

World Pipelines asked two companies to answer some questions and talking points in relation to HDD for oil and gas pipelines.



TOD MICHAEL, Product Manager,
Vermeer Corporation

Tod Michael has over 24 years of service at Vermeer with 23 years in the trenchless industry, holding a variety of positions within engineering and product management. Those positions include design engineer, project and senior project engineer, and engineering manager of Vermeer horizontal directional drills, mix systems, reclaimers, and downhole tooling. For the past five years, Michael has served as the Product Manager for pipeline and utility horizontal directional drills, mix systems, and mud pump systems.

MICHEL FAAS, Technical Supervisor,
Prime Horizontal

Michel Faas started in the HDD guidance business in March 1992. For the first four years, Michel worked as a technician and then as a guidance engineer around the world for Prime Horizontal. Later on he was office-based, and provided new engineers with both in-office and in-field training. Since 2016, Michel has been a site manager for high-end HDD crossings (maxi and mega rigs), as well as a HDD consultant.

Q When is HDD the most economical and environmentally friendly choice?

MICHEL FAAS, Prime Horizontal

Modern horizontal directional drilling (HDD) techniques definitely have advantages compared to former working methods like trenching, from both the economical as well as the environmental side.

Originally developed for the efficient production of oil and gas at great depths, the technology has evolved to also allow horizontal drilling very near the earth's surface.

The original drivers for this technology were pipeline companies who often had to lay pipelines under rivers, canals, highways, commercial structures and the like. Companies needed a more cost-effective method than the blind drilling that was commonplace. Thus, the HDD method was developed in which

a steering tool behind the drill bit was used to sense the local magnetic field, compute its geographical location, and steer the bit in a known and measured direction.

Every situation is different and therefore the choice is too. So, contractors must ask questions such as: Can we trench it the conventional way (forest, highway, bridge, etc.)? How long is the crossing? What are the restrictions? What type of machinery is needed? What needs to be installed?

TOD MICHAEL, Vermeer Corporation

HDD is valid and most economical any time disturbance to the surface must be avoided, or any time the cost of rehab or public disturbance is high.

Q What planning and preparation is needed for HDD design work?



MICHEL FAAS, Prime Horizontal

In general, contractors and crews need to know: where can you start and end the drilling? What is the jobsite size available for all the equipment? What kind of formation are we drilling in? What kind of product pipe needs to be installed? Are there already service lines in



Vermeer Corporation: For pipeline projects including gas, oil or water, a combination of excavating and trenchless methods are used. HDD should be considered for boring long distances and through cobble/rock.

the ground? Do we need a minimum depth at any place? Are there environmental issues? What size rig is required? What are reaming stages? Is there a transport road to the rig and pipe site for heavy trucks? What is the maximum truck load the roads can handle? What is the time frame for completion/deadline? In a nutshell, planning and preparation work needs to be undertaken by both the contractor and HDD company – drawings, bore plan, environmental conditions research, permits, etc.



TOD MICHAEL, Vermeer Corporation

Vermeer recommends that contractors create a complete bore plan, which includes topography, and potholing existing buried utilities.

In addition to the physical bore plan, contractors should understand soil properties. Having a good understanding of soil properties will provide a number of benefits, including helping to ensure the contractors are using proper drilling fluid additives and reduce the risks of inadvertent fluid returns.

Q How has the HDD process changed recently?



TOD MICHAEL, Vermeer Corporation

Some of the main changes in the HDD process have come around the validation of existing buried utilities. Cross-bore or utility strikes/damages are costly and can create hazardous conditions. The best practice for obstacle avoidance is to validate existing



Vermeer Corporation: Bore planning is an essential step on HDD projects. Crews need to understand soil properties, know the terrain, and expose all existing utilities ahead of time.

utilities, expose them to validate depths, and then use planning tools to ensure they are avoided.



MICHEL FAAS, Prime Horizontal

Technology has improved a lot; rigs have become stronger, but the process of HDD has stayed the same. The latest technology is direct pipe, which is not always possible, but with this technology the product pipe is installed straight away with a pipe pusher.

Several examples of recent product developments are the development of rig data recording with ProData and the recent addition of the ParaTrack Gyro Module, in which accuracy is not affected by interferences from either the environment or drill string.

Other attributes towards the modernisation of HDD would be the introduction of wireless abilities, for instance wireless driller displays and adaptors that can free up rig sites of unsightly wires. Developments include post-pipe mapping/surveying systems for measurement and archival storage of hole location in the form of the GyroTrack. To summarise, while there have been many variations in field geometry, tool design, and field techniques, the basic concept of HDD is mostly unchanged.

Q Describe the challenges when undertaking installations at sensitive crossings and rivers.

A **TOD MICHAEL, Vermeer Corporation**

There are a few challenges around river crossings. First, it is common to have cobble or glacial till around rivers, and unstable cobble can be challenging to keep a clear/open bore hole. Cobble can also cause unplanned deviation to the bore path.



Prime Horizontal: An American Augers drilling rig.

In addition to cobble and glacial till causing bore path issues, it is also imperative for crews to understand inadvertent drilling fluid return entering the river. The crews need to ensure they drill deep enough or use other methods to avoid this situation.

A **MICHEL FAAS, Prime Horizontal**

In environmentally sensitive areas or under rivers, the mud flow has to be controlled even more than in normal situations. When a contractor gets a blow-out in these areas, they will have a big problem taking care of the clean-up operation.

No access – this means environmental damage or a job stop. Neither examples are an option.

Firstly, the company must make sure it is deep enough while drilling under sensitive areas. Secondly, the company needs to monitor its mud viscosity and specific gravity – it cannot be too thin or thick, needs to be environmentally friendly mud, and annular pressure control needs to be taken into account. Thirdly, it is important to design the right downhole equipment, bit size, nozzles, reamer size, and volume to be pumped. Fourthly, there needs to be a back-up plan to cover any possible blow-outs. Is it accessible by foot, small excavator and/or specific trail to follow, or not at all?

Q What training is necessary for HDD operators?

A **TOD MICHAEL, Vermeer Corporation**

Key training areas for HDD operators and crew personnel are related to understanding the risks of utility strikes such as gas, electric, telecom, water, and sewer. Personnel should also have machine operational and safety training. Understanding bore and jobsite risk will help to reduce injury and property damage.

A **MICHEL FAAS, Prime Horizontal**

In some countries, there are dedicated schools for HDD. However, in most other countries it is learning on the job by practice, gaining on-site experience

and guidance under the watchful eyes of experienced HDD field personnel, and getting the hang of plotting, steering, and guidance software.

Prime Horizontal has a training programme guided by international, highly skilled engineers. The company's engineers aim to provide a high level of technical ability, interpersonal skills, and sensitivity to different working cultures.

Prime Horizontal also provides entry level engineers both in-office training and in-field training. After a satisfactory level of know-how is observed, only then will operators be sent on solo jobs.

Q How do you prepare for equipment and jobsite challenges that may arise during pipe installation?

A **MICHEL FAAS, Prime Horizontal**

Preparation is key. This starts long before the equipment goes to site. A lot of information is needed so as to gather as much knowledge as possible about the jobsite's soil conditions, surrounding environment, any particular issues that may be a matter of concern, etc.

Once a contractor has begun pulling pipe, they would want to continue with 24/7 operations. Before pipe pull, it is important to make sure the pipe is as straight as possible and in line with the prepared hole. Every extra turn will increase the pulling force. While reaming, the contractor must make sure they maintain mud returns and calculate the quantity of cuttings that need to come

