Manufacturer:

- Horizontal Directinal Drills
- Mud Rotary Drills:
  - Water Wells
  - Geothermal
- Auger Vertical Drills:
  - Geology
  - Geotechnics
  - SPT
- Auger Boring Machines
- Mud Mixing Systems
- Mud Recycling Systems
- High Pressure Piston Pumps
- HDD Mud Motors
- Geothermal Mud Motors
- Gas & Oil Mud Motors
- Tri Cone & Drag Bits
- HDD Fluted Reamers
- HDD Rock Reamers
- DTH Hammers & Bits
- Jet Grouting Pumps
- Hydraulic Power Packs
- General Purpose Pumps
- Sand Slurry Pumps
- Bentonite & Polymers
- Butt Fusion Machines
- Bursting HDD Systems
- Bursting Hydrostatic Systems
- Bursting Cable Systems

Distributor:

- Guided Boring Machines
- HDD American Drills
- HDD Drill Pipes
- HDD Guidance Systems

MARPOL HDD DRILLS – European Manufacturer since 1996

As a former dealer of Vermeer Manufacturing Inc. MARPOL has 30 years of experience in sales, training and technical service of horizontal directional drills. Based on that experience the first prototype of drilling machine was developed in 2003.

Horizontal directional drilling (HDD) was pioneered in the United States in the early 1970s by an innovative road boring contractor who successfully completed a 183 m (600 ft) river crossing using a modified rod pushing tool with no steering capability (DCCA 1994). By integrating existing technology from the oil well drilling industry and modern surveying and steering techniques, today's directional drilling methods have become the preferred approach for installing utility lines, ranging from large-size pipeline river crossings to small-diameter cable conduits.

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MARPOL HDD drills belong to the small-diameter and medium-diameter group and includes three major models with a pulling force in the range from 150 kN to 180 kN. Although there is no significant difference in the operation mechanisms among these systems, the different application ranges often require corresponding modification to the system configuration and capacities, mode of spoil removal, and directional control methods to achieve optimal cost-efficiency.

Directional drilling methods utilize steerable soil drilling systems to install both small- and large-diameter lines. In most cases, HDD is a two-stage process. Stage 1 involves drilling a pilot hole approximately 25 to 125 mm (1 to 5 in) in diameter along the proposed design centerline. In stage 2, the pilot hole is enlarged to the desired diameter to accommodate the pipeline. The pilot hole is drilled with a surface-launched rig with an inclined carriage, typically adjusted at an angle of 8 to 18 degrees with the ground for entrance and 8 to 12 degrees for exit angle (Miller the Driller 2002). The preferred minimum radius in feet for steel pipe is typically 100 times the diameter of pipe in inch. For plastic pipe, the multiplication factor is 40, i.e., 40 times of diameter of pipe in inch. Most systems adopt either fluid-assisted drilling or a high pressure fluid jetting method to create or enlarge the bore hole. In a few instances, some mini-HDD systems utilize dry bore systems (with compressed air) in hard, dry soils and calcified or soft rock formations.

The progress of the pilot hole is monitored by a specially designed surveying system, either a walkover system or an electromagnetic down-hole navigational system. In a walkover system, the drill head is equipped with a sonde (also called a beacon) transmitter behind the drill bit. The sonde is powered by battery and emits signals continuously. These signals can be picked up on the ground with a hand-held receiver. The receiver provides data on the position, temperature, depth, and orientation of the drill bit. An alternative detection system, the electromagnetic down-hole navigational system can be used in conjunction with a series of four electrical cables positioned directly above the desired path and secured in place. The cables, which can be laid directly on top of the street or highway, do not interfere with traffic flow. The cables transmit an electromagnetic signal that is picked up the navigational instruments in the drill head. These instruments determine the position of the drill head relative to the center of the cables and relay this information continuously to a computer on the operator's console. In case of deviations from the desired path, the operator can make necessary adjustments. After the drill head (or pilot string and washover pipe) exits at the desired location, reaming devices are attached for the pullback operation. This stage involves enlarging the pilot hole to the desired diameter to accommodate the pipeline. The utility pipe is attached to the reamer, with a swivel to ensure that the rotation (torque) applied to the reamer is not transmitted to the utility. The reamer enlarges the bore hole to the required size, and the utility is installed. For large diameter (greater than 500 mm (20 in.)), an intermediate prereaming may be required before pulling the utility into place. Prior to the pullback operation, the pipeline is usually assembled to its full length and tested.

The drilling process in HDD can be described as follows:

1. Site preparation

The construction site is prepared before the main drilling operation. A drilling rig is set up at the proper location. Slurry is prepared to stabilize the borehole and to lubricate the surface of borehole. A transmitter is inserted into the housing provided on the pilot drilling string near the drill bit. Other equipment and facilities such as generators, pumps, storages, and offices are prepared at this stage.

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2. Pilot hole drilling

Drilling the pilot hole can be the most important phase of a HDD project, because it determines the ultimate position of the installed pipe. A small diameter (25 to 125 mm (1 to 5 in.)) drilling string penetrates the ground at the prescribed entry point at a predetermined angle routinely between 8 – 18 degrees. The drilling continues under and across the obstacle along a design profile.

3. Prereaming

In general, the final size of the bore should be at least 50% larger than the outside diameter of the product pipe. This overcut is necessary to allow for an annular void for the return of drilling fluids and spoils and to allow for the bend radius of the pipeline. To create a hole that accommodates the required size of pipe, prereaming is necessary. Typically, the reamer is attached to the drill string at the pipe side and pulled back into the pilot hole. Large quantities of slurry are pumped into the hole to maintain the borehole and to flush out the soil cuttings (DCCA 1994). The type of reamer varies based on the soil type. A blade reamer is used for soft soils, a barrel reamer for mixed soils, and a rock reamer with tungsten carbide inserts is used for rock formations.

4. Pullback

Once the prereaming is completed, the pipe or conduit can be pulled back into the reamed hole filled with drilling fluid. The pipe is prefabricated and tested at the pipe side. If the pipe is made of steel, it is recommended that the pipe be placed on rollers to reduce the friction and to protect pipe coating. However, this operation is usually not required for High Density Polyethylene (HDPE) pipe installation. The drill pipe is connected to the product pipe using a pull head or pulling eye and a swivel. The swivel is a device used to prevent the rotation of the pipeline during pullback. A reamer is also located between the pull head and the drill string to ensure that the hole remains open and to allow lubricating fluid to be pumped into the hole during the pullback. The pullback operation will continue until the pipe or conduit surface at the drill rig. The pull head is disconnected, the drill rig removed, and clean-up and tie-ins are started. For small diameter pipes, the prereaming process and pullback process can be performed at the same time.

Main Feature and Application Range

Diameter range

In maxi- and midi-HDD, the size of pipe installed can range from 75 mm (3 in.) to 1,200 mm (48 in.) in diameter. Multiple lines can be installed in a single pull, but only in the case of small-diameter pipes. The installation procedure for multiple lines is the same as for single lines, with the bundle being pulled back as a single unit along the prereamed profile. A significant multiple line crossing is more than 600 m (2,000 ft) in bore length and consists of five separate lines, pulled as one, ranging in size from 150 mm (6 in.) to 400 mm (16 in.). The largest pipe that can be installed by the mini-HDD system is 300 mm (12 in.) in diameter.

Depth of installation

Mini-HDD can install pipes up to 4.5 m (15 ft) in depth. This depth limitation comes from the restriction in the capacity of walkover tracking system. However, for the larger machines, such as midi- and maxi-HDD, the maximum installation depth for HDD is 61 m (200 ft).

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Drive length

The length of bore in HDD is determined by the type of soil and site conditions. Depending on the size of the machines bore spans can range from 100 m (400 ft) to 1,800 m (6,000 ft) for maxi- and midi-HDD. However, small lengths are not economically feasible because of the high operational costs of these systems. Mini-HDD is capable of installing pipelines and utilities 200-300 m (600 ft) in one continuous pass to a specified tolerance.

Type of pipe

In general, the pipe to be installed is limited to one that can be joined together continuously, while maintaining sufficient strength to resist the high tensile stresses imposed during the pullback operation. In maxi- and midi-HDD, steel pipe is the most common type of casing used. However, butt-fused, high-density polyethylene pipe (HDPE) also can be used. HDPE pipe, small-diameter steel pipe, copper service lines, and flexible cables are some of the common types of pipe materials being used today in mini-HDD.

Required working space

The directional drilling process is a surface-launched method; therefore, it usually does not require access pits or exit pits. If utility installation is being undertaken, pits may be required to make connections with the existing utility. The rig working area should be reasonably level, firm, and suitable for movement of the rig. For maxi- and midi-HDD, an area of 120 m (400 ft) b y 60 m (200 ft) is considered adequate. The equipment used in mini-HDD is portable, self-contained, and designed to work in congested areas.

Soil condition

Clay is considered ideal for HDD methods. Cohesionless fine sand and silt generally behave in a fluid manner and stay suspended in the drill fluid for a sufficient amount of time; therefore, they are also suitable for HDD. High-pressure fluid drilling systems (mini-HDD and midi-HDD) normally do not damage on-line existing utilities and thus are safe for subsurface-congested urban areas. Fluid cutting systems, which are most suitable in soft soil conditions, have been used widely in sand and clay formations. Although small gravel and soft rock formations can be accommodated by higher fluid pressure and more powerful jets, steering accuracy might suffer. Generally, mechanical drilling systems (mini-HDD) can be applied in a wider range of soil conditions than fluid jetting methods. A pilot hole can be drilled through soil particles ranging from sand or clay to gravel, and even in continuous rock formations, by using suitable drill heads; however, problems might occur in spoil removal, pilot hole stabilization, and backreaming operations. Today's technology enables large drilling operations to be conducted in soil formations consisting of up to 50 percent gravel.

Productivity

HDD systems have the highest pilot hole boring rate of advancement among all trenchless methods for new installations. For mini-HDD rigs, a three-person crew is sufficient. In suitable ground conditions, a pipeline as long as 180 m (600 ft) can be installed in 1 day by a regular work crew.

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Visualization of drilling process

(pilot hole drilling, prereaming, pipe pullback)

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MARPOL-D35x50™

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MARPOL-D40x60™

MARPOL-D40x65™ II Series

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UNIVERSAL Inc. HDD Drills imported from USA

UNIVERSAL 12x15-L in Marpol stock (December 2016)

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Used HDD drills imported from US market

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Mud mixing systems manufactured by Marpol

Complete drilling set MARPOL-D35x50™

1. Drilling unit MARPOL-D35x50™ including drill pipes and mud pump on board.

2. Mud mixing system SP-PW-ZGW-3000 including 15 m hose.

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3. A set of HDD drilling tools (available in two different standards - value teeth and deluxe shark reamers):

Examples of fluted value teeth and deluxe shark reamers manufactured by Marpol

New deluxe shark fluted reamers from Marpol

Our new value shark fluted reamers can be connected directly into D24x40 FST-1 rod and if needed we can manufacture the same reamers that will connect directly to other drill rods like Vermeer D80x100 or Ditch-Witch drill rod.

We also run a good stock of American one-piece forged drill rods for the following machines: Vermeer D7x11, D6x6, D9x13, D16x20 (D18x20), D2022 (D24x26), D24x40, D36x50 (3 meters Firestick I) and Ditch-Witch JT 2020, JT 2720 Mach-1, JT-3020 Mach-1. Ask for the prices and order the drill pipe today and pick-up tomorrow!

Guidance and locating walk-over, cable and magnetic systems (examples)

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System lokalizacji magnetycznej TNS-200

System lokalizacji TNS-200 należy do rodziny systemów lokalizacji 2-giej generacji. Ustalenie położenia głowicy wiertniczej i wyznaczenie kierunku wiercenia (azymutu) nie wymaga czynności namierzania z powierzchni ziemi. Układem odniesienia jest naturalne pole magnetyczne Ziemi bądź sztuczne pole magnetyczne generowane w strefie przewiertu w sposób sztuczny. System TNS-200 wymaga użycia niemagnetycznej obudowy nadajnika. Firma MARPOL oferuje serwis kierunkowy oraz zapewnia dostawę wszystkich elementów niezbędnych do prawidłowego funkcjonowania systemu. Menu w języku angielskim a w przyszłości również w jezyku polskim. MARPOL jest jedynym dostawcą tej technologii w kraju.

Dane techniczne:

- Dokładność pomiaru azymutu około 0.1°,
- Dokładność pomiaru nachylenia w stosunku do płaszczyzny poziomej około 0.1°,
- Dokładność wyznaczenia pozycji nadajnika około 0.1°,
- Częstotliwość odczytu danych 800 ms,
- Zasilanie za pomocą kabla 220V-50Hz,
- Zakres pracy nadajnika od -20°C do 50°C.

Pulling heads (most beautiful pulling heads on the market)

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Mud cleaning systems manufactured by MARPOL since 1996

Mud cleaning system SOP-800 and MARPOL D45x60

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Hydraulic Power units and mud transfer pumps manufactured by MARPOL

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Drilling mud disposal vacuum pumping systems manufactured by Marpol

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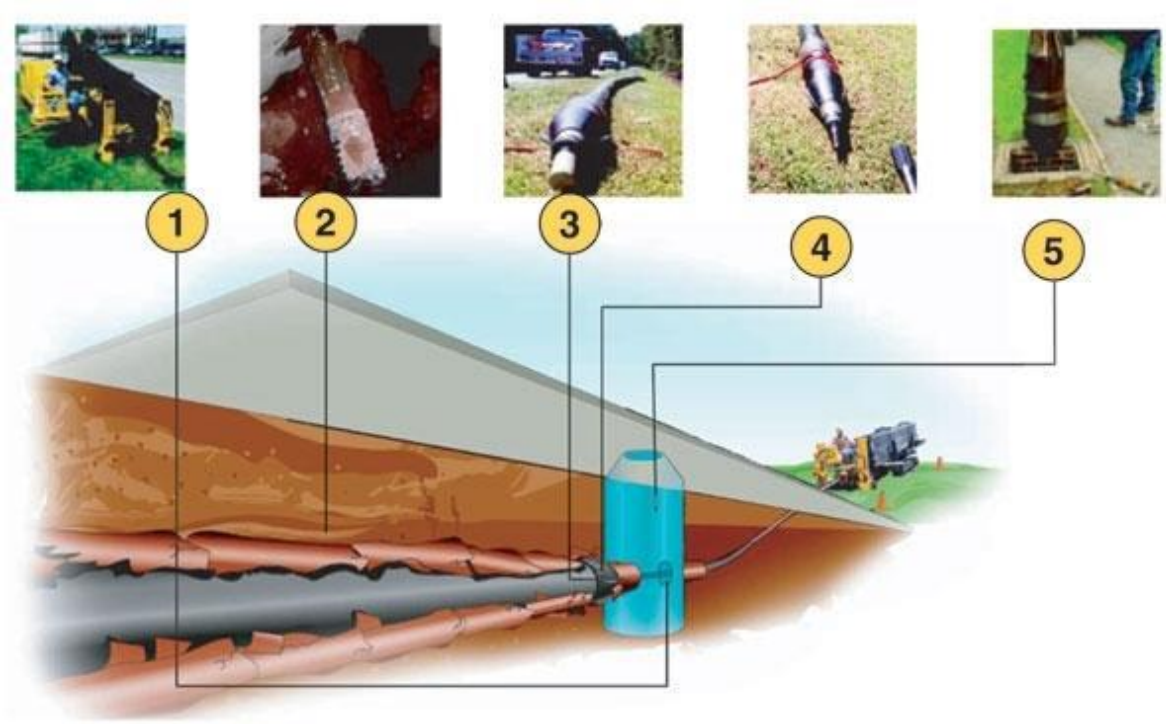
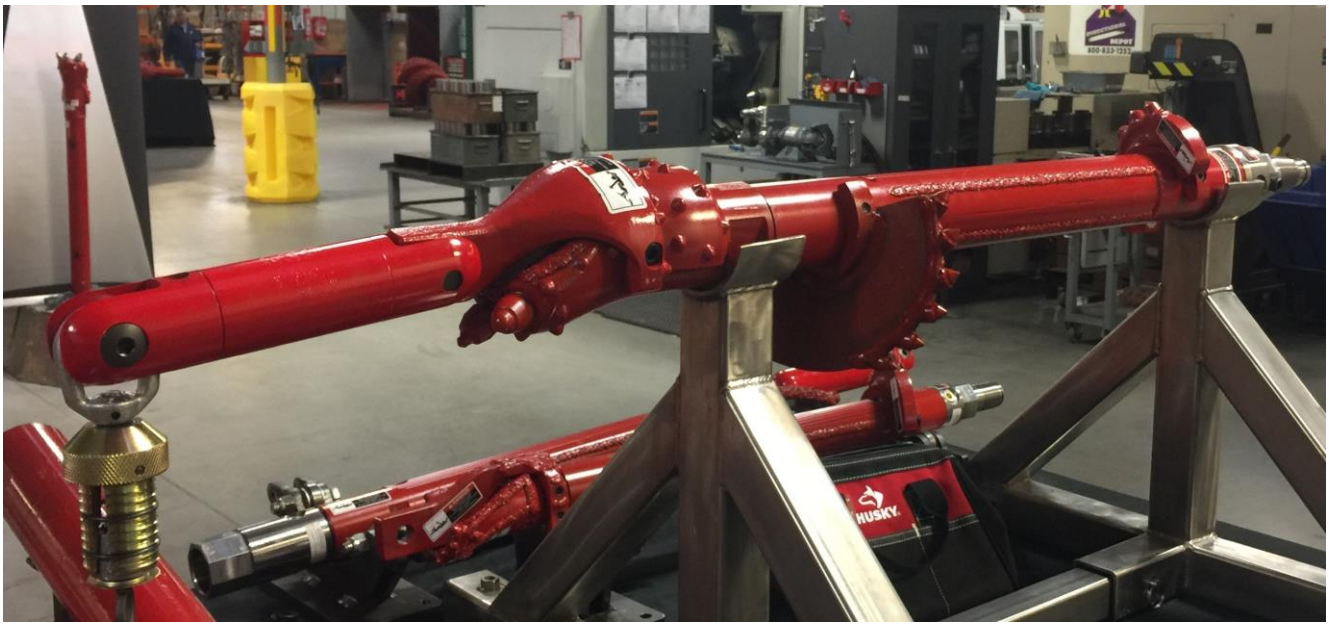
Old pipe displacement HDD bursting systems manufactured by MARPOL



MARPOL Pneumatic Rock Drilling Systems (PRDS Series)
(available for all models of HDD Marpol drills)

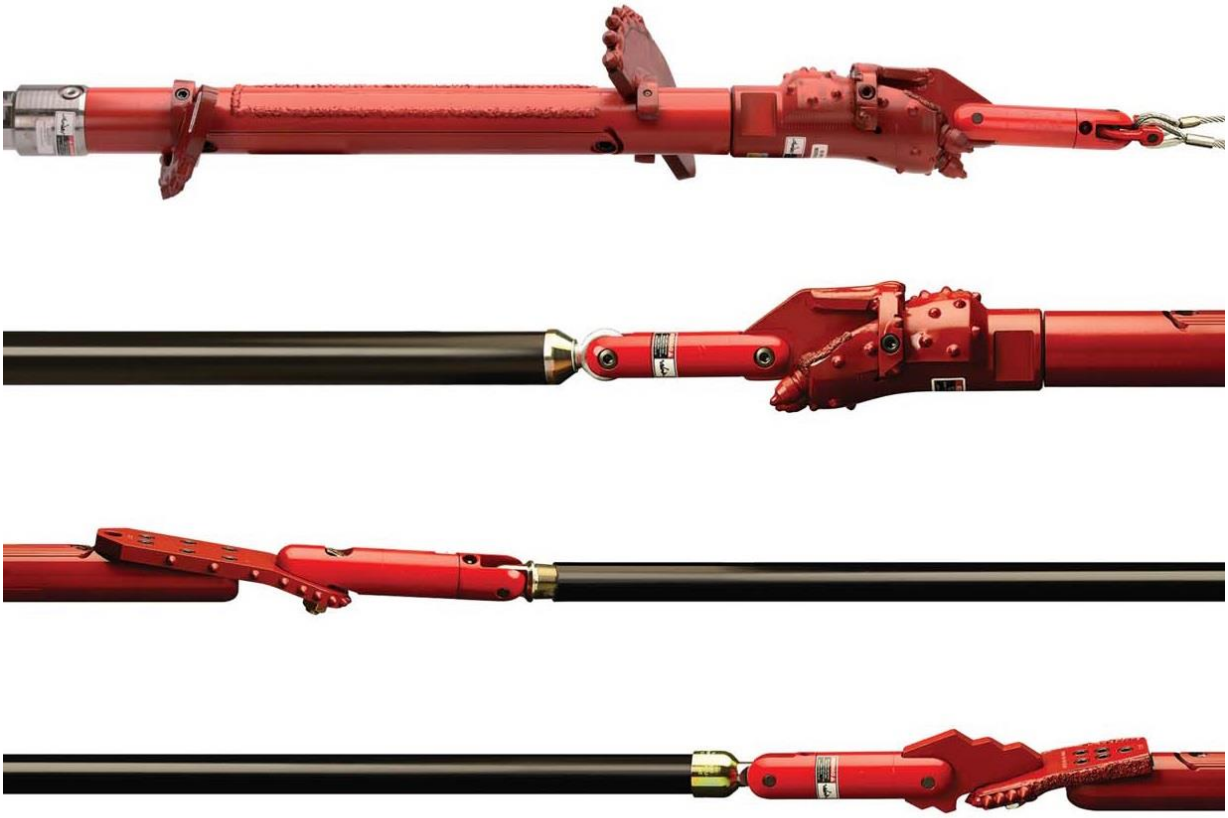
MARPOL Rock Drilling Mud Motor Systems (four models are available)

Advanced HDD Drill Head "PAZUR KRZYSZTOFA" for Compact Soil Conditions



Talerze skrawające pełniące funkcję rozwiertaka, obejma (tzw. przytulanka), krętlik i głowica ciągnąca nie wchodzą w zestaw te elementy są dostępne w opcji)

Pazur Krzysztofa i głowice wiertnicze standardowe – możliwości konfiguracyjne



Different HDD tools are manufactured by MARPOL Since 1996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•Agregaty prądotwórcze
•Kompresory powietrza


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•Kompresory powietrza
•Lokalizatory kabli i rur
•Georadary
•Minikoparki
•Koparko-ładowarki


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Example of HDD package (based on UNIVERSAL drill)

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Manufacturer:

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- Mud Rotary Drills:
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  - Geotechnics
  - SPT
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- Sand Slurry Pumps
- Bentonite & Polymers
- Butt Fusion Machines
- Bursting HDD Systems
- Bursting Hydrostatic Systems
- Bursting Cable Systems

Distributor:

- Guided Boring Machines
- HDD American Drills
- HDD Drill Pipes
- Vertical Drill Pipes
- Advanced HDD Tools

Marpol HPP Series High Pressure Mud Pump Systems

Marpol pump systems are manufactured per order to meet the required capacity. They are available as stand-alone high pressure pumps, diesel driven with choice between direct driven with clutch & gearbox, fully hydraulically or electrically driven.

Pump systems are available with several brands of Diesel engines (most popular are Cummins or John Deere engines) and if required electrical. All pumps systems are manufactured according to international standards and are designed for HDD drilling mud pumping applications. The systems can be modified to customer's individual requirements and needs.

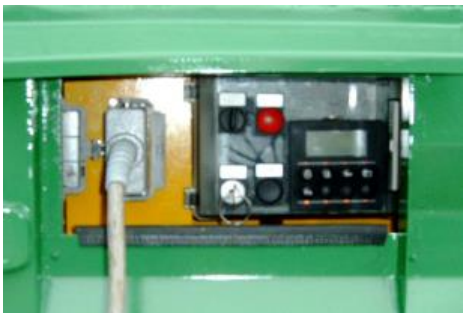
HPP-170D-1000 Pump System

This system can be partially or fully enclosed with sound attenuated engine area and air intake & discharge. Since each customer will require a certain flow capacity combined with pressure, these systems are always adapted to customer's needs. In fact if a 900, 1000 or 1100 system is required, we can build it. HPP-170D-1000 is specially developed for HDD drilling rigs in the range 40-80 tons of pulling force. The pump capacity is up to 1000 l/min. The pump unit consists of the two modules that are easy connected by spacer couplings.

As a driver we use 170 kW engine with 3 speed gearbox and a chain reduction is installed as well. The pump in HPP-170D-100 is a 5"" stroke triplex piston pump with 4" liners. It is equipped with a forced lubrication system and has a liner wash system. The capacity under a pressure 70 bar is minimum 150 l/min and maximum 1000 l/min.

Unit size: pump module dimensions 2.2 x 2.0 x 1.6 m and dry weight is 3000 kg, engine module 8 ft container 2.5 meters height with dry weight 3000 kg. Fuel tank is 350 liters.

Option. Remote unit for the pump speed, on/off basic engine information:



Summary: 8 ft container+ triplex+ diesel 170 kW+ gear box + chain box + piping + coupling + fuel tank + battery + exhaust + accessories.

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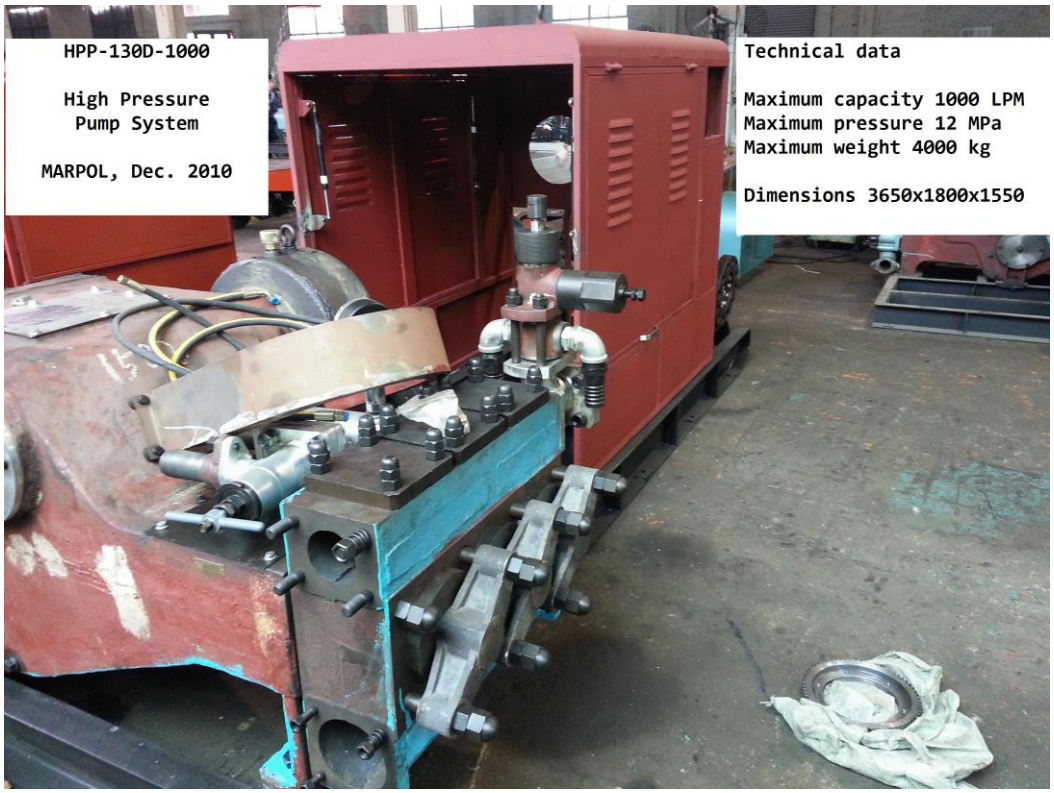
HPP-130D-1000 Pump System

This self contained high pressure system is a cheaper and more simple version of the previous one. It is built on the open steel skid as showed below:



HPP-130D-1000 under construction at Marpol Trenchless Technology Warsaw Poland

Optionally it can be partially or fully enclosed with sound attenuated engine area and air intake & discharge. The standard version does not include any sound protection. The color of the engine cover can be made according to the customer's order.

HPP-130D-1000 pump system is specially developed for HDD drilling rigs in the range 40-60 tons of pulling force. The pump capacity is up to 1000 l/min. The pump unit consists of the two modules that are connected each other into one system.

As a standard driver we use 130 kW USA REC Cummins engine mechanically controlled. The pump in HPP-170D-100 is a 6" stroke triplex piston pump with 5" liners. The capacity under a pressure 60 bar is maximum 1000 l/min and under a pressure 120 bar is minimum 150 l/min (six different working ranges are available).

Unit size: a complete system is mounted the steel skid with the following approximate dimensions 3650 x 1800 x 1550 mm and the total approximate weight is 4000 kg.

The extreme duty, extremely reliable, easy to operate and maintain, compact structure, high output pressure, simple design and lower price are the main advantages of this unit.

A brand new machine. Production time 3-4 months. Warranty 12 months.

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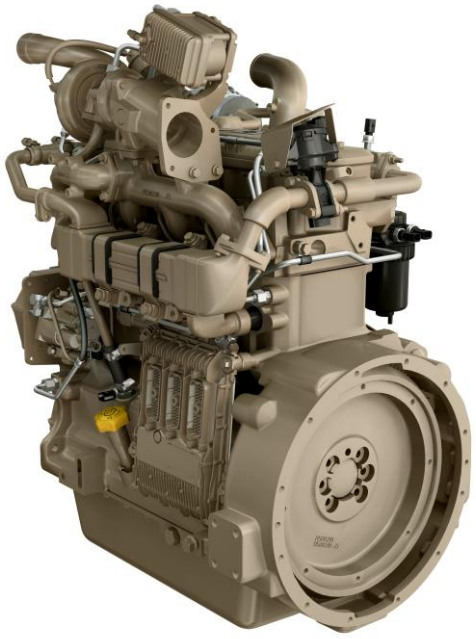
Option for HPP-130D-1000

John Deere diesel 4045HFC93 electronically controlled engine, 116 kW / 156 KM @ 2200 rev/min or 2400 rev/min. The engine is made by John Deere factory in France.



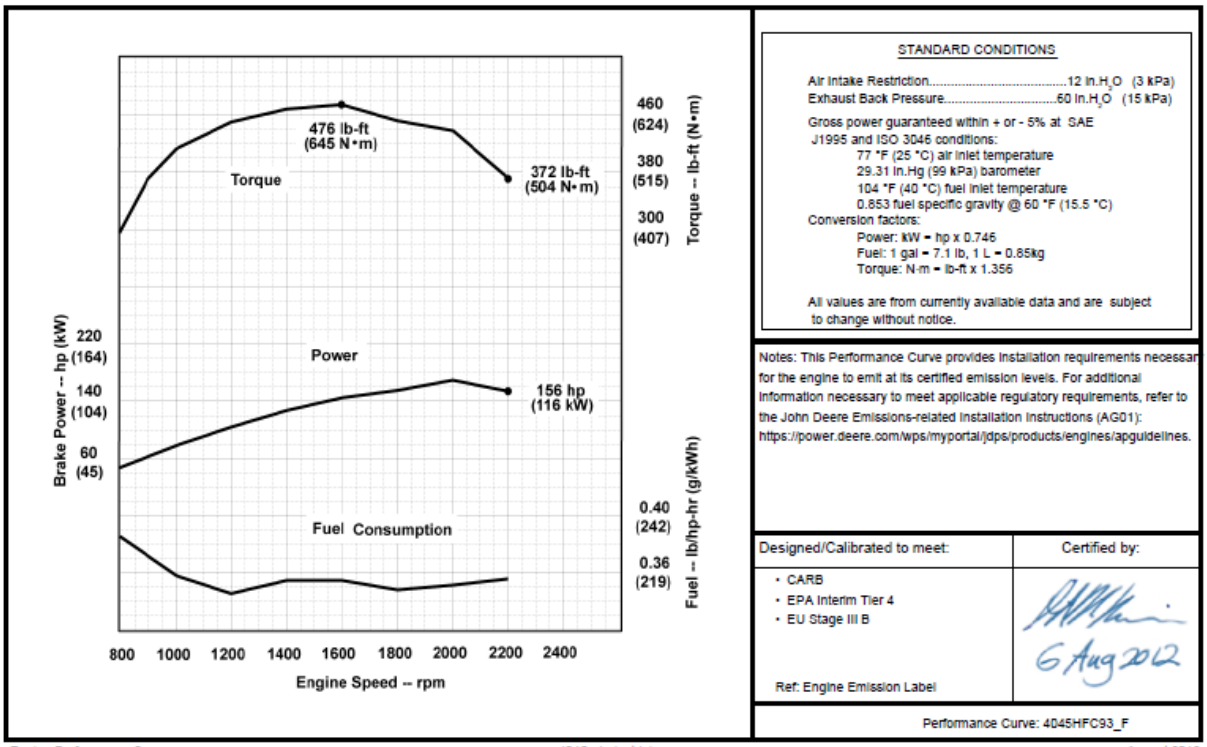
John Deere diesel 4045HFC93 engine 2016 model

JOHN DEERE

ENGINE PERFORMANCE CURVE

Rating: Gross Power
Application: Intermittent
Power Bulge - 7%
Torque Rise - 28%

PowerTech™ PVX 4.5L Engine
Model: 4045HFC93
156 hp @ 2200 rpm
116 kW @ 2200 rpm
[See Option Code Table]



STANDARD CONDITIONS

Air Intake Restriction.....12 in.H_2O (3 kPa)
Exhaust Back Pressure.....60 in.H_2O (15 kPa)

Gross power guaranteed within + or - 5% at SAE J1995 and ISO 3046 conditions:
77 °F (25 °C) air inlet temperature
29.31 in.Hg (99 kPa) barometer
104 °F (40 °C) fuel inlet temperature
0.853 fuel specific gravity @ 60 °F (15.5 °C)

Conversion factors:
Power: kW = hp x 0.746
Fuel: 1 gal = 7.1 lb, 1 L = 0.85kg
Torque: N·m = lb-ft x 1.356

All values are from currently available data and are subject to change without notice.

Notes: This Performance Curve provides installation requirements necessar for the engine to emit at its certified emission levels. For additional information necessary to meet applicable regulatory requirements, refer to the John Deere Emissions-related Installation Instructions (AG01): https://power.deere.com/wps/myportal/jdps/products/engines/apguidelines.

Designed/Calibrated to meet:	Certified by:
• CARB • EPA Interim Tier 4 • EU Stage III B Ref: Engine Emission Label	6 Aug 2012

Performance Curve: 4045HFC93_F

Engine Performance Curves | 4045 - Industrial | August 2012

New series of MARPOL butt fusion machines (from 160 to 1200 mm)
(all machines are manufactured by Marpol and can be equipped with a data logger)

Examples:

ODSM-400H

ODSM-250H

ODSM-160H

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All MARPOL butt fusion machines are data logger ready:

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MARPOL – your choice in HDD industry for reasonabile price

Technical service

Sales support

Trainings

HDD parts and accessories