FIRMS FINDING APPLICATIONS FOR ACOUSTIC SURFACE WAVES*

By:
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Surface acoustic wave devices that process electronic signals by turning them into sound are beginning to find their way into Canadian-built communications equipment. "It's a technology that's been around for a while, but its many potential applications are just beginning to be utilized in Canada," said Ezio Berolo, a project leader at the federal Government's Communications Research Centre in Ottawa. The centre has been designing the micro-electronic devices since 1975. "Back then, we had to catch up to the United States, the United Kingdom, and Japan. Now we are making significant contributions ourselves."

Surface acoustic wave technology involves converting electromagnetic waves to Rayleigh waves -- physical vibrations that ripple along the surface of an object. In effect, the speed of the waves is reduced from the speed of light to about 3,100 metres a second. "You can do things to the signal when it's slowed down that you couldn't possibly do when it's travelling at the speed of light. For example, you can perform complex mathematical functions, such as Fourier transformations," said Val O'Donovan, president of Com Dev Ltd. of Cambridge, Ont.

Mr. O'Donovan's company, which makes communications equipment used in commercial satellites, has been working with surface acoustic wave devices for three years, in conjunction witht the federal Department of Communications and the National Research Council. The world market for the devices is about $10-million a year, but is expected to grow to $1-billion by 1990, Mr. O'Donovan said. Com Dev has spent $2-million on research in the area, and is making a capital investment of $500,000 this year for equipment to make the devices. The company hopes the technology will enable it to broaden its product line to include two new fields: signal processing and radar systems.

Com Dev is developing equipment to process photographs transmitted by satellites, Mr. O'Donovan said. He hopes the application of surface acoustic wave devices will permit processing speeds to be increased by a factor of 10 over available equipment. The resulting pictures lack the quality obtainable from current equipment, but would be useful for screening large numbers of photographs, he said. Com Dev has received $300,000 in grants from the Department of National Defence to use the technology to develop radar systems with greater range of accuracy without increasing power requirements.

Bell-Northern Research Ltd., a unit of Bell Canada Enterprises Inc. of Montreal, has also received a defence grant to apply surface acoustic wave devices to processing of radar signals.

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RMS Industrial Controls Inc. of Port Coquitlam, B.C., a company involved in ultra-high frequency communications and microcomputer control systems, recently introduced its first radio transceiver module containing the technology. Peter Boorman, the company's vice-president, said a surface acoustic wave device was used to replace the transceivers' voltage control oscillator to reduce microphonics -- electronic noise caused by vibration. The technology also allows the radio to operate on 160 channels, and Mr. Boorman said RMS hopes to produce a radio that can be used on 2,000 channels. In addition, the company is looking at the possibility of mounting a surface acoustic wave device along with other components on thin film to produce a hand-held radio transceiver.

The largest application of the technology to date has been in frequency filters for television receivers. Colin Campbell, a professor of electrical and computer engineering at McMaster University in Hamilton, Ont., said about 12 million surface acoustic wave devices are used each year by television manufacturers in North America and Europe. "Virtually every domestic television receiver made in Japan now uses these devices," said Mr. Campbell, who has assisted both Com Dev and RMS in applying the technology. He is using it himself to develop a new resonator for television and precision radar applications. Surface acoustic wave technology enables the active part of some electronic filtering circuits to be reduced in size 100,000 times, he said. The circuits do not require hand tuning.

Velimir Ristic, a professor of electrical engineering at the University of Toronto, is using the devices in conjunction with integrated optics technology for potential applications in satellite communications and navigational systems in aircraft.

At McGill University in Montreal, Professor Eric Adler is seeking to develop a more complex surface acoustic wave device that can be mounted as part of an integrated circuit. Mr. Adler is trying to develop a device using Lamb waves -- sound waves that vibrate on a thin membrane instead of a thick surface. In addition, he is studying the possibility of using a surface acoustic wave device to deflect optical waves. Another McGill scientist, electrical engineering dean Gerald Farnell, is using acoustic waves to study the microscopic features of matter. The acoustic microscope, which is being developed in a joint effort by McGill, the National Research Council and the University of Sherbrooke, uses high-frequency ultrasound to produce images similar in quality to those produced by optical microscopes. Because it uses acoustic rather than light waves, the microscope can reveal details of an object's interior, a feature that could be used to detect faults in micro-electronic circuits.

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