EES Report

ENGINEERING EXPERIMENT STATION • GEORGIA TECH

Multiple building computer system conserves energy

In the future, managers in charge of multi-building complexes will need computer networks to control energy usage efficiently. Companies ready to invest in this technology can find a successful model for emulation in operation at Georgia Tech. EES researchers have developed a computer system which has allowed the Institute to reduce its electric power bill in the buildings where it has been introduced by more than 25 percent. Encouraged by these results, Tech's Physical Plant staff intends to install this system through the campus in coming years.

The computer network is known as the Facilities Management System (FMS) and it does more than control energy usage. The FMS also keeps records of equipment performance in order that timely maintenance schedules can be kept. Moreover, the computers in the network are set up to notify operators if fires or break-ins occur in the buildings under the system's coverage.

The FMS is made up of three levels of computers. The first is a minicomputer located in the Tech Physical Plant which provides overall system control. The second level is composed of eight-bit microprocessors located in each building. These computers analyze conditions and make decisions, which a third level of microprocessors execute.

Since the FMS was installed in 1978, energy consumption in the buildings it monitors has been reduced by at least one-quarter and, in some cases, by up to 45 percent. These usage reductions have been possible principally because the FMS takes advantage of free cooling from air outside the buildings.

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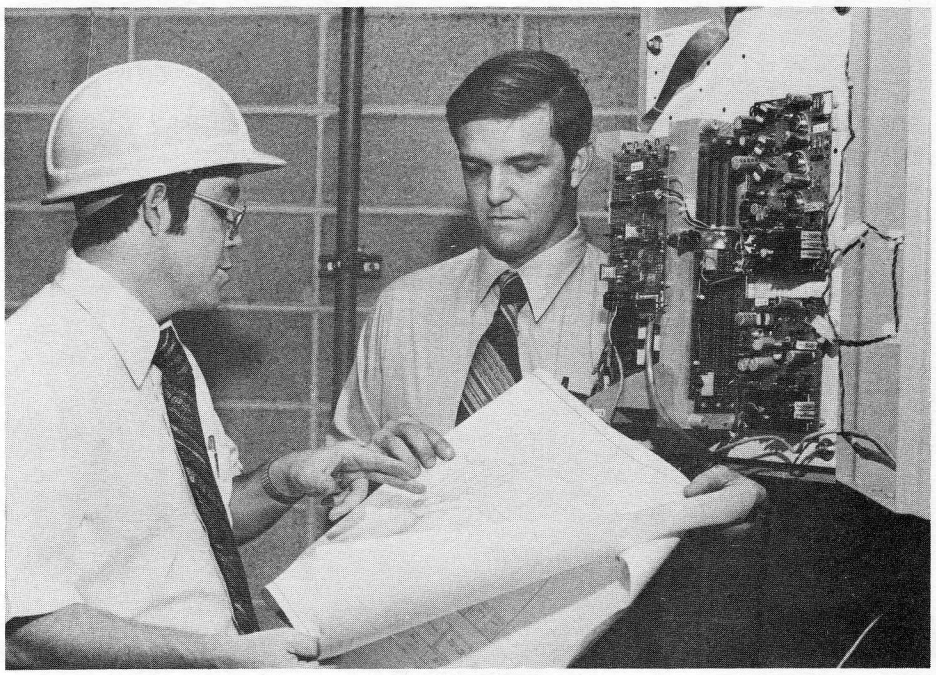

EES ENGINEERS Don Alexander, left, and John Scoville look over a part of the Facilities Management System they were instrumental in developing to manage energy consumption in a number of buildings on the Georgia Tech campus.

Large-scale synthetic fuel conversion system planned

Wood energy is already an economical alternative to oil and natural gas for homes and some small industrial applications. However, no proven technology exists for converting wood into synthetic fuel in quantities great enough to supply the energy requirements of large industrial plants on a continuous basis.

During the next three years, EES researchers will be developing equipment to meet this need. The Department of Energy has awarded $1.5 million to the Station to design and build an entrained system for pyrolysis/gasification of wood and other biomass materials.

The entrained system works differently from conventional pyrolysis/gasification units. It converts woody material into combustible gaseous fuel as it is blown through a reactor. Project director Dr. James A. Knight of the Station's Energy and Materials Sciences Laboratory believes the entrained method has special promise for producing synthetic fuel on a large industrial scale.

The EES unit will make syngas, a gaseous mixture of carbon monoxide and hydrogen which is useful in many manufacturing applications. Syngas can be employed directly as fuel for industrial and commercial heating. Manufacturers also may convert it by commercial processes into synthetic gasoline, methyl alcohol or natural gas. Methyl alcohol may be mixed with gasoline to make methyl gasohol. In addition, syngas contains hydrogen

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Station tests UHF receiving equipment

In 1952, the Federal Communications Commission (FCC) assigned television broadcasting to the very high (VHF) and ultra high (UHF) frequency bands. Since that time, most viewers have found UHF reception to be of a poorer quality than VHF reception. To answer these complaints conclusively, the FCC formed a task force in 1978 to investigate the "UHF handicap." Out of this study has come the conclusion that a judicious selection of equipment for UHF reception would solve many viewing problems.

Many TV owners are unwilling to buy special UHF equipment, but those consumers who make this investment must do so without reliable guidelines to assist them in comparative shopping. Federal regulations do not presently require manufacturers to rate the performances of their products by any standardized scale of measurement.

To give consumers guidance in the UHF market, the FCC asked EES' Electromagnetic Compatibility Branch to assess the quality of a variety of UHF receiving equipment commercially available today. The Station has been a pioneer in electromagnetic compatibility studies, the research field which deals with making electronics systems operate harmoniously in common environments. Though most of EES' work in this area has involved military applications, its engineers also have participated in important civilian programs, such as an effort to help General Motors improve its facilities for developing electronic automobile components.

EES engineers spent nine months evaluating UHF antennas, preamplifiers, transmission lines and transmission line components. As a result of these tests, they were able to make recommendations on equipment and installation methods which would most enhance UHF reception.

In general terms, the EES research team learned that the price of receiving equipment on the market is not always consistent with quality. The study also found a wide variation in the performances of the equipment tested.

Specifically, the study recommended:

- The best UHF TV antenna receiving system will consist of a "UHF only" antenna, a "UHF only" preamplifier mounted at the antenna and an RG-6/U type coaxial transmission line. Combination UHF-VHF antennas do not work as efficiently. From an overall performance and cost standpoint, 4-bay bow-tie antennas with screen reflectors are preferable.

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U.S. CONGRESSMAN Newt Gingrich, R-Ga., meets with leaders at Georgia Tech recently for a briefing on the state Advanced Technology Development Center (ATDC) being developed on the Tech campus. Among the group meeting Gingrich, seated at far left, were President J. M. Pettit, EES Associate Director Rudy Yobs, EES Director Dr. Donald Grace, ATDC industrial coordinator Wayne Hodges, acting ATDC Director Jerry Birchfield and Vice President for Research Dr. Tom Stelson.

EES laboratory director sought

EES is seeking a new director for its Electromagnetics Laboratory. The current lab director, J. W. Dees, has been selected to head Georgia Tech's Office of Contract Administration.

EML has a staff of 65 research professionals and is engaged in a broad spectrum of research and development programs including: millimeter/submillimeter wave technology, microwave solid-state techniques, infrared/electro-optical systems, remote sensing and physical sciences.

The director will be responsible for research operations in Huntville, Alabama, as well as Atlanta.

Candidates for the position must have at least a masters degree (PhD preferred) in electrical engineering or physics, a minimum of 12 years of relevant experience with significant technical management and research experience, proven leadership ability, effective communications skills, the ability to analyze technical needs and formulate applications, and U.S. citizenship.

Candidates should send resumes, including salary history and requirements, to: D. W. Robertson, Principal Research Engineer, Engineering Experiment Station, Georgia Tech, Atlanta, Ga. 30332.

EES REPORT

Mark Hodges — Editor

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EES completes UHF research

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- The input terminal of the preamplifier should match the output terminal of the antenna in order to eliminate the need for a balun between them.
- The preamplifier should provide approximately 20 decibels of gain and have a noise figure in the range of 2 to 5 decibels.
- The coaxial transmission line should be used because of its immunity to wetness, metal proximity, and the interference which could be picked up on an unshielded transmission line.

The study estimated that the recommended set of receiving equipment would cost around $70 — $10 for the antenna, $45 for the preamplifier and $15 for the transmission line.

EES may continue its work for the FCC in improving UHF reception. The Station has submitted a proposal to test the resistance of transmission lines and preamplifiers to weathering and aging. EES also may conduct a program to develop standardized product labeling practices.

Synthetic fuels

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which can be converted to ammonia for use in making fertilizers.

"Our project is the only entrained biomass conversion system which the Department of Energy is sponsoring," said Dr. Knight, who is collaborating closely in this research program with Dr. Charles W. Gorton of Georgia Tech's School of Chemical Engineering.

EES is one of the nation's leading contributors to applied research in the field of wood energy. Among the Station's most prominent programs is an effort to develop a process to produce ethyl alcohol for gasohol from wood rather than traditional foodstuffs. Under the continuing leadership of senior staff member Dr. Dan O'Neil, a pilot alcohol production plant will be built to test this technology. Through another important project, EES engineers have designed and built a prototype wood gasifier intended to remedy technical deficiencies which have plagued gasifier users in years past.

Careful planning can ease import competition threat

By Anthony DeCurtis
Economic Development Laboratory

For some time now, the impact of foreign products on domestic markets has been a primary source of concern for American businesses. This impact has been dramatic and, even more worrisome, seems to have been effected with surprising ease. Unquestionably, imports are now an established part of our business world and must be taken into account by any company desiring growth and a confident movement into the future. However, excessive alarm is not called for, nor can it be permitted to substitute for the informed and careful planning that can help American companies meet the challenge of foreign competitors and continue to thrive.

The U.S. Department of Commerce has given EES the responsibility for helping Southeastern businesses overcome import problems through the Trade Adjustment Assistance Center (TAAC). The Center is one of several programs operated by the Station to help regional business and industry

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Tech computers conserving energy

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"The old system ran all the time whether we needed it or not," explained EES computer specialist John Scoville. "We're finding that for a significant part of the year — probably four or five months — that we need no heating or cooling."

At other times, it is possible for the FMS to heat or cool buildings to the desired temperature levels by blending an appropriate mixture of exterior and interior air — without the need of using electricity for heating.

Another advantage of the FMS is its flexibility. Operators can adjust the system continually to meet changing conditions. This modification is significant. Until the current era, systems of this type could only be controlled by mechanical means, making them unresponsive to specific needs.

In the future, systems like the FMS may be used in homes as well as office and industrial complexes. Inexpensive computers already are on the market which have more than enough intelligence to control residential energy equipment. But before hardware like this can be economical, Scoville believes that the computer industry must design systems which can monitor and control all household appliances.

Cost-effectiveness of computer controllers in the home also will be enhanced if electric utilities began to offer customers the option of being charged by peak demand as well as total consumption. At present, residential electric rates are calculated according to total kilowatt hours of power used. However, if a billing system were set up which rewarded homeowners who ran their appliances during periods when demand for power within a region was relatively low, computer control networks would be helpful.

"You could load your dishwasher after dinner, then program the computer to run the appliance after midnight, when everyone is asleep," said Scoville.

EES laboratories complete merger

EES has merged two electronics laboratories into a single operating unit. The Computer Science and Technology Lab (CSTL) and the Electronics Technology Lab (ETL) are now functioning as the Electronics and Computer Systems Laboratory (ECSL).

Fred Cain, former associate director of the ETL, will be director of the newly-formed laboratory. Cain is a principal research engineer and was selected from a large field of candidates. He was chosen by a search committee headed by Dr. James Wiltse, associate director of EES.

Station offers import threat assistance

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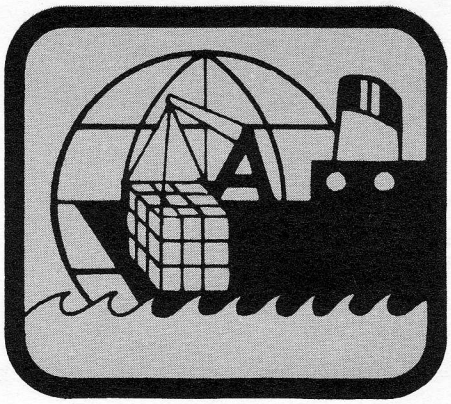
with specific concerns affecting profits and productivity. These assistance efforts are managed by EES' Economic Development Laboratory.

TAAC emphasizes the importance of Strategic Planning in the help it provides to firms confronting the import problem. Following a rigorous self-examination — to determine as precisely as possible a firm's current situation, how it arrived there, and the internal resources and market realities that will shape its future — a company can then begin to define its goals and objectives. Once these have been established, the firm can examine strategic alternatives to see how its stated ends can most efficiently be achieved.

For companies in competition with foreign suppliers, Strategic Planning leads in one of two directions: Combative Strategies or Avoidance Strategies. Combative Strategies, designed to compete head to head with imports for market share, work best for firms able to do one or, preferably, a combination of the following: capitalize on consumers' brand name preferences, offer superior product design, provide first-rate customer service, achieve quality standards due to a high level of technological efficiency.

Avoidance strategies, typically the more successful of the two approaches, are designed to ensure that foreign competitors will remain a minor factor in the domestic markets a company serves. Relying on extensive preliminary research, Avoidance Strategies can entail penetrating new markets with a company's standard products, developing new products for the company's established market, or, in a move toward diversification, creating new products for entirely new markets.



The history of Company A provides an example of a successful Avoidance Strategy designed and implemented with the aid of TAAC. Company A produced women's jeans directed primarily to a market of large chain stores and mass merchandisers. These large retail organizations are a prime market for imports because they can buy in large quantities, thus maximizing their savings; they can commit themselves well in advance of their needs, eliminating the delay factor in international trade, and they can obtain any necessary credit. TAAC helped Company A devise a plan that would discontinue its reliance on large retailers and would develop a market for it among specialty stores and boutiques, retail outlets that, as a rule, do not buy imports in significant quantities. To finance the plan, TAAC aided Company A's efforts to obtain Government Guaranteed Loans available to firms threatened by foreign competition.

Strategic Planning, as TAAC designs and implements it, takes into account two final points that all faced with foreign competition should be aware of. The import problem is not static; it is evolving and grows increasingly complex. Many foreign firms are now themselves confronted with rising labor rates and diminishing resources. At the same time, their merchandising and production skills are improving. These changing circumstances, in which today's successful strategy is tomorrow's failure, require an ongoing re-evaluation of policy.

While recognizing this, firms must also understand that foreign competition can never be the sole determinant of their market and product strategies. Domestic competition is still extremely strong, and to underestimate this fact in a short-sighted concern over foreign suppliers is to invite some unpleasant surprises.

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