

Fans of PUBLIC TRANSIT

MILITARY-SPONSORED RESEARCH INCREASES FUEL
EFFICIENCY AND HELPS CREATE JOBS



Mass transit buses across the United States have become more fuel efficient over the last 10 years, and it's largely thanks to innovations from a Michigan-based small business.

In the early 1990s, Engineered Machined Products was focused on producing high-performance water and oil pumps for vehicles in the trucking industry.

"We were a small company when I came on board 24 years ago," said Ralph Bedogne, EMP's recently retired vice president of government relations. "Our core competency was precision machining."

In order to diversify their product line and grow the company, EMP's leaders saw that they needed to innovate. They opened a research and development facility in 1999 and began to introduce new methods and ideas. Diesel engine components, for instance, have tradition-

ally been powered by belts connected directly to the engine. Each component adds parasitic load, making the engine work harder and hotter. EMP's engineers experimented with electric-driven components, like water pumps, and found significant load reductions.

"By taking the water pump off the mechanical drive line and putting in an electric motor, we got rid of pumps, we got rid of hydraulics, we got rid of belts and pulleys, and we thought this was the best thing since sliced bread," Bedogne said.

The efficiency-gaining electric water pump helped large diesel truck manufacturers reduce emissions, said Bedogne, and also started to get noticed by the military.

EMP began submitting technical papers on the efficacy of electric engine components to the federal government. They were subsequently encouraged to

apply for a Small Business Innovation Research (SBIR) contract from the Army.

“We went to a couple open forums on SBIRs and realized we were perfectly suited for it. We were in a HUBzone, we had less than 500 employees, and we were financially stressed,” Bedogne laughed. “But we were ready to do the research. SBIRs were definitely a stepping stone for where we’re at right now.”

The Army’s Tank Automotive Research, Development and Engineering Center, also located in Michigan, partnered with EMP to develop an ultra-high efficiency engine fan. During the first Gulf War, thin-skinned military vehicles were loaded with sandbags to increase their survivability in combat. But the increased weight overloaded the engines, which overheated in the desert environment. Through the SBIR work, EMP’s researchers devised strategies for thermal management. They developed durable electric fans that cooled the vehicles even while reducing engine load by 35 horsepower and increasing fuel efficiency by 10 to 25 percent.

But with the military deploying ground forces, to Afghanistan and then Iraq, EMP was unable to get enough vehicles from DoD for complete testing. Also around that time, the commercial trucking market began to strain under the global recession.

“Our traditional business was suffering because of the economy,” said David Allen, EMP’s vice president of engineering. “We downsized quite a bit at one point.”

Regrouping, EMP was inspired to adapt the durable electric fans to mass transit buses, and amended the scope of their SBIR work.

“The transits [bus companies] bought it like you wouldn’t believe,” Bedogne said, explaining that the multi-fan Mini-Hybrid



Cooling System improves fuel economy and safety, and lowers emissions and maintenance costs.

By 2010, EMP’s Mini-Hybrid Cooling System had become the industry standard for transit buses. Sales began to grow and jobs were created.

And EMP components, like the Power 450 alternator that was developed as part of the electrically-powered thermal management system supported by the early SBIR work, are now being used in the Army’s M915A5 armored semi-tractor. While EMP had a little over 100 employees in the mid-1990s, by 2017 the company’s staff numbered more than 400.

“The core technology and the infrastructure of people and capability came largely out of those development programs,” Allen said. “If we did not have the SBIR

research funding support we would not have hired the engineers, or worse, laid people off, and that would have stifled all of our technology development. The bus sales would have been delayed or possibly worse.”

The SBIR process can feel “out of the comfort zone of a lot of companies,” Allen ac-

knowledged, but he also said that the effort can be a rewarding introduction into the industrial ecosystem of DoD.

The process isn’t as daunting as it would initially seem, Allen maintained, adding that a successful application could do at least two things for a company. “It gives you some seed money for an idea that you have been sitting on,” he said, “an idea that might be a little higher risk but offer a long-term reward. And second, as we found, through those programs we developed contacts with the military and their contacts in the commercial sector. It’s those contacts that expanded our thinking and found new places where these technologies could find a home.”

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Engineered Machined Products, Inc.

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