

Clean Investment

With its environmentally-friendly hybrid drive systems for heavy-duty commercial vehicles, ISE Corporation, a young, California-based company, is targeting a rapidly growing market. Siemens Venture Capital (SVC) recently invested in this long-standing Siemens partner.



Emission regulations are becoming more demanding in the U.S., where the Environmental Protection Agency (EPA) intends to dramatically reduce emissions of nitrogen oxide and particulates from engines in heavy-duty commercial vehicles such as buses and trucks. California, which has been particularly hard-hit by air pollution, has stipulated that carbon dioxide emissions must be cut by 30 percent by 2020. The state is now being backed in these efforts by President Barack Obama, who announced that the federal government intends to provide funding for fuel-efficient vehicles and introduce more stringent CO₂ limits.

These goals are ambitious for heavy vehicles like trucks and buses, given their high fuel requirement and intense stop-and-go drive cycles. ISE Corporation, a young American company, is doing its part by providing environmentally-friendly hybrid technology for such vehicles. ISE's mature products and good market prospects have also impressed managers from Siemens Venture Capital (SVC). As a result, Siemens investment specialists joined four other venture capital firms last November in investing a total of \$17.5 million in ISE, which was established in 1995. The investment is intended above all to help ISE further develop its products and sales network.

Decoupled Engine. ISE, which employs 136 people, has enjoyed Siemens' support in its development work for years and uses Siemens electric motors and converters in its drives. The company offers a hybrid system in which electrical components and energy sources can be modularly exchanged depending on the application. "ISE's series hybrid drive system is technically superior to conventional parallel hybrid systems," says Gerd Götte, a managing partner

at SVC, and a member of ISE's supervisory board. The great advantage of ISE's technology is that the combustion engine it uses is smaller than those in conventional, heavy-duty commercial vehicle drive systems. That's because the engine isn't connected to the drive shaft and is only used to provide power to the energy storage system or electric motor that propels the vehicle. That's why it always operates in the most optimal, efficient manner possible, which means low CO₂ emissions.

The ISE system also ensures that the energy storage system is charged when the vehicle is braked. This "brake energy recovery" and the use of high-performance energy storage systems like double-layered ultracapacitors — or "ultracaps" (ISE's Ultra-E 500) — enables the system to deliver brief power spurts for acceler-

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ation or inclines, without requiring the combustion engine to provide additional energy. "ISE has important expertise in energy storage and energy management," says Götte.

The combustion engine in a conventional parallel hybrid operates less continuously than in ISE's series hybrid. That's because the engine has to cover increased energy demands by operating at a higher power level to immediately supply extra power to the vehicle drive, alongside the electric motor. This increases fuel consumption and emissions when parallel hybrids are used in heavy vehicles like buses, which are often driven in stop-and-go traffic.

Another advantage of the ISE technology is that the company's series-produced hybrid

drive systems can be offered with a choice of either a diesel engine, a gasoline engine, or a fuel cell system. "ISE has the broadest product range in a dynamically growing market," says Götte. As a result, ISE ideally meets the expectations SVC has of companies it invests in. "An investment such as this should provide Siemens with access to new technologies, while at the same time generating a good return," says Götte.

Fuel Cell Bus. Approximately 225 buses equipped with the ISE hybrid system are already on the road. Customers include 19 transportation agencies, among them Transport for London, which is planning to purchase at least eight hydrogen fuel cell buses by 2010. At the heart of ISE's successful technology is the com-

pany's adaptable control software, which regulates the finely-tuned interaction between the combustion engine, the generator, the energy storage system, and the electric motor. ISE's proprietary control software is used with its diesel hybrid drive systems, gasoline hybrids, and fuel cell variants.

The software and the Ultra E-500 Energy Storage System are critical contributors to ISE's high energy efficiency. "The control software is what enables us to obtain the maximum yield from brake energy recovery, and it also allows for automatic cutoff of the combustion engine whenever a vehicle comes to a stop or reduces its power demand," explains Kevin Stone, ISE Director of Engineering Applications.

Growth prospects for efficient, low-emission hybrid technology are good. "The hybrid bus market alone can be expected to grow by 50 percent or more in coming years," says Götte. "And it's not just the U.S.; we're seeing an increasing interest in hybrid technology in Europe and parts of Asia as well." ISE is set to profit greatly from these developments. The company's sales have in fact been growing at an average annual rate of 141 percent since 2006. With ISE's order books well-filled at present, this trend is likely to continue — despite the currently difficult economic situation. Sales of gasoline hybrid vehicles in particular are expected to increase rapidly in the near future, because they meet the tighter limits on nitrogen oxide and particulate emissions that are already in effect in smog-plagued southern California — and which will become law throughout the U.S. in 2010.

The outstanding environmental compatibility of ISE drive systems is also important to SVC. "Environmentally-oriented investments are a top priority for us," reports Götte. "That's because the clean-tech sector offers Siemens opportunities for major growth. Siemens generated sales of €19 billion with its environmental portfolio in 2008 — and that corresponds to around 25 percent of the Group's total sales." Accordingly, some 25 percent of SVC's total venture capital volume of €800 million is currently invested in clean-tech innovations such as ISE's hybrid drives — and this percentage is increasing. SVC believes its clean-tech investment volume will continue to grow despite the current economic crisis. This is because the sector benefits from a unique demand profile: the urgent need to solve infrastructure problems worldwide in a rapid, environmentally-responsible manner. ■ Anette Freise