

WELL SCAVENGER

Versatile wellbore clean-up tool for the most demanding operations

WELL SCAVENGER: A versatile wellbore cleanup tool for flow-restricted applications



The inability to recover wellbore debris during completions or interventions while working in brine fluids is a major contributor to completion-related non-productive time (NPT) and can be a threat to optimizing production. The poor solids transport characteristics of completion fluid make many cleanup operations impossible even with high circulation rates.

The WELL SCAVENGER[†] debris removal tool captures material in situ and removes wellbore junk and other debris from targeted areas without relying on high conventional circulation rates that may be required to attempt circulating the debris to surface, saving time and improving cleanup efficiency.

The WELL SCAVENGER tool from M-I SWACO, a Schlumberger company, has proven extremely effective in a variety of intervention applications, including recovering blanking plugs, removing debris from the top of isolation valves, assisting post-perforation cleanup and, when combined with other wellbore cleanup tools, accomplish multiple operations in one run.

The more complex the cleanup, the more you need the WELL SCAVENGER tool

FEATURES

- Downhole fluid-driving engine
- Modular design allows for multiple debris chambers
- Completely sealed lifting and handling subs
- Internal magnet assembly
- Robust components
- Localized reverse circulation
- Compatible with other tools
- Targeted flow for specific areas

BENEFITS

- Recovers debris from hard-to-access areas
- Minimizes need for high surface flow/pressure
- Removes large volumes of debris in single runs
- Facilitates simultaneous operations
- Effective in clear brine fluids
- Online debris chamber replacement capability
- Helps ensure integrity of sensitive downhole hardware
- Reduces trips
- Protects sensitive formations
- Decreases risks of spills
- Lowers overall intervention costs
- Helps maximize production
- Enhances safety on the rig floor

Post-perforation fluid loss zones and sensitive pressure-actuated downhole hardware that impose limits on pump-rates and pressures make conventional wellbore cleanups difficult and inefficient. Cleanup operations during this phase of the well are typically done in clear brines that have very low solids carrying or suspension characteristics.

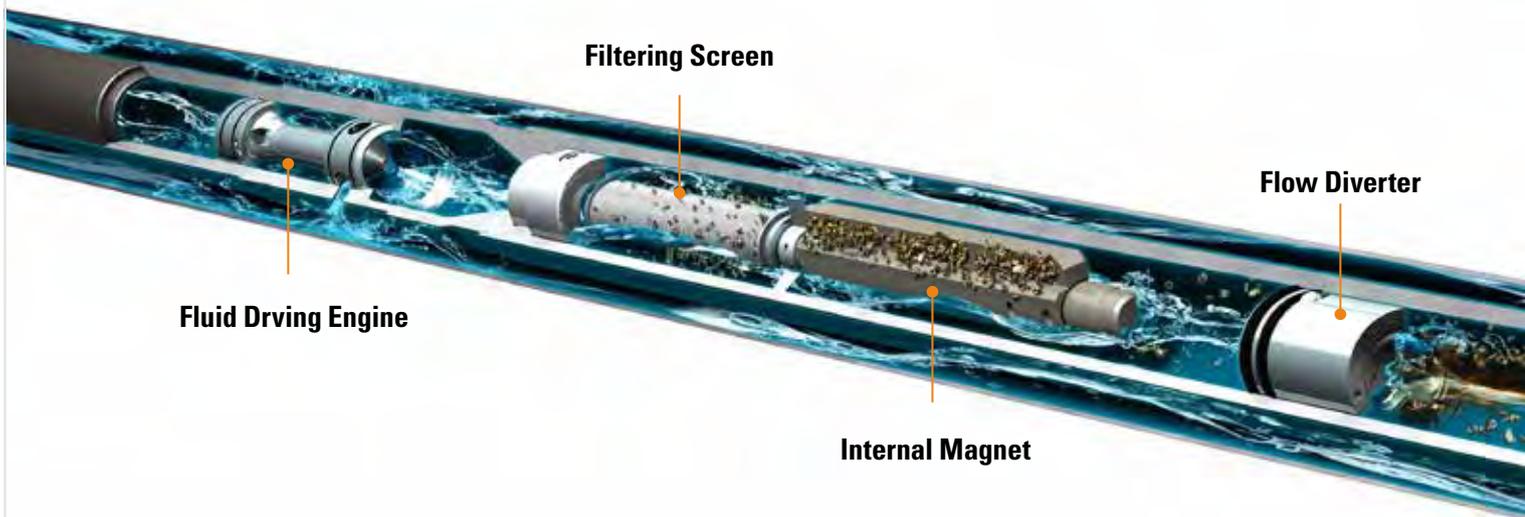
The modular WELL SCAVENGER debris removal tool overcomes problems caused by inefficient downhole circulation. At its heart is a single-nozzle, fluid-driving engine that generates and maintains an extremely efficient localized reverse circulation flow. As a result, even when run with Newtonian fluids, it achieves maximum lifting velocities with no need for high surface pump rates and pressures that could generate losses and damage sensitive formations and hardware.

A debris-screening module and one or more debris chambers complement the fluid-driving engine to make the WELL SCAVENGER tool one of the most versatile and efficient cleanup tools on the market. The tool can be run singly or in combination with junk baskets or string magnets such as the MAGNOSTAR[†] tool to remove larger debris and ferrous material. The modular design of the tool permits use of multiple debris chambers, capturing more junk per run and significantly reducing tripping costs.

As an additional benefit, the WELL SCAVENGER debris chambers, unlike other cleanup tools, are designed with sealed lifting caps that provide 100% containment, making it considerably safer when handling extracted debris and fluids on the rig floor.



How the WELL SCAVENGER tool works



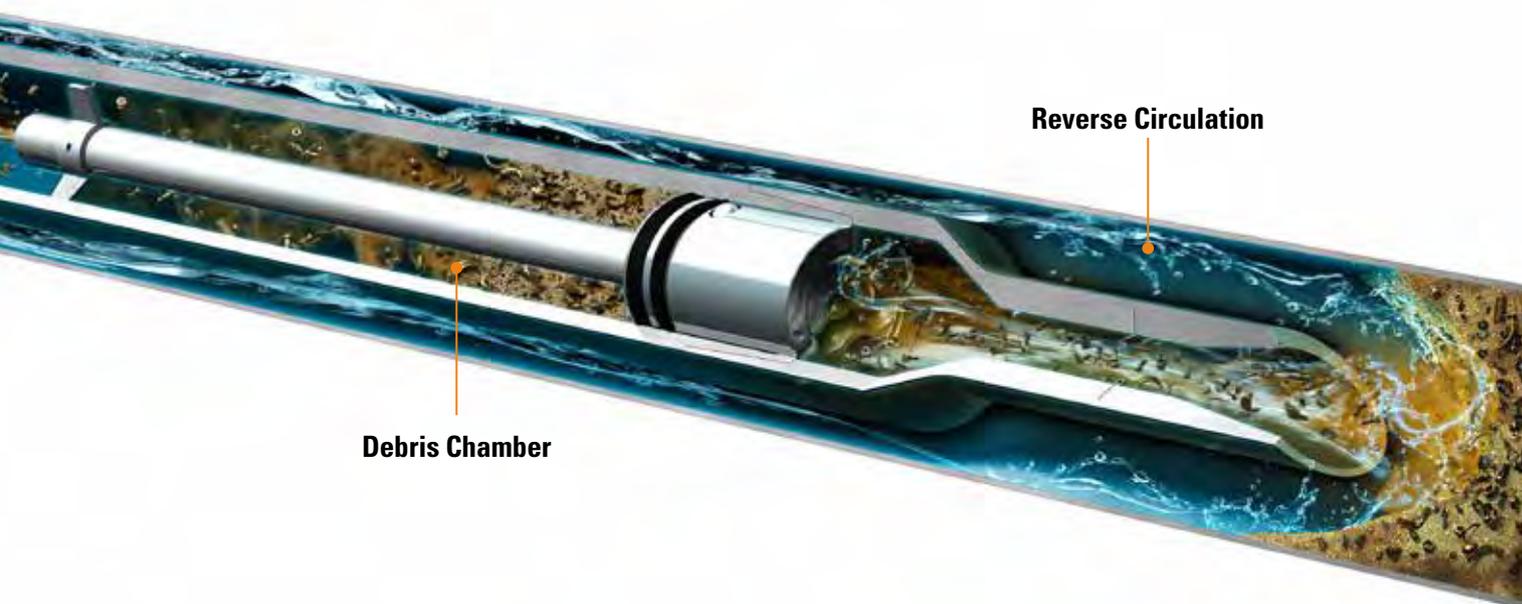
The single-nozzle design of the high-efficiency, fluid-driving engine incorporates four ports that internally initiate and maintain the reverse flow path. Conventional circulation through the fluid-driving engine module creates a low-pressure area that generates the localized reverse circulation flow path around the outside of the tool, which extends to the end of the work string. This reverse circulation pulls debris upward and inside the tool, where it is collected and retained in one or more debris chambers. The fluid then passes the powerful internal magnet assembly and continues through the debris-screening module to rejoin the driving fluid flow.

The high-strength screen filters out small non-ferrous particles. The internal magnet assembly is positioned within the screen module to capture ferrous material. The screen and magnet are internally centralized to provide stabilization in deviated wells. Each of the debris chambers is designed with a debris-collection area, a flow diverter and an inner flow tube that is also equipped with an internal centralizer for additional strength and stability. The inner flow tube provides the path for the reverse flow while the diverter causes debris to drop out into the collection area as the fluid flows through each chamber. Once on the rig floor, sealed lifting caps provide total containment of all fluid and debris.

Challenge: cleanup above an FIV

The WELL SCAVENGER tool is uniquely engineered to allow for the configuration of a BHA to provide a reliable method of debris cleanup above a formation isolation valve (FIV), ensuring trouble-free actuation. The ability of the fluid-driving engine to create an efficient localized reverse circulation pulls debris into the chambers without requiring pressures that could otherwise actuate the FIV prematurely.

The BHA for a typical FIV cleanup run using the WELL SCAVENGER tool includes the cleaning system components and complementary wellbore cleanup tools. Proper spacing out of the assembly enables landing out of a no-go collar on the packer



Debris Chamber

Reverse Circulation

with the fluted mule shoe only inches from the FIV ball, which allows the system to create reverse flow immediately above the valve without compromising it. A high-capacity MAGNOSTAR tool is normally placed above the engine module to capture ferrous debris. In addition, after cleanup, or if the WELL SCAVENGER tool becomes plugged, a SINGLE-ACTION BYPASS SUB[†] (SABS[†]) can be used to boost rates. The WELL PATROLLER[†] tool filters all fluid while pulling out of the hole and, in turn, verifies that a successful cleanup has been accomplished. Once at surface, the tools are inspected and safely emptied with all debris weights recorded.

Challenge: post-perforation plug retrieval run

The WELL SCAVENGER tool provides distinct advantages in post-perforation plug retrieval. Normally, a high pump rate is required to conventionally circulate out sand and debris above a plug. Depending on fluid type and density, this methodology often leads to high equivalent circulating density (ECD) and greater possibility of losses in the perforated zone. The reverse circulation of the WELL SCAVENGER tool allows it to be used with low flow rates across the perforations that effectively capture debris rather than circulating it up through the BOP's, wellhead and surface equipment. This can reduce the

risk of damage or interference that debris could cause to these vital components.

The WELL SCAVENGER tool is designed to work with other M-I SWACO cleanup tools. Along with the MAGNOSTAR tool for catching ferrous debris, the SABS can be deployed during packer plug removal to boost annular velocities after the cleanup, or if the WELL SCAVENGER tool becomes filled or plugged. The WELL PATROLLER TOOL, which filters all the wellbore fluid while pulling out of the hole, is used to verify a successful cleanup. In addition, the post-perforation BA plug retrieval BHA can include the RIDGE BACK BURR MILL[†] casing cleanup tool to remove perforation burrs during the same trip.

Engineered for versatility and efficiency

Due to limitations from pressure-sensitive downhole hardware, open perforations, and other factors, it is often impossible to generate adequate fluid velocities required to clean up debris and conventionally circulate it to the surface.

The WELL SCAVENGER tool can operate in optimum debris-removal mode without the need to boost surface pump rates/pressures. The technology captures and removes debris when other methods are ineffective or require high circulation rates that are unachievable or inadvisable.

The WELL SCAVENGER tool has been proven effective in extracting a variety of debris types, such as cuttings, sand, perforation gun residue, and lost drill bit cones and hand tools. If multiple runs are required, the debris chambers are designed for online replacement, further reducing the NPT associated with more conventional cleanup interventions.

In combination with the global mechanical debris management experience from M-I SWACO and pre-job planning, the modular flexibility inherent in the WELL SCAVENGER tool design allows for

bottomhole assembly (BHA) configurations that deliver the best possible engineered cleanup solutions that save time and money, even in the most daunting applications. The result is optimal well performance and maximum asset value.

Put the WELL SCAVENGER tool to work for you

To find out more about how our WELL SCAVENGER debris removal tool is working for our other customers worldwide, contact your local M-I SWACO representative.



WELL SCAVENGER tool success in the field

Offshore Brunei: WELL SCAVENGER tool instrumental in saving two dedicated trips during completion

The Situation

While reviewing plans for a completion Offshore Brunei for a major operator, the completion team was challenged to reduce rig time. Dedicated runs were initially planned to deburr a perforation interval, then perform a cleanup down to the GT plug and retrieve the GT plug. Wanting to avoid three runs, the operator approached M-I SWACO for recommendations.

The Solution

Due to inherent complications and limitations while retrieving the GT plug, M-I SWACO performed an exhaustive review of the operation and recommended only one run. The BHA consisted of the GT plug retrieval tool, the 5³/₈ in. WELL SCAVENGER tool, two MAGNOSWEEP II[†] magnet tools, a RIDGE BACK BURR MILL, a WELL PATROLLER, and a WELL COMMANDER[†] with BYPASS BALL CATCHER[†] in the 7 inch tie back casing. The tool configuration allowed deburring of the perforations, cleanup of debris above the GT plug, and retrieval of the plug in one run.

The Results

The one run resulted in deburring the perforation interval and retrieving the GT Plug while recovering 56 kgs (123.2 lbs) of debris in the WELL SCAVENGER tool and 7 kgs (15.4 lbs) of ferrous debris on the MAGNOSWEEP II magnet tools. More importantly the client saved two days of valuable rig time during the completion, which lowered the overall completion cost and enabled the operator to initiate production sooner.

North Slope Alaska: WELL SCAVENGER tool recovers over 545 kg (1200 lbs) of debris during a post packer milling cleanup operation

The Situation

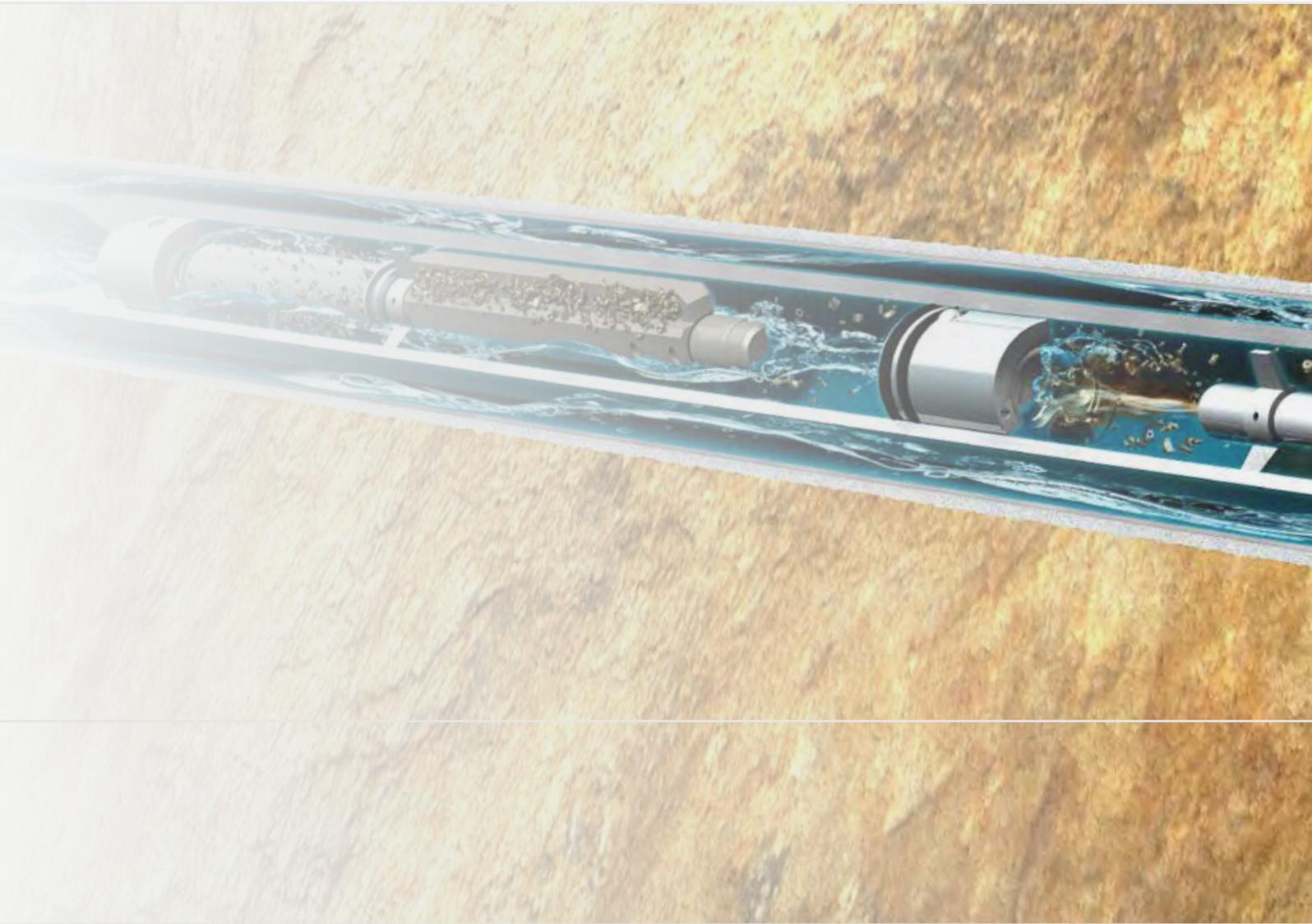
While running a packer in 9⁵/₈ in. casing, the packer set prematurely at 2494 m (8184 ft.) In addition to the stuck packer, another packer with a stinger assembly attached was previously set at approximately 3078 m (10,100 ft.). Once the stuck packer was milled out, the wellbore would need to be cleaned down to the top of the second packer. Debris removal was complicated by the well's 80 degree deviation from approximately 762 m (2500 ft) to total depth.

The Solution

After two runs with a competitor's boot basket retrieval tool yielded very little debris, specialists from M-I SWACO in Alaska and Houston recommended a specially modified bottom hole assembly combined with the WELL SCAVENGER tool and several high capacity MAGNOSTAR[†] magnets to recover the debris. The BHA included 27 m (90 ft) of wash pipe, a Heavy Duty RAZOR BACK SCRAPER[†], the MAGNOSTAR tools, the WELL SCAVENGER tool and SABS circulating sub.

The Results

After successfully cleaning the majority of the small debris from the wellbore with this BHA, the operator was able to run in hole with the polish mill to clean the lower packer bore and reach the desired depth. In total, M-I SWACO tools removed 748 kg (1649 lbs) of ferrous and non-ferrous debris from the wellbore in three clean up runs.



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