Buyer’s Guide for Submersible Pumps
Hard Metal Slurry Pumps: The Key to Efficient Horizontal Directional Drilling

Horizontal Directional Drilling
Horizontal Directional Drilling (HDD) is a trenchless method of installing underground pipelines, cables, and more. Various industries use this method, including oil and gas drilling, telecommunications and mining. Pumps are important to this application as fluids and mud are key to the drilling process.

HDD includes pumping a bentonite slurry (a mixture of clay and water or oil) to lubricate the drill bit. This slurry reinforces and stabilizes the drill hole. The spent drilling mud gets pumped into a reserve storage pit or cellar underneath or beside the rig.

Many HDD project managers use mud cleaning machines to recycle the mud for reuse. The mud cleaners also need powerful pumps to move the mud throughout the system.

The mud in these extreme conditions contains abrasive slurry, solids, grit, and sand. You need durable, reliable pumps to stand up to these materials. A shorter pump lifespan means decreased production and higher repair costs. Submersible slurry pumps are often the most reliable option. Self-priming pumps take up a lot of space on rigs and engine pumps require extensive maintenance.

Why Are Your Pumps Failing?
To select the right submersible pump that stands up to your harsh HDD application, you need to understand what causes your pump to fail. Using the wrong pump leads to the following common problems:

1. **Wear**: Gritty liquids quickly erode cast iron pumps; while petroleum-based drillers mud can attack some rubber lined pumps.

2. **Clogs**: Pumps without agitators do not get the solids into suspension, thus, simply dewatering the slurry, not pumping the slurry.

3. **Motor Damage**: Some pumps use simple carbon/ceramic mechanical seals which fail quickly in abrasive applications, causing a motor burnout; however, pumps with double hard face seals, like silicon carbide/silicon carbide, last much longer in abrasive applications assuring longer life and less down time.

These issues result in thousands of dollars in lost productivity. Understanding the types of submersible pumps available helps you match the right pump to your specific application.

Finding Pumps that Perform
You need pumps engineered to handle the severe abrasive materials in the slurry. Hard metal pumps (such as high chrome iron) repel these materials offering greater durability so you don’t have replace parts as often.

Built-in hard metal agitators and impellers handle higher concentrations of abrasive solids. Agitators stir up solids to keep them from settling at the bottom where they can cause clogs.

You may also deal with specific environments that call for more specialized pumps. Explosion proof pumps are perfect for offshore rig projects that require explosion proof equipment. Hydraulic-driven pumps are available for applications with no electric power or for variable speed needs.

We’re the Industry Experts
BJM Pumps provides submersible slurry pumps with hard-metal construction for HDD applications. Our hard metal slurry pumps are the standard for cellar pumps. They are compact to fit under drilling rigs without requiring a suction line. Our hard metal impellers and agitators help extend the life of the pumps.

We have been in business since 1983, and our pumps have been servicing the directional drilling market for more than 10 years. We offer a comprehensive range of pump solutions for the most challenging drilling applications. We keep your production running and help drive your success. Our durable pumps help you get the project done without hassles while saving you repair costs.
Hardened ductile iron (300 Brinell)

Volute

28% chrome iron (600 Brinell, 57 Rockwell C) components

Wear plate

Impeller

Agitator

Pump performance is critical to the success of any horizontal directional drilling (HDD) job. These punishing environments wreak havoc on submersible pumps with acidic, abrasive, and sometimes even explosive, slurries. You need reliable and durable pumps built specifically to stand up to corrosion and wear. BJM Pumps provides submersible slurry pumps with hard metal construction to outlast typical cast iron and rubber-lined pump models. We build pumps to save you repair and replacement costs, to minimize downtime, and to keep your production running so you complete your projects on time.

The pumps you need, guaranteed.

BJM Pumps’ KZN Series Hard Metal Agitator Slurry Pumps

Abrasional-Resistant Hard Metal Components

Our hard metal components withstand the severe abrasives that are common with horizontal directional drilling.

Hardened ductile iron (300 Brinell)

Volute

28% chrome iron (600 Brinell, 57 Rockwell C) components

Wear plate

Impeller

Agitator

Chrome Iron Agitator
The built-in agitator keeps solids from settling at the bottom of the pit to prevent clogging.

Top Discharge Design
The top discharge design offers a number of benefits including the ability to remove liquids to within inches of the bottom, more durable portability when moving from one project to another, and a slim design to fit in tighter spaces than side discharge pumps.

Explosion Proof Models
HDD drilling applications sometimes involve pumping liquids or environments that are potentially explosive. Your safety is our highest priority. Our explosion proof slurry pumps are FM-approved to operate in Class I, Division 1, Groups C & D hazardous environments.

FM APPROVED
Durable Heavy Duty Slurry Pumps Better Handle Spent Drilling Mud

The Company

Hundreds of companies discover and develop onshore oil and natural gas fields every day. Thousands more drill deep into the earth to bring water to the surface for commercial, industrial and residential use. All of them need to cleanly and efficiently manage the spent drilling mud that is a necessary by-product of their work.

The Challenge

Drillers—whether producing oil, natural gas or water—use a fluid containing bentonite clay to lubricate drill bits as they cut boreholes through soil, sand and rock. The lubricant is pumped into the well, and as they drill, the used (“spent”) mud is circulated out of the borehole to a holding tank, cellar or open reserve pit near the well. The contents of the spent drilling mud depend on the drilled formation, the type of drilling and the compounds used in the well bore. It often consists of drilling water, mineral oil or diesel; accumulated storm and wash water; bentonite clay; weighting agents and other chemicals; and well cuttings like pulverized stone, sand, sediment, coral and other gritty substances. Spent drilling mud is a heavy slurry that is often left in the reserve pits for emergency reuse or to settle out and dry. After evaporation, the solids are encapsulated within synthetic liners in the reserve pits or carried away for treatment, disposal or recycling. According to the American Petroleum Institute, about 1.2 barrels of drilling waste is produced for every foot of well depth drilled. Under extremely tough conditions, the used drilling mud must be pumped into and out of the reserve pits.

The Solution

Until recently, drilling rig operators had typically used cast-iron wastewater submersible pumps, but with very high failure rates. Because of the weight and high solids content of the mud, pumps often ran dry or against closed discharges. Shafts and impeller bolts broke, impeller keyways loosened and seals failed. Many operators and drilling-equipment rental companies have replaced their wastewater pumps with KZN Heavy Duty Submersible Slurry Pumps from BJM Pumps. Because these are top-discharge pumps, the KZNs are more forgiving of low fluid-level conditions. They also have agitators to fluidize settled solids back into slurry for efficient pumping.

Because key components of the KZNs—including the impeller, wear plate and agitator—are made of high-chrome iron to withstand abrasion and the bearings are both tough and oversized, these pumps are performing better and lasting far longer than their standard wastewater predecessors in the harsh oil field environment. The Oklahoma site pictured uses a 7.5-horsepower KZN55 pump. It has run reliably 24 hours a day, seven days a week (for more than a month at a time)—even while running dry regularly. Of approximately 80 pumps that BJM sold through its Oklahoma distributor in 2007, very few have had problems, most requiring only replacement power cords, worn from constantly moving the pumps from one location to another.

Challenge:
Spent drilling mud is a heavy slurry that causes cast iron wastewater submersible pumps to fail frequently.

Solution:
Replace current pumps with BJM KZN heavy duty submersible slurry pumps.

Results:
The 7.5-horsepower KZN55 pumps run reliably 24 hours a day, seven days a week (for more than a month at a time) with very few problems.
Heavy Duty Slurry Pumps Make Light Work of Drilling Mud

The Company

West Texas Premix Pits (WTPP) is a Midland-based surface rental company that manufactures premix pits, trash pumps and safety showers to oil and gas drillers. WTPP’s clients needed an efficient solution for recirculating and reusing the drilling mud necessary for drilling new wells.

The Challenge

Fluids play an integral role in oil and gas exploration and production. It serves a number of functions:
- lubricating and cooling the drill bit to extend its life
- transporting rock fragments (cuttings) to the surface
- preventing the wellbore from caving in
- preventing oil or gas from entering the well before completion

The base of the drilling fluid, or mud, can be freshwater or saltwater (brine), or an oil- or synthetic-based liquid. The fluid and the additives used are determined by the composition of the rock into which they are drilling, as well as cost and environmental impact. They also may need to modify the mud as drilling progresses and underground environments change.

WTPP installs the reserve pits used during oil and gas exploration. The pits are one-acre ponds that hold two to ten feet of drilling fluid. To facilitate the fluid’s recycling and reuse, cuttings settle out in a reserve pit and the remaining liquid is pumped back to the wellbore.

Moving this liquid requires pumps that sit in six to eight inches of water on the opposite end of the pit from where the cuttings settle. “It helps the drilling rig pick up cleaner fluid because the pumps are taking fluid off the top,” said Danny Freeman, owner of WTPP. “As the stuff settles out they have cleaner drilling fluid, resulting in faster drilling.”

WTPP needed a supply of heavy duty pumps that could operate reliably under varying conditions without being completely submerged.

The Solution

Ian Walker of United Rental recommended BJM Pumps’ KZN series heavy duty submersible pump for the WTPP application. “We like BJM’s durability in the oil field,” Walker said. “These pumps handle solids better than most electric submersible pumps we’ve seen.” The KZN series pumps are rugged enough to provide reliable long-term operation in the harshest drilling environments due to:

Hard Metal Components for Optimum Wear Resistance
All wetted parts are constructed of abrasive resistant 28% chrome iron (600 Brinell, 71 Rockwell C) for maximum wear life. A hardened wear plate on the suction side prevents erosion that degrades pump performance.

Maximum Solids Handling Capability
An integral agitator fluidizes settled solids into a slurry to prevent clogging. The semi-open impeller handles abrasive solid concentrations as high as 70% by weight.

Conclusion

Due to the KZN pumps’ success, WTPP operates 11 pumps in various oil field installations across West Texas. “We’ve been very pleasantly surprised with their durability and reliability,” Freeman said. “They are a great pump so we stick with them.”
Horizontal Directional Drill Pumps

The contents that make up spent drillers’ mud used in horizontal directional driller (HDD) break down average pumps. BJM Pumps’ KZN Series slurry pumps are not average pumps. The pumps are constructed with hard metal components that stand up to the abrasive and corrosive materials they pump. We build them to last longer to save you repair and replacement costs.

KZN Series

Hard metal components make the KZN pumps the right pump for the most difficult HDD slurries you deal with every day. The top discharge design allows the KZN pumps to remove liquids to within inches of the bottom.

- 28% chrome iron agitator, wear plate and impeller for unsurpassed abrasion resistance
- Hardened ductile iron volute for twice the abrasion resistance of standard ductile iron
- Superior protection with Class H motor insulation with FLA and temperature overload protection
- Top discharge, slim line design for additional motor cooling

KZNR Series

Some slurry solids are so abrasive that pump service life depends on an extremely hardened casting. BJM Pumps’ KZNR Series pumps offer this level of casting through a proprietary process to stand up to extreme abrasiveness.

- Hardened ductile iron volute up to 71 Rockwell C (compared to Class 30 for the KZN pumps)
- Severe duty submersible slurry pumps that are unmatched in the industry

All pumps are tested at factory, both for performance as well as safety. (Specifications dependent on model & may change without notice.)
Alternative KZN Slurry Pump Options for Special Applications

Some HDD applications call for unique needs. BJM Pumps understand the issues you deal with and offers additional versions of the KZN Series pumps to make sure you have the pump you need, guaranteed.

Hydraulic Hard Metal KZN-HYD Series Slurry Pumps

Our KZN-HYD Series pumps are the hydraulic version of our popular KZN Series slurry pumps. Used where electric power is not available or for variable speed needs, the pumps are ideal for difficult applications.

• Intrinsically safe in hazardous environments
• Speed can be varied for higher heads and flows or lowered to snore
• Ability to run dry without overheating the motor and to stall without damaging the pump
• Hydraulic version of our KZNR severe duty pump is also available

Explosion Proof Hard Metal XP-KZN Series Slurry Pumps

The XP-KZN pumps are hard metal agitator pumps designed for operation in Class I, Division 1, Groups C & D hazardous environments (temp. code T3C).

• FM-approved explosion proof motor meets NFPA (70), NEC and OSHA requirements for Class I, Division 1, Group C & D hazardous locations
• All the hard metal features of the KZN Series pumps
• Top discharge, slim line design for additional motor cooling

All pumps are tested at factory, both for performance as well as safety. (Specifications dependent on model & may change without notice.)