KANSAS STATE
ENGINEERING IMPACT
NEWSLETTER

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By F. H. Rohles, Jr. . . .

Day-Night Cycle Research Problems Studied at KSU

Aside from the tiring effects of flight, itself, persons who travel overseas by transcontinental jets often are upset for several days after reaching their destination.

Part of this upset is due to a change in what scientists call "the biological clock." For example, a person flying from Manhattan, Kan., to Rome, Italy, would lose eight hours of light and the chances are he would be somewhat upset by this experience.

The same sort of upset can be brought about artificially by changing the day-night (or light-dark) cycle. A Kansas State University professor, Dr. Frederick H. Rohles, Jr., associate director of the K-State Institute for Environmental Research, has been studying the effects of changes like this in feeding behavior and performance.

"I have pretty good proof," says Rohles, "that a person who is highly efficient in some kind of skill will experience a significant drop in that efficiency when subjected to a change in the day-night cycle. This is true," he adds, "only if a shift of eight hours or more is made. It is not apparent to the astronauts who experience 16 days and 16 nights of 45 minutes each to every one of ours."

This and similar research on biological clocks was the subject of a symposium Rohles presented at the University of Minnesota Medical School, November 1, at the request of Dr. Franz Halberg, a world authority on biological clocks. The title of the symposium was "Drive Modification and Performance Following Shifts in the Photoperiod."

Other recognition of Rohles's work has resulted in his recent appointment to the Science and Technology Committee of the Aerospace Medical Association and to the Advisory Committee for the editorial staff of Psychological Bulletin, a journal of the American Psychological Association.

ONE OF THESE THREE PRETTY KSU COEDS will be selected the 1969 St. Patricia and reign over the 45th annual Engineers' Open House March 14-15 at Kansas State. St. Patricia will be formally crowned in ceremonies at 6 p.m. Friday, March 14. Chosen finalists are (l. to r.) Miss Judy Jakowatz, junior, Wichita; Miss Judy Macy, junior, Manhattan; and Miss Rebecca Campbell, sophomore, also from Manhattan.

Alumni Symposium Adds New Dimension To Traditional Engineers' Open House

The College of Engineering at Kansas State University has scheduled its first annual Alumni Symposium for Saturday, March 15. It will coincide with the 45th annual Engineers' Open House on campus.

"The Symposium should add an exciting new dimension to our Open House," says Dr. Ralph G. Nevins, engineering dean.

Two goals have been set for this event—present to alumni the activities, goals, and needs of the College, and furnish a time where relevant feedback between alumni, faculty, students, and leadership of the College can occur in an informal setting.

"The Symposium has been scheduled," explains Dr. Nevins, "out of a growing awareness within our College and among many of our alumni for the desirability of closer relationships. It is felt the Symposium will bring about more such relationships by cultivating involvement and meaningful dialogue between these groups."

Alumni Award

The annual engineering alumnus award, the Distinguished Service Award, will be presented at the annual Open House banquet Saturday evening by K-State President James A. McCain.

Speakers for the Saturday morning Symposium include Dr. Nevins, "State of the College"; Dr. Cecil H. Best, associate dean, "Academic Affairs"; Dwight A. Nesmith, acting director of the Engineering Experiment Station, "Research in the College"; Dr. Kenneth K. Gowdy, assistant dean, "Student Affairs"; and Terry Fry, vice president of the Engineering Student Council, "The Student's View."

The Engin-Dears, a coed auxiliary group, will entertain wives of alumni attending the Symposium with a program including a fashion show which will be in the Bluemont Room of the KSU Union starting at 9:30 a.m.

Banquet Tickets

There is no registration fee for the Symposium. Tickets for the Open House banquet at 5:45 p.m. Saturday are $2.25 per person. Banquet tickets can be ordered by writing: Dean of Engineering, Kansas State University, Manhattan, Kansas 66502. Please enclose a stamped self-addressed

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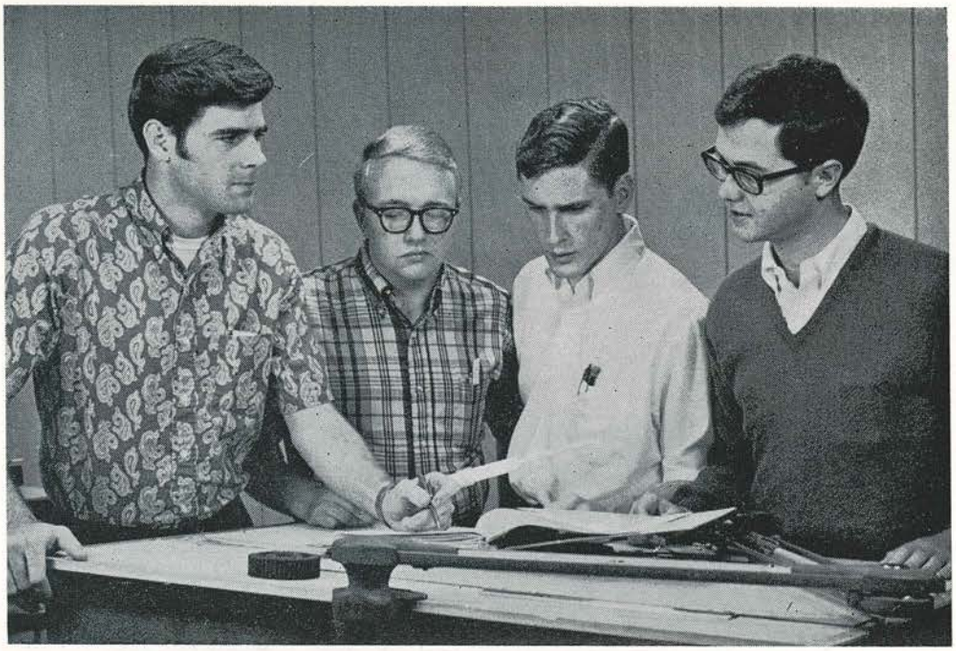

DISCUSSING THEIR DESIGN PROBLEM from Cessna Hydraulics Division, Hutchinson, are four seniors in the department of mechanical engineering design classes. Pictured (l. to r.) are Dennis R. Phalen, Riverton; Francis W. Moore, Ulysses; Alvin J. Martin, Topeka; and James E. Gagnon, Grainfield. These students are part of a continuing effort to serve industry by working with design problems provided by firms.

Kansas, Area Industrial Firms Derive Benefits From KSU Senior ME Design Students' Work

Kansas and area industry, students, and faculty agree—Kansas State University's mechanical engineering program for aiding industry in "solving technical design problems is really great."

Lauding the program are Kansas firms like Hesston Manufacturing and the Cessna Hydraulics Division and more than 15 other companies or corporations.

Firms like it because it enables them to solve some knotty design problems fairly inexpensively.

Students enrolled in the design program —seniors majoring in mechanical engineering—like it because they get to work on current practical problems. In the past they worked on design problems assigned by their professor which they indicated was "more of an academic exercise than a practical problem."

Valuable Training

KSU mechanical engineering faculty are thrilled with the program because their students are spending much more than the "required amount of time on their design problems and getting valuable training in oral and written communications."

The program, which involves about 35 students a semester, calls for them to work in groups of three to five on a problem at the beginning of each fall and spring semester.

A company representative comes to campus at the start of the semester and explains his problem to his assigned group. Then a contract is executed between the firm and the assigned student group along with the department of mechanical engineering.

Students work the problem during the semester and present their findings at the end of the course taught by Clarence Bell and Dr. John C. Lindholm.

Recommend Solutions

Shortly before the end of the semester, students take an expense-paid trip to the company to present and discuss their recommended solution with the firm's engineering staff. This gives firms additional opportunity to discuss employment with graduating K-State engineers.

Incidental expenses are covered by the firms, items like phone calls and duplicating of reports.

It costs each of some 20 companies now taking part in the program less than $1,000 a problem they contract. "This is very inexpensive for them," according to Dr. Preston E. McNall, professor and head of the department.

"Firms also like the program because the contract stipulates that the designs of the students become company property. This gives the firm patent rights.

Patent Application

"Some companies pay students for the patent rights as a matter of policy, others do not," he added.

One project conducted by a group last year has resulted in a patent application for some earth-moving equipment modifica-

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K-State EE Professor Improvises When Equipment Unavailable

How do you get expensive equipment for your laboratory when only limited funds are available? Improvise.

That is what Dr. Michael S. P. Luc[illegible] an Englishman who is an associate pr[illegible] fessor of electrical engineering at Kansas State University, has done quite successfully. He has saved hundreds of dollars in the process.

He's taken other equipment such as a common electric skillet, plastic gallon milk cartons, an unused metal base frame of a woodworking lathe, and a surplus surgical autoclave to make some rather sophisticated equipment for the new KSU solid state and thin film technology laboratory.

Lucas has converted a $23.99 electric skillet into a temperature control bath which would cost up to $300 if bought from a commercial firm. His graduate and undergraduate students use the bath to make thin film electronic circuits.

Saves Time

"This improvised bath is not quite as good as a commercial one, but it does serve the purpose initially," he explains.

Instead of buying commercially produced storage jars for distilled water, acids, and other chemical solutions, he has collected some emptied gallon plastic milk cartons. These would cost 50 to 80 cents apiece.

Since he is using only six or seven cartons, this has not been a great saving. However, it saved a lot of time that would have normally taken to order the storage jars from a manufacturer.

For $2.50, he devised a vapor degreasing tower, "better than any commercial one," used for cleaning in making miniature or microelectric thin film circuits. When produced by a manufacturer, this tower would sell for from $250 to $300.

Circuits Miniaturized

The vapor degreasing tower consists of a surplus surgical autoclave, originally used for sterilizing, and some old large glass jars given to Lucas by the KSU department of chemistry. The tower is used for graduate research and also by seniors in a solid state engineering course.

The base or mount of the old woodworking lathe is being used as a "very stable camera mount." The camera, set on the mount, is used for shooting photos of large circuits. From the negatives, these circuits are reduced or miniaturized and transferred onto a substrate or surface.

This lathe, originally purchased as surplus by the department of industrial engineering, is on loan, so there has been no cost involved.

Lucas has an ulterior motive for these ingenious improvisations. By saving mon[illegible] now, "when I need some expensive equ[illegible] ment for my lab which I cannot improvise, the powers-that-be just might look with more favor on my request."

KSU Gets OK To Use Its Nuclear Reactor At Higher Power

The TRIGA Mark II nuclear reactor at Kansas State University had been authorized by the U.S. Atomic Energy Commission to operate at higher power levels effective the final quarter of 1968.

Steady-state operation of the reactor has been increased from 100 kilowatts to 250 kilowatts. Authority was also obtained to pulse the reactor to 250,000 kilowatts, according to Robert W. Clack, director of the K-State reactor facility.

"Being a research reactor, the primary interest in operating it stems from the radiation, particularly neutron radiation produced during operation. The neutron flux available at the peak of the pulse is matched by only one other reactor between the Mississippi River and the Rocky Mountains," Clack said.

The TRIGA Mark II, originally purchased for $250,000 with a replacement value of nearly twice that total, is used in many teaching and research applications within the University.

Most active single class of use is called neutron activation analysis (NAA). The increased operating power substantially increases the sensitivity of the NAA technique. Thus, it has broadened the use of the reactor.

Alumni Symposium Adds

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return envelope along with your remittance for tickets.

The Open House exhibits will be available for viewing on Saturday from 9 a.m. to 5 p.m. There will be ample time for seeing these during the day.

Displays will be the highlight of the Open House on Saturday. Included will be many new and unusual student-developed and -created displays depicting the "truly fascinating world of engineering in 1969," with a glimpse into the future.

Among key display features will be Robby, the walking-talking robot; the Copper Man; and displays by leading industrial firms. For additional information, please write: John Kipp, Department of Applied Mechanics, KSU, Manhattan, Kansas 66502.

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Hood Can Be Effective In Cutting Physiological Strain, Says Konz

An eminent faculty researcher at Kansas State University has found that a water-cooled hood can be effective in reducing physiological strain during exposure to high temperatures.

Dr. Stephan A. Konz, associate professor of industrial engineering, feels that this finding is quite important because there are some environments which are not economically feasible to cool.

This project is one of eight currently being conducted at the Kansas State Institute for Environmental Research under a $200,000 Project THEMIS contract from the Department of Defense.

When a man enters a hot environment, he absorbs heat. This heat is either stored in the body, causing an increase in temperature, or it is removed from the body by evaporation of sweat, radiation, or other means.

An example of such a heat stress environment would be a mine where wall temperatures can soar to 130 degrees Fahrenheit. At that high level, even air ventilation systems do not cool workers, since the air itself becomes hot.

It has been concluded that it is far too expensive as well as impractical to install air-conditioning systems in such mines or other similar hot environments.

A former KSU graduate student in industrial engineering from Mexico initiated the investigation of this problem at the University in June, 1967.

Victor Morales was chief engineer at a lead and zinc mine at Charas, Potosi, Mexico. He became very concerned about the extremely high temperatures and their effect on the workers.

After he enrolled at Kansas State, he designed a water-cooled hood or helmet made of white rough canvas. A series of small plastic tubes were glued to the inner side of this canvas headdress.

From an attached tank, ice water was pumped through these small tubes in the hood. When the hood was worn, the cooled water passed over the head, throat and neck—thus cooling the bloodstream. And when these points in the head are cool, the whole body benefits, since sweating and the heart rate are reduced.

During the past year, Konz and some of his students have continued their "cooled head" investigations. They tried a more elaborately designed rubber hood with the tubes fabricated into the headdress itself.

This helmet, found less effective than Morales', covered the head, but not the throat and neck. Apparently, it is important for the hood to cover the neck and throat, Konz explains.

Another key factor was that the second hood was not porous like the canvas one. This meant that vapor could not get through the second, which lessened its cooling effectiveness, he reasoned.

"Headdresses lower a subject's sweat rate and temperature and also slow the heart rate under conditions of high temperature," he said. "Also, it does not appear to have any detrimental side effects."

Now Konz and his students are ready to use a hood which has been designed to overcome problems found in the previous two.

The latest is constructed of a special nylon material called Nomex, of which astronauts' suits are made. It has a high heat resistance, allows vapor to penetrate the hood as did Morales' canvas hood, and covers the neck and throat in addition to the head.

Primary advantage of these cooled hoods under heat stress thermal conditions is that they are relatively inexpensive. It also permits a worker to move about freely in a radius from a cooling tank to which the hood is connected. Body and arm movement, particularly, are not impeded.

Konz feels that cooled hoods can be used in most thermal conditions in which one does not want to go to the cost of installing an air-conditioning system or where it is impractical to cool the air, such as near a furnace.

Among typical places where it might be used: foundries, tractor cabs, firms with hot furnaces or other equipment giving off radiant heat, army tanks, ships, planes, carriers, radar huts, etc.

As a result of this research dealing with cooling local environments, the Institute for Environmental Research will host an international symposium March 13-14 to deal with other approaches to the problem.

This event, says Konz, is expected to attract researchers from universities and industrial laboratories.

Design Class Solves Problems

(Continued from page 2)

tions for J. I. Case Company, Burlington, Iowa.

Though the program is in its third year, purpose of the course remains the same—teaching engineering students to synthesize information from other engineering courses to solve problems.

The course also provides valuable training in oral, written and visual communication. Audio-visual aids are frequently used in presentations to firms at the end of the course.

Each report includes a statement of the design problem, outline of approaches taken to solve the problem and enumeration of conclusions and recommendations.

"Just the experience of making the presentation is extremely valuable. Once our students get out into industry such presentations are common for them," indicates Dr. Ralph Turnquist, faculty consultant to the senior design class.

Prof Thinks State's Oil, Natural Gas Resources Could Possibly Help Solve World's Food Needs

Several researchers at Kansas State University are studying a method by which the state's crude oil and natural gas resources could possibly help solve some of the world's food shortage problems.

One K-State investigator, Dr. Larry E. Erickson, associate professor of chemical engineering, thinks Kansas may have an opportunity to create a new industry by using these resources.

He studied last year at the University of Pennsylvania, Philadelphia, under Dr. Arthur E. Humphrey, professor and director of the School of Chemical Engineering.

Humphrey has been tackling bio-engineering problems associated with the microbial production of single-cell protein (SCP) from hydrocarbons of oil and natural gas.

Supplement

Erickson points out that the development of an economical process for producing SCP from these two Kansas resources could be successful. He indicates that protein is important to the world's diet and that SCP could be used to supplement the protein supply in meat and dairy products in the human diet.

Protein, he says, is important in solving the problem for at least two reasons: a minimum of 25 grams of protein is required by adults per day for growth and body maintenance because the body cannot synthesize certain amino acids, and protein cannot be stored in the human body for later use.

Not stored in the body, protein is the principal constituent of body cells and important for growth and repair of the body. Quality of the diet, however, is the real key to the starvation problem. If energy intake were the only nutritional requirement of human beings, the average person could live adequately by eating 1.7 lbs. of rice daily.

Microbial protein, says Erickson, has a high nutritional value and it can be produced in abundance cheaply and rapidly. "There is beginning to be a real awareness of the potential this process has for the state," he said.

Makes Proposal

A resolution suggesting the development of an SCP industry in Kansas was presented to the state House of Representatives.

Responding to the introduction of this resolution, KSU's department of chemical engineering has submitted to the state a research proposal entitled "Production of Proteins and Other Nutritional and Medical Elements by Microbial Metabolism of Natural Gas and Other Petroleum Hydrocarbons." If approved, the research will be conducted by Dr. Erickson; Dr. L. T. Fan, professor and head of the department; and Dr. William H. Honstead.

Recent interest in world food shortage problems was evidenced at KSU during the first annual Frank Carlson Symposium on World Population and Food Supply held on the campus December 3-4. President James A. McCain, discussing the significance of the symposium, said:

"The spectre of famine on a global scale is man's most serious problem today. Perhaps no other university is more deeply committed to helping solve the world food problem than Kansas State University."

Encounter Problems

McCain directed special attention to KSU's new multi-million-dollar research program of the Institute of Food and Feed Grains, newly established population laboratory, a decade of successful experiences in technical assistance programs in Asia and Africa, and a century of successful agricultural research and extension.

In the thinking of Dr. Honstead, professor of chemical engineering who is now the technical field representative of the Kansas Industrial Extension Service, any hopes Kansas has for taking advantage of this idea of developing a process for producing SCP must be "guarded."

Honstead, former head of chemical engineering at K-State, indicates that several oil companies—Esso, Gulf, Mobil, Sun, and others—in addition to other research interests are already involved in developing "efficient, workable SCP processes."

Erickson says that bio-engineers encounter two types of problems in producing SCP. First, there are the economic difficulties of developing a process which allows SCP production at minimum cost. Secondly, the SCP product must be nutritionally acceptable as a food or feed supplement.

Doubles Quickly

K-State's department of chemical engineering has been concerned with the first problem. The University's Institute of Food and Feed Grains is investigating the second problem.

Uses of SCP being seriously considered are for consumption by livestock as well as by humans. In Kansas, there is strong interest in SCP as a protein supplement for feeding livestock, says Erickson.

Main advantage of microbial production of SCP is that the mass of this protein doubles very quickly: 20 to 120 minutes. This is much faster than meat or even grasses and plants. Chickens may double their weight in two to four weeks and cattle in a month or two, while grasses and alfalfa double in a week or two.

A microbial protein production process also has no real space problem. It can take place in a small area, whereas production of protein from animals and crops, relatively speaking, requires much more land.

In addition, manufacture of SCP would not depend on agricultural or climatic conditions. SCP's growth is not dependent on surface or sunlight.

Thus, the relatively inexpensive microbial process of producing SCP may very well loom large in solving food shortages of the world, according to Erickson.

Distribution and Education

But the answer is not that simple. This is because SCP may not be in a form or taste acceptable to consumers. Initially, SCP in the form of beverages and soups would likely be most preferred by consumers.

But one fact remains, says Erickson "There is an opportunity for service as well as economic benefit to Kansas." He hopes something can be done to take advantage of it.

Succeeds W. R. Kimel . . .

Curtis Chezem Tapped To Head Nuclear Engg.

Dr. Curtis G. Chezem, 44, Gaithersburg, Md., a branch chief for the U. S. Atomic Energy Commission (AEC) in Washington, D.C., has been named head of nuclear engineering at Kansas State University.

His appointment was effective January 1. He succeeded Dr. William R. Kimel who became engineering dean at the University of Missouri, Columbia, September 1.

Dr. Chezem

Chezem, native of Eugene, Ore., was chief of the systems studies branch, Office of Safeguards and Materials Management of AEC.

Dr. Richard E. Faw, professor and director of the department's radiation shielding test site, served as acting department head from September 1 to December 31.

As head, Chezem oversees a department founded only 11 years ago which has achieved international recognition. The department's undergraduate program was the first of its kind accredited.

Supervisory Duties

Another important facility operated by the department is KSU's TRIGA Mark II reactor which has just been authorized to operate at full power capacity of 250 kilowatts.

Chezem supervises a 13-member faculty and some 40 graduate and 92 undergraduate students. The department is one of the largest in the country.

Before joining AEC, Chezem was associated with the Los Alamos (N.M.) Scientific Laboratory, operated by the University of California, much of the period between 1952 and 1967.

He was an AEC reactor program supervisor in 1963 in Bogota, Colombia, South America.