Wisconsin engineer. Volume 81, No. 5 April 1977

Madison, Wisconsin: Wisconsin Engineering Journal Association, [s.d.]

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wisconsin engineer

VOLUME 81, NO. 5
SPECIAL EXPO ISSUE
50¢

Dick Dent's job was made in Belgium.

Dick and his family live at 2905 Phillips St. in South Charleston, West Virginia.

He works just ten minutes away at the local Union Carbide plant.

But his job was created thousands of miles away.

You see, Dick's job is to make special chemicals called catalysts.

These catalysts are shipped to Belgium and other countries where Union Carbide plants depend on them to make petrochemicals that are sold abroad.

This interdependence is not unusual in the countries where Union Carbide and its affiliates work.

By manufacturing abroad we have actually increased the foreign demand for many products we make here at home.

This in turn has created more jobs here at home. A recent study shows our investment overseas has directly created at least 2,500 jobs in our plants in the U.S.

Still, we manufacture abroad only when it becomes unfeasible to supply and maintain a market from the U.S.

In fact, we export products from America to 100 foreign countries.

All of which is another way of saying that our international investment is helping improve the standard of living for people abroad and at home.

Including Dick Dent and his family.

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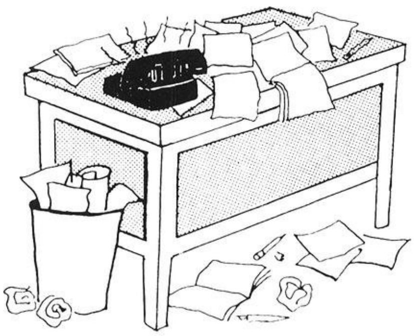

FROM THE DESK OF THE EDITOR

Engineering students fare even worse. For some reason they have become an object of ridicule to the L&S students. They spot a calculator hanging from your belt and your doomed to an hour long disertation on the evils of technology. Rumor has it that all engineers do is attend class (for missing a class is a fate worse than death for the typical engineering student) and study.

Engineering students deserve some good press, so here I go. An engineering student is as human as everyone else. Just because they work out complex nonlinear equations for fun, doesn't make them different. There are alot of people who work out every equation in their math books and save their favorite books so they can enjoy working out the equasions again at a later date, it's not just engineers. The only reason we spend alot of time in the library is because the college spent alot of money to build a place to get engineering students off the streets, we couldn't let them down, besides it beats the YMCA. Engineering students also eat. Just because you don't find too many over at McDonalds at lunch time doesn't mean we never go there. Most of us are too busy to sit over there and socialize, we get it to go. I've seen many a big mac accidentally welded to projects. Not all engineering students have pointed ears, there are a few exceptions. And when we spend all morning practicing our quick draw calculator routine, we're doing it for a good cause, our grades.

One of the main reasons cited for holding the Engineering Expo is to make the public aware of what engineers do. Engineering seems to be one of the few professions that no one knows much about. Think about it. Do doctors, lawyers or business majors have to show the public what they do? For some reason, the public has been misinformed about engineering.

I think the main cause of this is that engineering as a profession has gotten alot of bad press in the last decade. People pass on rumors and ideas about us without even taking the time to find out if they're true.

The typical engineer, to those who listen to these untruths, is a egg-headed man wearing wing tipped shoes and speaking on intangidble language of mathmatical formulas. They spend their working hours holed up in a lab working with all sorts of evil looking equipment. WRONG!

So now you know the truth. Go tell all your friends and anyone else you know. Word has it that engineering students start rumors about how bad engineering is to scare prospective students, so when graduation comes, there will be fewer engineers and they will be able to demand a higher starting salary. Let me tell you there is not truth to this rumor, no truth whatso-ever.....

The Editor

A special thanks to all those who made this issue possible by writing up their projects.

wisconsin engineer

PUBLISHED BY THE ENGINEERING STUDENTS of the UNIVERSITY OF WISCONSIN

Editor
Lauren Schlict

Assistant Editor
Brad Brown

Business Staff
Bill Fuhrmann
Delores Malloy

Layout
Roxy Engelstad
Laura Kohn

Circulation
Brad Bondus

Chairman: MARSHALL H. KAPLAN, Pennsylvania State University, University Park, PA 16802
Publishers Representatives: LITTEL-MURRAY-BARNHILL, INC., 60 East 42nd St., New York, NY 10017 and 221 N. La Salle St., Chicago, IL 60601.

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Second Class Postage Paid at Madison, Wisconsin, under the Act of March 3, 1879. Acceptance for mailing at a special rate of postage provided for in Section 1103, Act of Oct. 3, 1917, authorized Oct. 21, 1918.

Published six times a year, Oct., Nov., (Dec.-Jan.), Feb., Mar., Apr., by the Wisconsin Engineering Journal Assn. Subscriptions: one year—$2.00; two years—$3.75; three years—$5.25; four years—$6.50. Single copies are 35 cents per copy. 276 Mechanical Engineering Bldg., Madison, Wis. 53706. Office Phone (608) 262-3494.

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Bucky Badgers: Injection Molded

By Daniel Stillmank

This semester for my Expo project I took over the Two Cavity Plastic Injection Mold—Bucky Badgers. The die cavity blanks had already been made. What remained to be done was to machine the collars, to fit the die cavities into the existing die set, to cut the spur bushing and runners, and to put in injector pins.

Bob, the machinist at the Machine Shop helped assemble the die set and cut the spur bushing and runners while I machined the spur puller and two collars. I also machined the injector pin assembly.

Also I made a hoist to use in putting the die set into the plastic injection press.

During Expo I will run the press to demonstrate injection' molding and give the Bucky Badgers away as souvenirs of Expo 77. The whole operation can be seen in Room 140 F of the Mechanical Engineering Building.

The following appeared in the April 1940 Wisconsin Engineer commemorating the first Engineering Expo.

After years of dreams, talk, and embryo-stage development, the Engineering Exposition has finally been given a chance to become a Wisconsin engineering tradition. Because of the ups-and-downs and generally unpredictable nature of the historic St. Pat's Parade, the Polygon board, official engineering representative body, this year considered plans for a more worthwhile celebration, in the form of an exhibition, and early last November, voted to accept such a proposal and set in motion the necessary mechanism to carry it through. While emphasis should naturally rest on exhibits by the students because of the very nature of the undertaking, it was decided that the exposition would be better rounded out and would better fulfill its purpose if a number of industrial exhibits could be secured. In this way it would show what engineering students can do and are doing, and would also show engineering in practice out in industry. Thus it would be of practical interest not only to engineering students, but other students and the general public as well.

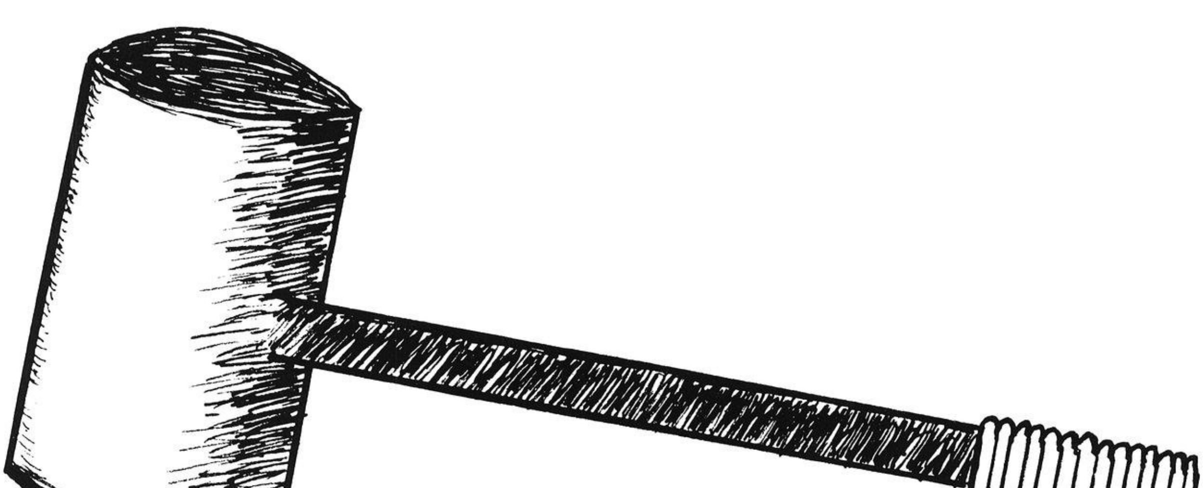
To plan and carry out the production of the exposition a general chairman, two assistant general chairmen, and a number of committee chairmen were appointed. Committee members were selected by various chairmen. Originally there were six committees, one for each of the following: industrial exhibits, student exhibits, publicity, finances, program, and housing. Later, a construction committee was created to help with the sizable job of building and setting up exhibits.

Weekly Saturday afternoon meetings, open for all to attend and presided over by the General Chairman, were held from November to April. Here, at sometimes stormy sessions, reports from committee chairmen were presented, policies decided upon, and differences of opinion worked out. Always the committees were breaking new ground, in the sense that this sort of thing had never been tried in its present form, and so there was no experience from which to work.
Polygon, and the element of uncertainty in such a new venture, the exposition budget was necessarily very limited, and an elaborate financial prospectus was drawn up, which provided for proportionate sharing by the various groups concerned, of whatever financial conquences might result.

To make the exposition feasible, it was necessary to secure assistance and cooperation from a number of sources. The engineering faculty consented to suspend certain classes in the M.E. building for the exposition dates, to provide necessary space, and some departments excused students from certain required work if they entered exhibits. A large amount of publicity was secured from the Daily Cardinal and Madison newspapers as well as from merchants who displayed exposition posters. However, it was from the students themselves, and from possible industrial exhibitors that the support was needed, and such support was enthusiastically given, as may be seen from the number and types of exhibits.

And so this exposition is in the nature of an experiment. Those who have devoted much time and effort, hope it will be successful and worthwhile. Your interest and reactions will be the judge.

. . .And so it was 37 years ago, but also today. We hope you enjoy this 11th biennial Expo.



Cryogenic Recycling of Rubber Tires

By Jeffery W. Parker

Cryogenics is a branch of physics that relates to the production and effects of very low temperatures on materials. The use of cryogenics for recycling of certain solid materials appears to be one relatively new solution towards the reduction of solid wastes. As much as seventy-five percent of the natural resources now being thrown away in the U.S. could be reclaimed and recycled by 1980.

The fundamental principle of the cryogenic process is to embrittle the material by simple cooling, allowing fracture to occur relatively easily. Simple physical separation can then be accomplished. Liquid nitrogen has become relatively inexpensive and widely used for cooling purposes, although many other cryogenic fluids can also be used. Liquid nitrogen, at -196# C., can embrittle many materials, including metals.

One of the many promising applications for cryogenics includes the disposal and recycling of rubber tires. An exhibit will be presented by Triangle Fraternity at EXPO '77 in which whole tires will be shredded, cryogenically embrittled and reduced to small granules of rubber. Table 1 lists some of the suggested uses for recycled rubber.

Also as part of the Triangle exhibit will be a model demonstrating the use of recycled rubber to clean up oil spills. The rubber particles could be spread over an oil soaked beach. The resulting mixture would become a sludge which could be solidified by spraying with liquid nitrogen . . . and then easily picked up and disposed of.

Cryogenic recycling provides a means to make economical use of waste material such as the rubber in tires. The technology now exists to make cryogenic recycling a realistic solution for the reuse of the materials from the estimated 215 million tires that are being discarded yearly.

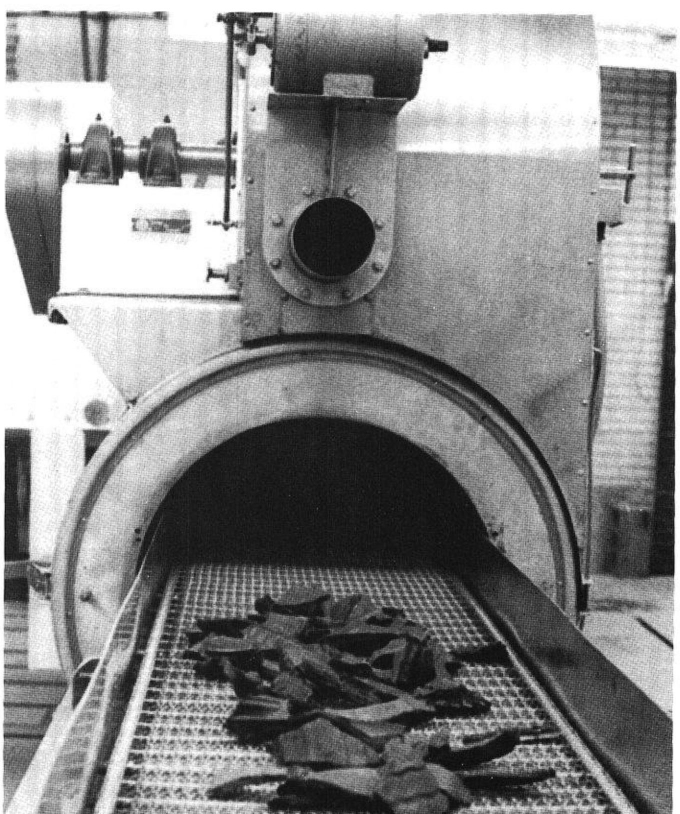


TABLE 1 - SUGGESTED USES FOR RECYCLED RUBBER

Asphalt Mixes	Roads, runways, flat roofs, playgrounds
Fuel Additive	Stoker mixes of 10% rubber, 50% coal
Filters	Remove mercury from contaminated streams
Erosion Breaks	To retard soil erosion on slopes and shore lines
Animal Mattresses	For race horses and prize cattle
Fuel Production	Destructive distillation yields oil and gas
Sports Field Base	Football fields, tennis courts, and tracks
Filler material	Thermoset plastics
Soil conditioner	Prevents caking and provides aeration
Oil Spill Clean-up	From leaking pipelines and tankers

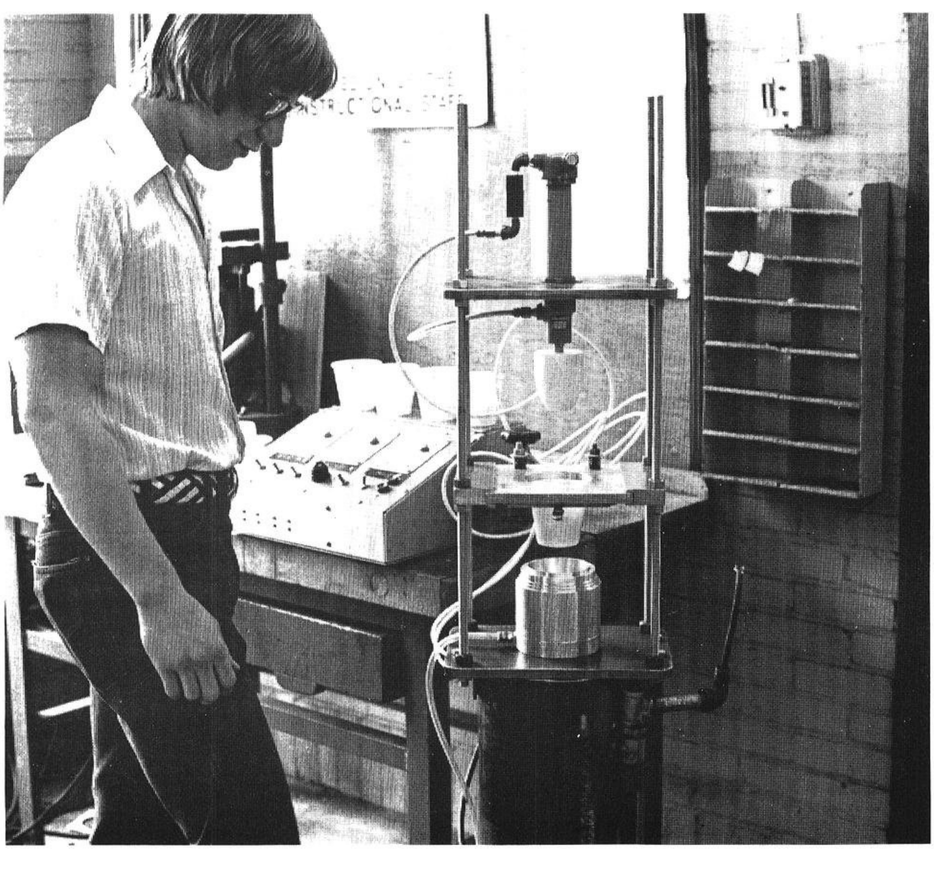
Experience and Fun by the Cupful

By Reginald Bruhn

When I decided to enter a project in Expo, I wanted to make something useful to all people of all ages. I didn't want to make a project that would sit around and collect dust for two years only to be taken apart later and used for salvage and different parts on other projects. I knew it would take deep concentration, a clear head and good engineering concepts to come up with something to meet these requirements.

It was Friday night of registration week and I was down in a local pub talking about the usually nonsence when the idea hit me like a ton of bricks, or should I say like a plastic beer cup. It was all plain and clear now. What do we use every day of our lives? **Cups!** The last two days of hard thinking had paid off and I was so happy I didn't even feel like punching the guy who drenched my shirt when he threw the beer cup at me, besides he was 6 feet 2 inches tall and weighed 230 pounds.

Taking my idea to Professor Duchon, he explained and showed me a relatively new process used to form plastic into deep molds. He called it a Plug Assist Plastic Thermoformer. After drawing up a couple of sketches the "fun" part began. Many of you who have worked in the shop and tried to find parts and materials that you need, know the "fun" I speak of. I got a lot of "we don't have that around here." and "you'll have to make due with this," but with the influential help of Professor Duchson and Professor Sandberg, I slowly but surely started this machine I was constructing solely by myself.

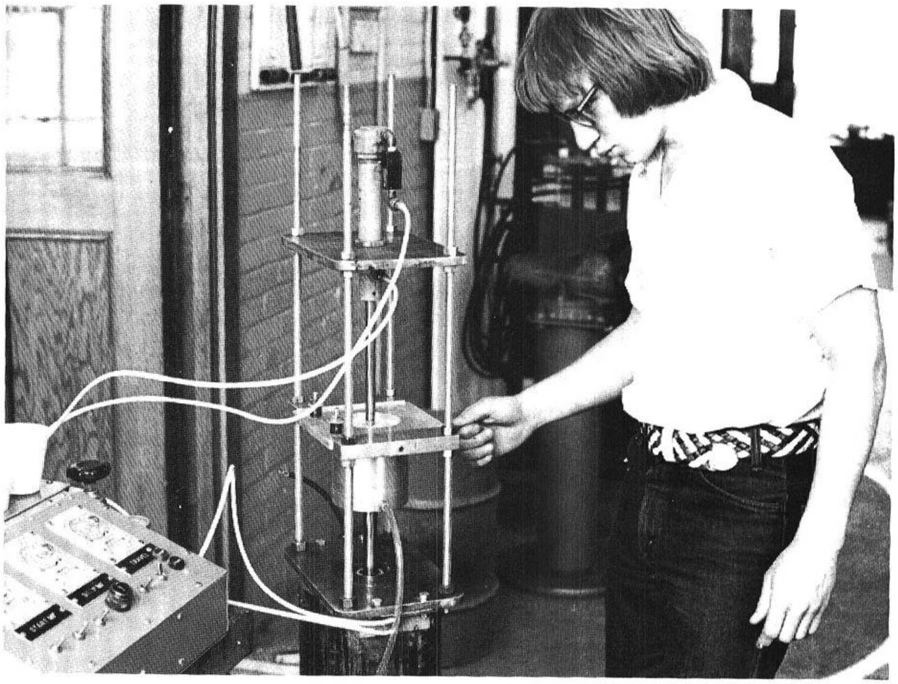


The machine molds plastic

After two months of hard work and headaches, I was ready to wire electricity into it. I got ahold of wire, timers, a soldering gun, some solder, and a bunch of other electrically looking stuff, and I was ready to play electrician. Ten hours of work later I had hooked up more wires and switches than I could imagine and I decided to plug it in. We had a Fourth of July as sparks shot from the wall receptical and I fortunately blew the fuse before I burnt myself up. After major adjustments, I plugged it in again and hit the start button and -ZAP! -120 volts into my fingers and I felt the tingle all the way down to my toes. But persistence paid off and after a few more blown fuses and 120 volt shocks the electronics was in working order.

Now came the first test, and this is how I imagined it to work: First head the plastic, put the hot plastic into the mounting bracket of the machine, push the start button and the bottom cylinder brings up the mold to the hot plastic. Two seconds later, the top plug comes down to preform the plastic, 1/2 second later the vaccum draws the plastic inside the mold. Pretty simple way to make a cup, huh? I crossed my fingers and pushed the button. The bottom cylinder came up and busted the holding clamp for the plastic sheet, it wasn't lined up straight. Three hours later I put out a cup that was so thin, I crushed it as I touched it to remove it from the machine.

As the deadline of Expo is less than two weeks away, I will once again have to rely on deep concentration, clear thinking, and bitter determination to get this plus assist plastic thermoformer operating. My roommates and I finally appreciate the saying "Engineering, a good way of helping people", just for the fact that 30 people at a party can spill an awful lot of beer on the floor trying to drink out of their hands.



Reginald Bruhn tests his Plug Assist Thermoformer cups.

Surveying and Mapping in the Mountains: A Map from Start to Finish

By David I. Goodrich

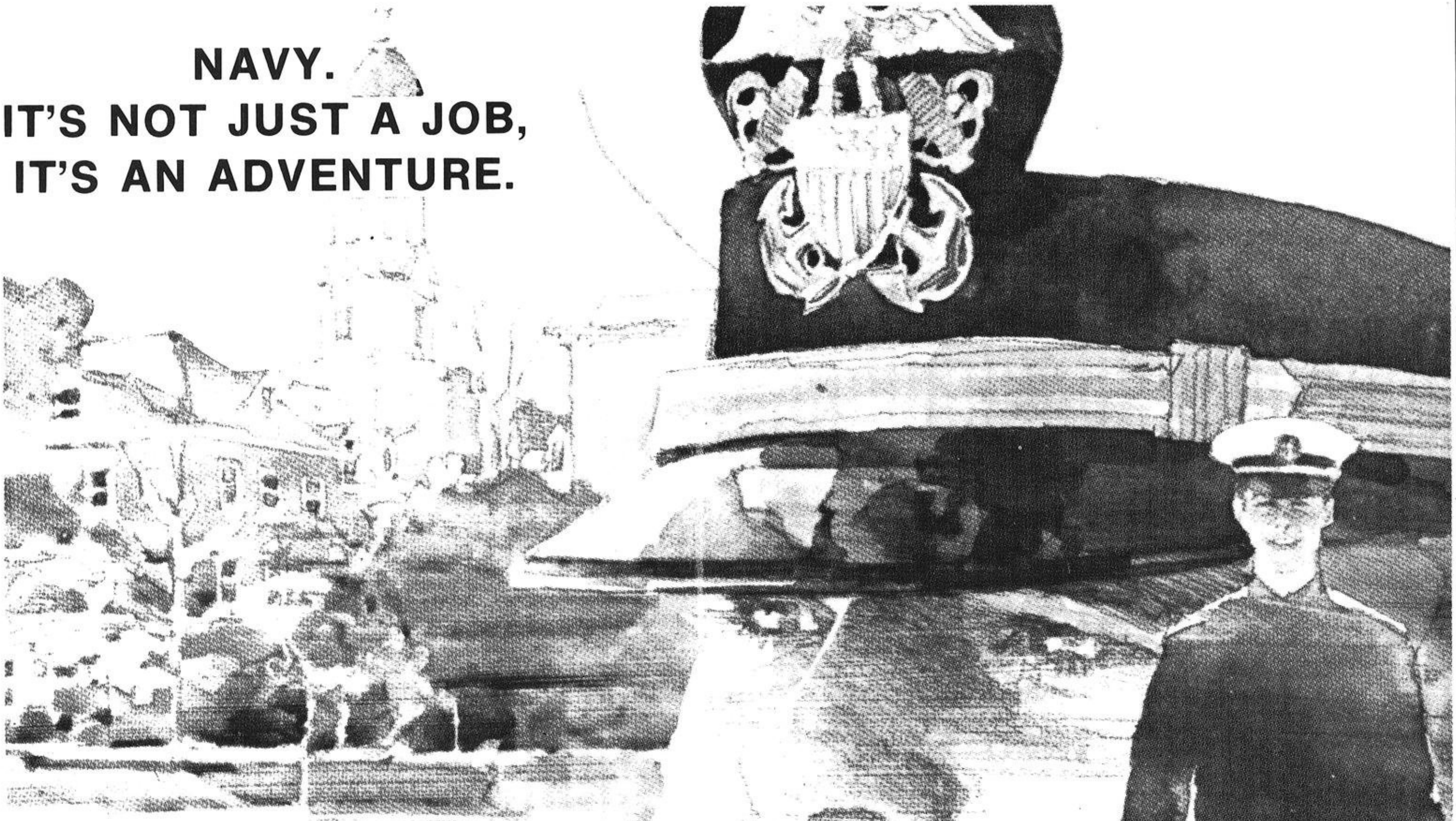
LOCATION: The Selkirk Mountains of British Columbia, in the Mt. SirSandford Valley. Approximately 60 miles northwest of Golden, British Columbia.

The Canadian Exploration Group initiated basic research in the Sir Sandford Valley of the Selkirks in the summer of 1975. In August of 1976 the same group returned. I was now a member of the expedition and my prime objective was the production of a large scale base map of Sir Sandford - Haworth glacial valleys. Also involved in the project was the accurate location and measuration of the Sir Sandford, Haworth and Silvertip glaciers to detect motional trends of the glaciers from the previous expedition.

My exposition project will illustrate the procedure necessary to make a map from start to finish. Surveying (data collection), data reduction, map plotting, map refinement and map publication, all fall under this category and will be covered in the exhibit. Unique problems involved with work in the mountains will readily show how photogrammetry (getting 3 dimension information for overlapping photography) lends itself to mapping.

I feel you'll enjoy the exhibit and I'll be happy to answer any questions you might have. Interesting slides will also be shown to illustrate the remote and rugged terrain, other areas of research, recreation and wildlife of the area.

NAVY.
IT'S NOT JUST A JOB,
IT'S AN ADVENTURE.



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Your Air:

Your Converter

By Sheri Sheppard

"How's your catalytic converter?"

"My catalytic. . . .what?" is the reply.

"Your catalytic converter."

If your life has been touched by a 1975 or later model American car, it has been affected by the catalytic converter. The converter is American automobile producers' response to the 1970 Federal Clean Air Act limits for 1975 and 1976 model cars and light trucks. These limits are:

> Hydrocarbons (HC), 1.5 grams per mile; Carbon Monoxide (CO), 15.0 grams per mile; Oxides of Nitrogen (NOx), 3.1 grams per mile.

These requirements resulted in a 90% reduction in HC, a 83% reduction in CO, and a 38% reduction in NOx from precontrolled cars (early 1960's).

In General Motors' search for an answer to these limits, more than 1,800 catalyst formulations were tested and evaluated by GM product engineers before the selection of the platinum-palladuim formula that is now used in GM's converter. This catalyst is the "heart" of the converter. The platimun-palladium combination is coated on ceramic beads and converts hydrocarbons and CO into CO^2 and water vapor via oxidation.

Considerable effort was also directed by GM in the design of a suitable container to hold the catalyst. The result of these efforts is the unique stainless steel "turtle" configuration.

If your car was produced by either GM or AMC, you will find your converter located under the floorboards beneath the feet of the right front seat passenger, directly before your muffler. It requires minimal care. Because of lead additives in regular and premium grades of gasoline which can contaminate the catalyst and deteriorate its conversion capability, it is essential that non-leaded fuels be used in all converter equipped cars. It is suggested that the catalyst be replaced every 50,000 miles to assure maximum efficiency.

In the two years since its birth, the converter has been severely attacked on the issue of sulfur emissions and on the issue of outside operating temperature. In March of 1975, the Environmental Protection Agency (EPA) announced that starting in 1979, emission standards would be imposed upon sulfuric acid emissions. The catalyic converter does change sulfur in incompletely refined fuel into sulfuric acid. The EPA based its decision on data furnished by EPA researchers and stated that sulfuric acid production from catalytic converters could build up, and under certain conditions could be a health risk.

After additional testing of the converter's sulfuric acid emission level by both the EPA and General Motors, the EPA retracted its sulfuric acid limit. A representative of the EPA stated that the agency overestimated the levels of the pollutant that commuters would be subjected to by basing their initial study on the worst possible test conditions. He went on to say that 99 percent of the drivers on a freeway would be exposed to less than 12 micrograms of sulfuric acid, a level assumed to be safe, and that the average exposure would be only two micrograms. The retraction of the EPA's initial recommendation is not a victory for converter producers, but rather a sign that accurate studies concerning sulfur emissions are needed now.

The converter has also been attacked concerning its outer "skin" temperature. A number of news stories in 1975 accused the converter of starting several forest fires. Further investigation into the fires showed, however, that the cars involved in the incidents were pre-catalyst vehicles. In hundreds of billions of miles of customer service, only a very few converters have overheated, and these occurances have been a direct result of carburetor malfunction, disconnected spark plug wires or other ignition system problems.

Tests confirm that the outer cover temperature of the converter in normal operation is about the same as an ordinary muffler. This temperature is far lower than that of a typical engine exhaust manifold.

The catalytic converter is the automobile producers' present answer to the EPA's emissions standards. Perhaps it's GM's answer, but it is YOUR converter; and EPA standards affect YOUR air. You are involved.

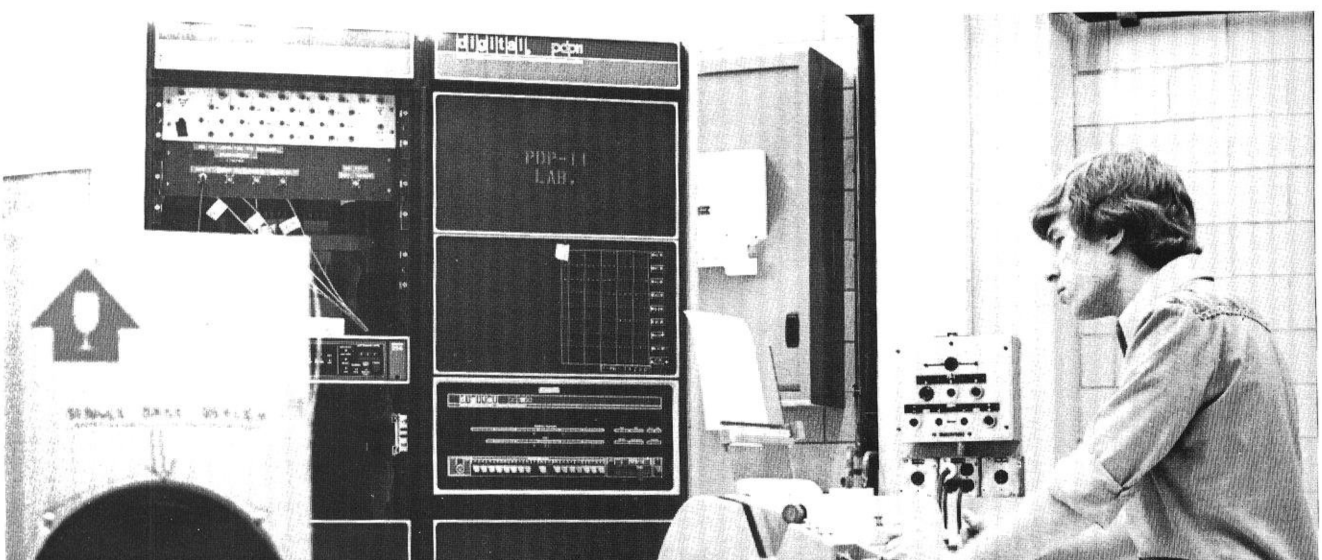
See you and your questions concerning the converter at EXPO!

Computer Music

By Alan Olson

Traditionally, computers have been thought of as high speed tools to aid people in solving complex problems. While this is most certainly true, there exists another whole world of applications to which computers are ideally suited. This is the world of "Real Time" applications. Real Time means that the computer must now function within time limitations set by some process or processes external to the computer itself. While a computer may be able to solve complex mathematical problems with great speed, this speed is not infinite. In fact, when one must deal with some external process, the speed with which the computer operates becomes quite critical, and may in some cases be simply too slow to perform adequately. There are a host of applications, however, which the computer can perform satisfactorily and synthesizing music happens to be one of them.

Our music synthesis scheme is by no means unique. Much has already been done at other major universities using equipment for more sophisticated than we have available. However, our equip-

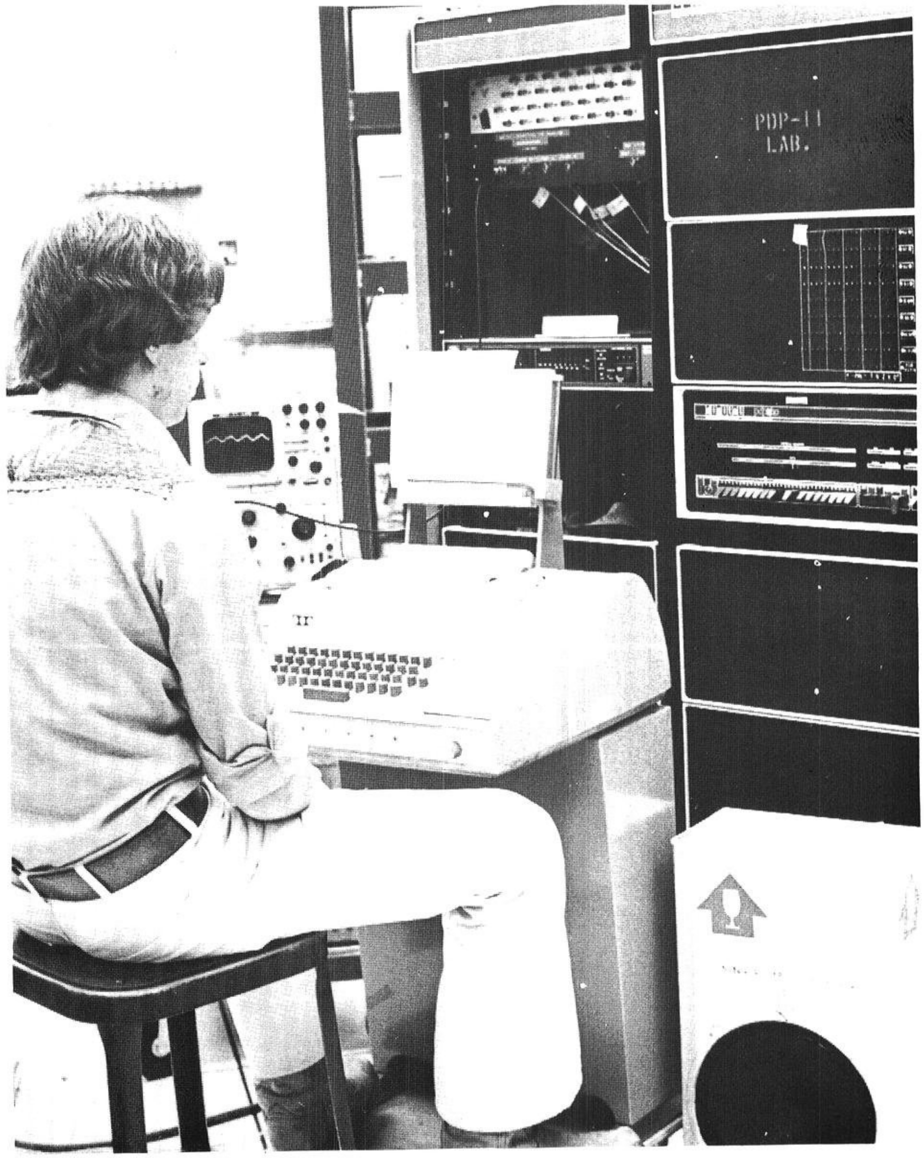


This computer plays Bach, Mozart and even Scott Joplin.

ment performs quite well in this particular application, given our performance criterion. We are using the PDP - 11/20 and PDP - 11/40 minicomputers along with conventional audio amplifiers and speaker systems to make the sounds audible. Our scheme is able to synthesize 4 simultaneous independent parts with 9 different voices available to each part. It should be noted that the computer must be told what to play as it has no ability of its own to compose musical pieces. All of the required information is stored in the computer's memory and is then recalled as needed. Our system has enough memory to store many hours worth of music of many different varieties.

One may ask, "How is a computer able to synthesize music such as this?" As we all know, sound consists of time varing waves of air set into motion by some sort of transducer. This can be your own vocal cords or, in our case, a conventional speaker system. The electrical signals which the speaker transforms into sound can be produced by a variety of methods. A computer generates electrical signals using a device called a "Digital to Analog" converter. This device takes a number stored inside the computer and generates a voltage corresponding to that number. Thus, by varing these numbers through a stored sequence, a time varing electrical signal results which may then be transformed into sound. By using four such devices, one can produce four sound sources, as we have done.

Our synthesis scheme, though somewhat impressive, is really quite crude. Much more sophisticated schemes exist such as the ARP and MOOG synthesizers which are commercially available. Our equipment is simply to show to perform as well as these fine instruments. However, we have learned a great deal about real time computer applications and are seeking better ways all the time.



Alan Olson programs the final steps into the computer.

A Flame Loudspeaker

By Jerry Fitzpatrick

The flame speaker was originally discovered by researchers at the United Technology Center who were experimenting with the acoustic properties of jet engine exhaust.

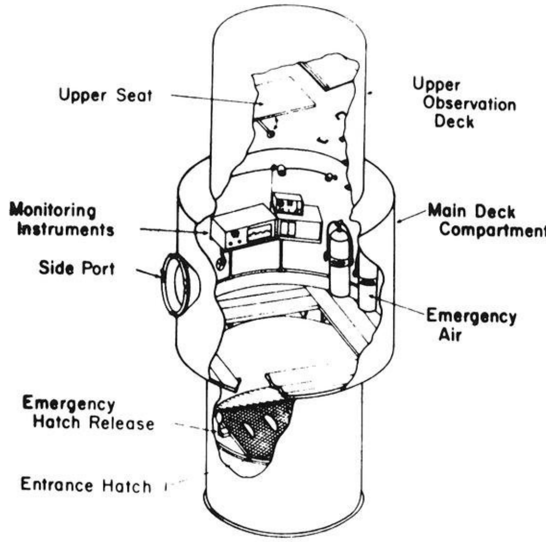
My demonstration will consist of two electrodes placed within the flame of a bunsen burner. A five-hundred volt DC bias and a modulated AC signal from a power amplifier will be applied to these electrodes, and the electric field created will cause the mobile gas ions— which are coupled to the surrounding air molecules— to produce a corresponding acoustic disturbance.

By applying a source of music, we essentially obtain the world's only omnidirectional and ultra-high fidelity loudspeaker.

Under the Waters of Lake Mendota

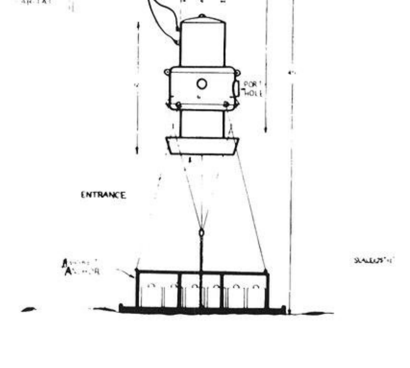
The Sea Grant Habitat is an underwater environment for use as a test and monitoring station in fresh water lakes. This project provided the opportunity for the student to acquaint themselves with the differing aspects of constructing and installing a year round submerged facility. Also it can be used as a training base for marine studies. Students supplied the labor. Professor Ali Siereg served as the faculty director; Fred Middleton the project engineer; and Dave Engeseth the diving supervisor.

Sea Grant Institute, along with the University of Wisconsin College of Engineering funded this project.



UNDERWATER HABITAT

The cylindrical design is based on a stability criteria requiring the center of gravity below the center of buoycency. To insure this criteria, three-quarter ton of ballast was added to the lower portion of the habitat. A component anchor system was designed utilizing concrete filled barrels to secure the habitat, which has a 12,000 pound buoyant force. The barrels permit easy assembly and collectively weigh approximately 15,000 pounds.



The 800 gallon center tank was donated by an overly optimistic farmer from Dodge County who was into producing his own wine. Recycled materials compose the bulk of the remaining parts.

The habitat itself is twelve feet long with an upper storage area, main compartment, and lower level of four, six and four feet in diameter respectively. Anchored independently, the platform above the habitat has a winch for mobility and a compressor to provide filtered breathing air. This allows for extended underwater experience for the divers. Two emergency tanks on the habitat itself, will supply up to an hour of air.

Power for the control module is also provided by the compressor. Communications, monitoring equipment and low power circuits are enclosed with the compressor. Raft-habitat and raft-diver conversations can be carried on with the 5-way communication system. There are matching control panels for the module and the habitat capable of handling 36 separate monitoring channels. The power circuits are based on a 12 volt DC supply.

For winter use the control module and compressor are portable enough to be repositioned on the ice above the habitat.

Dave Jansen is a senior in Mechanical Engineering and has been an underwater participant for five years, working on this project for three years.

NUCLEAR POWER

The ANS Expo project will be highlighted by a tour of the University experimental reactor. There will be films and slides on nuclear power (both fission and fusion) along with displays explaining the fuel cycle of nuclear reactors. There will be pamphlets and people to answer questions about nuclear safety.

The theme of the ANS project is education. We want people to understand that. Nuclear power from fission is a safe energy source.

Testing radioactive material.

Control panel for the nuclear reactor.

Details:

3 short films from ERDA — 2 on fission, 1 on fusion. After the tour of the reactor there will be posters on radiation, fuel cycle, and waste disposal. We hope to have displays of waste material and shielding. People will be shown the hot cell where very dangerous materials are handled. In the room next to the hot cell will be a slide projector showing shots of nuclear plants and fusion design reactors. There will be several students around at all times to answer any questions.

Crash a Corvette Using a Computer

Which discipline of engineering is usually stereotyped incorrectly? I'm sure there are many different opinions, but industrial engineering must be the answer most often heard. The American Institute of Industrial Engineers would like to put an end to this lack of knowledge with our Expo project, a car simulator.

What are industrial engineers doing with a car simulator? You can easily have this question answered by participating in this exhibit. That's right, participate. We believe the 'hands on' concept of our project will make it more interesting and leave a lasting impression.

In order for the Expo audience to be able to relate to the car simulator, we call it a Chevrolet Impala, but this Chevy was made with more than GM parts. We have accumulated a conglomerate of parts including: a Corvette seat, Ford steering wheel, and a Fiat dash. Acre Auto Salvage donated many of the parts.

As the visitors arrive they can sit behind the steering wheel and focus their attention on the T.V. in front of them. The challenge to this driver will be to keep a moving dot in the center of a one-half inch diameter circle that is controlled by the steering wheel. As he is intensely concentrating on this rather simple task, either a light will flash or a buzzer will sound which will demand a predetermined response. A timer will start at the instant the signal is set off and will not stop until the reponse of slamming on the brake, honking the horn or turning on the signal light is complete.

We have added some extras to make this Impala seem more realistic. First, we connected the accelerator to a variable resister and integrated it twice to give it a time lag through our analog computer. Then we connected it to a volt meter which in turn controls the speedometer. Thus, as the driver presses down on the accelerator the dot on the TV will move faster along with the indicated speed of the speedometer. A signal generator is also connected that will change frequencey with the speed. This will give the sound effect of accelerating.

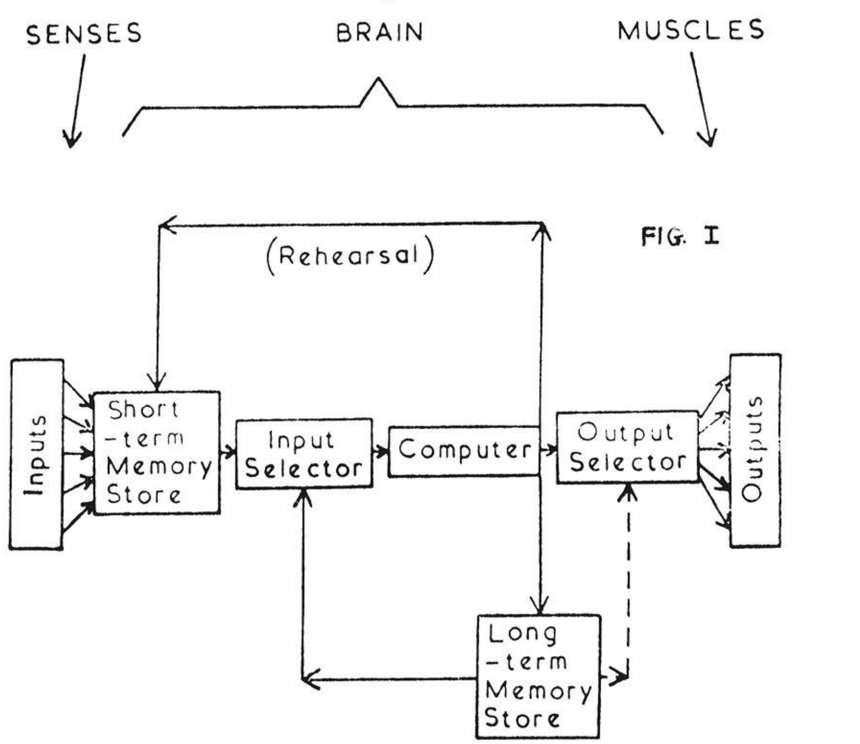
What will a reaction time of .25 seconds mean to the average Expo visitor? For a little excitement we are going to keep a record of the best reaction time of the day. More importantly we will display several charts in a simplistic form so the driver can quickly reference his reaction time to the distance a car would have traveled in that time. For example, consider a reaction time of .25 seconds (a relatively normal reaction time) and a speed of 60 mph, this would give a distance traveled of approximately 22 feet. This doesn't even take into account braking distance.

This will be fun for the audience but what does it have to do with Industrial Engineering? First, the Human Factors lab is concerned with 'Human limitations and needs to mechanical equipment in a systematic approach'. We believe that if you're going to design mechanical equipment for people to use, you should at least consider the limitations of human beings. 'It's pretty hard to redesign the human'. Any Expo visitor that has worked with very many machines will know of at least one machine that was poorly designed for human use.

As an approach to this human capabilities problem, consider the simplistic view of man in fig. 1. We are, in this drawing, viewing man as a processor of information with inputs as a flashing light and outputs as 'slamming on the brakes'. It is easy to see that the more inputs the input selector has to process, the longer it will take to get an output. A good example of this is shown in fig. 2 which shows two important concepts: a) as the number of possible inputs increased so did the reaction time, b) the 'learning curve" or as the human became more fmailiar with his required task, the quicker he can react. This can account for some of the problems of the beginning driver.

Our example is only a small exposure to the area of Human Fac-

Fig. 1.



A simple model of man as a car dirver, showing the bottleneck in the brain through which all information has to pass if it is to be acted upon. The box labelled "Computer" works relatively slowly, unlike an electronic computer (Modified from Broadbent, 1958).

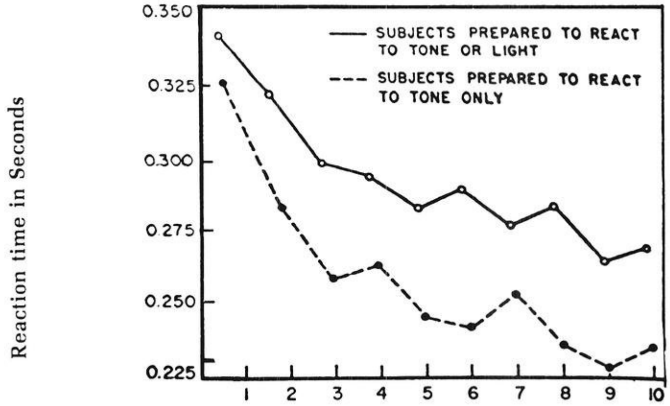
tors and Human Factors is only a small part of Industrial Engineering.

Experiments in the mechanical grinding and refining laboratory are concerned with minimizing the energy consumed during the mechanical process of tranforming wood into pulp. The ground wood pulp is used to make many different types of paper.

Basically, pulp is produced by forcing an abrasive moving surface against the outer fibers of the wood. This tends to pull and rip the long wood fibers into small pieces and to roll the loose fibers against the wood. The rolling action splits the tubular fibers along their axis.

The first wood grinding experiment, designed and built by Dr. David Dornfield, simulated the stone grinding process. In this case the abrasive surface is the outer circumference of a rotating, gritted stone wheel, the wood is forced against the stone with the use of a hydraulically controlled ram. Hot water is the lubricant.

Through the optimization of grinding conditions, ie. controlling stone speed and the loading force and the introduction of a slightly oscillating load, considerable energy savings is realized.



Average reaction times of 39 subjects to ten successive presentations of a tone. In all cases the stimulus was the same (a tone) and the response was the same (releasing a telegraph key), but the "set" differed. In half the trials the subjects were told to expect only a tone; in the other half of the trials they were told to expect either a tone or a light.

The second experiment, which is in its beginning stages, approximates the wood chip refining process. Disk refining involves producing pulp from wood chips by forcing the chips between two rotating disks. The same pulling and rolling of the fibers occurs here.

We are building a miniature disk refiner which has the capacity to measure the amount of energy consumed during the pulping of small quantities of wood chips.

First the wood chips will be pretreated with different fungus treatments. We will evaluate which fungus treatment is more efficient at breaking down the 'glue' (lignin) that holds the fibers together. The more breakdown occuring the less energy needed to fiberize wood chips.

Energy saving is of great interest to the paper industry which is the third highest consumer of energy in the United States.

Power Sports

By Dik Eierman

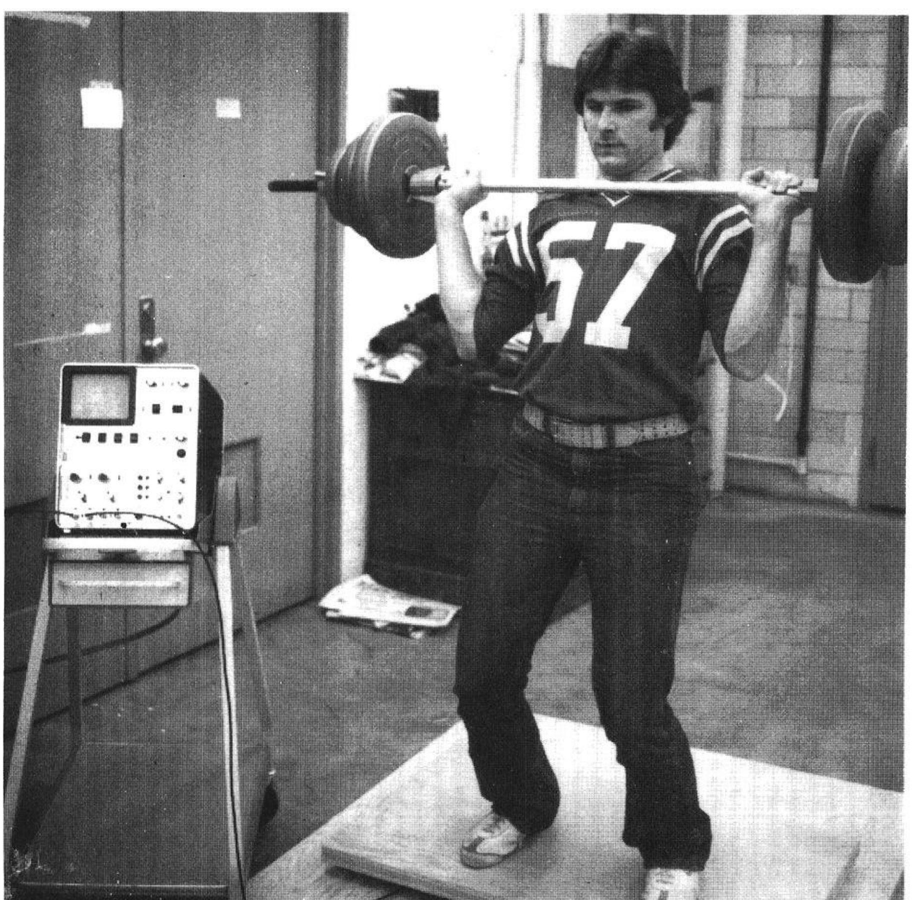
The Power Sports Laboratory is designed to measure and record human performance during various exercises. The human body is seldom thought of as a machine that produces horserpower. This is just one of the functions of the human body that can be measured using this device during vitually any exercise.

The laboratory consists of an assembly for force and displacement measurements, a digital memory oscilloscope, combined with a computer and accompanying graphics display unit. The exercise is performed and force measured on a large platform. Displacements can be measured with a small rope or time lapse photography. The oscilloscope directly displays out-put from the measuring devices. This display may be stored and plotted for further analysis.

Accepting the inputs from the measuring devices, the computer is programmed to convert this data into velocity, work, and power throughout the entire exercise. A graphics terminal displays the output which can be reproduced automatically on paper.

Members of the Engineering Mechanics Department will be demonstrating the Power Sports Laboratory during Expo 77. Visitors are invited to come and use the facility, then compare their performance with others. Fred Best and Keith Loss assembled and tested the platform and hardware. The computer work was done by Brad Boyce and Paul Veers, and B.J. Sandor was the faculty director.

A few considered uses for the Power Sports laboratory include helping athletes or persons in physical therapy detect weaknesses in specific performances, suggesting in detail the areas where improvements should be made; qualitatively recording improvements in exercise programs by past with previous performances; seeking new methods for superior performance; and providing a comparison of innovative methods with traditional physical fitness programs.



Electrical Engineering Fraternity's Projects

Kappa Eta Kappa, a professional electrical engineering fraternity, will be displaying two projects at Expo. One is a demonstration of techniques for measurement of some of the more well-known parameters used in high-fidelity specifications. For example, a commercial distortion analyzer will be used to perform an actual measurement of total harmonic distortion in an audio power amplifier. Where possible, an attempt will be made to provide a visual display of some kind illustating just what is being measured, and comparison will be made between units of varying quality.

A second project will concern a remote power control system for house lighting and other applications. The transmiter imposes an amplitude modulated carrier on the power line. This signal carries digital information which addresses any one of a number of 'on-location' receivers and contains an instruction to turn on or off the controlled device. For lighting use, a sixteen level dimming command may also be transmitted. Another application would be the use of multiple remote displays driven from a central digital clock. The system is designed for eventual use in the Kappa Eta Kappa fraternity house.