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Innoventor Awarded Seventh Patent

St. Louis – Innoventor, Inc. has been awarded its seventh patent, the latest one for chiller technology developed for use in laser surgery. The William E. Keck Free Electron Laser group at Vanderbilt University needed a tight tolerance chiller that would help the effectiveness of their break-through laser surgical process.

The development of this chiller allowed Vanderbilt's laser procedure to effectively melt the patient's skin rather than burn it therefore significantly decreasing scarring and speeding up the healing process. Vanderbilt's research found that temperature stability is critical to maintain the desired laser wavelength and output power to accomplish this. The cooling system exceeded Vanderbilt's expectations of steady state temperature stability of 0.1 degrees F and transient stability of 0.15 degrees. The laser method and chiller are currently being used in human trials. (See attached technical explanation for more information.)

Innoventor's other patents include technology in air scrubbing in the agricultural industry, food preservation technology safely using nitrogen for the consumer industry, a small parts inspection process in the medical industry and a leak detection technology for the aerospace industry. The company also has a number of additional patents pending including a critical Swine Manure to Green Energy Conversion process.

Innoventor is an engineering technology company that innovates for its customer and invents proprietary processes and products on its own. Its multiple engineering disciplines and industries participation allows for full turnkey solutions, and the ability to leverage technology from one industry to another.

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W.M. Keck Free-Electron Laser Center Vanderbilt University Laser Chiller

After a two-year search by W. M. Keck Free-Electron Laser (FEL) Center at Vanderbilt University in Nashville for an engineering company that could produce a laser chiller, Innoventor took on the job. This new cooling system is for the center's free-electron laser as part of a long-term project to improve laser stability and reliability. The cooling system created by Innoventor was specially designed to maintain the laser stability.

The FEL Center has made breakthroughs in recent years, particularly the discovery of an ideal laser wavelength for tissue removal. After significant progress over the last decade, the Center was ready to apply the research to benefit humankind.

The last step of the process, however, involved critical improvements focused on stability and reliability of the laser. Maintenance of the laser temperature was an essential part of those improvements.

In surgery, the laser is adjusted to the wavelength that matches the collagen in soft tissue. That wavelength "melts" rather than burns the tissue. Temperature stability is critical to maintaining the electron beam quality from the linear accelerator giving the desired stability for the laser wavelength and output power. Vanderbilt determined that wavelength stability was more than needed for research and for human surgical trials when the accelerator

temperature was stable to ± 0.10 degree F. This needed to be done for heat loads in the accelerator system from no load to a full 70 kilowatts at full load. And the system needed to "ride out" transients from full to no load.

The original, passive cooling system could maintain the specification in only the best of circumstances. During the hottest Nashville months or under the highest heat loads, it was unable to keep the temperature well regulated. Innoventor was recommended to Vanderbilt and they accepted the challenge.

After close evaluation, Innoventor proposed a solution that would meet the project's criteria, as well as satisfied the customer's budget and tight scheduling requirements. The contract was awarded in April 1998 and the cooler was delivered in late January 1999.

After a thorough demonstration at Innoventor's St. Louis facility, the cooling system was shipped and installed by the engineering company and a Nashville firm Peterson and Associates with less than a two week laser shutdown. The cooling system has exceeded the customer's expectations of steady state temperature stability of 0.1 degrees F and transient stability of 0.15 degrees F.

The laser with the Innoventor cooling system (patented) began being test in human trials in 1999.



Chiller Controls



Temperature Control & Mixing System



Rooftop Condenser Fan Assembly