

## Case Study

# Inferno Ball-Activated Steam Valve Ensures Effective Steam Injection and Reduces Operational Time in SAGD Horizontal Wells

CANADA, MCMURRAY  
INFERNO SYSTEM

An operator using horizontal steam-assisted gravity drainage (SAGD) operations to extract heavy oil from their oil sands assets in Alberta deployed the Packers Plus Inferno™ Ball-Activated Steam Valve to improve operational efficiencies compared to coiled tubing (CT) shiftable flow control devices. An average 45% reduction in shifting operational time was realized with the Inferno valves and additional savings in rig up time were realized due to the need to deploy only one pressure truck.



## Challenge

To improve steam distribution along the lateral section of horizontal SAGD wells, operators use flow control devices with an inner sliding sleeve. These valves are run into the well in a closed position for steam circulation and then shifted open to allow for steam injection. Multiple flow control devices are positioned in the tubing string across the horizontal to create the desired steam distribution and enhance reservoir coverage. Current flow control device designs typically use shifting tools run on coiled tubing to function the devices. Challenges associated with these operations include: shifting difficulties, inconclusive indications of shift and loss of heat downhole due to the need to kill the well prior to running CT downhole

## Solution

To address these challenges, technology from horizontal multi-stage ball-activated

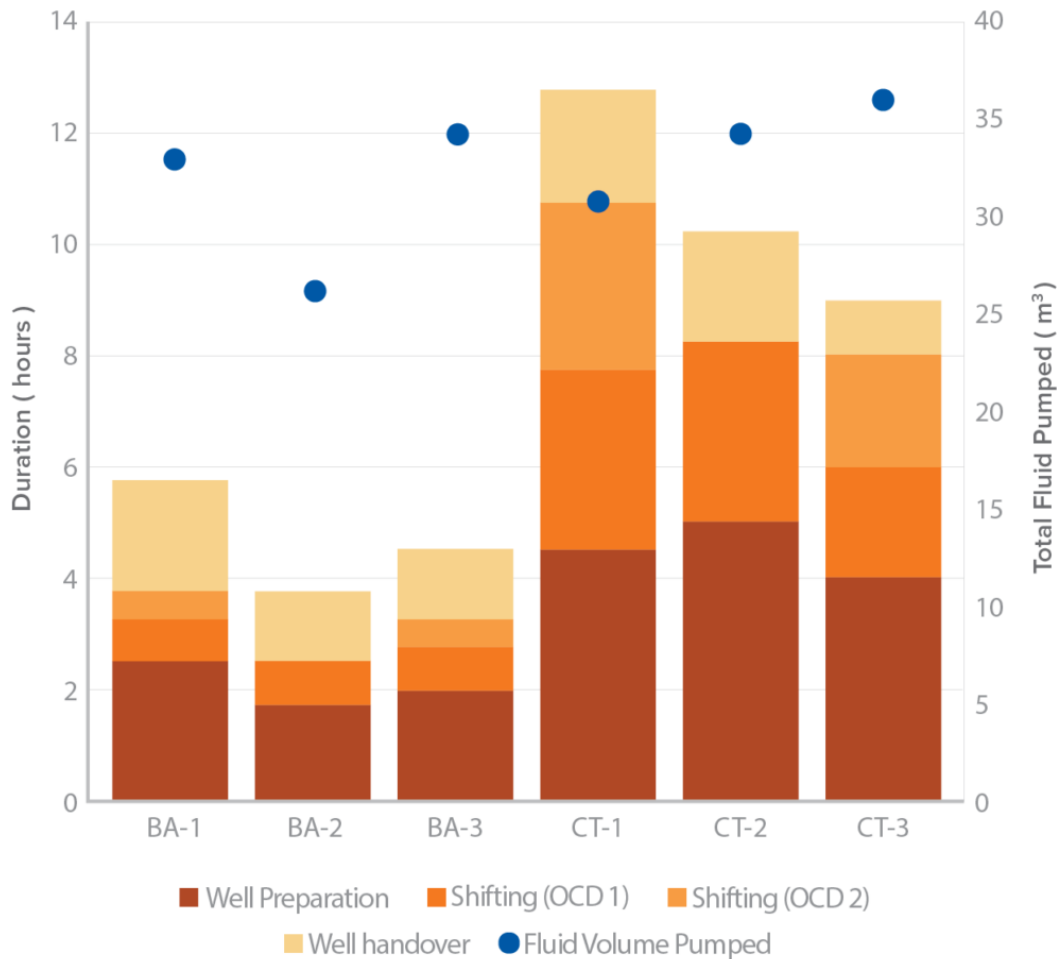
completions was used to re-engineer a SAGD flow control device and eliminate the need for coiled tubing intervention to shift the sleeve open. The Packers Plus Inferno Ball-Activated Steam Valves are activated by pumping degradable balls from surface to land on a seat in the valve, using hydraulic pressure to shift the sleeve. Once the sliding sleeve shifts open, the ball disengages from the seat and continues to the end of the tubing string leaving a full inside diameter. This process is repeated with progressively larger balls to open all the installed valves.

Since the valves are initially opened using actuation balls, there is no need to kill the well and unnecessarily cool the reservoir. The valves are adjustable for the desired steam injection rates and they can be closed or re-opened using a shifting tool run on coiled tubing for long-term flexibility in targeting specific injection zones.

## Results

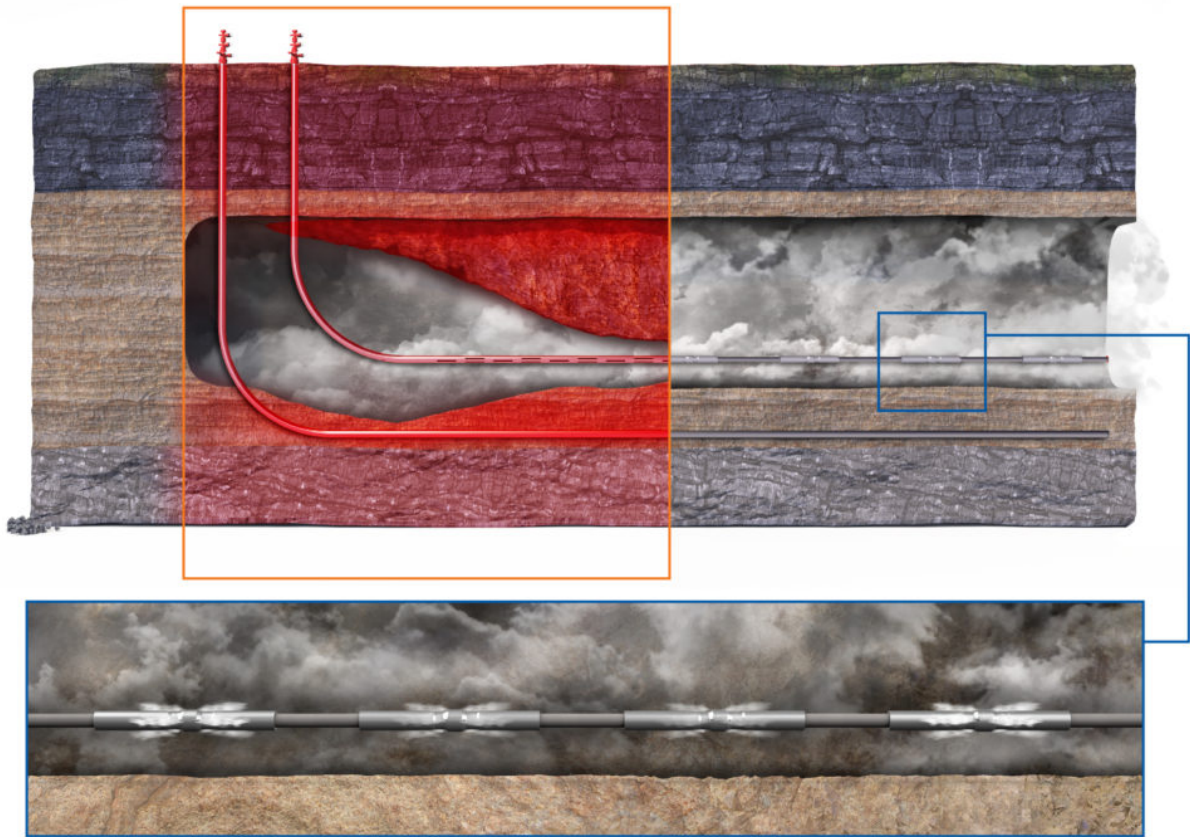
An operator looking to improve SAGD operations in their oil sands assets, performed a field trial to compare the operational efficiency and functional operation of the two flow control device designs. A total of 6 dual-tubing horizontal SAGD trial wells were completed with two flow control devices per well on the long tubing string run into the lateral: three wells with the CT shiftable design and three wells with the Inferno Ball-Activated Steam Valve.

Differences in operational efficiency became apparent when comparing well preparation and shifting operations. Well preparation time was reduced with the Inferno Ball-Activated Steam Valves due to the need to deploy only one pressure truck. Shifting operations were conducted much faster for the Inferno valves due to the speed a ball can be pumped downhole compared to coiled tubing. On average, the duration of the shifting operation for the Inferno Ball-Activated Steam Valve was 45% less than the CT-activated design. The CT devices experienced both variable and extended shifting times due to the need for multiple passes of the shifting tool through the device to properly latch and release.



The functional operation comparison was based on the ability to confirm a device had shifted open. For the Inferno valves, pressure signatures and acoustic data from the ePLUS™ Retina Stimulation Monitoring System were used to confirm tool function. For the CT devices, shifting tool latch/release was used to confirm tool function. Near identical profiles were observed for pressure and acoustic data on all Inferno valves that were shifted, clearly indicating successful shifting. In contrast, only two CT flow control devices showed successful latch and release from the shifting tool. All other CT devices required the differential pressure to be bled off to retract the shifting keys, resulting in an inconclusive shift.

The Inferno Ball-Activated Steam Valve provides greater confidence of tool functioning, increased operational efficiencies, reduced operational time, less equipment and personnel on-site, and improved project economics.



Packers Plus is the innovator of multi-stage completion systems, providing field-proven and cost-effective solutions for a range of applications worldwide. For more information about the Inferno Ball-Activated Steam Valve or other solutions, visit [packersplus.com](http://packersplus.com).