ULTRAFAST CAPACITOR BANK AND CONTROL SYSTEM

Dr. Glenn Daehn has developed several techniques for utilizing electrical energy from a capacitor bank that can be applied to OSU's patented vaporizing foil actuators and magnetic pulse processing. As Dr. Daehn advanced the suite of technologies that leverage rapid discharge of high power capacitors, it became clear that there was a need in the market place for capacitor banks that could keep up with these new and novel processes/devices. Dr. Daehn's group of researchers spent several years developing the next generation of capacitive discharge systems in the Impulse Manufacturing Laboratory (IML) on Ohio State's Main Campus.

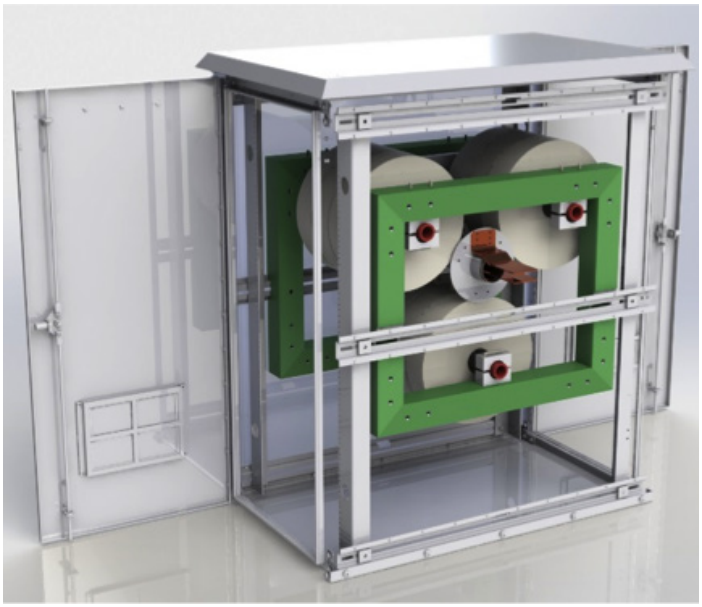
CDME, in conjunction with Dr. Daehn's staff, is working under a commercial contract to design an Ultrafast Capacitor Bank utilizing the advancements pioneered in the IML. This system is being designed and built to power both a magnetic pulse and a Vaporizing Foil Actuator system in a production manufacturing environment. The project will result in a commercially available system with all required designs and specifications.

THE TECHNOLOGY

The Ultrafast Capacitor Bank being designed, built and tested by CDME consists of the energy storage/delivery system, the programmable logic controller (PLC), and the human machine interface (HMI) systems. The capacitor bank is capable of charge to 13kv with 4.2kJ stored energy, which is the maximal allowed safe charge condition. The safety of the operator, the system and the surrounding environment is the primary focus of the PLC. The PLC is also configured to manage the charging, discharging, and synchronization of the external mechanical system (robots and other manufacturing systems). The HMI is in turn designed to create a simple and logical interface for the operator to control the system and manage the welding and forming processes.

SUPPORTIVE TECHNOLOGY

The Vaporizing Foil Actuator is a device and processing technology also invented by Dr. Daehn. The technology can be used for both metal forming and metal welding/joining. Unlike traditional processes that require large amount of electrical and/or thermal power deployed across a relatively long time period to create the formed or welded component, Vaporizing Foil Actuators deploy similar amounts of energy in the form of reaction force over exponentially shorter time frames.

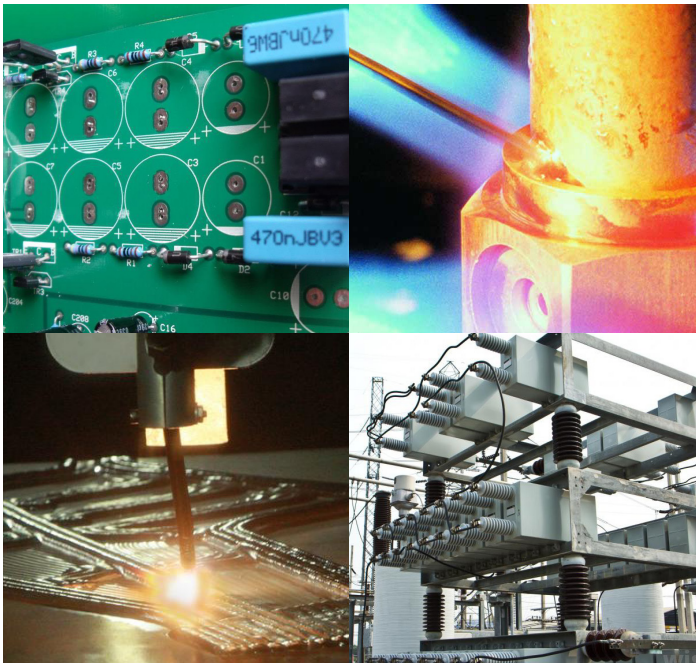


INVENTORS

Dr. Glenn Daehn holds the Mars Fontana Professorship in Materials Science and Engineering. His research is focused on impulse-based manufacturing. Additionally, he is involved in teaching and professional development as a trustee on the ASM Education Foundation Board. He founded and is the Director of the Ohio Manufacturing Institute. Dr. Daehn has central involvement in the Materials and Manufacturing for Sustainability Discovery Theme Initiative in addition to CDME's manufacturing initiatives.

PROJECT LEAD

Dr. Daehn and Dr. Yongbo Wan are leading the implementation of the Capacitor Bank project. Dr. Wan received his B.S. and M.S. in Electrical Engineering from Shaanxi University of Science and Technology, and then received a PhD in Biosystems Engineering from Oklahoma State University. He has more than 12 years of experience with embedded system software hardware design and extensive image processing experience. Dr. Wan worked for 2 years as a Post-Doctoral Research Scholar in the Department of Biosystems and Agricultural Engineering at the University of Kentucky. While at the University of Kentucky, Dr. Wan developed a CAN bus data acquisition system and executed laboratory and field experiments for agricultural chemical application equipment testing.



KEY FEATURES AND BENEFITS

- Weldments with mechanical properties 1.5 to 4 times stronger than those created using legacy techniques.
- The ability to join virtually any metallic material to any other metallic material without post processing.
- Measured energy savings of up to 80% over traditional forming and joining technologies.
- Exponentially shorter time frames in the welding process.
- Simple and logical interface for the operator.
- Configured to manage the charging, discharging, and synchronization of the external mechanical system.

MARKET OPPORTUNITIES

- The total energy storage market size in 2014 was $128 million, and by 2019, the U.S. energy storage market will be valued at $1.5 billion.
- The global welding products market is expected to reach $23.78 billion USD by 2020.
- The energy efficiency market is predicted to continue to grow and reach $120 billion USD by 2020.

THE OHIO STATE UNIVERSITY

CDME is supporting the commercialization of technologies that emerge from Ohio State's annual research efforts. Ohio State has one of the largest research and development budgets of all universities. The amount of annual funding is a leading indicator of the breakthrough innovation occurring within the University. Recent annual highlights from OSU:

» $934 Million: Total research and development (R&D) expenditures

» $470 Million: Federal R&D expenditures

» $101 Million: Industry-sponsored research expenditures

Whether your interest is in licensing, sponsored research, joint ventures, investment, corporate giving or placement of our best students, Ohio State is here to help accelerate your business through innovation.

Categories

Automotive, Manufacturing, Welding, Joinery, Energy Efficiency.

College

College of Engineering (COE)
Department of Materials Science and Engineering
Department of Mechanical and Aerospace Engineering

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