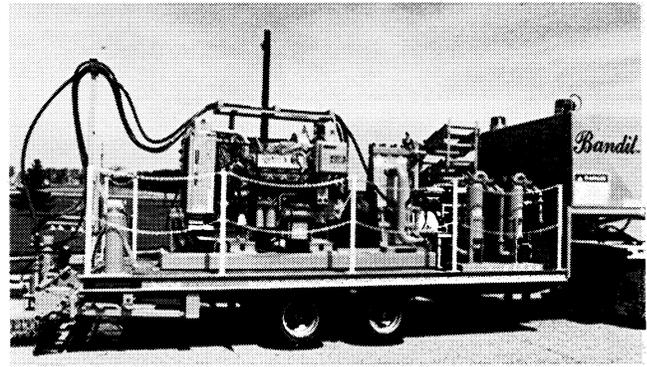


Water Jetting

Water jetting is the use of high pressure, high velocity water directed at a surface to apply an enormous amount of energy in a small area. It is, in effect, a cutting tool, used in such applications as removing granite blocks from quarries or concrete from bridges under repair. Among companies manufacturing water jetting equipment is Hi-Tec, Inc., Milbank, South Dakota; at right is a Hi-Tec trailer-mounted, diesel-powered, automatic water jetting system.

Hi-Tec was spawned as the result of a U.S. Bureau of Mines directive in the late 1970s requiring that the quarry industry find a less noisy method of removing granite from quarries, because existing equipment was so deafening it was considered health-endangering. Dakota Granite Company, also located in Milbank, initiated development of a low-noise water jetting system to meet the Bureau of Mines requirement in its own quarrying operations. The successful development program, directed by company chief engineer Roger Raether, led to formation of Hi-Tec for manufacture of the innovative water jetting systems and equipment that resulted. Raether became president of Hi-Tec and James Stengel, chief executive officer of Dakota Granite, became vice president.

Dakota Granite initially focused on development of the key element of the planned system, a high pressure rotating swivel capable of operating at a pressure of 24,000 pounds per square inch; the company intended to use commercially available hardware for other components of the system. It became apparent, however, that an effective system would require development or redesign of other components, such as self-sealing pumps, nozzles and nozzle holders, high pressure hose protection devices and new pressure sensing and automatic shutdown devices. In the course of an extensive research program, the company benefited from water jetting technology developed by Marshall Space Flight Center to clean and remove material from components of the Space Shuttle's solid rocket boosters in the process of refurbishing the boosters. In the lower photo, a Cincinnati Milacron computer-controlled robot is directing a sharply focused, high pressure water blast spray onto the forward skirt of a solid rocket booster; it is removing an ablative coating that provides thermal protection from the booster in flight.



The Dakota Granite/Hi-Tec effort culminated in development of completely automatic water jetting systems now built and sold by Hi-Tec. One is a quarry machine that cuts rock and granite at a pressure of 19,000 pounds per square inch. Hi-Tec also offers a 12,000 pound per square inch system for removing deteriorated concrete from the surface of bridge decks undergoing reconstruction. Among advantages of Hi-Tec systems cited by the company, in addition to noise levels far below those of earlier equipment, are minimal labor costs, due to automatic operation that requires only occasional adjustment; no dust, because the water spray suppresses it; high rates of production; low overall operational cost; and automatic shutdown if any part of the machine malfunctions.

