

DCI

Leading by Example

by Bernard P. Krzys



While Digital Control Inc. founders John Mercer and Peter Hambling have an aeronautical engineering degree in common, their interests go far beyond that. They have taken their engineering education and background into the world of navigating directional drilling through the ground.

In the 1970s, Mercer and Hambling found themselves in Seattle, one of the key cities in the world for aircraft production. They met when they worked together at Flow Research, which was a major R & D organization with considerable funding through the Electric Power Research Institute (EPRI). They both left Flow Research but stayed in touch. Hambling went on to other things, including working with Orbital Sciences Corp. in Washington, D.C., the first company to independently launch satellites for commercial purposes.

Mercer went to work for FlowMole Corp. (now Utilx), which is considered to be the first mini-directional drilling contracting organization in the world. At FlowMole, he spearheaded the intense development of directional drilling tools, which resulted in the production of the GuideDril System. Key to this development was the ability to locate the boring tool head. In the mid 1980s, microprocessors were capable of forming complex calculations and their low cost made them attractive to incorporate into electronic designs. This led to the development by Mercer and Albert Chau, who was also a key R&D engineer at FlowMole, of the FlowCator, a locator that used an array of antennas to determine the position of the tool head.



In the meantime, others would also develop methods and correspondingly patents that contributed to the development of today's locating and tracking systems. Mercer has shown in his research that "inventive efforts got as far back to 1933 related to tracking and locating." The closest reference he reports to current technology seems to be attributed to Robert Neff, who filed for a patent in 1955. Neff developed a locating system for finding blockages in sewer lines. In the 1960's, Bell Telephone Laboratories built a guided impact tool or mole. This system did not fall in the category of a walk-over tracking system, but it was the first time that a small-diameter boring device was outfitted with guidance."

Mercer's further research shows that "in 1970, Lester McCullough and Duane Ladine of The Goldak Co. developed a transistorized dipole transmitter that was one of the first documented references to the use of magnetic field shape for gathering locating information."

Throughout the 1980s work continued on the development of pipe and cable locating tools. This research and subsequent product introduction was being done by such companies as Radiodetection and Metrotech.

Mercer, 55, brings to the directional drilling industry a bachelor of science degree in electrical engineering from Swarthmore College near Philadelphia. He also holds a masters of science and engineering degree, a master of arts degree and a doctorate in aeronautical engineering all from Princeton University.

Not to be outshined, Hambling, 44, has a bachelor of science degree from the University of Washington in aeronautical engineering. He additionally has a master of science from von Karman Institute, Brussels, Belgium, and an MBA from Yale University.

Hambling was essentially raised in the aircraft industry. He was born in the United Kingdom where his father worked for British Air. His mother was from the United States, and when Hambling was 5 years old, the family relocated to Seattle so his father could represent British Air at Boeing.

Mercer left FlowMole in 1988, feeling that the company was really cutting back on its R&D, which is one of the driving forces in Mercer's personality. He worked out of his home with the plan of developing new and different directional drilling rigs. He also worked on an idea for a locating system and built a prototype.

Mercer and Hambling had stayed in touch over the years, and the two of them talked about forming an alliance, but they needed working capital. They tried raising funds through venture capital firms to begin to produce these drill rigs that had been designed but they found raising the money quite difficult.

The two shifted their attention to the locating system that Mercer had developed. They realized they could "bootstrap" the start-up of their company from their own resources if they focused on locating systems. On that basis, Hambling decided to leave Orbital Sciences and moved back to Seattle.

Between them, they started seeking a market for the DigiTrak locating and tracking system. The year was 1990 and now Mercer and Hambling had to convince somebody to purchase the DigiTrak System, which at its introduction had an operating depth of 20 ft., almost double that of other systems that were available. They went to a Trenchless Technology Center-sponsored conference in November of 1990 in Houston, to talk to people in the directional drilling industry. During that meeting, they met with Don Carey and Mike Young of StraightLine Mfg., who agreed to purchase the first 50 DigiTrak units and further agreed to assist them in the initial marketing of the DigiTrak line.



DCI's advancement in the locating/tracking area has moved at a very rapid pace ever since then. DigiTrak, the first walk-over system to display both roll and pitch orientation of the tool head, was introduced in March 1991 at the NUCA big equipment show in Phoenix.

It's important to note that from the beginning DCI was intent on developing a system to track the boring head only and not with the objective of being a conventional cable locator. In 1992, the company introduced a new technique into DigiTrak that was based on a magnetic field shape rather than the signal strength of the transmitter. This new approach also provided a way to track the tool head while the drill head was actually moving, thereby reducing locating time. Another enhancement made to the

DigiTrak in 1993 added a remote display at the drilling rig that included roll, pitch, battery status and temperature. This same remote display also added a left-right steer indicator that enabled the possibility to guide the drill head when an operator could not physically locate it, such as when crossing under busy streets.

The depth range of locating systems has always been an issue. In 1994 Digital Control offered a transmitter with a 50 ft. depth range. Now they have a transmitter that will go to 70 ft. with a battery life of 40 hours. The company also has a cable transmitter that will go to a depth of 140 ft.

Another interesting introduction by DCI came in 1995 when the company started producing transmitters at a 0.1 percent grade pitch sensitivity. This extended the use of directional drilling into the area of gravity sewer installations. In 1997, DCI and McLaughlin Mfg. both introduced a much-needed facet for locating/tracking systems - bore logging. Ditch Witch's Subsite system and Radiodetection's locating and tracking system now both incorporate bore logging. This much needed "as-built mapping" feature available from all of the locating/tracking systems has been a major improvement for project owners and engineers to incorporate into projects.

All circuit boards produced by DCI go through an extensive testing system developed by the company. Marie McNally, who had previously been with the leading manufacturer of heart defibrillators, has incorporated comprehensive procedures into the manufacturing process. McNally's product method is similar to what she had to do relative to Federal Drug Administration standards required of the company that she was with previously. Each morning the transmitter board testing system is checked out using a "gold standard" board that is used to confirm that all testing procedures are intact. This procedure includes a "bed of nails" test, which is unique to the electronics industry, when testing circuit boards before they are used in transmitter production.

The DCI manufacturing process is patterned after the Japanese Kanben, or "Just In Time," inventory approach. That is, inventory is made available from suppliers to just match the schedule of the company's production needs. All circuit boards are individually numbered and bar coded. These data are collected in a very comprehensive computer system, enabling the company to know exactly what components went into each DigiTrak unit to better track potential problems.

Jan Feifel, the company's first employee, was brought in part-time to work on programming PCs, and has developed a unique system for the company's Return Material Authorization (RMA) database. The RMA system monitors product from DCI's final assembly all the way through the company to the point of follow up with the customer regarding what problem. The system also tracks "loaners" that may be sent out to a contractor while a repair is made and tracks costs on a repair.

The company has a standard warranty program of one year for above ground products and 90 days for underground products, including transmitters. Any time a unit comes in for a chargeable repair, the company extends the warranty as if the unit had just been shipped to the customer. The warranty for underground products even applies when a transmitter is used with a mud motor or a percussive hammer that is featured with some drill rigs.



The company's unique operating style can be seen as you approach the front door. There is a sign on the door that says "Please do not let the dogs out." On any given day, you could find as many as 5 to 6 dogs in the offices, which adds to the personal feeling of how the company is operated. There are no walls in the offices and all workstations are in the open with separation of areas done by extensive use of indoor plants -- even Mercer's and Hambling's desks are out in the open. Every Friday is lunch on the company and DCI pays quarterly bonuses that are related to the performance of the company.

Randy Zeller, a DCI engineer and its first full-time employee, says what he likes about DCI is that it's "dynamic, wonderful and different from any other company (he has been) around." Feifel, developer of the RMA system, indicates she "never thought she would be able to do everything she has been given the opportunity to do at DCI."

DCI has a number of field technicians to advance the technology and train customers. These include individuals outside North America in Auckland, New Zealand, the United Kingdom and Germany. North American field personnel include Randy Petersen and Mike Young, based in Kansas, and the company is looking to hire two others on the East Coast.

When Mercer and Hambling talk about DCI's success, they say they always wanted to be on the leading edge, introducing newer and better technology. They also feel strongly about providing customer support.

As for the future of the industry, the founders of DCI feel that the directional drilling rigs are going to become more and more automated. They say the ideal situation would be to take the "individual judgement out of it" as much as possible. Because qualified drill rig operators are such a scarcity, they also expressed a serious concern for safety issues in drilling. Mercer is of the opinion that a certification program for drillers needs to be established by the industry.



The future holds for DCI another innovation the TransiTrak inGround Positioning System. This system will be available in the latter half of this year. TransiTrak operates like a Global Positioning System (GPS). It locates and tracks the transmitter and displays where it is and where it has been and monitors the actual position of the transmitter relative to a predetermined borepath, showing the drill operator how to steer and follow the borepath. Antenna cells are located on the surface above the drillpath to receive a transmitted signal which is relayed to a base station at the drill rig. The TransiTrak System will be fully automatic there will be no need for locating or tracking over the drill head, resulting in the elimination of one person from the drilling crew to do the locating.

Mercer and Hambling created DCI with the objective of being leaders in the directional drilling industry. They have accomplished this in several ways, particularly through innovative product development, support of industry professional associations, training and their participation at key industry shows such as No-Dig, NUCA and the outdoor demonstration show ICUEE.

Bernard P. Krzys is publisher of Directional DRILLING

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