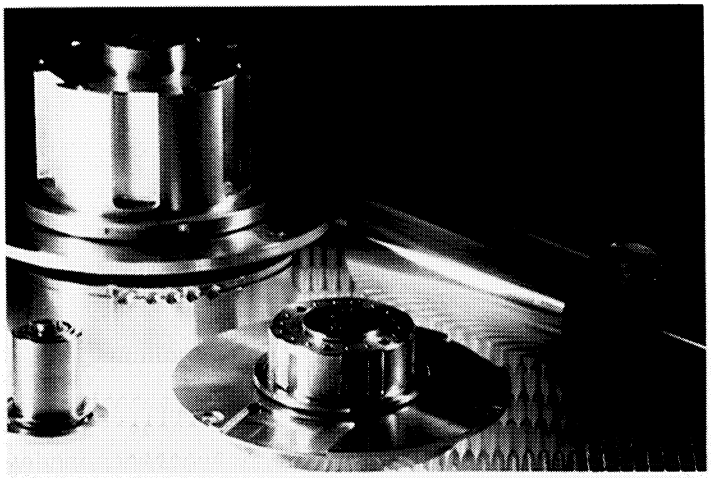
Magnetic Liquids

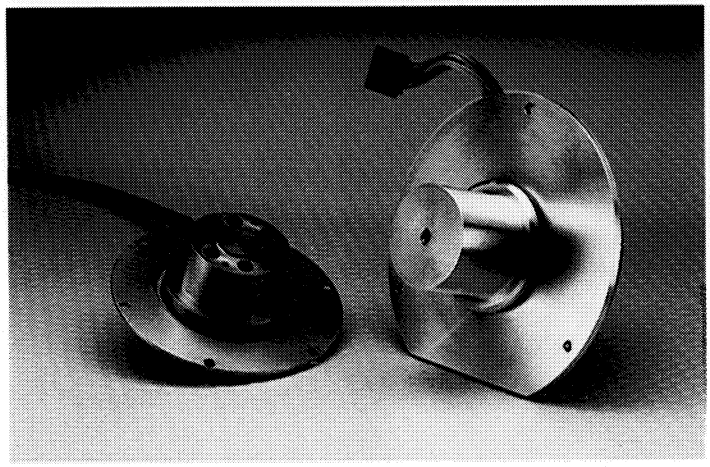
Ferrofluids are magnetic liquids that do not exist in nature; they are man-made substances that originated in space technology, fluids in which tiny particles of iron, nickel, cobalt or their alloys have been suspended. The material thus created can be positioned and controlled by magnetic force—and that offers unique advantages in a growing range of ferrofluid applications.

A recent ferrofluidic innovation is a spindle for rotating computer discs that supports the disc's rotating shaft on a film of magnetic fluid instead of conventional ball bearings. The spindle, according to its developers, offers greatly increased rotational stability, meaning substantially reduced vibration and mechanical noise, and non-repeatable runout, thus allowing disc drives to store two to 10 times more information.

The spindle is produced by SPIN Technology, Nashua, New Hampshire, a subsidiary of Ferrofluidics® Corporation of the same city. The latter company was formed in 1969 to develop and market the ferrofluid concept, which had its genesis at Lewis Research Center in the early days of the space program. Looking for a means of feeding weightless fuel to the engine of an orbiting spacecraft, a Lewis scientist hit upon the idea of magnetizing the fuel by dispersing within it finely ground particles of iron oxide; the fuel could then be drawn into the engine by a magnetic source. NASA never applied the concept to that problem but it surfaced again in the mid-sixties—at Avco Space Systems Division—as a possible means of controlling the temperature of a spacecraft. Again ferrofluids was bypassed in favor of another solution.

However, two of the Avco scientists—Dr. Ronald Moskowitz, now president of Ferrofluidics, and Dr. Ronald Rosensweig—saw great commercial potential in ferrofluids, obtained a NASA license for the technology and formed Ferrofluidics Corporation. They found an initial commercial application in a zero leakage, non-wearing seal for the rotating shaft of a system for making semiconductor "chips." The ferrofluidic seal solved a persistent problem—contamination due to leaking seals—and sparked widespread interest in the new technology. Use of ferrofluids in rotary shaft seals has increased rapidly and the great majority of computer memory disc drives also employ magnetic fluid exclusion seals. In the top photo are fluid film bearings in a variety of sizes and configurations; examples of ferrofluid bearings used in disc drives are shown above. Additionally, ferrofluids are now being applied in robotic, fiber optic and laser systems. From a sales volume of $65,000 in its first year of operation, Ferrofluidics has grown to a $30 million dollar a year company operating in six countries. ▲





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