



Centrifuges

High and variable speed units to meet your specific environmental and economic goals



Centrifuges: High- and variable-speed units to meet your specific environmental and economic goals

To meet ever-stringent global onshore and offshore disposal standards, cuttings must be stripped of free fluid, meaning higher treatment, transportation and disposal costs for operators. The conventional approach to improving separation can cause cuttings attrition that compromises solids removal efficiency and generates formation-damaging fines that hinder drilling fluid performance and can require continuous treatment. In today's costly operating environment, discarded "free fluid" includes drilling fluids that could be reused in active systems.

The all-inclusive suite of decanting centrifuges from M-I SWACO, a Schlumberger company, recovers as much as 95% of barite used in weighted drilling fluids. With barite in short supply and costs continually rising, the capacity to return it to the active mud system not only reduces costs but the overall waste stream as well. While reusing barite, our centrifuges remove and discard the finer, lower-gravity solids that can create havoc with drilling fluid properties.

You have enough to worry about. Your centrifuge should not be one of them.

Features

- Offshore, onshore, industrial applications
- High-volume designs
- Rugged design
- Fixed, variable frequency (VFD) or fully hydraulic drives
- Increased flights wear resistance
- High G-Forces
- Split pillow box design
- Compact, slim-line versions
- Corrosion resistant
- Engineered for barite recovery
- PLC control
- Designed for LGS separation
- Speed, vibration sensors
- Automatic shut-down

Benefits

- Maintains optimum drilling fluid condition
- Reduces waste volume
- Lowers operating costs
- Recovers barite, base fluid for reuse
- Simplifies operation
- Reduces maintenance
- Meets tight space requirements
- Promotes safe operation
- Reduces noise
- Minimizes installation time
- Elevates HSE profile

In a solids control package, centrifuges provide the last line of defense in keeping your drilling fluid system performing at optimum levels while reducing waste and ensuring compliance with environmental restrictions. But there's no one-size fits-all approach in selecting the right centrifuge for your particular application. Targeted formations, wellbore geometry, drilling rates, locally specific fluid-on-cuttings restrictions, and the type of drill bit all influence your selection. The wrong choice can have serious and expensive repercussions: non-productive time (NPT), additional mud conditioning costs, increased waste volumes, and generally unacceptable drilling and environmental performance.

M-I SWACO puts those issues behind you. We provide a comprehensive portfolio of high-volume, variable-speed, and fully variable-speed centrifuges designed specifically to process drilling fluids to the highest possible environmental and performance standards. More importantly, our highly qualified and industry-recognized specialists can perfectly match the right decanting centrifuge to your specific application and objectives, ensuring the highest level of fluid recovery rates and efficient solids control. Together, that adds up to a significant reduction in total fluids cost and less waste for disposal.

Whether onshore or offshore, in single or dual configurations, we offer a wide range of centrifuges for both oilfield and industrial applications. Our wide range of centrifuges are not only cost-effective for your drilling program, they are especially effective in meeting the most stringent fluid-on-cuttings discharge requirements in environmentally sensitive areas. In chemically enhanced dewatering systems, M-I SWACO centrifuges reduce liquid discharge volumes significantly while enhancing total solids control system efficiency.

From our 518' High-Volume (HV) centrifuge that replaces two conventional 518 centrifuge units, to the ultra-high volume CD-500' High-Volume (HV) centrifuge we have the solution for your most challenging environmental and economic objectives.

CD-500 High-Volume (HV) Centrifuge

The CD-500 High-Volume (HV) centrifuge is a high-powered centrifuge designed for exceptional low gravity solids (LGS) separation and barite recovery. It is ideally suited for applications where large feed rates are required.

The CD-500 HV centrifuge has been designed to process large volumes of fluids, improve barite recovery and produce solids that meet the strictest environmental regulations for disposal. Automatic Programmable Logic Controller (PLC) monitoring and adjustment compensates for varied drilling conditions and maintains maximum solids/fluids separation throughout the drilling operation.

The CD-500 HV centrifuge recovers valuable drilling fluid and barite while reducing the total volume of drilling waste that must be transported for injection, onshore disposal or remediation.

By recovering more fluid and producing drier cuttings with a smaller volume, the CD-500 HV centrifuge helps operators reduce their overall drilling waste and disposal volumes.

Features

- Operational
 - Quasi-Axial scroll
 - High bowl speed
 - Double feed chamber
 - Open-ended and slotted feed tubes
 - Oil forced lubricated main bearings
 - Variable bowl, scroll and pump speed
 - Split pillow blocks
 - PLC control
 - Stainless steel rotating assembly
 - Perfectly balanced rotating assembly
 - Tungsten carbide tiles (scroll)
- Safety
 - Vibration sensor
 - Torque limiter
 - Micro switches on vessel and guards
 - Bearing temperature sensors
 - Pressure sensors
 - Hydraulic oil temperature sensor
 - Speed sensors
 - Only on fully hydraulic drive types

Benefits

- Quasi-Axial scroll provides an increased flow area which minimizes the turbulence
- High bowl speed assures a high G-Force, solids removal efficiency, finest cut points and a high clarification capacity
- Double feed chamber and open-ended/slotted feed tubes assure better configuration for barite recovery or LGS removal
- Reduced bearing wear and maintenance requirements
- Higher torque resistance than conventional centrifuges
- Complete control of G-Force for improved separation efficiency
- Split pillow blocks for increased protection against contamination
- PLC provides continuous monitoring and automatic shut-down



CD-500 HV Centrifuge proves itself in the field

Port Fourchon: CD-500 HV proves value for fluid processing, barite recovery

The Situation

The industry lacked a single, cost-effective centrifuge capable of operating at a separation force sufficiently high for both solids removal and barite recovery. In response, M-I SWACO engineered the CD-500 HV centrifuge to close the considerable performance gap between the original CD-500 centrifuge and the CD-600⁺ centrifuge, while also removing overlap with the 518 HV centrifuge. The objective of the design was to deliver the high G-Force that would meet the industry requirements for both high-volume solids removal and barite recovery.

The Solution

To validate the design, yard tests were arranged at the Port Fourchon liquid mud plant to validate the hydraulic (processing) capacity, as well as the unit's separation efficiency with high volumes of weighted drilling fluid.

The Results

The yard tests confirmed the viability of the CD-500 HV centrifuge as reliable single-unit solution for both high-volume fluid processing for efficient solids removal and barite recovery. The unit recorded a maximum operating speed of 3,250 rpm for 3,249 g. The tests showed hydraulic capacity of 450 gpm up to 15.9 lb/gal (1.9 sg), effectively positioning the CD-500 HV centrifuge between the 518 HV centrifuge and the CD-600 centrifuge and far exceeding competitor capacities. The d_{50} cut point was recorded as a very fine 14 microns.



Technical specifications for the CD-500 HV Centrifuge

Specifications

All dimensions are expressed in inches (millimeters).

Performance

- Hydraulic Capacity: 674 GPM (2,551 LPM)
- Operating Speed: 3,200 rpm
- G-Force: 2,656 G
- Sigma Value: 49,589 ft² (4,607 m²)
- Solids Discharge: 53 GPM (12.0 m³/h)

Rotating Assembly

- Bowl Diameter: 18.6 in. (472 mm)
- Bowl Length: 67.5 in. (1,715 mm)
- Pond Depth: 2.2, 2.6, 3.0 in. (56, 66, 76 mm)
- Scroll Type: Single Lead Quasi Axial Flow
- Scroll Pitch: 5.12 in. (130 mm)
- Main Bearings: Oil Lubricated
- Internal Bearings: Grease Lubricated
- Feed Tube: Open Ended [LGS Removal] Slotted [Barite Recovery]

Rotating Assembly Material

- Bowl: Stainless Steel Duplex A890
- Scroll: Stainless Steel Duplex A890 AISI 304
- Scroll Flights: Tiles; Tungsten Carbide
- Discharge Bushings: Tungsten Carbide

Gearbox

- Type: Planetary [Model; ZG 3700/10]
- Gear Ratio: 80:1
- Torque, maximum: 6,269 ft-lb (8,500 Nm)
- Differential Range: 1 to 40 rpm
- Weight: 474 lbs (215kg)

Nozzle Schedule

- Liquid Discharge: 8 in. Victaulic
- Solids Discharge: 31.9 x 17.7 in. (810 x 450 mm)
- Feed Tube: 2 in. [ANSI B 16.5]

VFD Type

- Power: 400/460 V - 50/60 Hz, 3 Phase
- Main Drive Motor: 100 Hp (75 kW)
- Back Drive Motor: 30 Hp (22 kW)

FHD Type

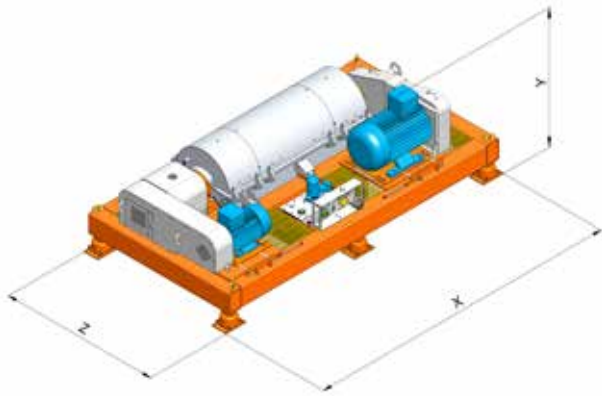
- Power: 400/460 V - 50/60 Hz, 3 Phase
- Main Drive Motor: 120 Hp (90 kW)
- Hydraulic Pump: Variable Displacement Pump

Certification

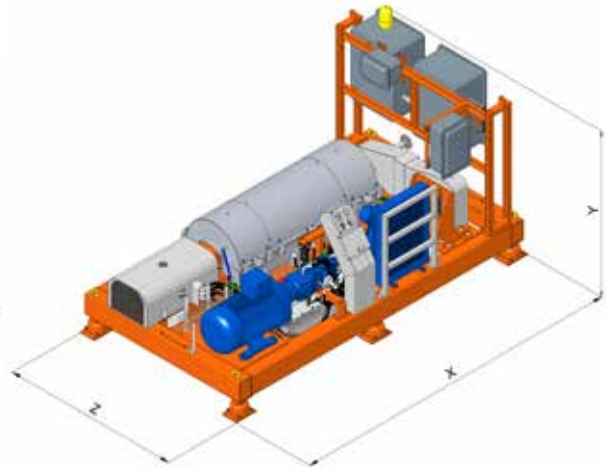
- CD-500 HV VFD: ATEX CE Ex II 2G c b IIB T3 or Class I, Division 1 hazardous areas for USA and Canada
- CD-500 HV FHD: ATEX CE Ex II 2G c b IIB T3
- CD-500 HV SL VFD: ATEX CE Ex II 2G c b IIB T3 or Class I, Division 1 hazardous areas for USA and Canada
- CD-500 HV SL FHD: ATEX CE Ex II 2G c b IIB T3

Dimensions & Weights

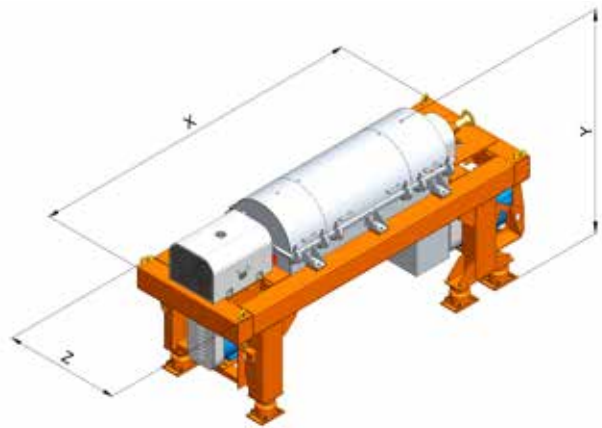
	X	Y	Z	Weight
CD-500 HV VFD:	155.4 in. (3,946 mm)	47.8 in. (1,215 mm)	79.5 in. (2,020 mm)	11,023 lbs (5,000 kg)
CD-500 HV FHD:	163.2 in. (4,146 mm)	90.2 in. (2,290 mm)	87.4 in. (2,220 mm)	14,330 lbs (6,500 kg)
CD-500 HV SL VFD	163.3 in. (4,149 mm)	76.1 in. (1,934 mm)	48.4 in. (1,230 mm)	11,023 lbs (5,000 kg)
CD-500 HV SL FHD [Centrifuge Module]	157.9 in. (4,010 mm)	76.3 in. (1,937 mm)	47.6 in. (1,210 mm)	10,417 lbs (4,725 kg)
CD-500 HV SL FHD [Hydraulic Module]	129.9 in. (3,300 mm)	90.2 in. (2,290 mm)	68.5 in. (1,740 mm)	6,989 lbs (3,170 kg)
VFD Control Panel [ATEX]	41.3 in. (1,050 mm)	98.4 in. (2,500 mm)	82.7 in. (2,100 mm)	3,527 lbs (1,600 kg)
VFD Control Panel [UL]	48.0 in. (1,219 mm)	90.0 in. (2,286 mm)	102.0 in. (2,591 mm)	2,640 lbs (1,198 kg)



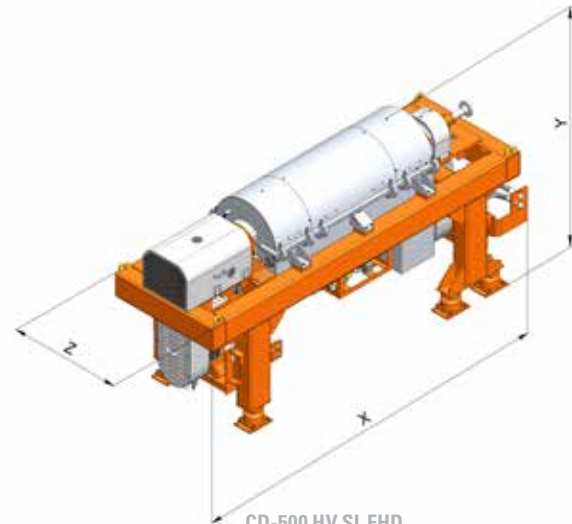
CD-500 HV VFD



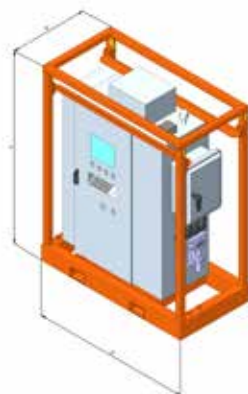
CD-500 HV FHD



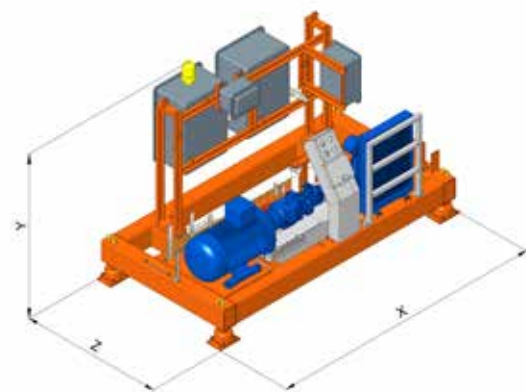
CD-500 HV SL VFD



CD-500 HV SL FHD
[Centrifuge Module]



VFD Control Panel



CD-500 HV SL FHD
[Hydraulic Module]

518 High-Volume (HV) Centrifuge

The 518 HV centrifuge replaces the operation of two standard 518 centrifuges in a single unit through an increased fluid handling capacity and improved solids separation. The 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.

Increasing the available power for the main (50 Hp) and back (15 Hp) drive allows more fluid to be fed into the bowl while providing the necessary torque to remove an increased solids load from the higher feed rate. The unit also has an improved fluid accelerator to reduce turbulence and bring both the magnitude and direction of fluid velocity up to the bowl rotating speed and direction as quickly as possible. Accordingly, the 518 HV centrifuge reduces the energy consumed for fluid acceleration and reserves more energy for solids conveyance.

Features

- Operational
 - Quasi-Axial scroll
 - Tungsten carbide tiles (scroll)
 - High bowl speed
 - Variable bowl and scroll speed¹
 - Fixed bowl and differential speed²
 - Variable feed pump speed
 - Split pillow blocks
 - Stainless steel rotating assembly
 - Perfectly balanced rotating assembly
 - Programmable Logic Controller (PLC) control¹
- Safety
 - Vibration sensor
 - Torque limiter
 - Micro switches on vessel and guards
 - Bearing temperature sensors
 - Pressure sensors³
 - Hydraulic oil temperature sensor³
 - Speed sensors³

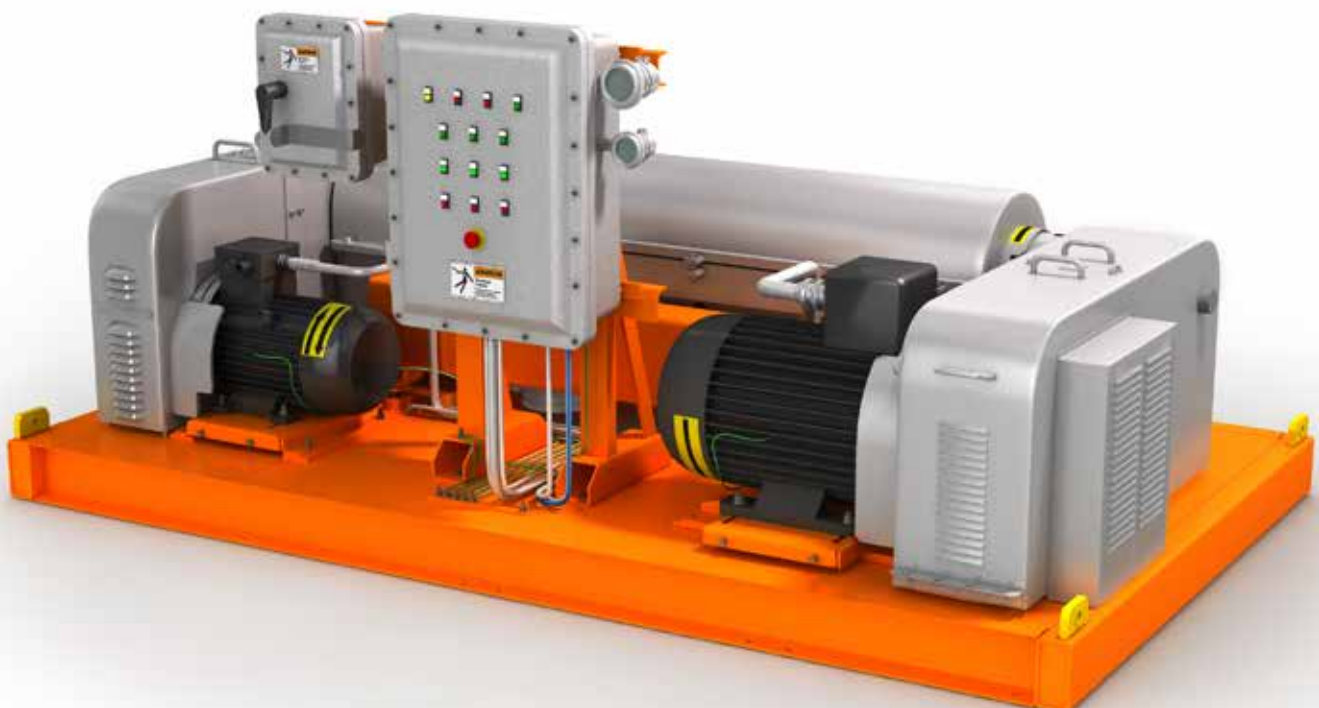
1. Not applicable to Fixed Drive

2. Only applicable to Fixed Drive

3. Only on Fully Hydraulic Drive types

Benefits

- Quasi-Axial scroll provides an increased flow area that minimizes turbulence
- Increased flights wear resistance reduces maintenance requirements
- High bowl speed assures a high G-Force, solids removal efficiency percentage and finest cut points.
- Complete control of G-Force and differential settings for improved separation efficiency
- Six bowl speed/differential combinations on fixed-drive units for enhanced simplicity and efficiency
- Split pillow blocks for increased protection against contamination, extended material life and easier maintenance
- Highly corrosion resistant
- Minimal vibration and noise emissions
- PLC provides continuous monitoring and automatic shut-down



Field proven performance

Colombia: One 518 HV centrifuge does job of two

The Situation

The highly reactive clays inherent to wells drilled in the Llanos Orientales basin generate low-gravity solids (LGS), requiring high rates of dilution and increasing drilling fluid costs appreciably.

The Solution

M-I SWACO proposed the operator use its new generation 518 HV centrifuge, which is designed to increase processing capacity and improve solids separation. The unit is specifically designed to handle higher mud processing rates at finer cut points.

To evaluate its effectiveness, a head-to-head field trial was conducted with one 518 HV centrifuge installed and its performance compared to two standard 518 centrifuges on offset wells under identical conditions.

The Results

The 518 HV centrifuge delivered higher processing capacity than the two standard 518 centrifuges combined and with improved solids separation. The single 518 HV centrifuge processed the 9.4 lb/gal (1.1 sg) water-based mud at a rate of 170 gpm, compared to the cumulative 140 gpm of the two standard units at the same 2500-rpm bowl speed. Both the solids removal efficiency and cut point improved considerably, despite the 100% increase in the processing rate.



Technical specifications for the 518 HV Centrifuge

Specifications

All dimensions are expressed in inches (millimeters).

Performance

- Hydraulic Capacity: 248 GPM (939 LPM)
- Operating Speed: 3,200 rpm
- G-Force: 1,975 G
- Sigma Value: 24,326 ft² (2,260 m²)
- Solids Discharge: 27 GPM (6.1 m³/h)

Rotating Assembly

- Bowl Diameter: 13.9 in. (353.1 mm)
- Bowl Length: 57.5 in. (1,461.1 mm)
- Pond Depth: 2.3, 2.42, 2.54 in. (58.5, 61.5, 64.5 mm)
- Scroll Type: Single Lead Quasi Axial Flow
- Scroll Pitch: 4.31 in. (109.5 mm)
- Main Bearings: Grease Lubricated
- Internal Bearings: Grease Lubricated
- Feed Tube: Open Ended

Rotating Assembly Material

- Bowl: Stainless Steel Duplex A890
- Scroll: Stainless Steel Duplex A890 AISI 304
- Scroll Flights: Tiles; Tungsten Carbide
- Discharge Bushings: Tungsten Carbide

Gearbox

- Type: Planetary
- Gear Ratio: 57:1
- Torque, maximum: 2,531 ft-lb (3,432 Nm)
- Differential Range:
 - Fixed Drive: 10 to 79 rpm
 - VFD: 1 to 55 rpm
 - FHD: 1 to 80 rpm
- Weight: 159 lbs (72 kg)

Nozzle Schedule

- Liquid Discharge: 8 in. Victaulic
- Solids Discharge: 21.0 x 13.8 in. (530 x 350 mm)
- Feed Tube: 2 in. NPT [Male Connection]

Fixed Drive Type

- Power: 400/460 V - 50/60 Hz, 3 Phase
- Main Drive Motor: 50 Hp (37 kW)
- Back Drive Motor: 15 Hp (11 kW)

VFD Type

- Power: 400/460 V - 50/60 Hz, 3 Phase
- Main Drive Motor: 50 Hp (37 kW)
- Back Drive Motor: 15 Hp (11 kW)

FHD Type

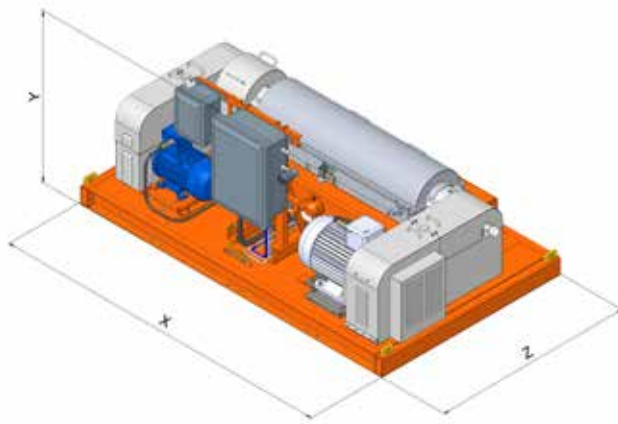
- Power: 400/460 V - 50/60 Hz, 3 Phase
- Main Drive Motor: 60 Hp (45 kW)
- Hydraulic Pump: Variable Displacement Pump

Certification

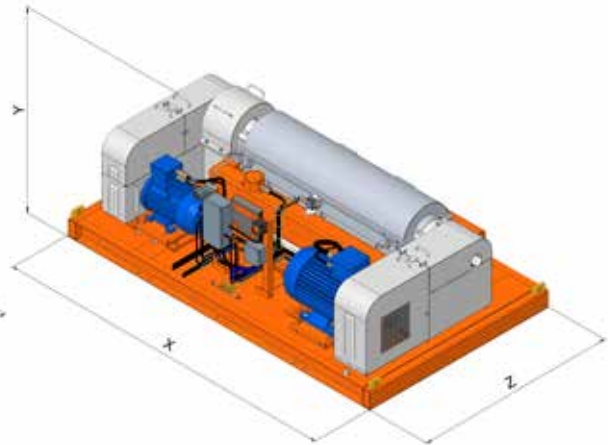
- 518 HV (Fixed Drive): ATEX CE Ex II 2G c IIB T3 or Class I, Division 1 hazardous areas for USA and Canada
- 518 HV VFD: ATEX CE Ex II 2G c IIB T3 or Class I, Division 1 hazardous areas for USA and Canada
- 518 HV FHD: ATEX CE Ex II 2G c b IIB T3
- 518 HV SL VFD: ATEX CE Ex II 2G c IIB T3 or Class I, Division 1 hazardous areas for USA and Canada
- 518 HV SL FHD: ATEX CE Ex II 2G c b IIB T3

Dimensions & Weights

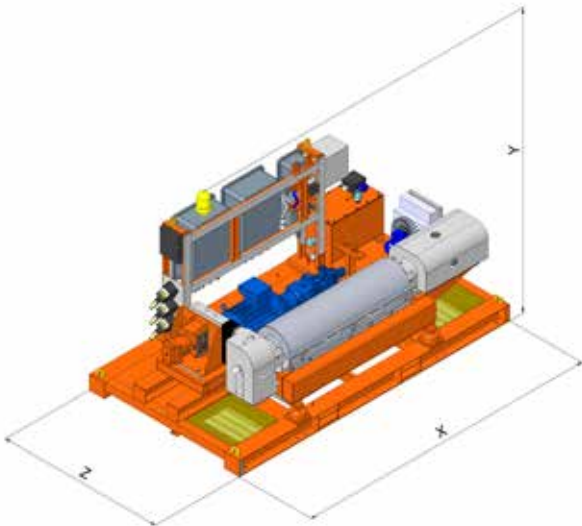
	X	Y	Z	Weight
518 HV (Fixed Drive)	119.0 in. (3,023 mm)	53.3 in. (1,353 mm)	70.0 in. (1,778 mm)	6,173 lbs (2,800 kg)
518 HV VFD	119.0 in. (3,023 mm)	34.9 in. (887 mm)	70.0 in. (1,778 mm)	5,291 lbs (2,400 kg)
518 HV FHD	142.0 in. (3,608 mm)	70.1 in. (1,780 mm)	78.7 in. (2,000 mm)	10,141 lbs (4,600 kg)
518 HV SL VFD	132.6 in. (3,368 mm)	65.9 in. (1,674 mm)	39.4 in. (1,000 mm)	5,855 lbs (2,656 kg)



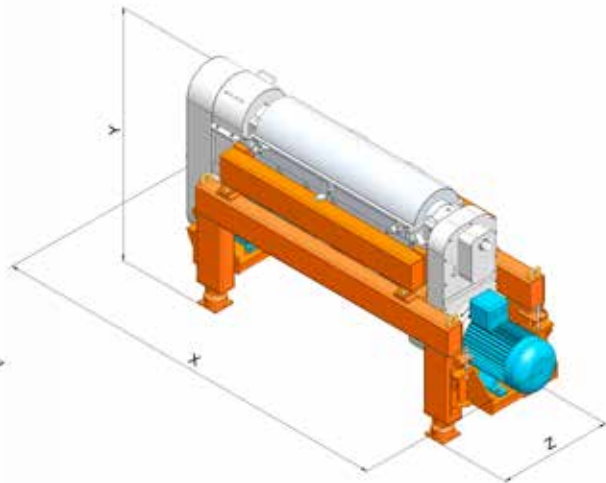
518 HV (Fixed Drive)



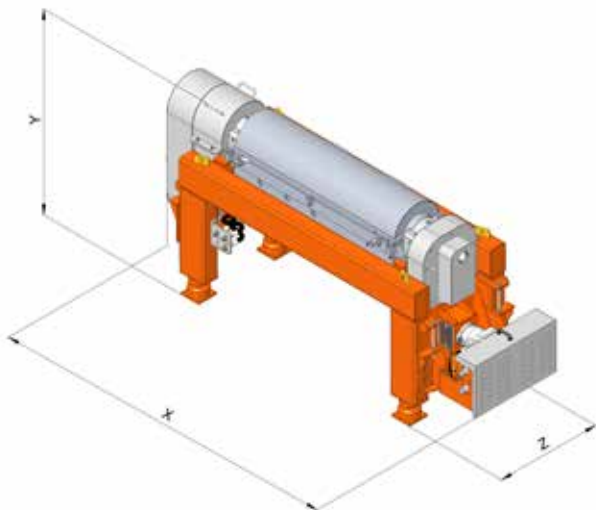
518 HV VFD



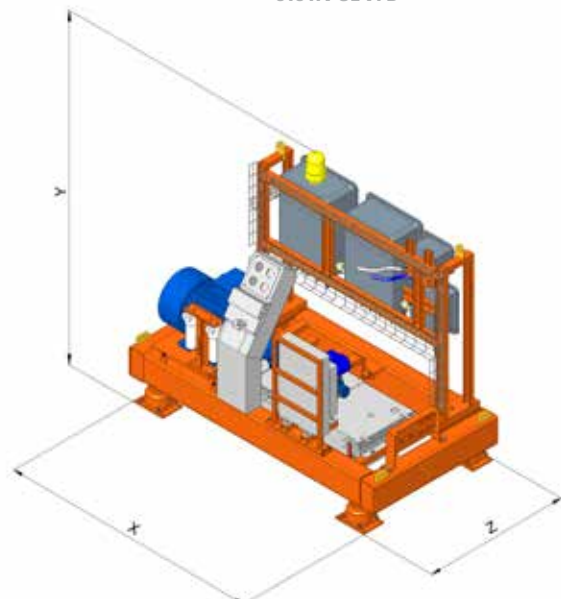
518 HV FHD



518 HV SL VFD



518 HV SL FHD
[Centrifuge Module]



518 HV SL FHD
[Hydraulic Module]

Enhanced centrifugation enables the RHE-USE system to raise the bar in drilling efficiency

Chemical-mechanical process to remove LGS, reuse OBM

Typically, reducing the build-up of ultra-fine, low-gravity solids (LGS) to allow for the reuse of premium oil-based drilling fluids over multiple wells required dual centrifuges and high rates of dilution. With the RHE-USE non-aqueous fluid-processing system, M-I SWACO developed a process that uses a single and readily available CD-500 centrifuge to treat invert emulsion

drilling fluids, reducing solids below 1% while drilling, and delivering relatively dry cuttings.

The RHE-USE system employs staged centrifugation with chemically-enhanced treatment that renders both LGS and drill solids manageable. Unlike conventional mechanical separation that is unable to extract LGS from an oil-base drilling fluid, the RHE-USE fluid-processing system has been field-proven to return the fluid to the

loop at the same weight as the original mud system. The spent fluid is run through the CD-500 centrifuge where the specially engineered chemical package comprising dual surfactants and a polymer in a water-based carrier is added to further remove the LGS and return clean fluid to the active mud system. By consistently delivering a clean fluid system, the RHE-USE system improves drilling efficiency while reducing both mud costs and your waste volume.

RHE-USE system proves itself in the field

Haynesville Shale: RHE-USE fluid-processing system saves operator an estimated \$163,282

The Situation

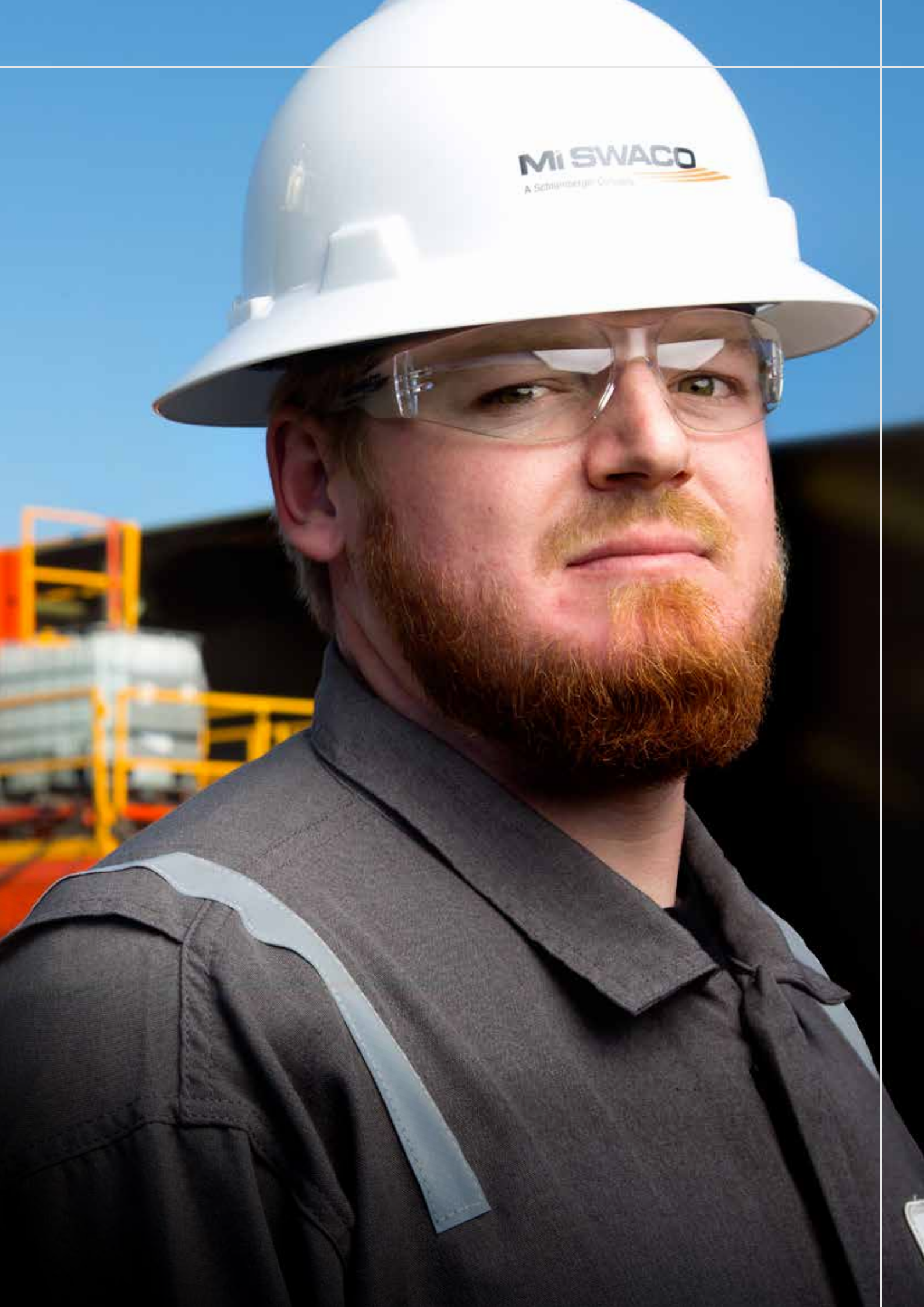
The operator was prepared to drill a well in Caddo, LA where low-gravity solids (LGS) previously had presented a host of costly problems. In offset wells, the operator had to contend with the enormous costs and potential environmental liabilities associated with hauling large volumes of contaminated cuttings to distant disposal sites. In addition, the inability to remove LGS restricted drilling performance, further increasing well construction costs.

The Solution

M-I SWACO recommended the operator employ the new-generation RHE-USE fluid-processing system to completely remove LGS to enhance drilling efficiency and reduce disposal costs. The technology had consistently demonstrated its capacity to optimize drilling while delivering cuttings suitable for onsite disposal. The RHE-USE fluid-processing system was accepted for use in a 5,049-ft (1,539-m) interval from 10,768 to 15,817-ft TD (3,282-4,821-m).

The Results

By using the RHE-USE fluid-processing system, the operator saved an estimated \$163,282, including the recovery of 1,045 bbl of reusable oil-base drilling fluid through the use of dual MEERKAT¹ shale shakers. Total dilution amounted to 537 bbl of diesel, water and barite. In comparison, at the 100% dilution rate previously required, up to 18,517 bbl would have been consumed to maintain 2.9% LGS. In addition, the 5,049-ft interval was drilled in 12 days with generated hole volume of approximately 275.2 bbl based on a 6¾ -in. bit and 10% washout. Removing the bulk of the LGS concentration also reduced friction appreciably, thereby lowering downhole mud temperature by 20 to 30°. Less abrasion likewise allowed the downhole motor and bit to drill longer without tripping for maintenance.



MI SWACO

A Schlumberger Company





The OPTM-IZER system is a closed-loop solids control system in a mobile unit

Portable, on-demand closed-loop solids control system

The ultra-mobile OPTM-IZER closed-loop solids control system gives onshore operators a fast, self-contained and when-needed solution for specialized operations, such as barite recovery and dewatering. Whether used as a standalone system or to supplement existing shakers, the uniquely engineered, highly efficient and inherently flexible OPTM-IZER system can be mobilized, rigged up and ready for operation within two hours. Engineered with three processing modes, the automated OPTM-IZER system can be quickly programmed for the targeted application, including the specific solids control requirements of high-volume drilling rates, dewatering or barite recovery.

The OPTM-IZER system increases drilling rates, while enhancing solids removal efficiency to reduce dilution and waste volume, which in turn, translate to lower disposal costs and fewer environmental issues. In addition, the incorporation of fully variable-speed centrifuge technology lowers the percentage of liquid on cuttings, further reducing both the volume of waste generated and costs.

As the OPTM-IZER solids control system arrives on location in a portable, compact package, it gives you the flexibility to put it to work only when you need it, without the costs and space limitations of a permanent, and often inactive, specialized solids control system. In addition, the unique solids control system can be customized to meet customer-specific objectives, as well as distinct site-specific operational issues.

OPTM-IZER system proves itself in the field

Douglas, WY: OPTM-IZER solids control system performance and reliability reduces days on well

The Situation

An M-I SWACO competitor was having difficulty providing high-quality equipment and maintaining the drilling fluid properties required for the horizontal drilling program. Further, the production interval was a porous sandstone with bentonite stringers that created a high potential for lost circulation. The operator also expressed a desire to reduce rig-up time, achieve a minimal equipment footprint, obtain high-capacity dewatering capabilities when needed, and utilize conventional centrifugation for the entire well.

The Solution

The skid-mounted OPTM-IZER solids control system with a drying shaker package was mobilized at the client's location for a trial. The key criteria for the client were reliability, performance and cost savings.

The Results

The OPTM-IZER system performed flawlessly, achieving these results and exceeding the client's expectations.

- No measurable downtime
- The active mud system was maintained below 9.0 lb/gal while drilling the entire well
- Maintained the proper drilling fluid density
- Rigging up of solids control went from 10-12 hours with the competitor to 1-2 hours with OPTM-IZER system with no crane-lifts required
- Reduction of two loads per rig move

ONLINE RESOURCES

Solids Control

www.miswaco.com/solidscontrol

Centrifuges

www.miswaco.com/centrifuges



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