

Technology

## Safer Machining: Seco Partners With Fusion Coolant Systems

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Oils, pastes, gels and emulsions – traditional machining fluids come in many forms. But they all have something in common in that they pose a risk to worker health and the environment. Steve Skerlos of Seco Tools' new partner Fusion Coolant Systems has come up with a sound alternative.

The development of cutting tools that shape, drill, grind and plane metals has made modern manufacturing possible. But the progress that these tools have helped achieve would not have been possible without machining fluids for cooling, lubrication and chip evacuation. The list of materials used as machining fluids is long and includes oil, pastes and gels, emulsions and synthetics, to name a few. But their use comes with a few problems.

Steve Skerlos knows this better than anyone. A world-renowned expert in machining fluids, he is a tenured professor of mechanical engineering at the University of Michigan in the US, Director of the Center for Socially Engaged Design in the university's College of Engineering, and Founder and Chairman of the Board of Fusion Coolant Systems, Seco Tools' new partner.

Skerlos has seen the problems of traditional machining fluids firsthand, having worked with emulsions as a PhD student for five years. "These fluids made me and the machining colleagues I got to know over time suffer a variety of health problems," he says. "The health risks to workers exposed to traditional machining fluids have been known for decades. It's an antiquated way of doing things." The fluids themselves are a "lasagna of chemistry", as he puts it.

Skerlos, a straight-talking man, is avid about preserving the environment. A devoted cyclist, he pedals to work whenever he can. As a graduate student, initially he did not want to study machine fluids. "But it was my opportunity to get into the sustainability area, which is where my passion lies," he says. And in studying the way fluids are formulated (their chemistry, biology and physical characteristics), he knew there had to be a better way.

Working with his PhD students, he began experimenting with a substance known as super-critical carbon dioxide (CO<sub>2</sub>). Picture a high-pressure container, half filled with CO<sub>2</sub> in its gaseous state, and half with liquid CO<sub>2</sub>. Increase the pressure beyond the magic point of 1079 pounds per square inch and above 31 degrees Celsius, and you get matter of a different state: neither gas nor liquid. A fusion. And that fusion is, well, magical for machining. "I came at this from an environmental, health and safety standpoint," says Skerlos. "And I said 'wow, this is perfect in that respect.'"

When he and his students got the first results back and recognized that the substance far outshone regular machining fluids, he asked the students to check their protocols. "We'd never seen such low friction and lubricity, or been able to achieve speeds like that. The way it out-performed emulsions came as a massive surprise."

Skerlos knew he had a revolutionary product on his hands. He checks off the advantages. It's safe and bacteria-free. Tools last longer. It's easy to apply to machine tools. CO<sub>2</sub> is an inexpensive waste product. And unlike with fluids, there's no mess. "Think about it..." he says "If you're making biomedical implants, you don't want to get machining fluid on them only to have to find a way to remove it. So far, we haven't come across an application where we cannot replace emulsion, so this technology could ultimately replace emulsion everywhere. And that's what should happen."

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