GETTING THE MOST OUT OF LARGE HDD RIGS

by Jeff Griffin ■ Senior Editor

BIG RIGS PROVIDE DIFFERENT CHALLENGES THAN SMALL RIGS

"Big" horizontal directional drilling projects (HDD)– those that must install large-diameter material at long distances – call for large drill rigs, and this month *Underground Construction's* continuing series on productivity focuses on HDD equipment with 100,000 pounds or more pullback power.

Considering productivity in relation to equipment capabilities only – clearly large HDD machines have tremendous production potential. However, overall production over the course of every project to bring it in on time and on budget involves many factors. Everything costs more on a "big" directional drilling project, and the three contractors who share their views for this report agree on one thing: planning is the key.

Tim Gabrielse, P.E., president and chief executive officer, Gabe's Construction Co, Inc., Sheboygan, WI: "Costs of drilling with big HDD equipment isn't just higher or double the cost of HDD projects with medium-size or small drilling machines, it is exponentially higher when you must use large drilling units. There is no margin for error."

Many of the company's large-machine projects are water crossings or working through wetlands for pipeline, power and gravity sewer construction.

Gabrielse says there are three key elements for productivity and completing a job successfully: planning, planning and planning.

"And with the planning," he adds, "mix in coordination during preparations and throughout the project for logistics, transportation, site preparation, drilling and product pullback. Evaluating conditions on the job site is important. Not only do larger machines have a bigger footprint, more space is needed for mud systems and hoses and cables, to store fluid additives and for support equipment.

"You also have to consider vertical space. Big machines have booms and cranes, and care must be taken not to come in contact with overhead cable which could be damaged and cause injury to personnel."

How easy is it for personnel to move from medium-size drilling equipment to big rigs?

"The language is the same," says Gabrielse, "but compared to smaller equipment the forces involved are much greater – higher horsepower, more torque, more drilling fluids. Fluid management on big machines is a huge step up from smaller models, and it is often difficult for personnel to make the adjustment."

Gabrielse says training is accomplished by blending personnel new to big machines in with experienced crew members.

Gabe's often drills through rock, and Gabrielse says mud motors remain the only effective method of drilling through the volumes of rock for the larger holes made by big drill units. Gabe's rents mud motors suited for the varying job conditions encountered.

Walk-over trackers are occasionally used, but 90 percent of Gabe's big-rig projects use wireline guidance systems.

"Water crossings are not conducive to walk-over tracking," says Gabrielse, "and the specifications of most projects we do with our large equipment don't allow it – they require the tolerances of wireline systems. We have personnel trained in wireline use, and we also subcontract navigation."

Founded in 1942, the fourth generation of the Gabrielse family manages Gabe's Construction today. Gabe's performs diversified underground utility construction throughout the United States and has installed thousands of miles of fiber optics, underground pipes and cables for telecommunications companies, gas utilities, electric companies, municipalities and private industries.

Involved in directional drilling since 1989, Gabe's currently operates American Augers 330,000-pound pullback DD 330 and 140,000-pound pullback DD 140 equipment.

Bryan Dolan, president, Dolan Directional Drilling Inc. Keller, TX: "Our large drilling equipment includes machines with

pullback ratings from 100,000 to 300,000 pounds which are used primarily on gas pipeline projects, but also for water and electrical projects. Clearly there are jobs that only big drill units can do. We've done shots to 3,300 feet of 10-inch steel pipe and 3,000-foot-long installations of 24-inch pipe and installed 40-inch casing jobs from 200 to 300 feet. These are such large holes that they require high volumes of mud and high horsepower and torque to move material; small machines simply cannot do the work.

"The key to productivity is planning.

"Planning is important on any project, but the stakes are so much higher on big HDD jobs. Everything is bigger, not only the drill rig itself, but drill pipe, downhole tools and support equipment. We always recirculate drilling fluid and that takes bigger equipment and more fluid additives – we may be cleaning 800 gpm of mud. We buy mud by the truckload, not the pallet."

To maximize production once a job begins, it is essential to gather as much information as possible about job-site conditions.

"Core samples, geological information – we get everything possible to know what we will encounter," Dolan continues. "If you don't do your homework or miscalculate in planning for a big job, not only do you risk not making any money, the project can turn into a six-figure loss."

Skill of crew members plays a major part in productivity of large drill rigs.

"To be effective, personnel need training," Dolan says. "We do move guys up from smaller equipment, but they need quite a bit of training about the way things operate with big machines. Everything is on a greater scale, many methods are different, and mud is much more important than with smaller drill rigs. Many jobs encounter rock, and the only way to work through rock with big equipment is to use a mud motor, and operators of smaller equipment often do not have experience with mud motors. We rent mud motors as job conditions dictate."

Jobs with big equipment often require use of wireline guidance systems, rather than walk-over equipment common on installations with small- and medium-size HDD units.

"But we do use walk-over tracking whenever we can with our big equipment," says Dolan. "We only use wireline when required – either by job conditions or because the project owner specifies it. Depth is one factor. Walk-over equipment usually is limited to depths of 30 to 40 feet, and many big-rig jobs are between 60 and 125 feet. We always use wireline crossing creeks and rivers, under ravines and on any deep water crossing."

When wireline equipment is needed, Dolan hires a wireline company to provide the system and operate it. "They do it every day and are very proficient," he says.

In summary, Dolan says keys to achieving maximum productivity with large HDD equipment include:

- Planning and knowing ground conditions;
- Using correct fluid additives and mixtures for soil conditions; and
- Proper assessment of the downhole tools that will be required.

"It all goes back to proper planning," Dolan concludes. "Planning minimizes mistakes. You can always hit something on any job or when going through gravel you can lose cutting volume. You have to pay attention to what's going on down hole so corrective action can be taken immediately. Monitoring mud flow is critical because that alerts you to down-hole problems."

Dolan Directional Drilling was established in 2000, and its first projects were telecommunications installations.

"We got started at the end of the long-haul telecommunications boom, but were fortunate to get into the gas pipeline market soon after we went into business and we have built on that ever since," says Dolan.

Dolan operates three Vermeer HDD units with pullback above 100,000 pounds: a D100x120 (100,000 pounds); D200x300 (200,000 pounds), and D300x500 (300,000 pounds).

Steve Ugrich, president Southeast Directional Drilling, Tempe, AZ: "Risk sets big HDD projects apart from those that are done with smaller machines. The larger the diameter the more risk of successfully pulling in the product line. You are dealing with more weight, torque, mud volume, larger reamers and by the time you have the hole ready you have a great deal of your own money into the crossing. The payday can be great, but if you are not successful in pulling in the pipe you get zero."

With drill units and all related equipment bigger, every project with large equipment is more complex.

"With our large directional drill rigs," Ugrich says, "there are 11 semi loads that go with each rig. The drill pipe for these rigs average about $100 per foot and we like to carry close to 6,000 feet with each of our large rigs. On the smaller rigs you can get by with about three or four guys to operate it; with the large rigs we average a 10-man crew. The working area for a smaller rig is normally 40 by 60 feet, where a large rig pads require 200 by 250 feet."

Crew members must be properly trained.

"The problem with advancing to a large rig from a small rig," he explains, "is that everything is two to five times larger and heavier and with the torque the bigger rigs use, the smaller rig operator doesn't always recognize the extreme danger."

Ugrich says mud motors remain the most efficient method of drilling through rock on the pilot bore. With big equipment, the company always uses wireline guidance systems.

"Southeast employs three surveyors (navigators), but once in a while we will need to hire third-party surveyors," he says.

The most common causes of problems that reduce productivity? Ugrich says they are:

- Failure to pre-plan;
- Inadequate personnel; and
- Breakdown of equipment.

Ugrich says Southeast has the capability of handling most any type of large HDD job and currently is involved on large 36- and 42-inch pipelines. The company started operations in 2002 with two large drill units and currently owns seven machines. Those with more than 100,000 pounds of pullback are a Cherrington machine with 1.4 million pounds of pullback and four American Auger models of 250,000, 500,000, 800,000, and 1.2 million pounds of pullback.

"Most of our supervision and drilling personnel have been with us for many years, starting as laborers and working their way up through the ranks," Ugrich says. "I credit our success to the hard work and dedication of all our employees."

FOR MORE INFORMATION:

Large Rig HDD Contractors:

Gabe's Construction Co. Inc., (920) 459-2600, gabes.com
Dolan Directional Drilling, (817) 482-1680, dolandirectional.com
Southeast Directional Drilling, (480) 222-4440, southeastdrilling.com

Large rigs:

American Augers: Astec Underground, (800) 527-6020, astecunderground.com
Vermeer Manufacturing, (888) 837-6337, vermeer.com
Barbco, (800) 448-8934, barbco.com
Robbins HDD, (800) 323-5894, robbinshdd.com