NASA successes

SBIR/STTR Program

High-Efficiency Lighting With Integrated Adaptive Control (HELIAC)

Objective

Headquartered in Madison, Orbital Technologies Corporation (ORBITEC) is Wisconsin's aerospace research and product development leader who uses the Small Business Innovation Research (SBIR) Program as a catalyst for its innovative technology development ideas. ORBITEC has been awarded over 180 Government contracts, exceeding $125M. Most of ORBITEC's current activities and revenue base are technology developments that evolved from the SBIR Program. ORBITEC was awarded Wisconsin's Professional Service Business of the Year (1995) and the Tibbitts Award (1996 and 1999) from the Small Business Administration for its outstanding work for the U.S. Government.

Success Highlights

The hardware and system control protocols developed for the High-Efficiency Lighting With Integrated Adaptive Control (HELIAC) have the potential to provide large energy savings in commercial protected agriculture. Power is one of the largest costs in the production of high-value crops, and providing a tool to reduce power costs will benefit this significant sector of agriculture. ORBITEC has been subcontracted by Purdue University for 2 units, which was a result of a NASA grant awarded to the university for plant research.

Benefits

Solid-state lighting units have a significant advantage over current gas discharge lamps, including:

- Lower radiant heat output that reduces energy usage because the units can be closer to the plant
- Longer life expectancy
- Improved safety; no pressurized bulbs, broken glass, mercury, or other hazardous materials; and low surface temperatures
- Robust and easy to maintain
- No expendables (e.g., ballasts or bulbs)
- Variable light output control
- Compatible with complex control protocols and integration into sensor systems

The Technology

The HELIAC technology involves the use of solid-state light-emitting diode (LED) lighting for biological systems. For NASA, this technology has applications in plant research hardware and in large plant growth facilities as part of advanced life support systems. Commercially, this technology has a variety of applications in agriculture, including greenhouse supplemental lighting and aquarium lighting.

The HELIAC precision enables lamp configuration to be adapted to species-specific growth habits so that photons can be absorbed efficiently by all available photosynthetic tissues. HELIAC also provides the capability to adapt spectral balance automatically to the plant development stage. Finally, it has the capability to automatically detect the proximity of plant tissue and to power only adjacent light engines, thereby greatly decreasing power requirements, particularly in the early stage of plant development.

Commercial Applications

Currently, ORBITEC developed a HELIAC lighting system under a NASA Research Announcement as a follow-on to our earlier SBIR work. The HELIAC project led to improvements in our solid-state systems that were incorporated into aquarium lighting systems scheduled to go on the market in late 2010 and in greenhouse lighting systems currently being tested in anticipation of a commercial product release in 2011.

Patents and Licenses

United States Patent number 7,220,018 B2 was issued 5/22/07 titled "Marine LED Lighting System and Method."

To Learn More

Additional information on HELIAC is available at *www.orbitec.com*.

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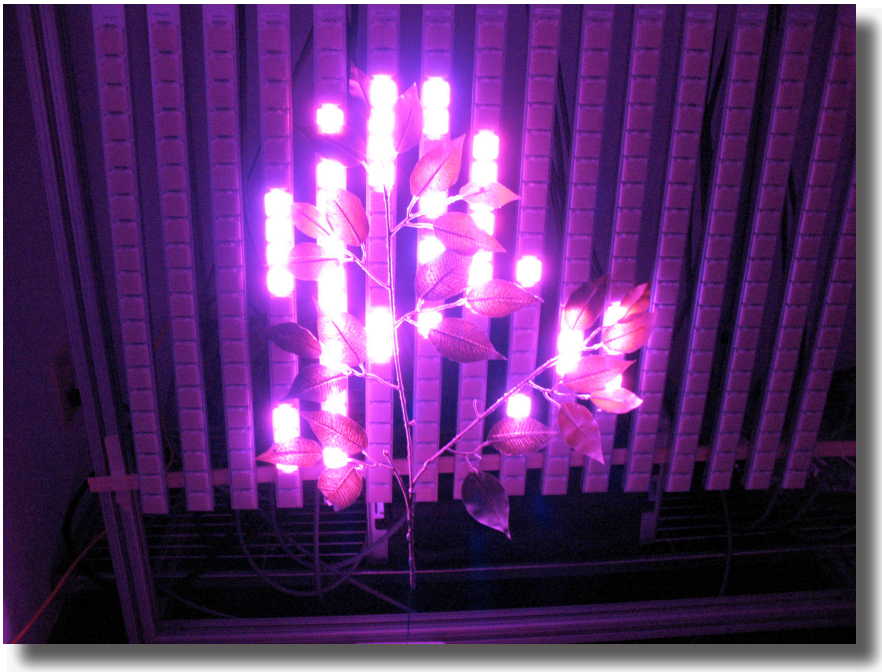

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