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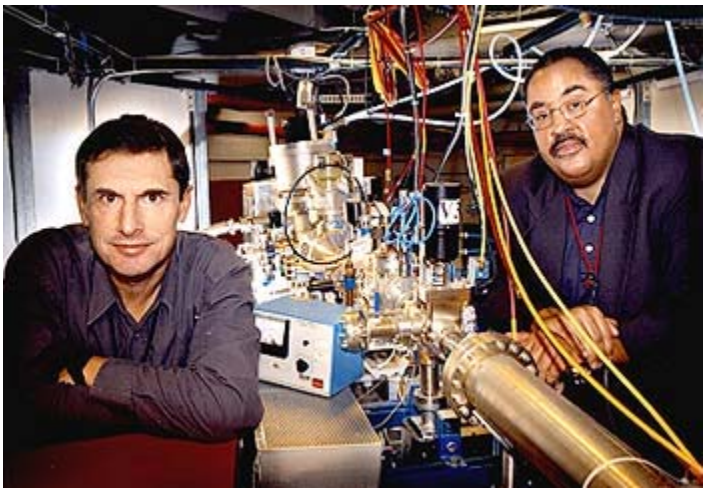
Acceleron Electron Beam, LLC, Wins Grant from the U.S. Department of Energy to Commercialize New Welding Technique Developed at Brookhaven Lab

UPTON, NY — An electron-beam welding technique developed at the U.S. Department of Energy's (DOE) Brookhaven National Laboratory is one of 13 energy-saving projects nationwide that won a grant from DOE's National Industrial Competitiveness through Energy, Environment and Economics program, known as NICE3. The grants help U.S. companies overcome regulatory, economic, and other barriers by demonstrating and commercializing innovative, energy-saving technologies.



Brookhaven Lab physicist Ady Hershcovitch (left) and Michael Greene from Brookhaven's Office of Intellectual Property & Industrial Partnerships, are pictured in front of the plasma window mounted on a beam line at the Laboratory's National Synchrotron Light Source.

Administered by the Connecticut Department of Environmental Protection, the $525,000 DOE grant will help Acceleron Electron Beam, LLC, an electron-beam and laser-production facility in East Granby, Connecticut, to work with Brookhaven to further develop and commercialize the new welding technology. Additional funding will come from the The Connecticut Light and Power Company, which added $250,000 to the project, and Acceleron, which is contributing over $519,000 to it. Acceleron holds an exclusive license to the welding technology patented by Brookhaven.

Electron-beam welding has many advantages over other welding techniques. One of the prime advantages of electron-beam welding is the ability to make welds that are deeper and narrower than conventional welds. A second advantage is higher welding speeds, which are due to the high melting rate associated with the concentrated heat source. With these advantages and others, electron-beam welding has commercial applications in many industries, such as automotive, medical, semiconductor, aircraft, and more.

Present-day electron-beam welding is performed in a vacuum chamber, limiting the size of the work piece that can be welded. Maintaining the vacuum requires pumps that use a lot of electricity and special, expensive lubricants that must be disposed of as waste. A device called a plasma window, invented by Brookhaven Lab physicist Ady Hershcovitch, is expected to overcome these obstacles by facilitating non-vacuum electron-beam welding.

Hershcovitch said, “This grant provides the opportunity to commercialize the plasma window that I started to design a decade ago. I am very pleased that Acceleron will work on testing it and bringing it to the marketplace. I expect that it will be a commercially successful energy-efficient device.”

Acceleron President Rory Montano commented, “Acceleron has been using electron-beam welding technology for more than 25 years. The plasma window will open many doors to strengthen electron beam technology in many areas of manufacturing. We are very excited to be a part of this program and are looking forward to its success.”

In present-day technology, an electron-beam welder consists of an electron gun enclosed in a vacuum box that can be as large as a room but is generally much smaller due to efficiency considerations. In contrast, in the new non-vacuum electron-beam welding method, the plasma window is mounted on the electron gun and maintains the small vacuum area needed to propagate the electron beam. The whole assembly is no longer than three feet high and about 8 to 10 inches in diameter, and it can be mounted on the arm of a robot. The new welding technique will not only be extremely energy-efficient, but it will allow electron-beam welding of large structures, such as airplanes and ships. Also, the plasma window will more than double production rates over the traditional vacuum electron welding. As a result, cost-savings will be substantial in manufacturing, and the cost of equipment will be less expensive than it is today.

Hershcovitch likens the plasma window to the “force field window” in the shuttle bay area of the Starship *Enterprise* in Star Trek. The “force field” separates atmospheric pressure in the Enterprise from the vacuum in outer space. In the plasma window, hot ionized gas particles are trapped by electric and magnetic fields. The particles, like any gas, exert pressure, which prevents air from rushing into the vacuum chamber housing the electron gun.

The plasma window is about 40 times as hot as the air at room temperature. This intense heat makes the ionized atoms and molecules move around faster and collide more often with air molecules, thus stopping most of them when they try to cross the plasma window. The electron beams can still pass through it unharmed, making it a viable non-vacuum electron-beam welding device.

The development of the original idea of the plasma window was made possible by a technology maturation grant from DOE's Energy Research Division and Laboratory Technology Program. Also, Hershcovitch acknowledged the help of students participating in DOE's Energy Research Undergraduate Laboratory Fellowships program in designing and piecing together the plasma window.