soft technology

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Inside:

- Run your home with sun and wind
- Making methane... it's a gas!
- Sewing with 12 volts
- Compact fluoros: new developments
- Wood powered cars?
- Where to get it: resources and suppliers

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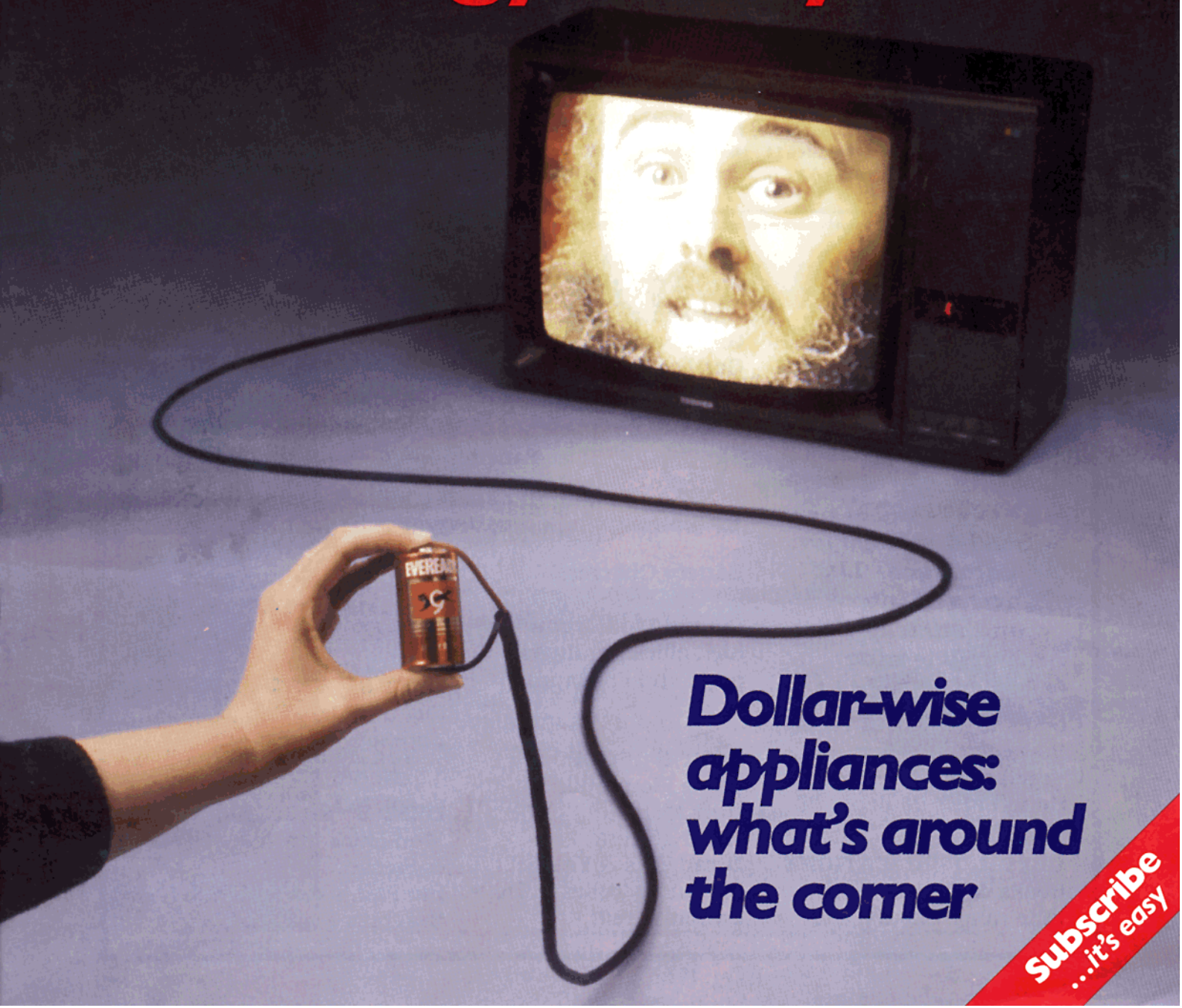

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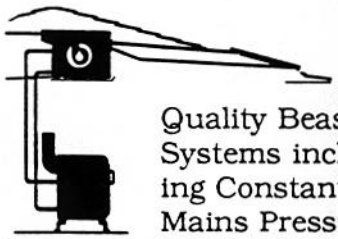

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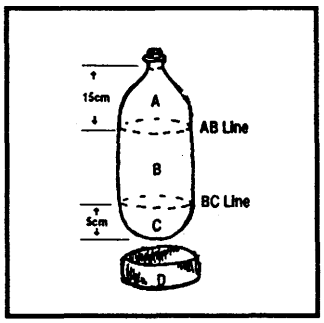

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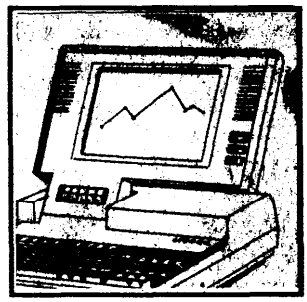

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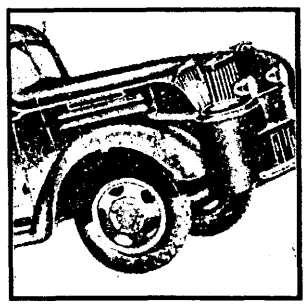

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ENERGY FLASHES

Solar Subsidy

The State Electricity Commission of Victoria has introduced a cash rebate for purchasers of solar water heaters. The SEC will pay $158 in the form of a rebate to the purchasers of approved units after installation has taken place.

It is interesting to note the way the SEC uses the description, "solar boosted electric hot water" in its publicity, rather than "solar water heaters with electric boosting". Since the SEC's own material acknowledges that the majority of the water in the heaters is heated by the sun, (65% sun in the southern states), then you really would expect them to call these electrically boosted.

Not surprisingly the rebate does not apply to water heaters which are not electrically boosted such those with wood or gas.

More information is available from the Hot Water Hot Line on (03) 614 6600 or (008) 134 866.

Indian Wind Power Takes Off

Answers to India's escalating power supply crisis seem to be finally blowing in the wind. Policy makes appear to have accepted the raw resource as a source of renewable energy well worth serious investment. Targets are ambitious. The Indian Department of Non Conventional Energy Sources (DNES) has targeted an installed wind power capacity of 500 megawatts by the end of the Eighth Plan (1990-95) to be further expanded to 3,000 megawatts by the end of the century.

The only problem is the thorny matter of the "Made in India" label - considered a must by the authorities. With limited production runs and high material costs, the Indian manufacturing industry is not immediately attracted by the new technology. At the same time wind companies overseas are only too glad to go on selling machines to India

But Vestas-RRB India Ltd. has firmly set its sights on full scale manufacture at its own production plants to meet the demands of a growing market for independent power generators. And there is every indication the company has good reason for its optimism. Recent government announcements suggest private generation of power in India is about to become an enormous market

Windpower Monthly, January 1991

Microbe Fuel

The US Department of Energy's Solar Energy Research Institute (SERI) has signed a $225,000 contract with the California firm, Microbial Products, to design, fabricate, and operate an outdoor test facility for the production of gasoline and diesel fuels from microalgae ponds.

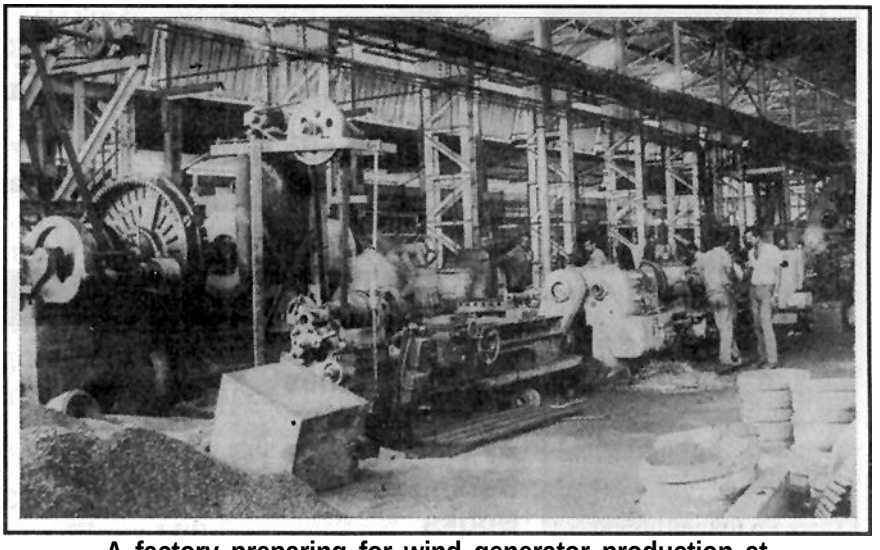
Microalgae are the most primitive members of the plant kingdom. The vast majority exist as single cells in a water habitat. They take in solar energy and efficiently convert it to biomass. Up to 70 percent of the body content of some microalgae is lipid oils that can be converted into gasoline and diesel fuel.

The facility, to be located in Roswell, New Mexico, will grow microalgae whose oil content is high enough to produce up to seven barrels of fuel per acre per week. The Roswell site has been chosen because it offers flat land, lots of solar radiation, few competing land uses, and large reservoirs of salt water.

Technology Review.

Running on Rice

A generator fired mostly by rice husk could soon supply electricity to rural areas in Indonesia. Developed by the Bandung Institute of Technology, it comprises a 20,000W engine which uses one part diesel to 10 parts rice husk. The generator is currently supplying power to local handicraft industries and some 300 households in the town of Majalengka, West Java.



A factory preparing for wind generator production at Meenambakam near Madras. The aim is to install 500 megawatts of capacity before 1995.

Aussie Hot Water Makes a Big Splash

Commercial solar hot water systems manufactured by Edwards Hot Water Systems, an Australian company, are reported to be gaining popularity in the Asia-Pacific region.

Installations have already been made in Singapore, Malaysia, Indonesia, New Caledonia, Tahiti, Mauritius and the Seychelles.

The many commercial systems installed by the company in Australia include a huge system at the Cadbury/Schweppes factory in Perth, where a daily volume of 80,000 litres (17,600 gallons) of hot water is needed to wash bottles and other items. Comprising solar collector panels totalling 600m² (6460 sq ft), the system is believed to be one of the biggest of its kind in the world. The company has also supplied systems for four major hotels in Perth. In addition to their proven value in drink plants, hotels, and hospitals, the systems have applications at airports, in old people's home, sports complexes and government buildings.

Australian Export News.

Wave Power for the Danes

A wave power field test is taking place off the Danish coast. The concept is to use a float attached by a synthetic fibre rope to a piston. The piston moves up and down in a vertical cylinder, firmly fixed in a concrete base on the sea bed. As the piston is pulled up by the crest of a wave, it sucks water through a submersible hydro turbine generator. As the water is sucked in, it turns the turbine and the generator.

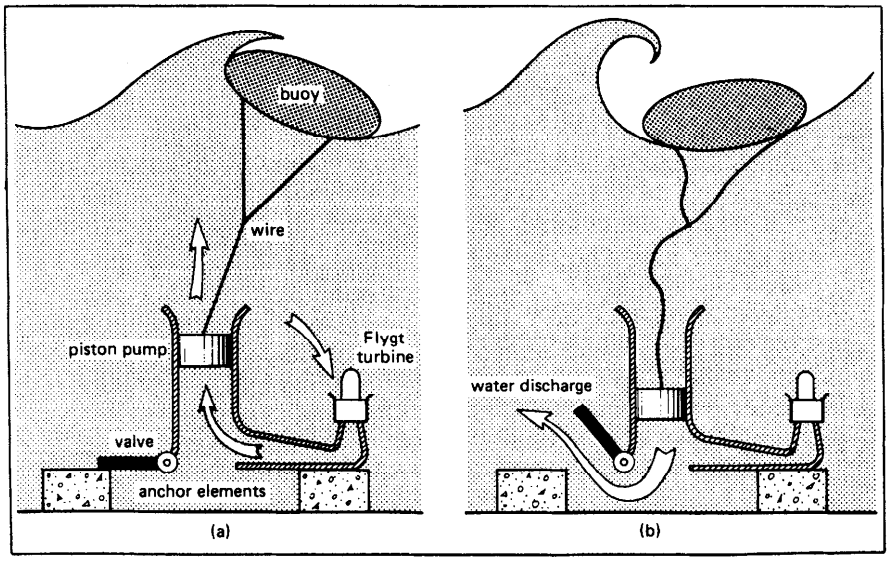
The wave power converter was developed and designed by Danish civil engineer Kim Nielsen. He first built a 1 kW scale model wave power unit as part of a project at the Technical University of Denmark.

Construction of the apparatus was carried out at Hanstholm harbour, where Danish Wave Power has a small division employing ten people. The concrete base was cast on the slip-way, in a small boat yard, and rolled down rails into the water.

The concrete volume of the base is 90 m^3, and its weight is 200 ton. There is a rectangular chamber inside the circular structure. The inlet from the cylinder containing the piston is in the middle of this chamber. The submersible hydro turbine generator (a Flygt EL 7555, rated at 45kW) is mounted in a seat on the roof of the chamber.

B. Hojlund Rasmussen, of Consulting Engineers and Planner A/S (one of the consortium of companies that form Danish Wave Power), has estimated that 3000 to 4000 of the Nielsen-type wave power units could theoretically generate between 10 to 30 per cent of Denmark's electricity requirements.

Water Power and Dam Construction



Arrangement of the Danish wave converter, showing: (a) power phase, during which the piston is drawn up by the waves and water sucked in through the turbine: and (b) rest phase, when the buoy is in a wave trough, and the piston drops, pushing water out through the valve.

Sulphur-Eating Bugs Stop Acid Rain

Biologists have bred a microbe to devour the sulphur in high-sulphur coal that causes acid rain.

Researchers at Arctech Inc. in Alexandria, Virginia, called the bacteria a promising entry in the race for technologies to remove harmful sulphur emissions from coal-burning powerplants - a race whose stakes have been raised by the prospect of toughened clean-air legislation at both the federal and state levels.

The scientists said they are still improving the breed of the tiny bugs, which have performed successfully in the laboratory.

They said the bacteria, whose relatives and ancestors are found in coal mines and soil, rely on sulphur for sustenance. As they browse on coal, they break down its carbon-sulphur bond and convert the sulphur into harmless solid sulfate.

The Asian Wall Street Journal

NEW PRODUCTS

Green Cleaner

"Simple Green" is a new environmentally sound all purpose cleaner. It can be used for a large range of purposes including cleaning appliances, kitchens, bathrooms, floors, windows, paintwork, vinyl and upholstery. It can also be used to degrease engines, clean chrome and remove stains such as blood, grease, coffee, wine, etc.

Its environmental benefits arise from the claims that it is non toxic, biodegradable, non abrasive and non flammable. The distributors state, "Simple Green is the best OIL DISPERSANT and cleaner. It is gentle enough to remove the oil from the birds feathers yet strong enough to dispense oil spills from the land or water without damaging plant or animal life".

While we can't be sure that the promotional claims are accurate we did try a sample out for ourselves. We found with general kitchen cleaning, it seemed to do just as well, if not better, than an ammonia based commercial product. However we did notice, it didn't seem to work as well on some types of jobs, when compared to the abrasive cleaners.

One interesting thing, was the way it seemed to clean effectively without using the soapy action of conventional cleaners. Instead it still worked but must have used some other mechanism.

While our test was rather limited it did seem to indicate Simple Green works. It could be worth a try.

For more information contact: In-Sealation Pty Ltd on (059) 712 099 or pick some up from the shops.

Soma Watter Micro Hydro Turbine

The Rainbow Power Company has added another water tubine to its range. The SOMA WATTER micro hydro turbine generates 12 or 24 volts for battery charging and depending on the water flow and the amount of head available it will produce up to 500 watts of power.

It does not require expensive earthworks or dams to store large amounts of water. Instead the unit is fed by an intake pipe itself and operates 24 hours a day.

The prime mover is the "Turgo" wheel which operates at high efficiency under varying conditions of water pressure and flow. One or more jets are directed at the Turgo wheel. Jet size varies between 6mm (high pressure) and 25mm (low pressure) depending on head and flow of water supply.

Soma Power Ltd. manufactures its own permanent magnet alternators which are completely encapsulated in

high temperature epoxy resin, to provide protection from moisture. A control panel which can be situated up to 300 metres from the micro hydro rectifies the AC output from the alternator and regulates the current to the battery bank.

For more information contact the:

Rainbow Power Company,
70 Cullen Street,
Nimbin, NSW, 2480.

Phone (066) 89 1430.

A Self-Baiting Fly Trap

This trap is being tested in many areas in Africa by the World Health Organisation. The unit fits over old jars of many popular sixes (thus recycling glass) and, once working, the catch becomes the bait. In a quarter acre (one-tenth hectare) garden, during three summer months, six traps caught over 5kg of flies.

The system is non-toxic and the dead flies make great plant-food. This is the answer to blowflies as well as fly-free barbecues. Using fruit juice, the traps catch fruit flies.

For more information contact:

Graham Davies-Smith
Locked Bag 1,
Mortdale, NSW 2223

ENERGY EFFICIENCY

the key to the Greenhouse challenge

By Alan Pears

We are now fairly familiar with the principle of the Greenhouse Effect. Basically, the concentrations of a number of gases are increasing as a result of human intervention. These gases are trapping an increasing proportion of the heat that, in the past, escaped back into space.

There are many uncertainties associated with our understanding of the Greenhouse effect. But the one thing we now know without doubt, is that what we don't know, about our impact on the earth, could hurt us.

Energy Use In Developing Countries

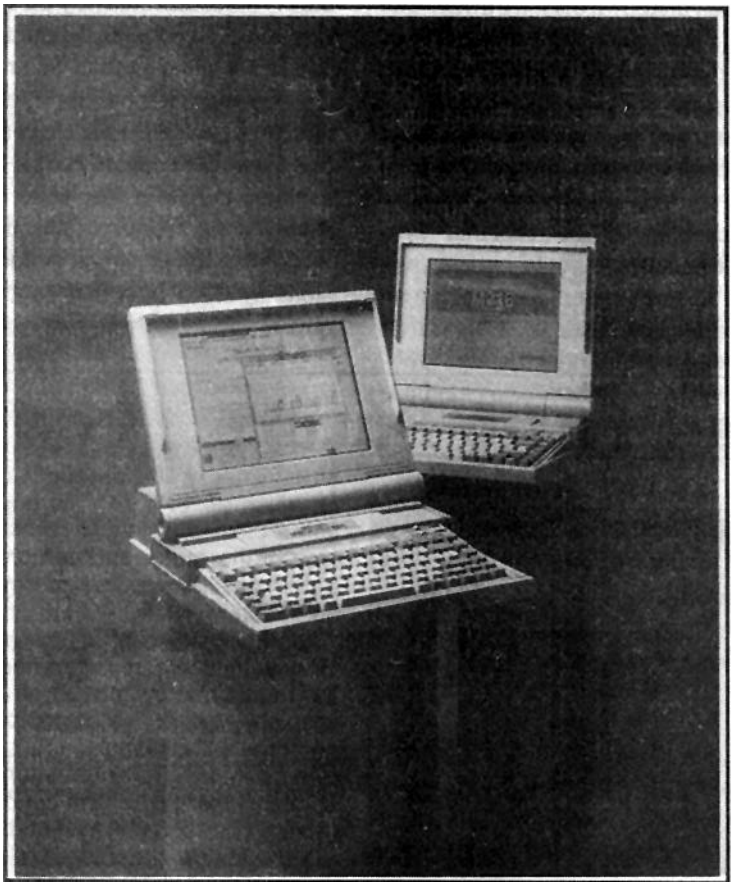
In developing countries, driving factors for the increasing levels of CO_2, include population (which is closely tied to economic development), land use and agricultural practices, energy efficiency and type of energy source.

Energy efficiency and type of fuel are much more significant issues than most "experts" appreciate. For example, a typical person in a developing country uses over ten times as much energy as a European for cooking. This is because the person in the developing country uses wood very inefficiently and unsustainably, while the resultant pollution causes major health problems such as emphysema. In contrast, the European uses gas relatively efficiently.

It can be argued that wood is a renewable resource, while gas is not. However, in most developing countries, wood resources are being used so rapidly they are being depleted. Wood can only be described as renewable if it is being used at a sustainable rate. Further, renewable resources can be used to produce gas at quite high efficiency, for example via biogas generation or wood gasification. The key point is that gas can be distributed and used efficiently. Efficiency of wood utilisation can certainly be markedly improved, but must fall short of the potential efficiency of gas.

Goldemberg and his associates have shown in "Energy For A Sustainable World" that energy efficiency and use of modern energy carriers could provide developing countries with the physical living standards of mid 1970's Europe with only a 30% per capita increase in energy use. Aggressive development of renewables could make a substantial contribution to this energy requirement.

The "experts" who argue that Australia's greenhouse response would be dwarfed by massive energy growth



Japanese electronics manufacturers are spending a billion dollars commercialising colour liquid crystal technology, first for use in laptop computers and then conventional television. The energy savings will be massive. TVs of the future could use as little as 5% of the energy they use today.

in developing countries are ignoring the potential of energy efficiency and renewables to allow developing countries to take a new path, instead of repeating the mistakes of the developed countries. The challenge is to help these developing countries utilise our most efficient technologies, rather than use them as a captive market for our outdated technologies.

Our Energy Use.

In developed countries, populations are relatively stable, so greenhouse emissions per person and per unit of gross national product are the major issues.

We in Australia, and many other developed countries, are at a crucial point in the greenhouse debate. Decisions and commitments being made now will shape our greenhouse response. Two opposing viewpoints have emerged.

One is egocentric. It's assumption is that the long term future will take care of itself if we just "let the market work". Further, extreme proponents of this view make the assumption that any action that has long term benefit must necessarily have short term disbenefits. They therefore oppose many environmentally and socially beneficial strategies because they believe they must be in conflict with short term goals. They also oppose these strategies because they often involve ideologically unacceptable action such as regulation to protect the public interest, or because the benefits are undervalued.

In the context of greenhouse, this view can be described as accelerating blindfolded towards a cliff of unknown height an unknown distance away. The logic is that, since we didn't fall over the cliff with our last step, the next step will also be safe.

The second view sees humans as an important element in the natural system which has very real limits. This view is characterised by the belief that "what **I** don't understand could hurt me/us". Thus, it places emphasis on longer term, strategic judgments. It also infers a greater degree of control over the shaping of our future and a commitment to international responsibility.

As the proponents of the second viewpoint become more adept at understanding economics and technology, they are beginning to show that many of the environmentally and socially beneficial strategies are actually attractive in narrow, short term economic terms as well. This will create an increasing dilemma for the economic pragmatists, while it will also force some environmentalists to confront the problems of practical change.

An interesting illustration of this process is the recent study by the National Institute of Economic and Industry Research for the Victorian Solar Energy Council (now Renewable Energy Authority). This year-long study suggests that Victoria's economy could be up to a billion dollars a year better off if it achieved the Toronto Objective of a 20% reduction in carbon dioxide emissions by 2005 than if it continued to pursue energy growth.

Fridges Of The Future

Massive energy savings are possible by increasing the efficiency of refrigerators. At the moment the average 250 litre fridge costs about $75 per annum to run. With currently available technology the same fridge could be costing as little as $12.00 per annum to operate.

Many of the changes needed to make this possible are not revolutionary. Improving the insulation and door seals makes it possible to reduce the amount of heat that enters the cabinet through its walls and doors. Interestingly, fridges actually use relatively little electricity keeping cold as the door is opened and closed. Most warming takes place as a result of heat penetrating the walls and hence insulation is very important. Some fridges have as little as 25mm of insulation in their walls. Energy efficient fridges have as much as 100mm. More insulation makes it possible to reduce the size of the motor and compressor, automatically reducing energy consumption.

Another method of improving efficiency involves improvements to the heat pump system, which operates the fridge. Both motor and compressor efficiencies can be bettered with design improvements. Increasing the size of the condenser (on the back of the fridge) and evaporator (inside the fridge) also increases the efficiency of the fridge. Further improvements are possible by moving the motor and compressor to the top of the fridge so the heat they generate is less likely to enter the cabinet as it rises

New Scientist

Barriers To Greenhouse Response

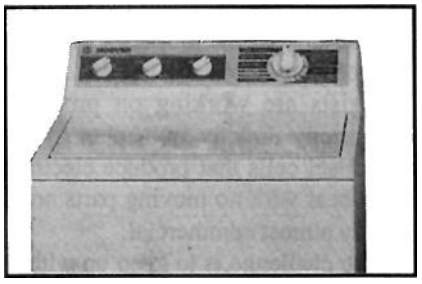
The two major barriers to effective greenhouse response are:

* lack of creative vision about what is possible, and

* lack of commitment of resources to implementation of radical options.

We often simply don't realise how fast our perspectives have changed. Energy is a good example. In 1981, the State Electricity Commission and the then Victorian Government released a report outlining how the SEC would build 23 new power stations over the next 50 years. Today, it's debatable whether the first of those power stations will ever be finished.

Instead the "radical" forecasts on the potential of energy conservation made by Amory Lovins in the mid 1970's are now looking decidedly conservative.

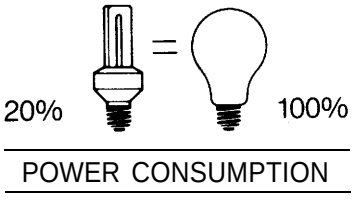


Energy use for washing could drop dramatically with the use of genetically engineered cold water detergents

These illustrations emphasize the rapidity of change. So, instead of talking about the problems of change, and finding excuses to oppose it, we should be reaching towards a vision of a sustainable energy future. We should be looking for the most beneficial ways of achieving this goal. As in almost every area, the more closely you look at the potential of energy conservation and renewable energy, the greater are the opportunities.

Lighting Improvements

Compact fluorescents have already achieved an energy saving of 80% on ordinary incandescent lamps. Future developments could



make these twice as efficient.

Older fluorescent fittings were often designed with little concern for efficiency. By improving the efficiency of the fixture and the ballasts, a two tube fitting can be made to deliver the same amount of light as was previously delivered by a four. The older fittings can use as much as 175 watts to supply the same amount of light as the new fitting which would use only 69 watts.

Other improvements involve the fitting of a photocell which dims lights when the light entering a room through the window reduces the need for artificial lighting. An occupancy sensor can be used to turn off lights when rooms are empty and specific task lighting over desks or work places can make it possible to reduce energy usage on general background lighting. Even simple things, such as light coloured finishes (which reflect light) on room surfaces, can reduce lighting requirements.

Scientific American

The Potential of Conservation

We can already foresee homes in southern Australia that need little or no heating and cooling, use mostly solar energy to heat water and have very efficient appliances. And point of use photovoltaic cells (no doubt bought from K-Mart) will be plugged into their meter boxes and will contribute to their power requirements while feeding excess power into the grid.

A range of new energy efficient products will make this kind of scenario possible.

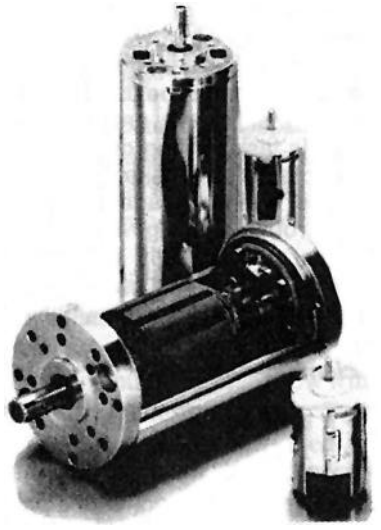
Under development are transparent and translucent insulation products which will make it possible to reduce heat loss through windows and skylights; both major areas of heat loss in otherwise well insulated homes and office buildings. The University of Sydney has recently developed a product which consists of two sheets of glass with small glass pillars separating the two sheets. This option is cheaper and easier to use than any previously available. Another product uses a polycarbonate sheet with small honeycomb shaped cells which trap pockets of air. Other insulation materials use foamed glass, silica aerogels, and coated multiple layers.

New buildings could use insulating panels such as aerated concrete. This material is made when bubbles of air are foamed into concrete blocks, (like an "Aero" chocolate bar except in concrete). These blocks are strong but lightweight, cheap to make, (less material), easy to handle, (you can cut one with a handsaw) and have good insulating characteristics.

More efficient cold water detergents will make it possible for dishwashers and washing machines to use a small fraction of the energy they use now. Work is currently being done on genetically engineered enzymes which will give you "the whitest wash" in cold water. Dishwashers of the future could utilise the hydraulic energy of the mains water pressure to dramatically

Motors Can Do It Too!!

In the United States motors consume 65 to 70% of industrial electricity, with the annual bill for the energy they use running at about $90 billion per annum.



Many of these motors are used in conjunction with fans or pumps. By using adjustable speed and electronic drives it is possible to reduce energy consumption by 10 to 40 %. Replacing standard V belts with toothed belts can increase drive efficiency by 30%.

Higher efficiency motors made from better quality materials, with lower magnetic, resistive and mechanical losses are now widely available in North America, Western Europe and Japan. Unfortunately, however, these motors are unavailable in some industrialised countries, including Australia.

Scientific American

reduce their energy consumption. Combined with the new cold water detergents, such developments could mean that a dishwasher could run on almost no external energy.

Several Japanese electronic companies have been spending $1,000 million commercialising colour liquid crystal technology. Initially the technology will be used in the top of the range laptop computers. But eventually the technology will filter through to home television, making large full colour screens, only centremetres thick, (and literally able to run off one small battery) readily available.

Other commonplace electrical appliances are expected to become much more energy efficient as technology advances. Developments in computerised control systems will mean even smaller appliances can be 'intelligent', and therefore more easily designed to be energy efficient. The new equipment could make use of heat recovery, microwaves, and even ultrasonics in order to make much better use of available energy resources.

In commerce and industry, we have already seen significant reductions in resource usage. The continuing shift from metals to plastics and composite materials, integrated waste management strategies that include re-use, recycling, and energy from waste will continue this trend. The shift towards services and away from manufacturing and resource processing will also help reduce resource and energy use.

Energy supply systems will also change dramatically. Neighbourhood-scale biogas digesters will not only produce energy but will also reduce the load on the sewerage system. This will be vital, as increasing urban densities would otherwise create a need for massive investment in expansion of sewerage infrastructure.

Even motor vehicles, notorious squanderers of energy, are not immune to the winds of change. Lightweight, low to medium speed vehicles will begin appearing on our roads. They will use high efficiency internal combustion motors based on knowledge evolving from work on mileage miser vehicles, or electric motors with some contribution from solar cells. These will appeal to many of the people who are at present disadvantaged by our dependance on cars, including the young, the old and the poor. They will complement improving public transport systems and help reduce dependence on conventional cars.

Recent developments have seen an engine designed by Ralph Sarich (of orbital engine fame) tested in a Honda CRX. The combination delivered 100km of driving for every 3.8 litres of fuel. In a world that seems (at least for the moment) inextricably wedded to the motor vehicle, this development gives real hope to for cheaper transport which emits fewer harmful greenhouse gases.

The improvements in renewable energy technology will continue. Already, new blade designs are improving wind turbine output by up to 20%. The latest thin film photovoltaic cells have achieved efficiencies of over 20% (in conditions similar to space), four times the efficiency of earlier ones. And biologists are working on producing electricity directly from photosynthesis. Fuel cells that produce electricity and heat with no moving parts are already almost commercial.

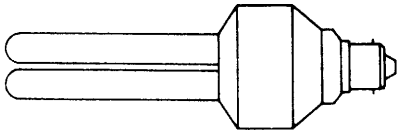
The challenge is to keep up with the possibilities that are opening up before us. Another challenge is to gain access to adequate resources for development of these emerging options. For example, Victorians spend over $3,000 million each year on gas and electricity, but the recently established Victorian Renewable Energy Authority will have less than $5 million each year. Only when each state is spending $200 to $300 million, and Australia as a whole is committed to spending over $1.5 billion each year on energy conservation and renewables, will we be able to claim that we're beginning to get serious about a sustainable energy future.

More News on
COMPACT FLUOROS

In the last issue of Soft Technology we had a look at the way a recent Utility initiative backfired, increasing the cost of compact fluorescent lamps. Since then we have done some more digging and come up with some more information on what is going on behind the scenes.

What are Prices Like Overseas?

One thing we tried to find out is if the Australian retail prices of compact fluorescent lamps are too high. From what we can work out the U.S. prices for compact fluorescents are between $7 and $13 dollars U.S. (with tax). Some of the poorer quality lamps are sold for even less.

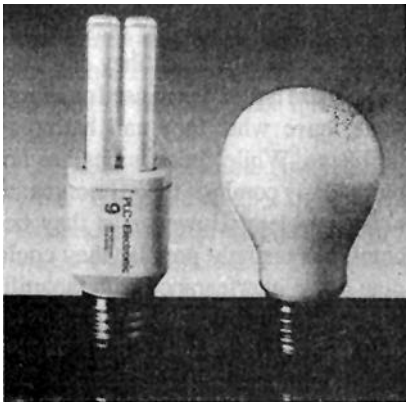


What should we Pay?

Even allowing for the lower value of the Australian dollar, the standard price for Wotan and Phillips lamps of around $30.00 is much too high. It appears the price we should be paying for these better quality lamps is under $20, maybe even $15 or $16.

Over the last 6 months or so there have been changes in the standard prices of around $30.00. Specials offering compact fluorescent lamps for around $20.00 have been quite common is some areas of Australia.

Most of the lamps being offered for around $20 are manufactured in China



The latest generation of Philips Compacts are almost as small as a conventional light globe.

with an electronic ballast manufactured in Japan. These lamps tend to be of a lower quality than the Philips and Wotan lamps. They have a slightly shorter life, are less reliable and have a harsher white light.

Despite this, their lower price has led to them making significant inroads into the market, at the expense of Wotan and Philips. However, even though the $20.00 price sounds good, it is not so wonderful when you consider that the bulk purchase price of these lamp from the Chinese manufacturers is around $3.00 per lamp. Of course you have to add to that import and transportation costs, wholesale and retail mark-up etc. And you do have to order large quantities. But nevertheless, there is room for these Chinese manufactured lamps to drop in price.

It's worth reflecting on why we are paying such high prices. In a free enterprise economy we assume manufacturers are competing with one another for sales. If the overseas prices are so much lower, then you would expect that competition in the growing Australian market would ensure that we don't pay too much. There may be costs which we are not aware of which are leading to the high Australian prices.

We will ask the lighting companies to comment.

New Technology

As well as Australians paying too much for compact fluorescents we are also being sold a very limited range of lamps compared to what is available overseas. In Europe and the U.S. you can buy lamps which come in a greater range of shapes and sizes, as well as ones which are dimmable.

There is also a range of lamp fittings which are designed to take compact fluorescents. These include downlight fittings, and a range of fittings with decorative shades for domestic use.

The Cheapest Solution? We Miss Out Again

Also widely available overseas are lamps with separate ballasts. This deserves some extra explanation. When you buy a compact fluorescent there are two major components, the tube and the ballast (which can be the new electronic or old ferro-magnetic technology). When the lamp wears out the tube is almost always the part that fails first. The ballast, which has a much longer life, will still be fine. Being able to buy ballasts and lamps separately, dramatically reduces cost, because you are not always replacing the ballast at the same time as the lamp. If you have a separate ballast the cost of a new tube starts to get down to being close to the cost of a new conventional incandescent lamp. In the U.S. about $4 will get you a replacement tube when you have a separate ballast.

However in Australia this much cheaper approach is generally not available. Compact fluorescent lamps with an electronic ballast and a replaceable tube do not conform with the Australian standard. While the electric utilities could change the standard and make these lamps legal, they don't because these lamps, when used on a large scale, have what they call harmonic problems; While these lamps are not particularly common, the harmonics are not a problem. However as they become increasingly popular they could play cause interference with the utility's supply system.

You can buy the old ferro-magnetic ballast with separate tubes. But they are big, heavy and expensive and hence have not been popular. The silly thing is that most of the compact fluorescent lamps around that we are buying these days, as well as a number of other appliances, have the harmonic problem. However the Australian Standard does not allow the utilities to stop the use of these lamps and appliances.

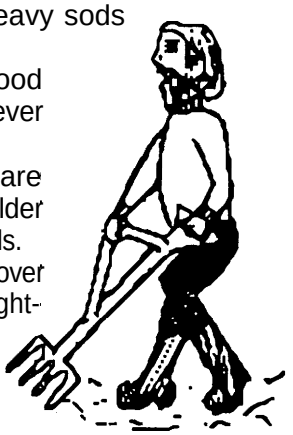
So it's the new kid on the block, the lamps with the separate electronic ballasts and tubes that get banned. And they are the ones which could save us so much money. So once again we pay with a more expensive option.

To their credit, some utilities are working in conjunction with local manufacturers to solve the harmonic problems. Lets hope they come up with a solution. In the meantime this is just another reason we pay more than we should.

Lazy Fork Adaption

I've used this little garden back-saver for years and what a dream. Any fork may be retro-fitted with the bent steel pipe gimmick. It's other applications include:

1. Being able to pitch heavy sods effortlessly.
2. Ability to get a real good shaft rotation in order to lever out stubborn roots.
3. Loads on the prongs are easily carried on the shoulder facing forwards or backwards.
4. When you turn the fork over and rest it on the near-right-angle handle extension, the fork is readily picked up without stooping because it's handle is then at your arm height.
5. My all-steel handle shaft is so strong that I can jump on it to remove recalcitrant roots or rocks. The leverage is immense.
6. Finally, I had 2 small prong loops welded under a handleless shovel blade. This simply slid on to the fork prongs and single- bolted to a hole below the handle shaft. Thus the spade shares this lazy gardener's fork handle without my having to make another.



Last year the unit was on exhibit for several weeks at the Queensland Innovation Exhibition, Brisbane Cultural Centre Museum.

Patrick F. Howden, Con St.
Macleay Island Queensland 4184

Classic Comfort With Renewable Energy

People using alternative energy systems such as wind and solar often go for alternative building techniques using mud brick or timber pole construction.
In this article Ralph Proven describes how he decided to stick to standard of design and conventional techniques, but supply his energy needs through non conventional, renewable sources. The results is classic comfort but with independance.

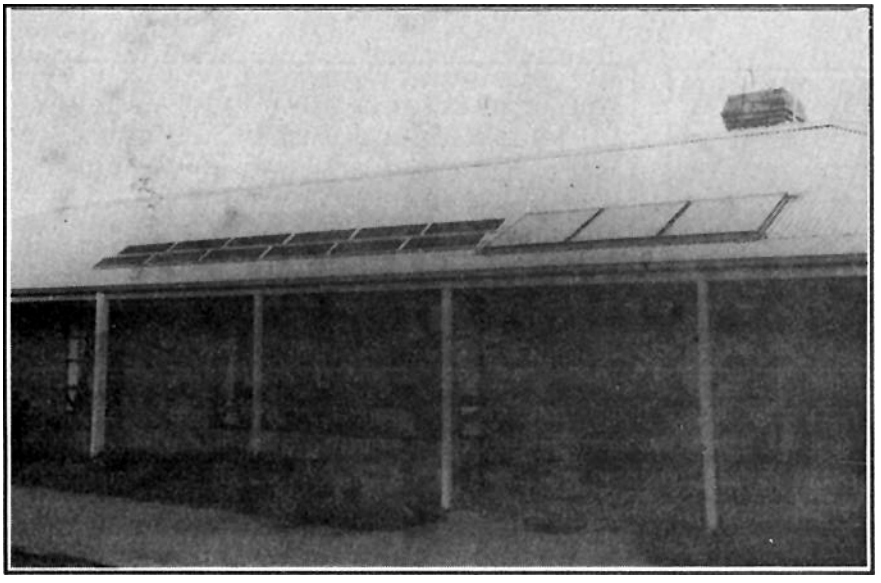
Ralph Provan

When I was young I was amazed by the ways in which our forefathers used wind power. Sailing ships, powered by wind, moved millions of tons of goods. The wind mills of Holland also fascinated me. They had worked so well for so long at no cost other than maintenance.

These things promoted my interest in wind power and at 13 I built a Wind Generator using an old bike dynamo. It was not very successful but I remained determined to make it work one day. Later I had the chance.

A Trial Run

By the late 1960's our four children had out grown our 12'6" home - made caravan, so we purchased a house block at Wahring on the Goulburn Weir North of Nagambie. We built a small 7.5 square holiday house using as much second hand material as we could and doing the plumbing, painting and 32 volt wiring ourselves.



The front of the house with the solar water heating and photovoltaic panels clearly visible

In 1970 we started looking for wind generators and purchased a. 1,000W Dunlite 3 Blade on a 40' Tower at Harsden for $20. Our three daughters and young son, supervised by my hard working and long suffering wife, dismantled, transported and re-erected the unit.

After an overhaul of the generator using sealed ball races, the unit was up and running. It has now run for 20 years non-stop except for when the batteries are fully charged and the generator isn't needed.

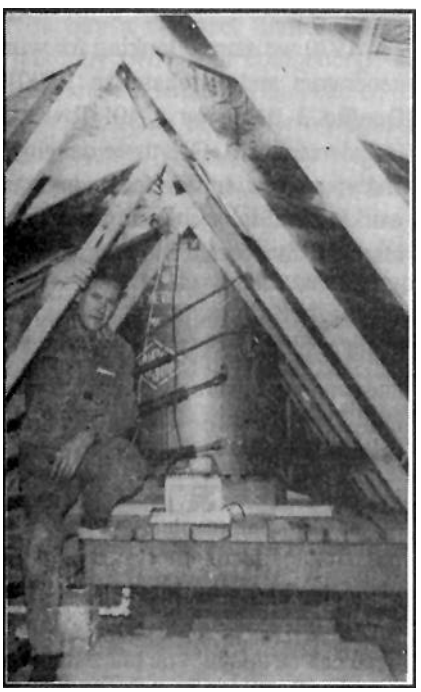
This introduction and apprenticeship into independent energy taught me plenty the hard way. More importantly, it gave our children an appreciation of what can be done if you make the extra effort in life and learn to suffer the ridicule of others reluctant to become motivated.

While the house was running on wind power, the children took great delight in turning on every light inside and outside. However this was nothing compared with the problems of our neighbours, who suffered frequent blackouts due to swans hitting the power lines over the lake causing a short circuit and up to 4 hours without power.

By 1972 we had installed three Beasley flat plate hot water collectors in conjunction with our slow combustion hot water service. Since then we have enjoyed the convenience of hot showers on arriving from Melbourne plus free hot water for over 6 months of the year.

Building the House

My wife and I had anticipated moving out of the city on retirement. We decided four years in advance to inspect rural land within 100 miles of Melbourne, north of the Dividing Range, with a view to enjoying more sunlight hours. So as to be independent of the Grid System we finally purchased land eight miles east of Seymour, situated on a hill. It was a suitable home site, was reasonably priced and there was no SEC within 1.5 miles.



The hot water tank sits in the roof above the wood stove and open fire.

First we built a passive solar designed shed 200 metres down the hill from the proposed. home site and fitted out a section with a slow combustion stove, shower, septic toilet, stainless steel sink, benches etc. We parked the old caravan in a corner so we could have a warm comfortable living area whilst we built our new home.

Designing for Energy Efficiency

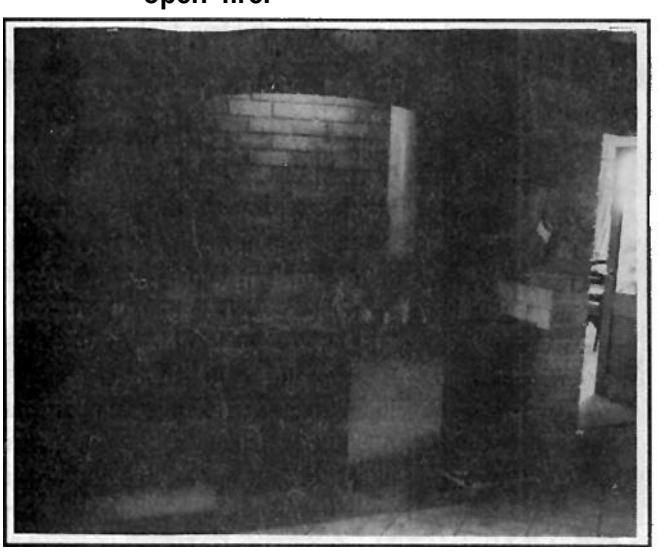
We then started to look at solar efficient house designs, display homes etc. After 12 months we combined the most suitable of what we had seen and read with our own ideas.

A 6' verandah surrounds the 28.5m x 8.5m farmhouse. The long wall faces true north with three bay windows. The sun shines on the floor from late March. We also have two bay windows on the south side.

The roof of mist green colour bond custom orb has sisilation between the top cord of the trusses and the battens to avoid contact with the roofing iron. The ceilings have R 2.5 fibreglass insulation.

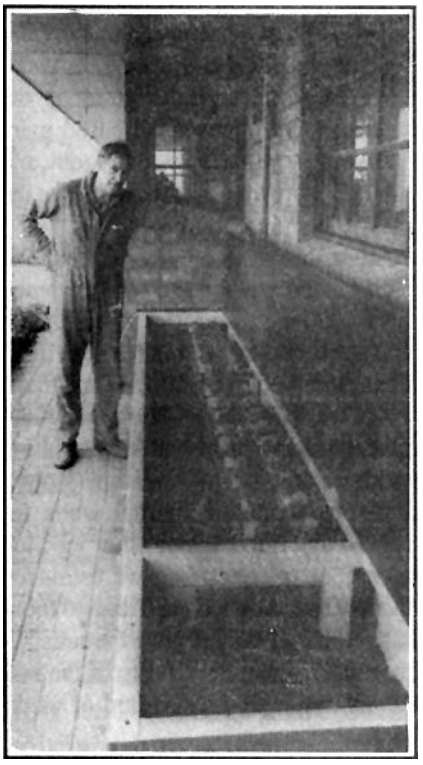
The brick veneer walls have sisilation plus R 1.5 fibreglass, and all windows

One of the heaters which is run by hot water from the "Bosky" boiler.



The "Bosky" cooker boiler, which centrally heats the house, sits next to the conventional gas cooker.

On the other side of the chimney is an open fireplace and bookcase.



The batteries are stored in a box on the back verandah.

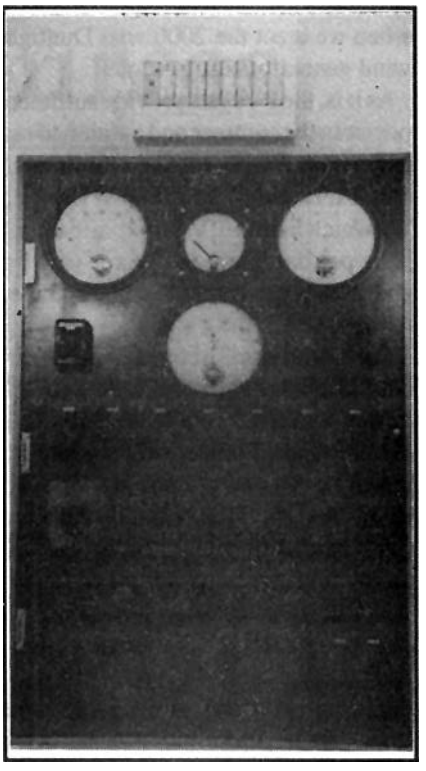
in the living area have lined curtains and pelmets.

The floor is a suspended slab on strip footings and consequently the edge is not exposed to the weather.

Wood Powered Central Heating

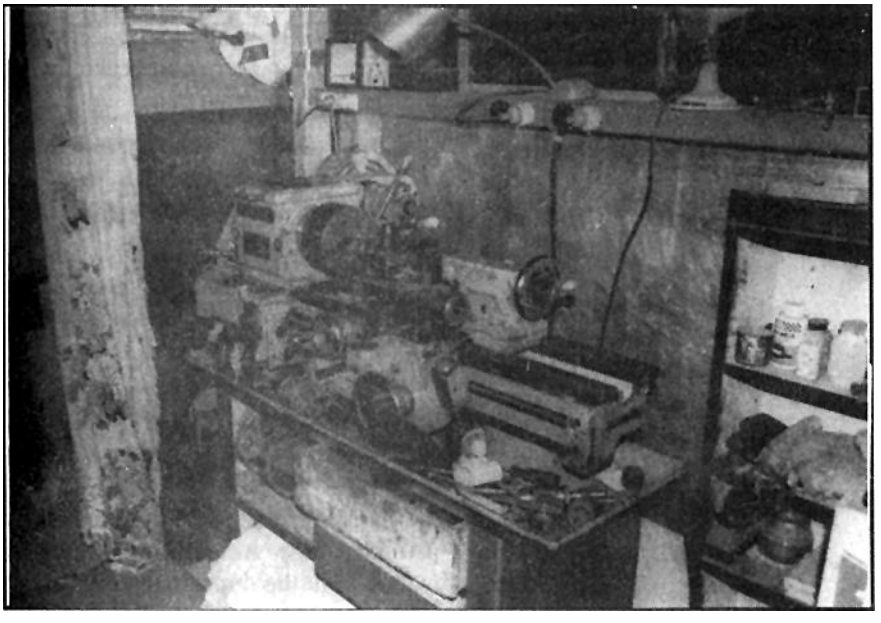
Our home is a traditional Australian farm house of 23.5 squares. It is built around a central chimney in a living area which houses a slow combustion "Bosky" cooker boiler of 80,000 BTU'S alongside a porta gas range. On one side of the chimney there is an archway which features a combined fireplace and bookcase. The central brick wall supports a 75 gallon "Edson" hot water heat exchange cylinder high up in the roof.

A section of the slab has two hundred metres of 25cm poly pipe which carry hot water to centrally heat the house. There are four separate circuits of pipe under the tiled section of the slab.



The control panel with large, easy to read meters.

Each room has a hot water radiator of "Spirotherm", except the bath room which has a heated towel rail. Hot water pipes pass through the wardrobes and linen closet keeping them dry. The 80,000 BTU "Bosky" handles our heating needs with ease. It gives a natural pleasant atmosphere far exceeding our expectations. We have an unlimited hot water supply, excellent slow combustion cooking plus an extremely cosy home for only one barrow of good dry wood per day.



In the large workshop a whole range of tools and equipment including this lathe are operated from a separate solar electric system

The Power Supply

The power supply of 34 volts comes from twelve, 54 watt "ARCO" PV panels placed at 35 degrees facing true north on the house roof. At present storage is by 17 ex telecom 500 AH batteries. The capacity will be doubled

when we erect the 2000 watt Dunlight wind generator before winter.

As it is, the PVs just provide sufficient power in the summer and autumn to run a two door freezer refrigerator through a WEA, David Clarke 1800W inverter. We watch a little T.V. (approximately 1 hour per day on a 26" Luxor Colour) and use any other 240 volt appliance needed.

The house has 3 separate wiring circuits, 32 volt light and power, 240 volt power, and a 12 volt radio and sound system. The 32 volt wiring is 4 mm for power points and 2.5 mm for lighting, using ring grip DC3 old style switches (still being manufactured in brown) throughout the house on both 32 and 240 volt so as to match the facias. 32 volt is used for all lighting, washing machine (agitator bowl type), mix master, vitamiser, fans, sewing machine, flour grinder, iron etc. We have the equivalent in 240 and the appliances can be used via the inverter.

We soldered all wire ends before fitting the switches and power outlets, and kept our wire runs as short as possible from the central switch board close to the battery bank. All wiring conforms to ASA standards and whilst doing the wiring, we installed alarm circuits to all windows and external doors. We are fortunate to have a son who is an "A Grade" Electrician to supervise and assist with the wiring.

Solar Water Heating

The solar hot water system is a thermosyphon flat plate collector type with three Beasley units mounted directly onto the 26 degree roof. They feed into a 75 gallon cylinder, with 18" height between the top of the collector and storage. This has proved most efficient as we have more than sufficient hot water for our needs without the stove burning from early November.

The plumbing for the heating system includes normal hot and cold water supply, via a stainless steel header tank placed inside one half of the chimney. Rain water drains into the three 5000 gallon concrete tanks, 50 metres down the garden slope. A 52 volt pump maintains the header tank level via a mercury switch and relay, attached to the ball valve arm in the tank.

The plumbing required approximately 5 weeks of hard work under the supervision of a licensed plumber conforming to ASA Standards.

We used 110 litres of paint on the interior of the house. Oil based paint was used in the laundry, bathroom, and kitchen, and water based paint for the. rest of the house.

All of this wore me down. My good lady sanded, stained and polyethylened over 1000 metres of 3" x 4" architrave and skirting plus 110 metres of vertical lining in 6 weeks. In the three and a half years we spent on the bricklaying, ve randah paving, electrical and plumbing work, installation of insulation (including rock wool on internal walls for sound) and hundreds of other jobs too numerous to remember, we estimated that we saved between 30 and 40 thousand dollars. We also have the satisfaction of knowing the quality of the materials used and the standard of workmanship.

Some Points To Remember

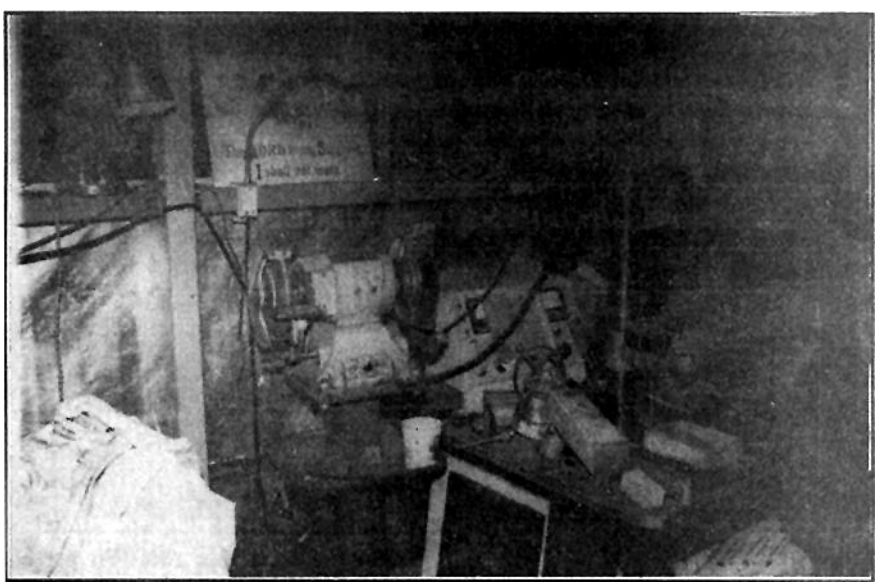
Use plenty of copper in wiring. Don't skimp. If anything, overdo water and electrical storage. Avoid cathedral ceilings. Plan well in advance; if you purchase in a hurry you generally pay top price.

The Rewards

We enjoy the peace and quiet that come with country living. We enjoy the fresh air, the unfluoridated water, the lack of SEC and MMBW rates and the grand feeling of independence now the house is our home and is a pleasure to live in.

Finally

I would like to thank the Alternative Technology Association, Seymour Council, the local tradesmen, our plumber friend and all who have given encouragement.



The drill press and grinder ready for use in the workshop.

Solar Energy Resources Catalogue

This catalogue has been produced by the Alternative Technology Association (ATA).

The ATA is a community based organisation involved in the promotion of technology which works in harmony with the environment. The group runs a wide range of activities including meetings, film nights, field trips and practical workshops.

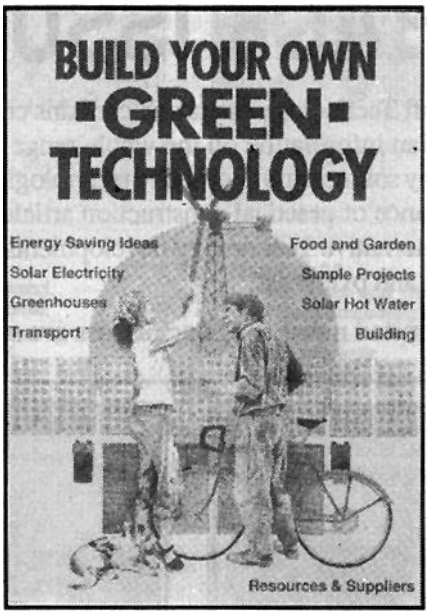
The ATA also produces a quarterly magazine Soft Technology and a bi-monthly newsletter. It built and manages the Solar Workshop and maintains the Alternative Technology Resource Library. If you wish to contact the group write to the ATA at the address at the back of this catalogue.

Energy Conservation

"Energy to Burn?: A guide to saving energy and money around the home" is a comprehensive 48 page A4-size booklet giving many hints and information about insulation, lighting, appliances etc.

Published by the Conservation Council of Victoria.

Price: $4.20 posted.



Build Your Own Green Technology

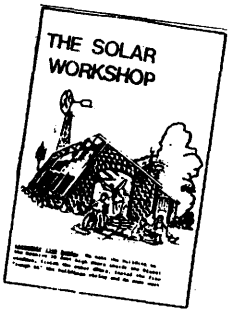
Green Technology is a source of ideas, information and inspiration for all those with an interest in environment friendly technology and energy self sufficiency.

The book provides the reader with a rich supply of practical do-it-yourself projects covering building, natural energy sources, food and garden, transport, home appliances and a special chapter on simple projects.

It is filled with the practical experiences of people all over Australia drawn from Soft Technology magazine

Price $19.90, (plus $4.00 post and pack)

The Solar Workshop



A detailed description of the Solar Workshop including information on the wind generator, solar electric system, water turbines, solar water heating and the building's passive solar design. The booklet includes diagrams with detailed explanations of the various features of the workshop. It also contains details on materials used, their costs and sources.

Price $2.00 posted.

Soft Technology:
BACK ISSUES

Soft Technology magazine contains current Australian information on the whole range of renewable energy sources and alternative technologies. It includes a balance of practical construction articles and reports of Alternative Technology developments both in Australia and overseas.

A limited number of back issues are still available.

Number 8.
Appropriate Technology.
Methane digestion.
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Suburban solar houses.
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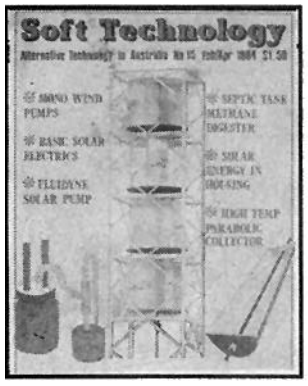

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Mono wind pumps
Parabolic collector.
Fluidyne solar pump.

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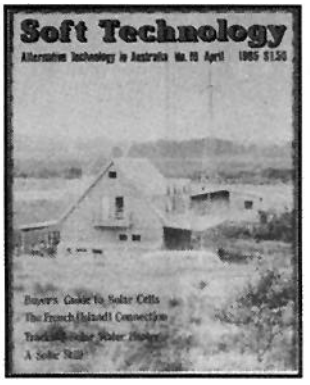
Nepalese watermills.
Solar electric system in a suitcase.
Siddons solar heat pump.



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Planning for the sun.
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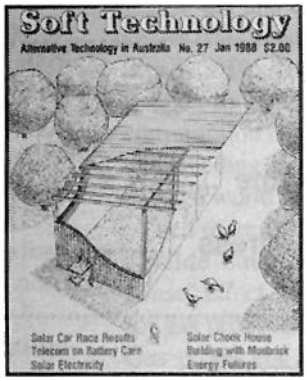
Solar heat pump.



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Mudbrick solar house.
Savonius rotor.
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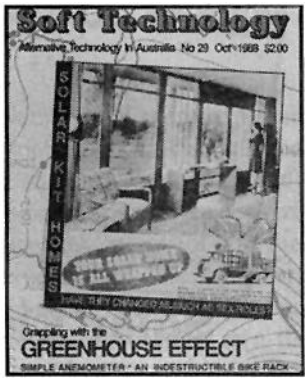

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Community electricity loops
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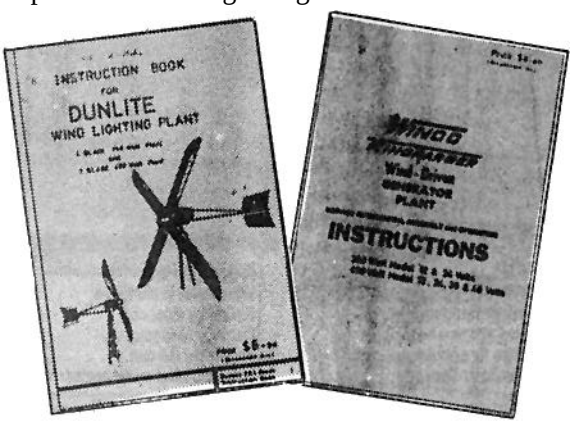
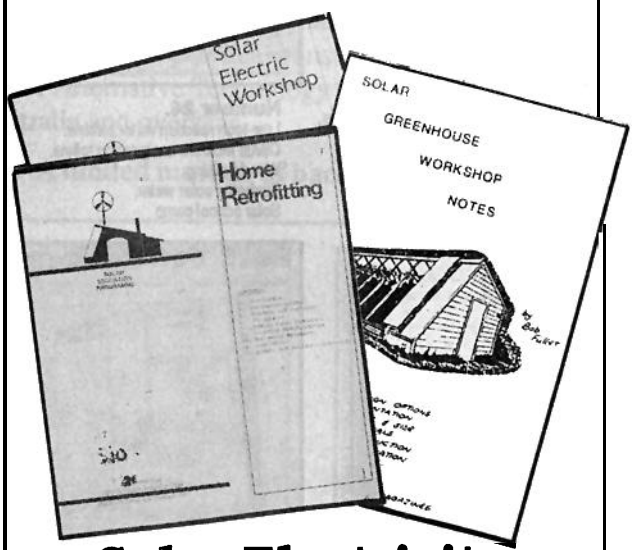
Rainforest timbers
Nimbin soft technology.
Windmill efficiency.
Dunlite blades.

Number 35.
Compact fluoros: why the ripoff?
The Tyson Turbine.
Solar in the suburbs.
Welding from a battery.
Design a Cross Flow Turbine.

Windpower Information

These booklets give technical details of individual windgenerators. They give information on installation, maintenance and basic repairs. A must for owners or people reconditioning old generators but who have no printed information on the machines. The booklets cover the range of Australian made Dunlite windgenerators as well as the imported "Windco" and "Rutland" machines.





Solar Electricity

Everything you could ever want to know about setting up your own solar electric system. Solar cells, batteries, wiring, inverters and appliances are all covered. How to design and size your own system - and once it's put together how to maintain it with minimal effort.

Home Retrofitting

How to make your existing home save energy by adding features which will improve its thermal performance. Includes information on insulation, weatherstripping, building modifications, landscaping, energy use of appliances and emergency measures to save energy.

Solar Greenhouses

Standard greenhouses overheat in summer and are too cold in winter. A correctlydesigned solar greenhouse gives the plants the best conditions all year round. The kit describes in simple terms how to design a solar greenhouse, materials to use and where to get them. It also gives a recipe for a small Solar Greenhouse and information on a simple greenhouse you can build into your home.

Price: All $6.00 each. Posted.

Order Form

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247 Flinders Lane, Melbourne, Victoria 3000.

Gas Producers
can they make a comeback?

Jerry Grimwade

Among the many requests for information received from our readers those for gas producers rank high. Gas Producers were the bulky instruments mounted on motor cars during the Second World War which substituted charcoal for petrol as the fuel source

They came into quite common use from a real need. Australia was not exploiting its indigenous petroleum resources at that time - they were 100% imported and wartime rationing was, of necessity, severe. The basic monthly petrol allowance was four gallons per car and government officials, all the way up to State Premiers, fitted "producers" to set a good example to those who could claim essential travel needs and a large ration.

Gas producers had their disadvantages: cold starts were a real problem and engine valves and seatings burnt out at an alarming rate. Consequently when petrol rationing ended in 1950, gas producers disappeared almost overnight. In light of the current concerns over fuel costs and supplies, many are asking whether they should now be revived?

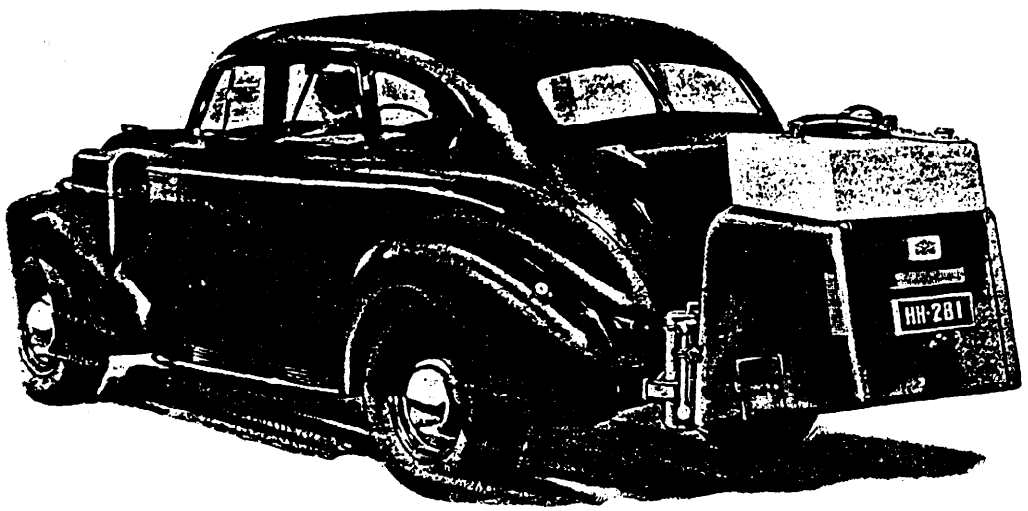
In terms of cost there may be a case. In 1950 petrol sold for about four cents a litre. By 1970 the price was 12 cents and 1990 almost 70 - three and six fold increases in the respective 20 year spans. At this exponential rate of increase it should sell for around $8.40 a litre in 2010. There are also very good reasons to halt the ongoing galloping consumption of petroleum, which notwithstanding the present glut, should exhaust world reserves by 2050.

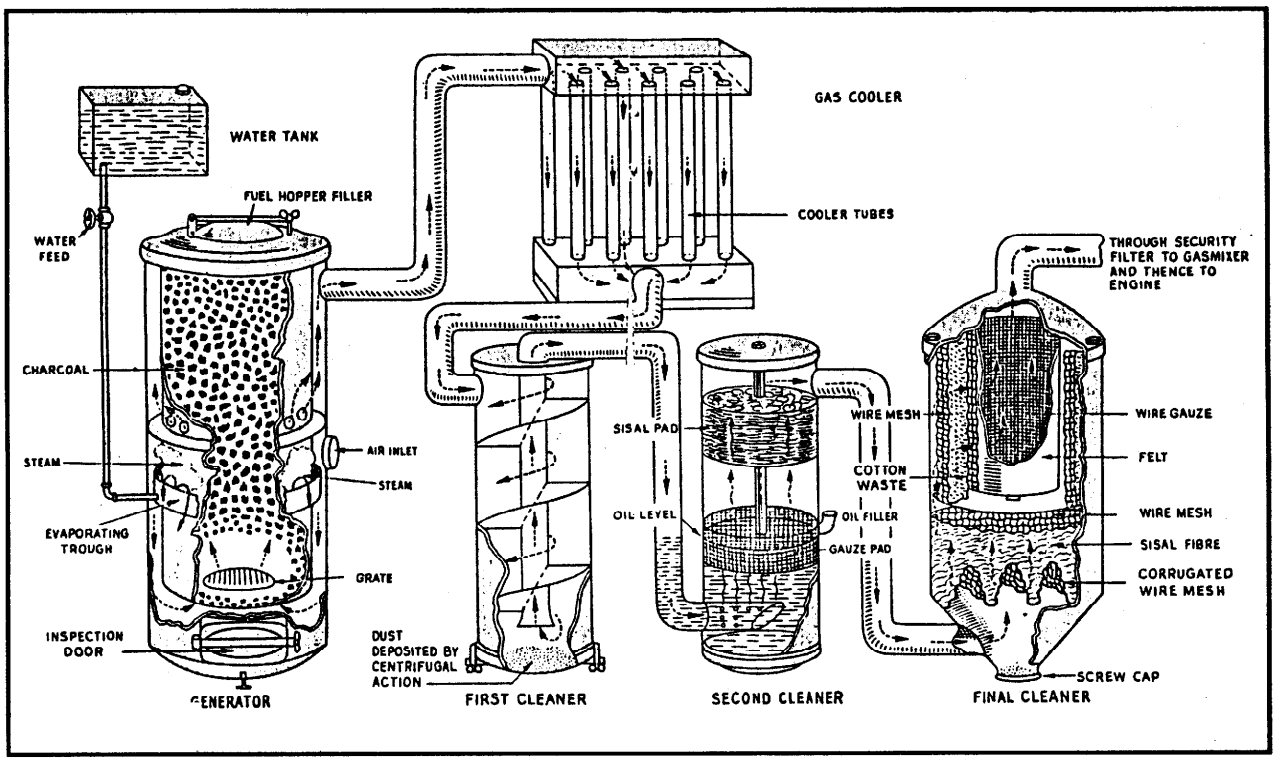
Then there is the question of carbon dioxide emmission and its "greenhouse" effect, but here the plus factors for gas producers begin to look shaky. Gas producers' output is also carbon dioxide; in fact, rather more than when petrol is the fuel for internal combustion engines.

Before we can support the use of gas producers we must draw up a balance sheet of pros and cons of their use. Of course, we are interested in helping individuals to solve their problems in the construction of energy frugal and essentially low technology devices. But we also seek to influence the large policy issues. Here, low tech versus high tech is not the issue.

The chemical balance sheet

Motor vehicles are powered by internal combustion engines. The fuel must be a gas (or an easily vaporised liquid), and the power is derived from converting the chemical energy of the fuel explosively into heat. The heat in turn causes rapid expansion of the gas thus forcing down pistons which turn the crankshaft and, by way of the differential, the axles and wheels.

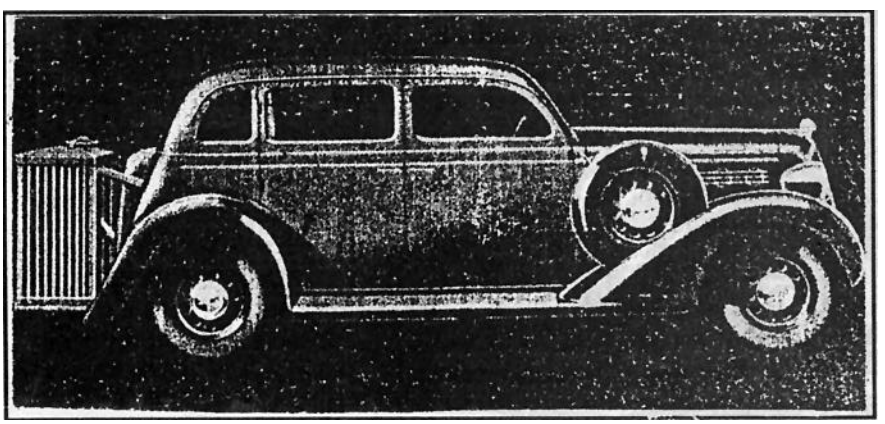




Schematic Diagram Showing Elements of a Gas Producer

The energy applied to the motor car is therefore chemical energy. The burning process in the cylinders converts this to the mechanical energy of the car and its moving parts. By comparison, in an electric train or tram the electric motor converts electrical energy into mechanical energy.

The gas producer, similarly, is a chemical energy converter using charcoal - a very pure and porous form of carbon, as its basic fuel. To comprehend the workings of a gas producer, therefore, we will need to brush up our knowledge of chemical reactions and their energy implications: in particular, those reactions known as oxidation and reduction. This has been done in detail in the accompanying box. (Refer Page 24).



A Wishhart Type Gas Producer fitted to the back of a car.

Oxidation reactions are usually exothermic - they are accompanied by the emission of heat. Reduction on the other hand, is usually, (but not exclusively), endothermic - energy is absorbed as chemical or molecular energy as the reaction proceeds. The most common examples of oxidation are burning or rusting. The process of photo-synthesis whereby carbon dioxide and water are converted into glucose, is an example of reduction. The energy required for the process is obtained from sunlight. In addition to producing glucose the starting point for the production of all living tissue, photosynthesis stores solar energy.

The fossil resources

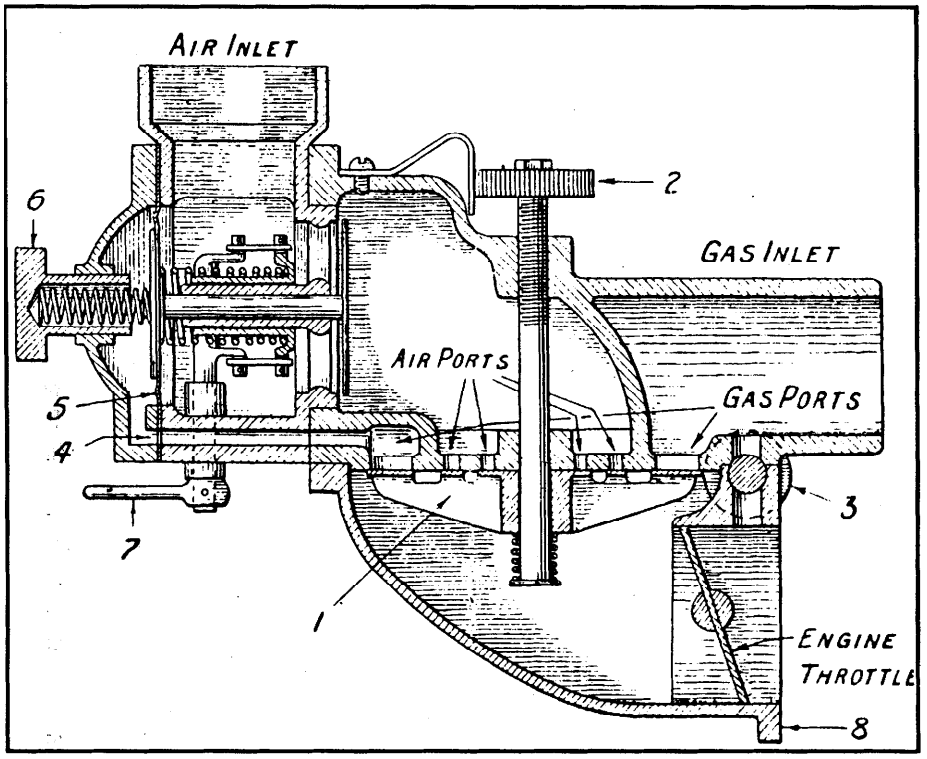
Starting with the glucose molecule, numerous other reactions occur within plants and animals involving other elements, such as nitrogen, sulphur and phosphorous leading to the formation

of complex protein molecules. Death and geological processes accumulate the remains and subject them to intense pressures and temperatures over many millenia. Two hundred or so million years later the residues emerge as organic fossil deposits. Essentially these processes are reductive, with the carbon atoms being stripped down to hydrocarbons (compounds of carbon and hydrogen only) or even to almost pure carbon, which we call black coal.

(Brown coal is an incomplete form with some associated complex molecules remaining.)

One group of residues are the liquid hydrocarbons, such as octane. These are compounds of carbon and hydrogen which, being in a highly reduced state, have much stored molecular energy. They are quite stable at ordinary temperatures, and being liquids, they are easy to transport. In many cases they are highly volatile, that is, easily vaporised. They can, therefore, be readily sucked or sprayed into internal combustion or jet engines which, being relatively light, are ideal for mobile transport - cars and aeroplanes.

Their appearance soon put the steam traction engine out of business and gave rise to the twentieth century miracle. We move around the world comfortably and cheaply, and this is probably the greatest difference between the common man of the nineteenth and twentieth centuries - at least for those in western countries.



WISHART GAS AND AIR MIXING VALVE

1. Triple Disc Valve, automatically controls the flow of both Gas and Air, and maintains a constant ratio.
2. Knurled adjusting screw for varying the spring pressure upon the disc valve.
3. Idling, gas adjustment screw. Allows extra gas to pass direct from the gas pipe to the engine.
4. Gas Passage, to rear of diaphragm.
5. Diaphragm, operates the air valve to equalise the pressure of the air to that of the gas.
6. Adjustment for the outer spring of the diaphragm.
7. Combined diaphragm inner spring adjustment and air choke, lever operated from the drivers seat.
8. Flange for bolting to the Engine Inlet Manifold.

Fossil folly

By this time many readers will be regarding this elementary lesson in chemistry with yawns. Where is it taking us? Well, it should be taking us to an understanding that in a mere 200 years we will burn up 200 million years of stored complex molecules and solar energy. If our civilisation continues in this manner, it must surely fall apart when these supplies of hydrocarbons are exhausted around the year 2050.

Moreover, the burning process will return to the atmosphere as carbon dioxide all the carbon locked up in the fossil deposits. Before the advent of plant life the atmosphere was more than 20% carbon dioxide. Today, it is less than 1% but increasing. The difference between today's pleasant climate and the harsh conditions prior to plant life is due to the huge amount of carbon locked up in living things, notably trees, and in vast accumulations of organic fossil deposits. By foolishly treating these latter as fuels we are rapidly returning our planet to something like that at present on Mars.

Gas Producers - how they work

The detailed chemistry of gas producers is set out in the box. Basically, gas producers substitutes another gas for the petrol vapour normally used in in-

ternal combustion engines. Producer gas is a highly adulterated form of water gas, which in its pure form is produced by passing steam over red hot coke (coal from which the other components have been removed). It is a mixture of the highly combustible gases hydrogen and carbon monoxide and has many applications in the metallurgy industry.

Water gas has a severe disadvantage for direct use in car engines because its production is strongly endothermic; as the reaction proceeds the red hot coke cools down. The reaction soon stops and the coke must be reheated. This makes its production a cyclical process unsuitable for motor cars. However, if the procedure is varied by passing atmospheric air over burning charcoal on which water is dripping, the reaction becomes continuous. The oxygen in the air is burnt off by the burning carbon generating enough heat to sustain the endothermic water gas reaction. The result, a mixture of carbon monoxide, carbon dioxide and hydrogen with large quantities of nitrogen, which has a much lower energy value than pure water gas and is known as producer gas. This passes from the gas producer into the manifold and cylinders of the engine to be compressed and ignited as with petrol.

Driving with a gas producer

In practice gas producers were temperamental. In addition to cold starting

The Chemistry of Oxidation and Reduction

Oxidation reactions add oxygen or remove hydrogen and release energy. They are therefore exothermic. Reduction reactions remove oxygen or add hydrogen and absorb energy. They are endothermic.

For instance, burning carbon in air is oxidation and exothermic.

$$C + O_2 \rightarrow CO_2 + \Delta h$$

carbon oxygen carbon dioxide heat

Photosynthesis, the reaction taking place in green plants leading to glucose, the essential building block of all living (organic) matter is endothermic with both carbon and hydrogen atoms being reduced

$$6CO_2 + 6H_2O + \Delta h \rightarrow C_6H_{12}O_6 + 6O_2$$

carbon dioxide water solar energy glucose oxygen

The absorbed energy is stored in the molecule structure of glucose.

The above reaction can go in the reverse direction by applying initial heat to glucose in an oxygen atmosphere - a process commonly called burning. Respiration (as in breathing) is a slow form of burning and is the process whereby living things gain energy. (Respiration also occurs in plants by the way - overall a mature tree has a balance between the oxidation and reduction directions and in an old tree respiration is more active: it is only in a young tree that photosynthesis pre-dominates.)

Chemical reactions in an internal combustion engine

An internal combustion engine requires a gaseous fuel. The fuel petrol is a mixture of octane and similar hydrocarbons. This mixed liquid is readily vaporised by reducing the pressure above its surface. The resultant gas, if quickly compressed and simultaneously ignited by a spark will explode by oxidation and release its molecular energy almost instantaneously.

$$2C_8H_{18} + 25O_2 \rightarrow 16CO_2 + 18H_2O + \Delta h$$

octane oxygen carbon dioxide water heat

Water gas

Water gas is produced by passing steam over red hot coke.

$$C + H_2O + \Delta h \rightarrow CO + H_2$$

carbon water heat carbon monoxide hydrogen

This is strongly endothermic reaction so that it must proceed

Cyclically, that is, since the reaction cools the red hot coke the steam flow must be stopped and the coke reheated.

When Water Gas is mixed with oxygen and ignited two explosive exothermic reactions occur.

$$2CO + O_2 \rightarrow 2CO_2 + \Delta h$$

carbon monoxide oxygen carbon dioxide heat

$$2H_2 O_2 \rightarrow 2H_20 + \Delta h$$

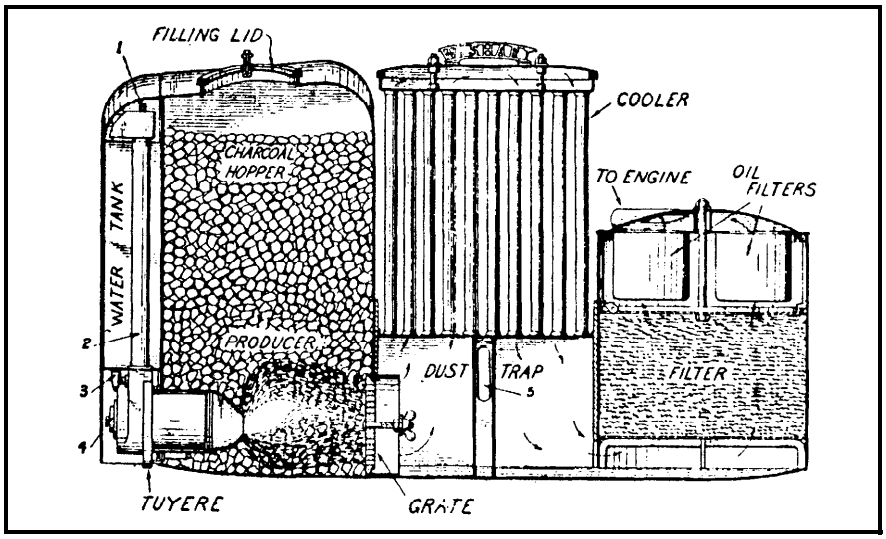
hydrogen oxygen water heat

If the above three equations are added together the net effect is shown as

$$C + O_2 \rightarrow CO_2 + \Delta h$$

carbon oxygen carbon dioxide heat

Producer gas is effectively water gas much diluted with nitrogen and carbon dioxide which are not inflammable. The presence of oxygen in the intake gas, however, causes burning of a proportion of the charcoal and hence enough heat to sustain the water gas reaction.



Section Through Gas Producer
1. Steam Control Screw, Water Circulator, 3. Water Hinge Cock
4. Lighting up Door, 5. Stating Handle Passage

problems (a few initial miles on petrol was the best method), cars accelerated slowly and wheezed their way along with frequent stops for skilled work with a poker or a well directed swift kick. Valves and cylinder linings are made from better alloys these days but it is possible that regular valve grinds and rebores would again become part of the motorists life. Finally, as cars are now much lighter than in the 40's, the addition of the heavy gas producer unit would seriously reduce the power to weight ratio, particularly in small cars.

Cost factors

In addition to the the considerable capital cost of gas producers, the running cost prospects do not look good. Charcoal - coke has too many inpurities to be really effective in a gas producer, is labour intensive to produce and difficult to transport in quantity.

You could make your own: logs of wood are readily available. However you would also need a kiln which produces heat sufficient to drive out the volatiles through partial burning, (as well as providing an oxygen starved environment, to promote the endothermic reduction of the timber proteins). It would be a troublesome process to manage.

It is estimated that an old telegraph pole (one tree) converted to charcoal will drive you 1,600 kilometres. Work out your requirements in trees per annum from that and then multiply this by the number of motor vehicles and you will get a picture of the consequences if we all switched to gas producers.

The fact is we already have a crisis in timber supply in Australia. We import over $2 billion in wood products each year. By the way, timber offcuts are unsuitable for charcoal production as air gaps between the small pieces would make an oxygen starved environment unachievable.

Conclusion

If you thought that this article was going to describe how to make your own gas producer and thus give you lower cost and more environmentally friendly motoring you will by now be disappointed. I did start out hoping to do this but once I began thinking about it I was soon converted to opposing any move to gas producers. However, in a second box we have provided some technical details about gas producers.

As a short term answer for survival during wartime austerity gas producers had some merit. They would be an incredible folly today.

Sewing with 12 volts

For those of us with 12 volt DC electrical systems, the range of appliances available off the shelf is rather limited This is often quite a pain for people living with such systems. In many cases it is the lack of the particular favourite appliance that can be the straw that breaks the camels back and ends up with another solar electric system for sale in the Trading Post.

It would in theory be quite simple to convert even a dishwasher to 12V DC operation if you feel you can't live without it. (But don't expect it to heat its own water). They only use about 200 watts, apart from the heating elements. What has this got to do with 12V sewing machines?

The point is that a system has to suit the needs and wants of the user. One person may feel that a dishwasher is an extravagant yuppie toy but watch hours of colour TV every night. Another person may be happy to forgo the telly to be freed from the kitchen sink. Whilst a basic 12v system will never cope with a house full of power hungry gadgets, if there is a particular appliance that you can't live without, why not convert it?

A Conversion

A simple conversion for the novice is a 12V sewing machine. I converted an old straight stitch machine, it is all I need. To convert a machine with more tricks up its sleeve would be just as easy, as long as its not electronically controlled. The newer machines with push button or touch controls couldn't be converted, but those whose clever tricks are performed mechanically, rather than electronically, could be converted.

Those with the motor inside the case would be more difficult due to the space problem, but you may be able to find a small enough motor, or cut the case to suit. If you are unsure about electronic/mechanical controls, phone the manufacturer's service department.

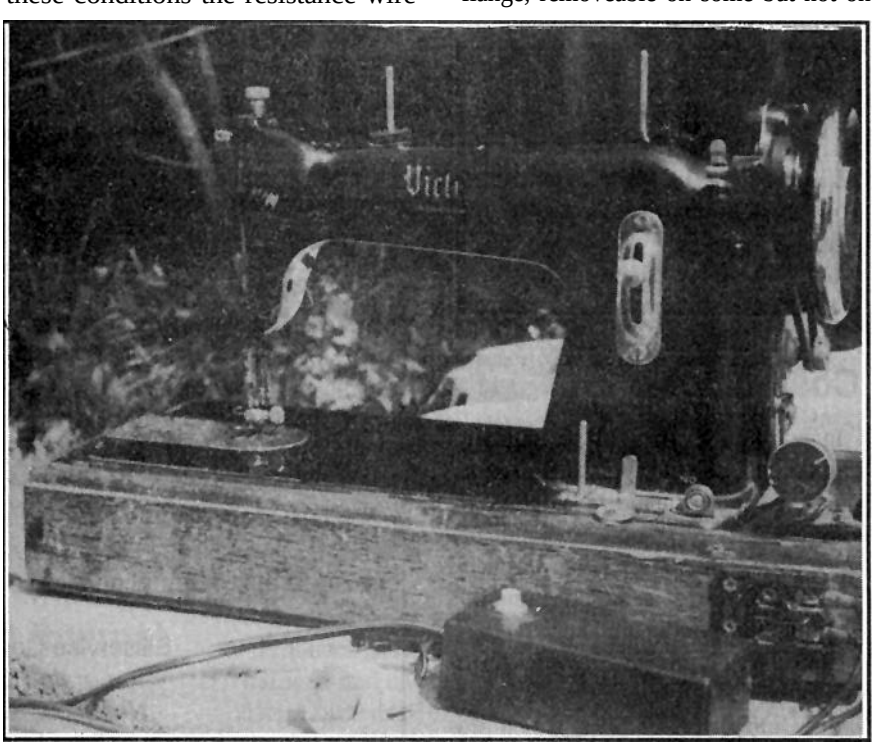
How it is Done

Peter pedals had an article some years ago in earth garden magazine, showing a simple 12V conversion. This conversion is based on that one, the difference being electronic speed control. Peter's conversion used resistance wire as a way to cut the voltage to the motor and thus control the speed. This is the simplest system, used by the manufacturers for years. It does however, have a slight draw back. At slow speeds the motor tends to stall under heavy load, such as sewing heavy denim. Under these conditions the resistance wire heats up and dissipates (as heat) the energy which was driving the motor.

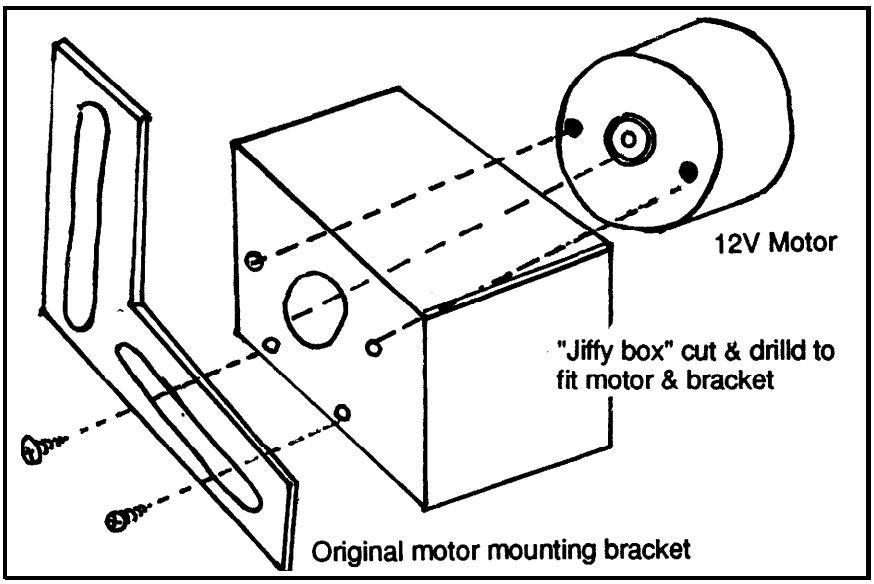
A better system is electronic control, which supplies a constant voltage to the motor, the voltage varying according to the speed selected. The controller in the conversion is very simple to construct (as long as you can solder) and although not as efficient as a chopper control, it is very effective.

The first thing to do in the conversion is remove the 240 volt motor. It will be attached by a bracket of some sort which can be used to mount the 12 volt motor. Now take it with you to the car wreckers, and look for a heater fan motor of a similar size. There is a huge variety of car heater fan motors, so finding something suitable shouldn't be too hard.

Many motors have a large mounting flange, removeable on some but not on



The converted sewing machine ready for use. The black box contains the foot switch.



Mounting details for the 12 volt motor

others. If the flange is not removable, try another motor as it will only get in the way.

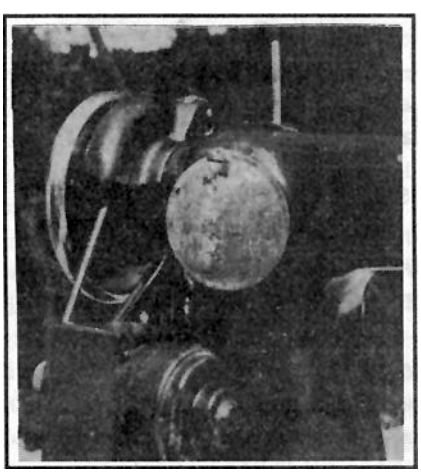
The motor I used came from a Suzuki carry van. Small Japanese cars seem to have the most compact heater fan motors.

The shaft diameter varies too, if you are lucky, you may find one to match, otherwise the pulley from the 240V motor could be drilled out a little to suit. I was lucky - the 6mm shaft on the Suzuki Unit was close enough for the 1/4 inch shaft on the sewing machine motor pulley. Expect to pay $10 or $20.

When you get home, remove the mounting flange, and the fan. (Allen Key, clip or nut depending on type).

Hold the motor in place on the sewing machine. This will give you an idea what sort of bracket you'll have to make up. I happened to have an old electronic project box ("Jiffy box") of suitable size, so I mounted the motor into the box, and attached the box to the mounting bracket of the 240V motor. Otherwise right angle brackets could be bought from any hardware store.

If the original belt doesn't fit, a bearing supplier could supply a rubber O-ring of suitable size.



Motor and belt in place

Speed Control

In this conversion, I have separate speed control and on/off switch. You select the speed by hand, then step on the foot switch to "GO". This is much easier to construct than to make up a foot-controlled "accelerator pedal". Though if you really want one, it shouldn't be too hard. A slider variable resistor would be easier than a rotary one in that case.

But How Does It Work

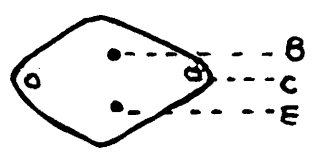
If you connect a resistance across the terminals of a 12V battery, then at the +ve post you have 12V and at the negative post you have 0V. It thus follows that halfway along the resistance you have 6V, three quarters along you have 9V and so on, just like a number line. The variable resistor is used to do this - called a voltage divider.

However the resistor is only rated at three watts, not nearly enough for the motor (about 50 watts) so we use a transistor to mimic the voltage of the resistor, at a higher current (amplify).

Thus the resistor tells the transistor what voltage to put out. This output is used to drive the motor. We use the variable resistor to alter the output of the transistor and thus the speed of the motor.

Making The Speed Controller

1. Drill heatsink to accept variable resistor as shown & mount it.
2. Mount the transistor in the heatsink.
3. You will notice that the two pins on the transistor are not centred, they are more to one side. When working out the following, the pins should be right of centre as shown:



C is one of the mounting bolts.

Transistor pin detail.

Mount the completed heatsink unit to a convenient place on the RH front of the sewing machine. Attach the knob to the variable resistor shaft. This is your speed selector control.

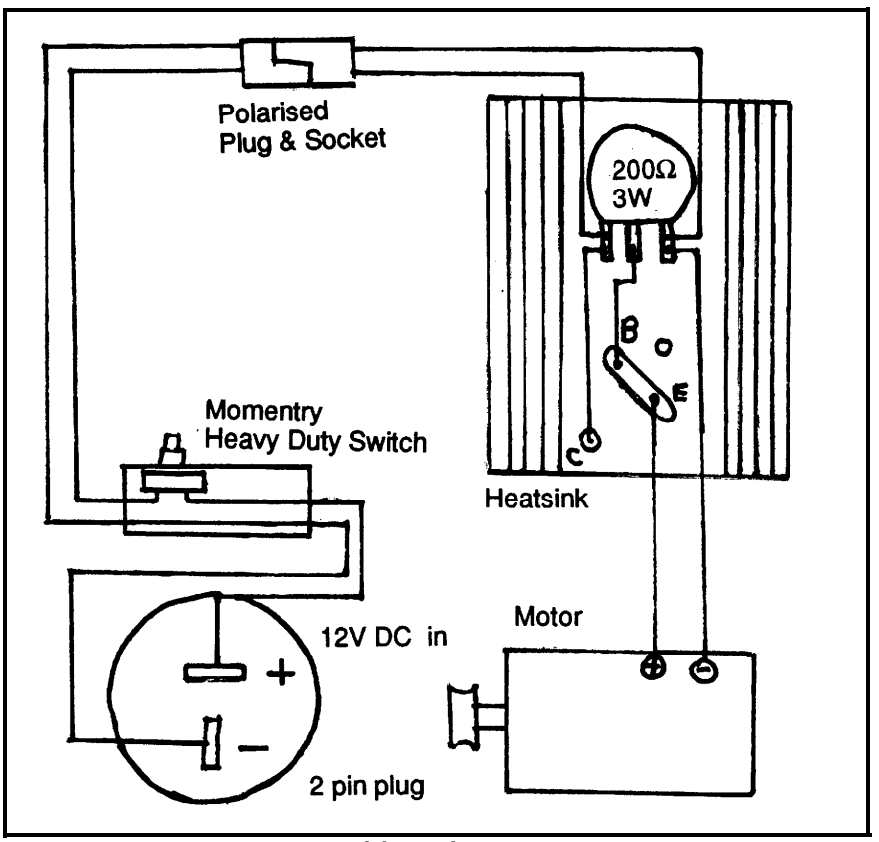
Foot Switch

This is the easy bit. Mount the switch on the box so that you can rest your foot on the box and work the switch. Allow about 1.5 metres. Cut through the positive wire and attach one end of the cut to each terminal on the switch.

Continue the run of wire for another 2 metres or so, then fit a 2 pin polarised plug. Of course you have the correct low voltage socket to match, don't you!

Parts List

One old sewing machine
Car heater fan motor (Preferably permanent magnet type)
TO3 type heatsink (Dick Smith cat no. H-3471)
2N3055 Transistor
3 watt, 200 OHM, wirewound variable resistor, (DSE Cat. No. R 6911)
Resistor and knob. (eg DSE P7014)
4 metres approx 2 or 3mm "figure-8" thin wire, colour coded for polarity (eg DSE W-2025) or heavier
Plastic Project Box for Pedal Switch (eg DSE H-2853)
Heavy Duty Momentary Push-On Switch (horn or starter switch from auto electrician)



Wiring Diagram

Nuts, bolts, wire, sticky tape, bits of string and chewy to put it all together
12V polarised plug (& socket)
Plug and socket (polarised to suit 12 volts) for attaching foot switch to machine.

To Use

1. Set desired speed using knob
2. Step on the button to "go".
3. Use as a normal sewing machine, but release the foot button before changing speed.

Happy sewing !

What Do You Think?

In the last few issues we have changed in the mix of articles to include a broader range. If you think this new balance of articles is better....or worse, please drop us a note and let us know. Write to us at:

Soft Technology
Alternative Technology Association,
247 Flinders Lane,
Melbourne, 3000

Biogas-Centred Domestic Waste Recycling System

While this material describes an Indian situation it could easily be applied to small scale waste disposal in Australia

C L GUPTA

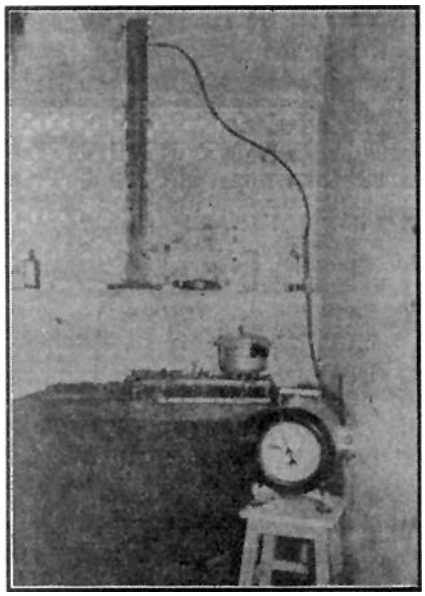
The author is the Hony Director of Tata Energy Research Institute Field Research Unit, Pondicherry 605002

In all the new suburban developments around growing towns, there is an urgent need for an integrated system for waste recycling and energy and fertiliser supply on a single house basis. This is tank-soak pit arrangement, kitchen and bathroom water and solid organic wastes have to be discharged outside the house. A biogas based domestic waste recycling system has been designed and constructed by us in a residence in Pondicherry, which has been successfully working since March, 1982.

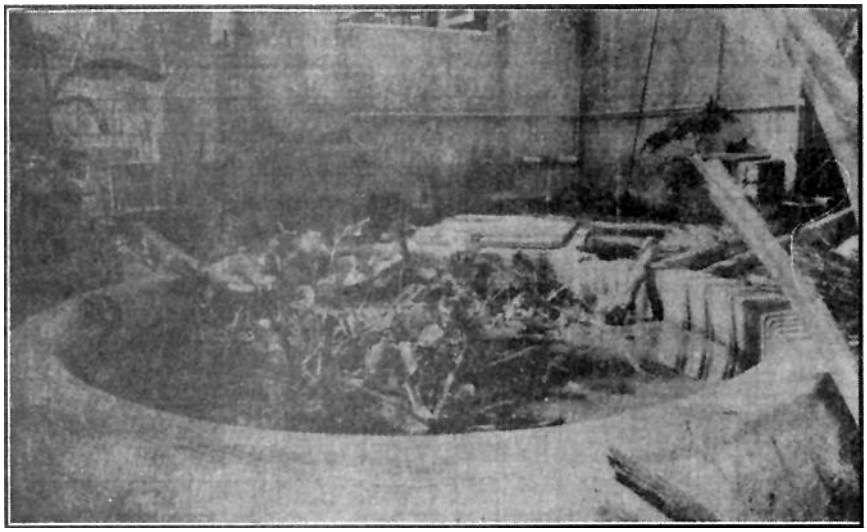
The essential elements are a drumless digester with a stirrer and an open slurry cum bath water tank. The digester of 3.0m^3 slurry capacity (1.5m^3 gas) takes in toilet waste from toilets having pushcock type low water flushing, kitchen organic waste and some recycled water hyacinth/leaves etc., from the garden through a separate entry port. Bathroom and kitchen water are discharged into the open slurry pit having a retention time of two days. Here, growing water hyacinth cleans it enough so as to be used along with liquid organic manure for the house garden. Levels are so adjusted that entire hydraulic system is by gravity flow. It is a complete waste recycling system providing manure and water for the house and cost Rs.2200 - at 1982 costs (US$ 1 = Rs.9.60).

Design calculations showed that the amount of biogas thus produced would only meet 40% cooking needs of a family of five. A single cow's dung was therefore added to bring the gas supply to satisfy up to 80 to 100% needs of the family as well as make the biogas operation more stable and balanced in terms of dilution and C/N ratios. A hand operated stirrer is a novel feature of the system. The photo to the right shows the actual measuring set up in the kitchen.

The only snags so far have been poor growth of water hyacinth in the slurry pit and failure of fishes to stop mosquito breeding. (see photo below) There are no flies or bad odours. Even tilapia fish, put in the tank for biocontrol of mosquitoes died probably because of heavy deoxygenation. Low surface to depth ratio, which is governed by considerations of soakpit space availability in a house, seems to be the limiting factor. A recently developed emulsifiable concentrate microbial pesiticide formulation of Victor Control Research Centre is under trial to tackle this problem.



The gas is used in an ordinary stove and can satisfy an average families cooking needs



Outside, water hyacinth are grown in the pond to further purify the effluent after it has left the methane digestor.

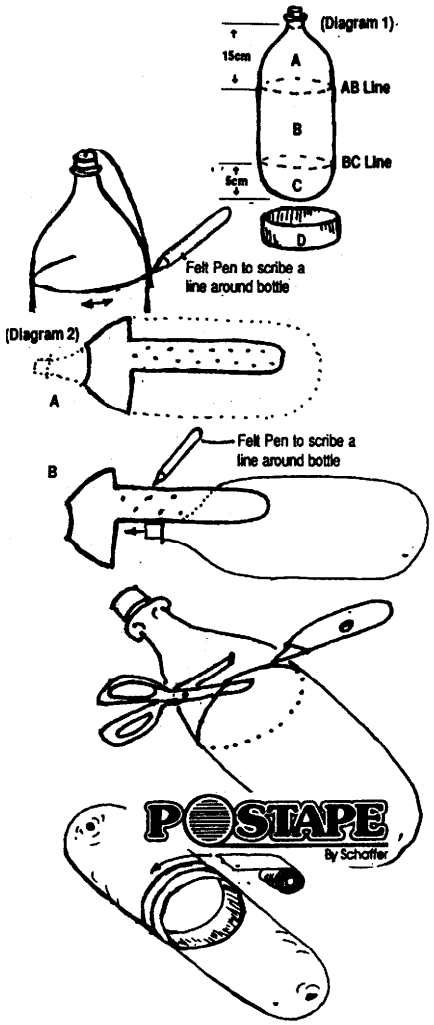
REUSING PLASTIC BOTTLES

THE OZON RING

How to mark, cut and assemble 2 ltr soft drinkbottles to make hundreds of useful containers with the help of the ozon ring.

The name "OZON" was derived because when you make a pressurised post pack the protection is the same principal as the way the ozone layer protects the earth.

Cut the bottle anywhere in section B & the Ozon ring will fit the bottle to rejoin it.



A hole in the cap and a string down the side of the bottle is a simple way to make a straight line around the bottle.

Using another bottle you can make a jig to draw straight lines, see diagram 2 A & B. It is best to have one person rotate the bottle while another holds the felt pen against the required hole.

To cut the bottles leave the cap on. The air pressure makes it easy to start the cut, use a Stanley knife or similar to start the cut, then complete with a pair of scissors.

In some cases such as post packs and bird feeders adhesive tape is required to seal the join. It is best to use a cloth tape as the glue is very strong on plastic I recommend PosTape by Schaffer.

To remove the labels soak in water and then use a pot scrubber. Nailpolish remover or eucalyptus oil will remove any traces of glue.

The Ozon ring comes in clear & the Olympic games colors red, yellow, green, blue, and black. Simple instruction sheets are available for most of the popular designs eg: bird feeders, auto water plant pots, fly catches and general containers. A video for teachers and distributors is available, for informtion contact:

Mike Morrison 018 371737 P.O. Bag 5000 Ringwood. 3134

Available from K-Mart and other environmentally aware stores.

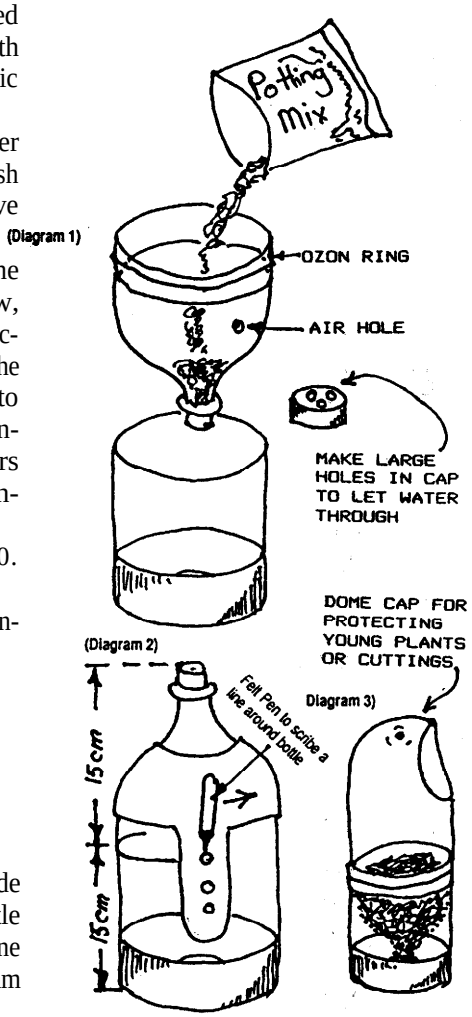
AUTOMATIC WATERING PLANT HOLDER

The auto watering plant pot is made by cutting a two litre soft drink bottle in half and joining both halves over one side of an ozon ring as seen in diagram 1.

Holes are made in the cap and one further up the neck of the bottle. These holes allow water to flow to the outside container creating a reservoir that will keep the plant evenly watered for weeks. The ring prevents the water from escaping between the two layers of plastic. These planters tend to remain more even in temperature because of the double glazing effect.

Use peat moss to strike cuttings and you can easily cover the cutting with a dome made from the bottom of another bottle as in diagram 3.

These are very effective plant pots at a fraction of the cost of their nearest equivalent.



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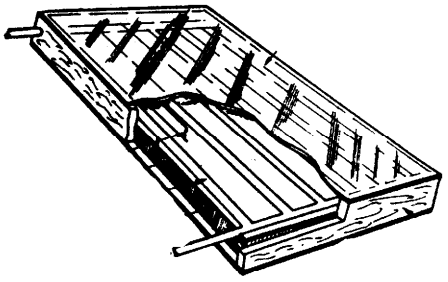
Manufacturers of domestic solar hot water systems and flat plate collectors. Main pressure or gravity systems for coupling to slow combustion boosting.



BP Solar

P.O. Box 519,
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NSW. 2100.
Phone: (02) 938 5111

Manufacturer of Australian made solar cells. Also distribute a range of other products including regulators, inverters, batteries, refrigerators, pumps and lighting equipment.

Choice Electric Co. (Aust.) Pty Ltd.

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PH: (07) 252 4909
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D.C. lighting & components. RFI suppressed power inverters. Microprocessor controlled solar trackers. BP solar wholesaler to Queensland. SANTECH registered trade mark.

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591 Bridge Road
RICHMOND, 3121.
Tel: (03) 429 1163

Solar water heating equipment, electric wood and gas backup. Suppliers in other states.

Elante Pty Ltd.

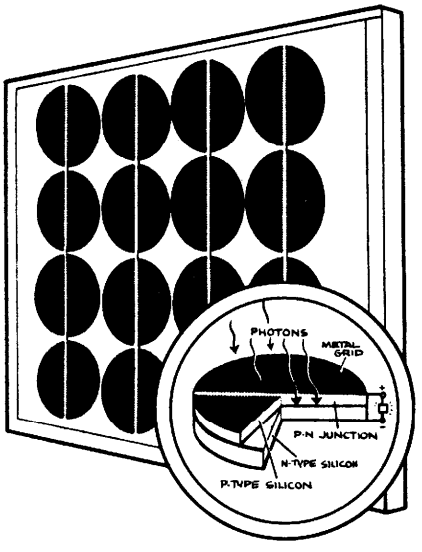
380 Canterbury Road,
Surrey Hills, Vic. 3127.
(03) 836 9966

Photovoltaic Panels and components for remote area power supplies. Also agents for a range of wind generators and other equipment.

GF Solar,

34 Reginald Street,
Rocklea, Qld. 4106.
(07) 277 9688.

Solar modules S.C.A. (Aust. made). Solar battery charging/fencing. Solar home power systems (RAPS). Water pumping systems.



Gippsland Energy Alternatives

Bellbird Road, Clifton Creek,
RMB 8600, Bairnsdale. Vic. 3875.
(051) 57 9304.

Solar electric power systems, appliances, etc.

Going Solar

320 Victoria Street
North Melbourne, 3051.
Tel: (03) 328 4123

Solar electric systems, batteries and components, appliances, wood stoves, books, beekeepers supplies, environmentally safe paints, solar water heating.

North West Heating and Cooling

13 Hill street,
Tamworth, N.S.W., 2340
(067) 66 5868.

Solar and solid fuel heating, hot water systems, central heating, spa and pool heating, home lighting and power incl. inverters, pumps etc.

One Stop Energy Shop Pty. Ltd.

Unit 11, 2 Paton Pl.,
Manly Vale, 2093.
Phone: (02) 948 0215, 948 0216
Fax: (02) 949 3710

Energy supply and energy conservation. Gas, Solar, Electric, Fire Insulation, Glasshouses, Double Glazing etc

Outlook Alternatives

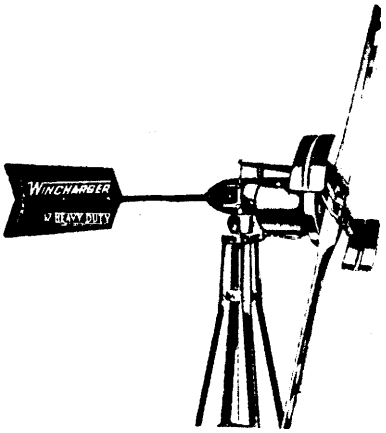
52 Faithful Street,
Wangaratta, Vic. 3677.
(057) 21 9900
Solar electric systems, wind generators, solar water heating, wood heating systems.

Power Plus Energy Systems

99 Mary Street,
Cygnet, Tas. 7122.
(002) 95 1708
Solar electricity, windpower, hydro systems, appliances, etc.

Quirk's Victory Light Co. Pty Ltd

13 Albemarle Avenue,
Rose Bay, 2029.
(02) 371 0014.
Solar modules, wind turbines from 5 watts to 450 watts, full range 12v/24v inverters, fluorescent/quartz halogen light appliances, batteries, efficient refrigerators and deep cycle batteries.



Rainbow Power Company

P.O. Box 217,
70 Cullen Street,
Nimbin, NSW, 2480.
(066) 89 1430,
Low voltage equipment including appliances, batteries, control boards, electric fences, hydro systems, inverters, lighting, stereos, pumps, solar panels, wind generators, etc.

Rayward Energy Services Pty Ltd.

8 Wyatt Avenue,
Regents Park, N.S.W. 2143.
(02) 93 5313
Electrical and solar contractors. Air type collectors for space heating. All types of electrical work.

SolaHart Pty Ltd

112 Pilbara St., Welshpool, W.A., 6016.
Tel. (09) 458 6211
Manufacturers of solar water heating systems.

Solar Generation

Whites Road,
Landsborough, Qld, 4550.
(071) 94 1144
Solar Electric Systems.

Solarex Pty Ltd

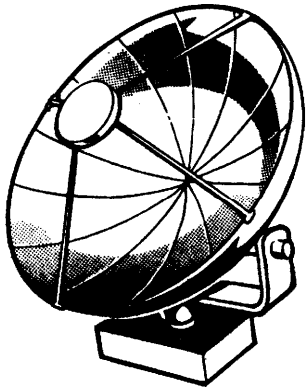
P.O. Box 204,
Chester Hill, NSW. 2162.
Photovoltaic systems for refrigeration, water pumping, lighting, etc. PV regulation and control equipment. Water pumps, inverters, battery chargers.

Solar Charge

115 Martin Street,
Gardenvale, Vic. 3185.
(03) 596 1974.
Supplier of solar electric energy systems, solar panels, batteries, components and appliances.

Southern Cross Corporation

133-135 McIntyre Road,
Sunshine, Vic. 3020.
(03) 311 0261.
Manufacturers of wind pumping windmills. Solar pumping systems. Branches in other states.



Suntron Energy Company

861 Doncaster Road,
Doncaster East, Vic. 3109
(03) 848 8944.
Manufacturers and suppliers of solar electric energy systems.

Tamar Designs

Deviot, Tas. 7001.
(003) 94 7357
Manufacturers and sells a range of hydro electric generators including pelton wheels and turbines.

Wildwood Wind & Solar

"Wildwood", Tinderry Road
Michelago, NSW, 2620.
(062) 35 7172.
Smale scale solar, wind, hydro systems, 12 & 24 volt appliances. ATRAA

Behind the Scenes

News on the work of the Alternative Technology Association

The first half of 1991 saw us busy getting out and about. We attended the Green Home Show for the second time, and were given twice the exhibiting space in recognition of the quality of our exhibits.

During the show we sold over $2,000 worth of Green Technology books, which was a great help in our efforts to get the printing bill paid. We were also visited by Ros Kelly, the Federal Minister for Environment, Arts, Tourism, etc. She seemed impressed when we offered her a solar (cooked) sausage, but didn't take us up on our offer.

The Energy Display Trailer has continued to be very popular. So far this year over 3,000 students have benefited from classes using the trailer. It is almost fully booked for this year and we are already receiving bookings for 1991.

Our courses have continued to be popular at the Solar Workshop. An activity day in autumn resulted in some much needed work on the building before winter set in.

We also ran a visit to Bruce McKenzies home, which is a beautiful two story mudbrick building. His home is powered by a combination of photovoltaics and a "Fiscar" Savonius wind generator. Bruce has been working with Telecom to monitor the performance of the Fiscar generator. The visit went so well that after arriving in the morning some people didn't leave till late in the afternoon.

The last few months have been an important time for getting the office better organised. We have made another office move, (but not far this time); just to another space on the third floor of Ross House. We are now located next to the Energy Action Group a community organisation who concentrates on the social issues to do with energy.

As part of the move we have been able to move the library in from the Solar Workshop. After some reorganisation its contents of more than 1,000 books in print and on microfiche will be available to members.

An increasing work load in the office has has meant it is now necessary to open two days a week, (Tuesday and Wednesday) with a real possibility of opening additional days in the future.

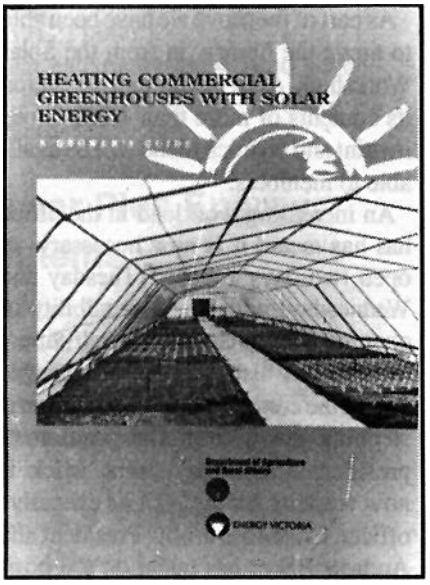
There has also been some changes within the committee, with Mick Harris stepping down from the position of president after many years. Mick is now working for the ATA as executive officer. Chris Moss is now President and Andrew Baker has taken on the position of Public Officer. Another new face is Imelda Evans. Imelda who is fresh from Western Australia and is our new office manager. She has already made her presence felt....that's her hand on the front cover.

Oh No! .....

Is he really going to ...

offer me a sausage.

BOOKS



Heating Commercial Greenhouses with Solar Energy - A Growers Guide

by Bob Fuller

All growers know how important the sun is to their business. During the day, the sun provides one of the vital ingredients for plant growth, and also warms the air inside their greenhouses.

However the sun can also be used to reduce night time heating bills. Solar heating systems for commercial greenhouses have been researched in Australia for over ten years, and at least twenty solar greenhouses have been built around the country.

Bob Fuller worked with the CSIRO for a number of years developing and testing commercial solar greenhouse designs. He has contributed articles on solar greenhouses to Soft Technology in the past.

This booklet is designed for commercial horticultural&. It includes a review of both water and air based heat collection, storage and distribution systems. A number of examples are then discussed. Six Australian and two overseas solar greenhouses are reviewed in detail. These range from a system in Greece which uses water filed black plastic sleeves on the floor of the greenhouse (costing a mere $500) through to an elaborate system with pumped hot water for the princely sum of **$200,000.**

The booklet finishes with a design checklist for installing a solar greenhouse and a list of information sources. **Heating Commercial Greenhouses with Solar Energy** is published by Victorian Dept of Agriculture & Rural Affairs. Price $10 + $2 postage. 36 pages. Available from the dept.

Solar vehicles

The BP Quiet Achiever was the first solar car to make an impact on the public when it travelled across Australia in the early 1980's. It was considered an interesting novelty by most people. Less than 10 years later, there are about 20 solar car races organised around the world. Some are sprints, others are marathons.

The solar car and the associated developments in electric motors, aerodynamics, batteries and body construction are at the leading edge of technology.

A booklet 'The Status of Solar Powered Transport' by the NSW Department of Minerals and Energy puts these developments in context..

It is available from the Department (02) 234 444 for **$7.00.**

Letters

Dear Friends,

Just writing to tell you how I enjoy the magazine. The technical articles are way above me, but I do like the consumer interest items, eg. low energy light bulbs and solar car progress.

In regard to the light bulb article, how about assisting the uninformed such as myself. I have bought two, for lights that are left on for long periods. I have been told not to use them in lights that are turned on and off frequently. We have down lights in the lounge room that are turned on and off frequently but are used a lot. I would love to put low energy lights in them but have been deterred by the info received so far. Can you give us a little more info on this respect of the issue.

I am passing your newsletter onto the community worker at our local new council built community centre. She has a group of young women in a discussion group and they want to start a working group on how to do things in an environmentally friendly way. We don't know where the group W.H.E.N. are (as featured on Question of Survival) as they seem to be working along the lines the group wants to follow.

How about a bit of publicity for the grass roots groups that are doing their bit for the environment. In N.S.W. there's a group against plastic who are doing a lot of good work.

Keep up the good work.

Yours sincere/y,

Barbara Wright.

Dear Barbara,

Thanks for your letter. Here is a quick answer to your questions. Your information that it is not good to turn compact fluorescents on and off frequently is correct. This will reduce the life of the lamps signtficantly, although it doesn't have much of an effect on the amount of electricity they use. Even if they fit in your downlight fittings they will not operate efficiently as you need special fittings with reflectors designedfor the use of compact fluorescents. It might be better to wait until the available technology can catch up with your particular needs.

As regards your second point about grass roots organisations. We are always happy to give them publicity and may even run a regular column in the future about what the groups are up to.

Mick Harris, Ed.

To the Editor

Dear Michael,

I enjoy reading Soft Technology from cover to cover and like the wide variety of practical articles you print. However I am surprised at the uncritical coverage you give to solar/electric cars, eg the "Electric Sportscar", "Solar Cars are Coming" and "1990 World Solar Challenge" articles in "Soft Technology" no 35.

The case against the continued use of fossil fuelled cars has been well documented (eg "Car Sick by Robert Schaeffer in the May/June 1990 issue of "Greenpeace" magazine). Unfortunately some of these problems also apply to solar/electric cars. In particular:

Road Accidents: Will there be more pedestrians, cyclists and wildlife killed and injured because they cannot hear these quiet vehicles coming? How will the occupants of small solar/electric cars fare when they collide with trucks and buses?

Equity: A car based transport system favours people with a drivers license (and the money to buy a car). What about people with disabilities, old people, sick people and young people? Unfortunately the quality and frequency of public transport drops markedly when the governments and individuals accept the private car as a major form of transport. We have seen this all around the world time and time again.

Resource Use: How would our ecosystem cope if every family on the planet had a solar/electric car? If they used lead acid batteries, what about the health hazard and pollution associated with lead mining and processing? What are the likely environmental impacts of the production of other types of batteries?

The "Halting Global Warming" report which was commissioned by Greenpeace says that energy related emissions of carbon dioxide should be cut by 70% by the year 2020. Can we goal if we plan to manufacture a solar car for every family?

Land use: If cars continue to dominate our transport system I can imagine the road lobby staying as strong as ever, demanding more freeways, city carparks, etc.

Lets drastically reduce the number of private cars on our roads to make way for a high quality public transport system and a safe extensive network of bicycle paths, walkways and recreation areas.

Regards

Ashley Campbell

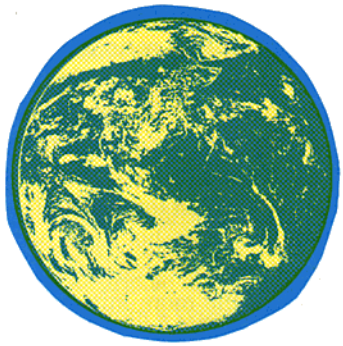
Dear Ashley

Thank you for your letter. We agree with your sentiments about the private motor vehicle and the need for us to move to better public transport and other alternatives. We will take your comments into account in our future selection of material.

Mick Harris, Ed

Soft Technology is the Australian magazine for environmentally friendly energy and technology.

We will keep you informed about the latest developments with renewable energy, energy conservation and appropriate technology. You will also get the practical, nitty gritty details on how you can harness renewable energy sources, build with natural materials, and create technology which works in harmony with the environment.



We cover the vital policy issues which allow us to maintain a society where our needs are satisfied without sacrificing our planet.

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