A shocking way to compress CO_2

Compressing carbon dioxide captured from power plants to 1,500–2,200 psia for pipeline transmission or underground injection is a challenge that requires eight stages or more, using conventional compressors. A compressor that promises to do the job in two stages, for 50–60% of the installed cost, is being developed by Ramgen Power Systems, Inc. (Bellevue, Wash.; www.ramgen.com).

Ramgen has been working on the compressor for some time, supported by the U.S. Dept. of Energy (DOE, Washington D.C.; see *CE*, June 2006, p. 16), but the project has received a boost from Dresser-Rand Group Inc. (Houston, Tex.). Dresser-Rand has committed to a staged investment in the company, says Ramgen president Peter Baldwin, who spoke at the recent Spring National Meeting of the AIChE in Tampa, Fla.

Baldwin notes that the inlet flow in conventional compressors is typically limited to a Mach number of below 0.90 at the inducer blade tip, to avoid generating shock waves in the blade passages. In contrast, Ramgen's "Supersonic Shock Wave Compressor" borrows from supersonic aircraft engine inlet technology, using a combination of rotor rpm and inlet vane design to operate at a relative Mach 2. Instead of conventional blades the machine uses rotating disks whose rims are contoured to form inlet compression ramps that mimic the inlet design of supersonic aircraft engines (diagram). The goal is to achieve a pressure ratio of 100:1 in two stages, each with its own separate drive.

In association with Dresser-Rand, Ramgen is working on a 13,000-hp (10-MW) second stage that could handle the CO_2 generated by a 250-MWe power plant. "The second stage is the high-pressure stage, so it's the critical one," says Baldwin. "We expect to have it running sometime in 2011." He adds that, besides CO_2, the compressor could be used for other heavy molecular weight gases and low-temperature applications.