 284	4 to 140	5,000	345
	12.6						
	13.5						
5 1/2	17	7,500	516	39 to 284	4 to 140	5,000	345
	20						
	23						
7	23	7,500	516	39 to 284	4 to 140	5,000	345
	26						
	29						
	32						

Evo-RED[®] Bridge Plug

Because of the significant number of design variables, the information provided is for guidance only.



eMotion[®] Remotely Operated Downhole Control Unit

The eMotion[®] unit is a computer-controlled, downhole electro-hydraulic power unit. When connected to the Halliburton LV isolation barrier valves or HS interval control valves, the resulting eMotion-LV and eMotion-HS valves are then permanently deployed as part of the completion.

The eMotion unit allows these "slave" valves to be operated by remote command without the need for any surface control lines (and associated tubing hanger penetrations) or interventions, saving time, costs, and helping reduce risks.

Applications

In principle, interventionless control of any hydraulically operated tool can be achieved remotely with the integration of an eMotion unit. The application of the eMotion unit therefore varies depending on the type of slave valve that it is integrated with and its planned position within the well.

Operation

The eMotion unit is connected directly to the hydraulic open and close ports on the slave valve. It has integrated pressure and temperature sensors that it uses to monitor the well conditions and is programmed to pump hydraulic fluid down the relevant control line to either open or close the valve whenever a specific well condition (trigger) is detected.

The triggers use a variety of well parameters including ambient pressure, temperature, time, or surface-applied pressure. Each time a trigger condition is detected, the eMotion unit reacts by either opening or closing the slave valve according to its instructions. This process can be repeated time-and-time again without any form of intervention.

Controlling the eMotion Unit Remotely

No surface connections or interventions are required to operate or communicate with the eMotion unit. Instead, by applying a defined pressure for a defined time at surface, the operator can activate the pressure window trigger. This allows direct communication with the eMotion unit so it can be remotely operated. For example, applying between 1,000 and 1,500 psi for 10 minutes could instruct it to open the slave valve. The eMotion unit ignores any pressure applied outside the defined values. Therefore, pressure can be applied to the tubing (for tubing integrity tests or packer setting, etc.) without the risk of inadvertent activation.

Onboard data analysis allows the eMotion unit to distinguish its own commands from other external factors, such as naturally fluctuating hydrostatic or reservoir pressure. This helps enable it to behave as planned, even if the downhole conditions change unexpectedly.



eMotion® Remotely Operated Downhole Control Unit



eMotion[®]-LV Valve

The eMotion®-LV valve is a computercontrolled, isolation barrier valve that can be repeatedly opened or closed by remote command. It is permanently deployed as part of the tubing where it is used as a full-bore, testable barrier during completion deployment operations.

The valve is actuated without the need for any surface control lines (saving tubing hanger penetrations) or interventions. Each time it is operated, an intervention is eliminated from the operation, dramatically reducing rig time, costs, and associated risks.

Application

The eMotion-LV valve is particularly suited for use during completion deployment. To obtain the greatest benefit and flexibility, two eMotion-LV valves are used.

The first valve is positioned in the lowest part of the completion below the production packer. It is deployed in the open position allowing the completion to self-fill and well fluids to be circulated. It can be instructed to close at any time using one of the triggers. When closed, the tubing can be pressure tested and the production packer hydraulically set against it.

The second eMotion-LV valve is positioned just below the tubing hanger. This valve is also deployed in the open position and can be closed using any of the triggers, although the pressure window trigger (applying pressure at surface) provides the greatest flexibility. Once the upper eMotion-LV valve is closed, it provides a second testable barrier so the blowout preventer can be removed and the Christmas tree installed and safely tested. Both eMotion-LV valves can subsequently be remotely reopened, even without the rig on location. They are permanently left downhole in the open position, with the full bore providing the maximum flow rates for production or injection.

Using the eMotion-LV valves instead of conventional barriers allows the entire operation to be performed without any form of intervention, thus providing substantial cost savings and helping reduce risks.

Benefits

- » Eliminates multiple wireline runs during completion placement operations, saving time, costs, and helping reduce risks
- » Operational for up to 10 months based on one battery; extra batteries can be added for increased life
- » Provides flexible deployment options and well control
- » Provides maximum production or injection flow rates
- » Provides a fully testable downhole barrier





Completion Tools

Operation

The eMotion[®]-LV valve consists of two existing devices the eMotion downhole control unit and the LV isolation barrier valve. The eMotion unit is directly connected to the hydraulic ports on the LV valve, providing surface communication and the motive force to operate it, while the LV valve provides a field-proven barrier.

The eMotion-LV valve has integrated pressure and temperature sensors, which it uses to monitor the well conditions and is programmed to either open or close whenever a specified condition (trigger) is detected.

The triggers use various well parameters including ambient pressure, temperature, time, or surface-applied pressure. Each time a trigger condition is detected, the eMotion-LV valve will either open or close according to its instructions. This process can be repeated time-and-time again without any form of intervention.

Options

- » Available to suit 7-, 9 5/8-, and 10 3/4-in. casing
- » Ball differential rating up to 10,000 psi (689.5 bar)
- » Temperature rating to 284°F (140°C)
- » LV4 valve is qualified in accordance with ISO 28781 requirements



eMotion[®]-HS Valve

The eMotion[®]-HS valve is a computercontrolled sliding sleeve that can be repeatedly opened and closed by remote command. No surface connections or interventions are required to communicate with or operate the valve.

Permanently deployed above the production packer as part of the tubing string, the eMotion-HS valve controls the flow of well fluids between the tubing and annulus, without the need for any interventions or surface control lines, saving rig time, costs, and helping reduce risks.

Applications

The eMotion-HS valve is specifically designed to offer a safe and highly efficient method of circulating well fluids during a well completion operation.

It is deployed as an integrated part of the tubing string positioned above the main production packer. This configuration eliminates the need to circulate across the unset packer, reducing the risk of damaging the elements and preventing the circulation pressure from impacting on the reservoir.

Normally, the eMotion-HS valve is run in hole in the closed position and subsequently opened by remote command after the packer is set. The valve is commanded to open by applying pressure at surface (e.g., 2,000 psi for 10 minutes) against a deep-set barrier, such as a reservoir isolation barrier.

When open, well fluids can be circulated to underbalance the well ready for production. The large flow ports allow faster pump rates to be used, saving rig time. With the circulation successfully completed, the eMotion-HS valve is commanded to reclose and/or permanently lock using another pressure window trigger. Each time the valve is operated in this manner, an intervention is eliminated from the operation, saving rig time, costs, and helping reduce risks.

The eMotion-HS valve can also be used in various other completion applications in which a remotely operated sliding sleeve device is required. This includes using the valve for zonal isolation, acid stimulation, and for fluid loss control in sand control completion applications.

Benefits

- Eliminates multiple interventions during completion operations, saving time, costs, and helping reduce risks
- » Allows for faster pump rates, providing safer and more efficient circulation of well fluids
- » Provides flexible deployment options and well control while running in hole
- » Reduces the number of operations personnel, saving costs and helping reduce risks
- » Includes debris-tolerant, V0-rated seal capable of withstanding high circulation rates



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Operation

The eMotion[®]-HS valve is an integrated assembly of two existing devices. The first is the eMotion electro-hydraulic control unit. This unit provides surface communication and the motive force to operate the second device — a Halliburton HS circulating valve.

The assembly has integrated pressure and temperature sensors, which it uses to monitor the well conditions and is preprogrammed to either open or close whenever a specified condition (trigger) is detected.

The triggers use various well parameters including ambient pressure, temperature, time, or surface-applied pressure. Each time a trigger is detected, the valve will either open or close according to its instructions. This process can be repeated time-and-time again without the need for any form of intervention or any control lines to surface.

Options

- » Available to suit 7-, 9 5/8-, and 10 3/4-in. casing
- » Sleeve differential rating up to 10,000 psi (689.5 bar)
- » Temperature rating to 284°F (140°C)
- » HS circulating valve is V0 gas-tight qualified (for 9 5/8-in. casing size)

