

New M-I SWACO 518 HV CENTRIFUGE Replaces the Operation of Two Standard 518 CENTRIFUGES

“A Colombian operator used a 518 HV CENTRIFUGE* unit in its land drilling operations with unweighted muds, increasing processing capacity and improving solids separation and removing fine particles at a high bowl speed.”

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M-I SWACO 518 HV CENTRIFUGE

THE SITUATION

Low-gravity solids have represented a challenge in the Llanos Orientales basin because of highly reactive clays present in the lithology, resulting in increased well fluid costs due to dilution requirements.

THE SOLUTION

Use of the 518 HV CENTRIFUGE unit was proposed to increase processing capacity and improve solids separation. The unit is specifically designed to handle higher mud processing rates at finer cut points.

Well Information

Location Puerto Gaitán, Colombia
 Start date March 4, 2009
 Mud weight 9.3 – 9.4 ppg
 Mud type WBM
 Final depth 5,125 ft
 518 HV CENTRIFUGE operation 306 hours

The Situation

The wells drilled in the Llanos Orientales basin have always experienced issues due to the high amount of low-gravity solids incorporated into the drilling mud as a result of the highly-reactive clays present in the lithology, which leads to an increase in the dilution rates and, consequently, an increase in the volume of fluid to be treated and drilling fluid costs.

With the purpose of providing a solution to the above, M-I SWACO proposed utilizing the 518 HV CENTRIFUGE in order to increase the processing rate of mud from the active system while increasing the separation, thus improving the removal of low-gravity solids of the mud.

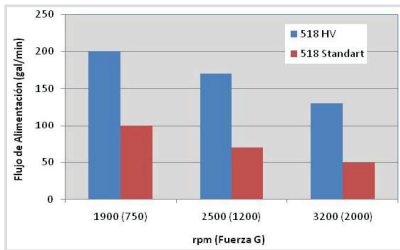


Figure 1. Maximum processing rate at 9.4 PPG mud weight as a function of the bowl speed. The maximum processing rate is achieved when power consumption in the main motor reaches its maximum design value.

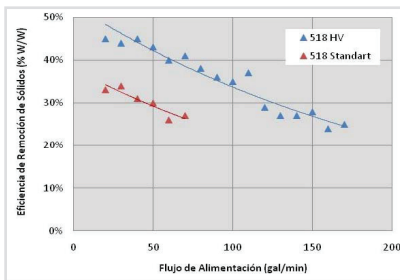


Figure 2. Solids removal efficiency at 9.4 PPG mud weight as a function of the processing rate for a bowl speed of 2500 rpm (1200 G force). Solids removal efficiency is the mass flow rate of dry solids in the solid discharge, expressed as a percentage of the mass flow rate of dry solids in the feed.

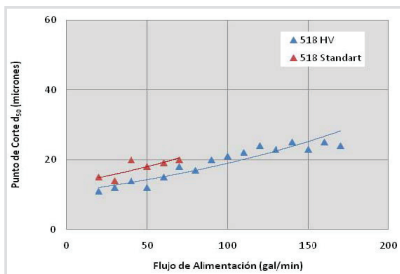


Figure 3. D50 as a function of the feed rate for a bowl speed of 2500 rpm (1200 G force). The d50 cut point is defined as the particle size that has a 50% chance of returning to the system in the liquid discharge and a 50% chance of being discarded in the solid discharge.

The Solution

The M-I SWACO 518 HV CENTRIFUGE is designed to handle higher fluid processing rates by providing more power and improving the fluid flow in and out of the machine (see Table 1). Increasing the available power for the main and back drives allows more fluid to be fed into the bowl while providing the necessary torque to remove the increased solids load resulting from the higher feed rate. The unit also has an improved fluid accelerator to reduce turbulence and bring the fluid velocity (both magnitude and direction) up to the bowl rotating speed and direction as quickly as possible, thus reducing the energy consumed for fluid acceleration and reserving more energy for solids conveyance.

Fluid flow is further improved by increasing the internal diameter of the feed tube and the liquid discharge.

However, increasing the flow rate generally has a negative effect on solids separation by increasing the fluid velocity inside the bowl, which can lead to turbulence, causing poor separation and re-suspension of settled solids. To overcome these problems the conveyor has quasi-axial flow, which increases the flow area inside the bowl thus reducing the fluid velocity and hence the onset of turbulence. Finally, the conveyor is fully tiled to reduce wear and increase the operating time between maintenance.

Table 1. Design Data from the M-I SWACO 518 HV CENTRIFUGE

Description	Standard 518	518 HV
Main Drive Motor	25 HP	50 HP
Back Drive Motor	7.5 HP	15 HP
Feed Pipe Design	1 ¼-in. ID pipe with slotted outlet	1 ⅞-in. ID pipe with open outlet
Conveyor Type	Conveyor designed for standard radial flow	Conveyor designed for quasi-axial flow with unique feed accelerator
Feed tube design	1¼-in. ID adjustable closed-ended with slots	1⅞-in. ID fixed position, open ended with fluid diffuser
Liquid Discharge Pipe	6-in. Victaulic coupling	8-in. Victaulic coupling

The Results

The test was carried out while drilling the Caracara Sur C6 well where the M-I SWACO 518 HV CENTRIFUGE was installed and compared to the performance obtained by two standard 518 CENTRIFUGES in surrounding wells with the same characteristics.

The first test consisted of comparing the processing capacity of the 518 HV unit using the three available operating speeds. The 518 HV unit attained a maximum processing rate of 170 gpm with the bowl speed of 2500 rpm (1242 G force) processing a 9.4 lb/gal mud, while the two standard 518 units handled a combined processing flow rate of 140 gpm at the same bowl speed (Figure 1).

Figure 2 compares the solids removal efficiency of both types of machines as a function of the processing rate and at a bowl speed of 2500 rpm (1242 G force).

One of the best performance indicators for a centrifuge is the d_{50} cut point, defined as the particle size that has a 50% chance of returning to the system in the liquid discharge and a 50% chance of being discarded in the solid discharge, compared to the feed particle size range. Figure 3 shows a comparison of the d_{50} cut point as a function of the feed rate. It is clearly observed that the 518 HV unit provided a finer cut point than the standard 518 unit, reducing the fine solids content of the fluid and, more importantly, it was capable of removing fine particles at a high bowl speed (2500 rpm/1200 G force).

Summary

The M-I SWACO 518 HV CENTRIFUGE delivered a greater performance than the two standard 518 units combined, since it increased processing capacity and improved solids separation. The 518 HV unit attained the following improvements when processing 9.4 lb/gal water-based mud:

- Processing rate per well increased from 80 gpm (with the two standard 518 units) to 170 gpm using the 518 HV Centrifuge.
- Solids removal efficiency and cut point improved despite the fact that the processing rate had increased more than 100%



Figure 4. Solids discharge of the M-I SWACO 518 HV CENTRIFUGE

Questions? We'll be glad to answer them.

If you'd like to know more about the 518 HV CENTRIFUGE product and how it's performing for our other customers, please call the M-I SWACO office nearest you.

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