Laboratory wins awards

Advances made at the Lawrence Livermore National Laboratory have been recognized by *R&D Magazine* as among the top 100 industrial inventions or products worldwide for 1995. In all, six awards went to the laboratory, with five of them won by researchers in the Laboratory's Laser Program.

Among the projects recognized by the awards is a lithography technique that produces flat panel displays by using two ultraviolet or violet laser beams to interfere with each other. The new process may permit field emission displays to compete in the same cost range as other flat panel displays for use in televisions, computer screens and electronic billboards.

A new sensor for flexible manufacturing also led to an R&D 100 award. This non-contact optical sensor can markedly increase the capabilities and flexibility of computer-controlled machines. Called the six degrees of freedom sensor, it is said to be more than 200 times faster and up to 25 times more accurate than competing sensors.

One of the laboratory's newest lasers is pointing the way to applications in surgery, detection of biological weapons and wire communications, and has also won one of the R&D 100 awards.

The Ce:LiSAF, or cerium lithium strontium aluminium fluoride, laser was developed by a team of laboratory employees working in collaboration with II-VI VLOC, formerly known as Lightning Optical Corporation.

An optical amplifier also received one of the awards. The miniature, low cost, terabit per second optical amplifier uses semiconductor optical amplifier (SOA) technology. It could replace bulky fibre amplifiers currently being used to distribute signals across computer networks and other communication links.

The other two awards were for an electronic dipstick, which is a micropower impulse radar system, with applications in fields such as medicine, security, vehicle safety and tools; and a magnetic sensor for reading computer hard disks.

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Laser optics to improve oil refining

Laser optic instruments developed at the US Department of Energy's Argonne National Laboratory could, it is claimed lead to the development of better oil injection nozzles in petroleum refinery equipment.

Argonne and a consortium of companies will join forces to improve feed nozzles for fluid catalytic cracking (FCC) units. The FCC process is the major conversion process used by petroleum refiners to convert heavy crude oil components into gasoline and other valuable products.

During the past 15 years, FCC technology licensors and refiners have identified the importance of creating small feed droplets and injecting them evenly into the catalyst stream.

However, the refining industry has lacked the ability to measure accurately droplet size and size distribution, and has not been able to develop the necessary mathematical tools to predict what would be the optimum feed-spray pattern.

The combination of more accurate spray measurement and mathematical modelling of feed/catalyst behaviour will enable the industry to improve further this critical piece of FCC technology.

Researchers at Argonne will study spray characteristics of commercial feed nozzles under different operating conditions.

According to Argonne engineer Rajesh Ahluwalia, 'We will use computer-controlled laser-optical instruments to measure the size, speed and distribution of atomized droplets in the air.'

He continued, 'These measurements will enable Argonne engineers to develop a computer model and a numerical database for use by the oil companies to understand how atomized droplets interact with themselves and with catalyst particles in the FCC process.'

The data will help the oil companies design and fabricate better feed nozzles, which will then be used in field experiments to identify any deficiencies. Further testing of the redesigned nozzles will follow.

The companies involved in the joint project include Amoco Corporation, Chevron Research and Technology Company, Phillips Petroleum Company and UOP.

The three-year project is funded through the Laboratory Technology Research Program in the Department of Energy's Office of Energy Research, which will contribute $821 128 for Argonne's effort.

The consortium's contribution is $720 000, for a total of $1541 128.

The project is being conducted under a cooperative research and development agreement (CRADA).

CRADAs are cost-shared agreements designed to foster cooperative research between industry and government laboratories.

Argonne National Laboratory, Argonne, Illinois, USA. WWW Home Page: http://www.anl.gov/

Chip material holds promise for optical networks

A semiconductor material that, it is claimed, can be fashioned into an optical-communications laser that operates stably even at high temperatures has been developed by Hitachi and the Real World Computing Program, sponsored by the Japan Ministry of International Trade and Industry.

As reported recently in *The Nikkei Weekly*, the material is made by mixing nitrogen into a gallium-indium-arsenide compound semiconductor. Using this material, the research group fabricated a semiconductor laser that can operate continuously at room temperature. The laser is said to exhibit strong thermal stability, operating even when the current is raised to 85°C and the current is increased to 1.6 times that at room temperature.

The prototype is said to emit 1.2 μm light, but by adjusting the nitrogen content the research group said that it should be possible to design a laser that emits 1.3 μm light, the wavelength used for optical communications.

Such a laser holds promise for use in optical networks. Since the laser requires neither a cooling system nor complicated control circuitry, it would make possible the design of smaller transmitters that consume less power.