Electricity-Saving Cooker That Costs So Little

by David Spark

A cheap electric cooker, which despite its low power, can fry and roast as well as boil is being tested in villages in Nepal. The cooker, which will cost only 2,000 Nepalese rupees, can be used with as little as one-amp power supple. Cookers used in the West require 30 amps. Gemini News Service reports on the new simple cooking help that could make life a bit easy for the Nepalese women.

A cheap electric cooker which, despite low power, can fry and roast as well as boil is being tested in villages in Nepal. Aimed to cost only 2,000 Nepalese rupees, it manages with little more than a one-amp power supply. Cookers used in Britain require 30 amps.

The basis of the new cooker is a metal box of pebbles, insulated by a jacket containing rice-husk ash. The pebbles are heated by the low-power electricity to 450 degrees Centrigrade, four-and-a-half times the boiling point of water.

When the user wants to cook, an electric fan blows air through the pebbles, reaching a temperature of 300 degrees Centrigrade. The air emerges from holes in two cooking plates and can heat pans even if they are battered.

"It makes very good chapatis apparently," says Mark Waltham of the Intermediate Technology Development Group (ITDG), an international agency which since 1979 has been helping Nepal produce suitable equipment for village hydro-electricity.

The new cookers are being tested in two villages. Up to twenty cookers are being installed in February.

The growth of Nepal's population, from two million in 1950 to 19 million today, has resulted in destruction of forest for farmland and firewood. So cooking with power generated from streams could save trees.

Many villages have generated sets to light homes with 25 or 40 Watt bulbs. Power from these is available for cooking during the day without extra cost to villagers, who pay for the connection, not the amount of power used.

The snag is that the limited power of a lighting circuit is not normally sufficient for cooking.

ITDG has been encouraging villagers to use slow cookers which, given time, can cook rich and lentils with a low power supply. But is recognised the need for something more versatile.

Waltham and his Nepalese colleagues got villagers to try three new types of cookers, two with hot plates, the third an oven. The oven proved too big and heavy. The hot plates were unsuited to battered Nepalese pans. So a conference decided on a different, hot-air approach, and a British company produced the design.

Nepal has a long history of using water power. Waltham says bout 25,000 turbines of a traditional design are in action, milling rice into flour. Then Nepalis began making crossflow turbines and using them not just for flour-milling but for husking rice and extracting oil from seeds. "They relieve women of a lot of drudgery," says Waltham.

Turbine power is related to the flow of water and the "head" from which it falls. Crossflow turbines, which operate like a rotary lawnmower, are well suited to the medium heads of water in Nepal's meddle hills. The higher hills, with less water, require a different form of turbine, the Pelton wheel — a wheel with buckets round the rim.

Waltham has been helping Nepalese manufacturers how to make these. He says: "The turbines are simpler, more reliable and cheaper per kilowatt."

In the design he is using, the buckets are bolted to the wheel so that, if one breaks, it can easily be unbolted and replaced.

Waltham has also introduced to the Nepalese industry a simple seal to prevent the water that drives the turbines from reaching and ruining the bearings.

A few years ago, Nepalese realised that their turbines could generated electricity and provide light for villages. The government provides half the money for electricity schemes. The villages provide the rest by contributing labour and by borrowing from the Agricultural Development Bank of Nepal.

However, the lighting was sometimes poor and the cabling ill-planned. Waltham has produced guidelines to ensure that electric circuits are safely installed and properly earthed, overhead wires are well above the ground and lights stay bright.

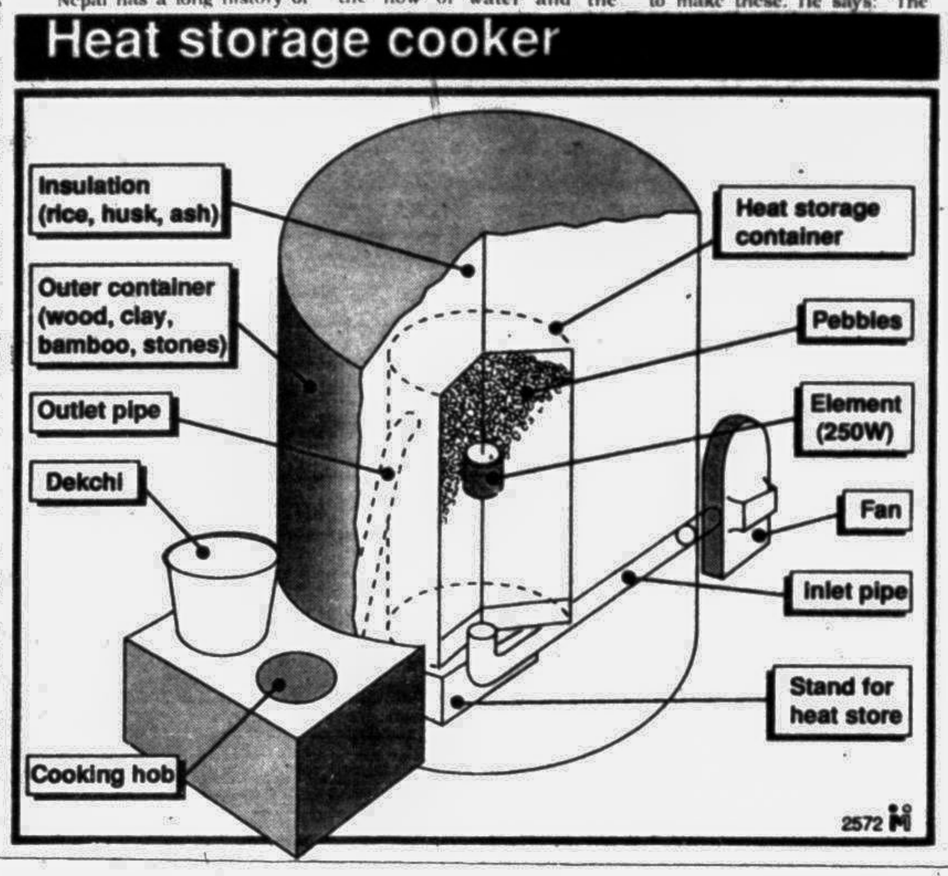
He points out that, apart from lighting and cooking, electricity could also be used for food processing. Women could then prepare food in the village instead of having to take it down to the stream to machinery directly driven by the turbines.

Waltham, a former teacher, has worked on windpumps in Thailand. He has been in Nepal for ITDG for two years.

He says that Nepalese firms can provide power-generating equipment for as little as 11,000 Nepalese rupees a kilowatt (enough to light four houses). But they are under threat from imports.

Chinese turbines are sold for less than the cost of the steel, though so far in larger sizes. Meanwhile, aid finances turbines from Europe and Japan: Waltham mentions one which could have been made in Nepal for a third of the cost.

But if the Nepalese industry goes out of business, who will keep the foreign turbines in repair? - Gemini News



Colours Combine to Magical Effect

by Rathindra Nath Sanyal

RED, green and blue are the three primary colours. In combination of all these three colours in different proportions, we can produce all colours. White is a mixture of red, green and blue in equal proportion.

The circles show the addition of colours. It is a combination of red (R), green (G) and blue (B) colours. Some of the parts overlap partially. Where the circles are superimposed, the colour shown is the mixture produced by adding the primary colours. At the center, all three colour circles overlap, resulting in white.

When green and blue mix, the result is a greenish blue mixture, we call it cyan. Somebody might consider this colour just blue or perhaps turquoise. However, cyan is the name of green-blue mixture for remembering. Again when red and blue are added, the colour produced is called magenta. This colour is similar to violet or purple, but magenta is more reddish. By mixing approximately equal parts of red and green, a yellow colour is produced. By adding more red and less green, orange colour is produced. In this way practically all natural colours can be produced as mixtures of red, green and blue, including so-called neutral colours, such as white and grey. No primary colours can be recreated by mixing the other primaries.

Brightness is the average or overall intensity of illumination and it determines the background level in the reproduced picture. By the term contrast we mean the difference in intensity between the black parts and white parts of the reproduced picture. When the value of intensity between the bright white and dark black will be extreme, the picture is very strong and the contrast range will be great. Hue is a popular term in colour function. But what is it? The colour itself is its hue, or tint. A red rose has a red hue, green leaves have a green hue. The colour of any object is distinguished primarily by its hue.

When the colour is vivid, intense, deep or strong then it is saturated. When it is pale or weak, there is little saturation of colour. If there is no white in the colour then it is fully saturated.

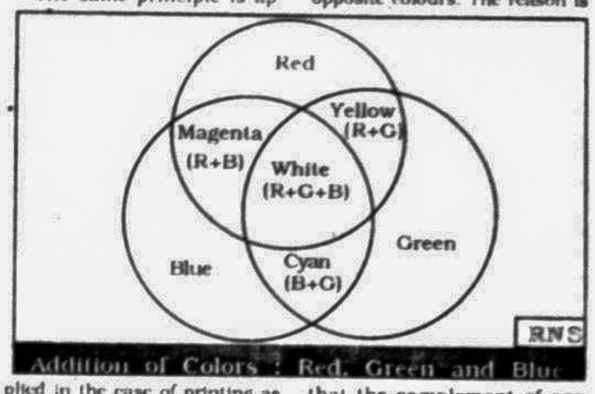
The same principle is applied in the case of printing as well as lighting (such as colour TV). But their character is in the opposite. Let us think in the case of printing, if it is a white paper and if no colour is present i.e. absent of colour then it is white. On the other hand if all the three colours are present in equal proportion then it is black. Again in the case of lighting, if there is absence of colour then it is dark or black while presence of colours means light.

Let us think about another three colours cyan, magenta and yellow which we are called complementary colours. The colour that produces white light when it is added to a primary is called its complement. For instance, magenta, when added to green, produces white light. Therefore, magenta is the complement of the green primary.

Actually magenta plus green equals white because magenta is a mixture of red and blue. Therefore, the combination of magenta and green actually includes all three primaries.

Similarly cyan is the complement of red and yellow is the complement of blue primary. Sometimes the complementary colours cyan, magenta and yellow are referred to as minus red, minus green and minus blue respectively, as because each can be produced as white light minus the corresponding primary.

A primary and its complement ca be considered to be opposite colours. The reason is that the complement of any primary contains the other two primaries.



Addition of Colors : Red, Green and Blue

In the case of colour photography a subtractive system is used. Mixtures are obtained by subtracting individual primary colours from white light in this method by means of colour filters. Thus cyan, magenta and yellow are the subtractive primary colours used to filter out red, green and blue respectively.

VIBGYOR, the acronym of seven basic colours is not true. This VIBGYOR stands for Violet, Indigo, Blue, Green, Yellow, Orange and Red. It is not also true that the rainbow colours is seven in place of many or combination of three basic or primary colours. Also VIBGYOR is only helpful for determining the value of a resistance of electronic component by adding another two colours, black and brown and omitting 'I' i.e. indigo from the abbreviation. Then VIBGYOR become VIBGYORBB.

The colour printing would have been so complicated unless the basic colours were three or less. If the basic colours were more than three the invention of colour TV would have been much more complicated.

China's Wonder Scientist Expands Frontier of Genetic Engineering

by Zhou Meiyue

CHEN Zhangliang likes to call himself " a lucky fellow." Born to illiterate parents, he did not enter school until he was nine years old. By 1989, when he was 28 years old, he became a professor at the prestigious Beijing University, the youngest man to get the title in China.

Understanding not a word of English when he entered college, Dr Chen has published a number of influential studies in English both at home and abroad — this after getting his doctorate in just one year in the United States.

In October 1991, Dr Chen was awarded what is considered the Nobel Prize for scientists aged 35 years and below — the Javed Husain Prize for Young Scientists given by the UN Educational, Scientific and Cultural Organisation (UNESCO). He won the honour for his outstanding achievements in the fields of plant molecular biology and plant genetic engineering.

Dr Chen, 30, is the youngest scientist and the first Asian to win this international award. He is also the award's first solo winner (previous winners shared their prizes with others).

Nobody in his fishing village, in southeast China's Fujian province, expected the mischievous boy to become one of China's accomplished scientists. His parents, both illiterate, nearly gave up hope of bringing up the baby boy, born in 1961.

"At the time China was suffering a severe food shortage and my family was very poor," Dr Chen recalls. "I had whooping cough and nearly died. My parents could not afford the medical treatment for me and had resigned to my fate. But survive he did and became one of the most mischievous kids in the village. "I was the 'king of children' in the village," he said. "I didn't go to school until I was nine just for fear of being disciplined."

Before he got his doctorate in 1987, Dr Chen Already attracted international attention on his experiment in which he successfully transferred a soybean seed storage protein gene into a transgenic petunia. The paper was published in the European Molecular Biology Organisation Journal in 1985 and the experiment was widely praised by scientists.

In 1987 he discovered and proved the existence of DNA which regulates the development of plant embryo. That was regarded by the scientists as a "milestone" in genetic research.

While a graduate student, Dr Chen was twice invited to the Gordon Research Conference on Molecular Genetics and Molecular Plant Biology, the world's most important conference on life sciences. He was the only graduate student to give a plenary speech at the Gordon Conference.

Dr Chen has secured fellowships and funds from a number of renowned American institu-

Dr Chen, 30, is the youngest scientist and the first Asian to win what is considered the Nobel Prize for scientists aged 35 years and below

tions, plus obj offers with handsome pay. But he decided to return home and work for the government. Dr Chen joined the faculty of Beijing University in 1987. Prof. Ding Shisun, then president of Beijing University, was eager to have the young scientist work with him.

A few months after he came back, Dr Chen and three colleagues set up the first-rate Laboratory of Protein Engineering and Plant Genetic Engineering. The lab, which has since attracted more than 50 young scientists averaging 28 years of age, has made a number of breakthroughs in the field of biotechnology and life sciences.

The lab has successfully purified and cloned, or reproduced with biotechnology, the coat protein genes of several major plant viruses and used them to create virus-resistant strains.

The first transgenic plant to emerge from Dr Chen's laboratory was PK-873, a virus resistant tobacco. The field test on the new strain in over 30 acres of tobacco, the largest such test in the world, resulted in increased yield of more than 10 per cent.

With the help of Prof Li Debao, one of the country's outstanding scientists, Dr Chen has isolated a brand-new protein from an organism in the Chinese soil that exhibits strong resistance to rice leaf blight and fungal blast, two major diseases affecting rice production.

"We named this new member of the protein family the 'anti-bacteria protein,' " Dr Chen said. "We are going to clone the protein and transfer it to rice to enhance disease resistance in rice."

The laboratory is also purifying the active component of certain traditional Chinese herbal medicines. The component, Dr Chen said, is able to selectively kill cells infected with hepatitis and AIDS.

Today a professor fascinating the academic world with his achievements, Chen Zhangliang the pupil was not particularly enthusiastic to be a learned man at first. "I continued to be a mischief," he said, "and I cared only to maintain my authority among the kids."

Then the boy came to see that his "authority" at school lay in his studies. He worked hard with his lessons and soon excelled all his classmates. He even bypassed a grade in high school.

It was in high school that Dr Chen made up mind to pursue an academic career. In 1978 he passed the entrance examinations for institutions of higher learning and was enrolled at the South China Tropical Plant College based on Hainan Island.

"Had I failed, I would have become a fisherman like my father, and would have supported a big family by now," said the professor who is still a bachelor. "But I knew I had no retreat and I made it."

As head of China's first Laboratory of Protein and Plant Genetic Engineering, Dr Chen has published a number of influential papers in English both at home and abroad. But when he first entered the college as an agronomy major, he did not speak a word of English.

Yet he fully understood the importance of the language to his academic studies, especially after he took an interest in plant genetic engineering.

"You have to master English if you wish to keep abreast with the latest development in the field," Dr Chen explains, "since the most important papers on the subject are published in American and European journals."

He could hardly read through such journals as Science and Nature when he noted a name that he frequently came across — Dr Mary Dell Chilton of Washington University in the United States. "I ventured to write her a letter, saying I had plenty of questions on the subject and asking for her guidance," Dr Chen recalls.

Dr Chilton quickly answered the letter and asked for Dr Chen's resume. In 1983 he went to study with the American professor in Washington University and work in her lab. He formally shifted his major to biology and biomedical sciences.

"Dr Chilton, a member of the US Academy of Sciences, is indeed an authority in plant genetic engineering and a founder of the discipline," Dr Chen says. "Many a scientist and student wish to work with her but few could get the chance. I'm really lucky to have begun at a very high starting point."

Yet he was aware that he could not rely on luck for his success. While he finished his doctorate in only one year, he achieved some pioneering results that are still often cited by genetic researchers around the world.

— (Depthnews Asia)

Science Briefs

Spinning with Air

Spinning yarn quickly and efficiently is oen of the age old challenges of the textile industry. Now the problem has been solved using a new type of air jet guide, known as fibreguide, reports British Commercial News.

The device has just won its British manufacturer a Queen's Award for Technological Achelvement and is shown in use here at Intex Yarns, said to be Europe's largest independent texturiser, and based at Radcliffe, near Manchester, northern England.

In early times, fibres were held together by being twisted between finger and thumb. The hand whorl followed, then the spinning wheel and then the spinning machine. The principle remained the same: fibres and filaments were fed into the twisting zone and twist was inserted by rotating components.

With the new technology, the filament is fed into draw-texturing machines at a plant which processes about 200 tonnes of yarn a wek. Airjets of a special design interlace the fibres quickly, efficiently and in a way that facilitates integration with a range of high speed processes.

Mosuetrap Captures Transputer Power

A new hand-held computer developed by Britain's Royal Signals and Radar Establishment exploits the parallel processing speed of the British invented transputer to pack a computing power claimed to be greater than that of 100 conventional minicomputers into a unit weighing roughly two kilogrammes.

Known as the Mousetrap, the world-leading hand-held supercomputer can sustain operating speeds of 200 MIPS (million instructions per second) and 20 MFLOPS (million floating point operatios per seconed), making it actually more powerful than many current mainframes computers.

Despite this, it has a very low power consumption of only 40 watts. Features include a 125 mm colour liquid crystal display, and a key panel enabling users to key in data and execute algorithms.

Electric Automobiles Make Comeback?

by G S Mudur

NOISELESS, pollution-free electric automobiles might yet make a comeback, almost a century after they were displaced by petrol-driven vehicles that have since then reigned the roadways.

Engineers across the world are now trying put back electric cars on the road, a part of the quest for alternative technologies for automobile propulsion, coupled with a desire to transform a long-proven technology into a commercially viable one.

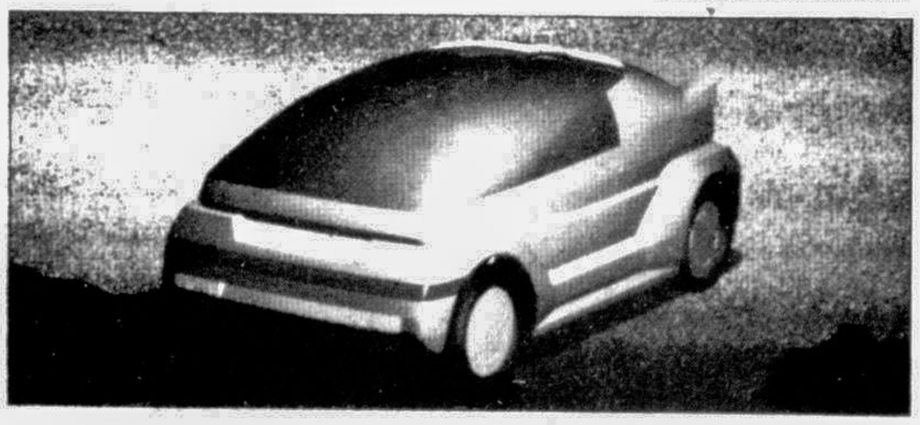
The feasibility of electric vehicles was established at the beginning of this century and electrically-powered vehicles were plying on roads in the early years of the automobile era. In fact there were more electric automobiles registered in the United States in the early 1900s than automobiles running on steam or petrol, and an electric vehicle held the world's road speed record.

An electric vehicle is propelled by an electric motor, powered by a rechargeable battery. Presentday electric vehicles, most of which run on lead-acid batteries, are not considered commercially viable. The batteries are too heavy, and they impose severe limits on the speed and range of the automobile.

A typical electric automobile today can be likened to a petrol-driven vehicle that needs to be refilled every 25 to 50 kilometres, the "refilling" process takes upto eight hours, and the batter itself weighs one-half to one-third the weight of the vehicle.

The major performance requirements for batteries in electric vehicles are a high energy density to provide an adequate driving range, and a long life cycle to keep the cost and frequency of the battery replacement low.

Scientists believe the lead-acid battery, which has traditionally been used for starting, lighting, and ignition operations in automobiles and other vehicles with internal combustion engines, is still a good candidate for running electric automobiles. They are already in use as power sources for hundreds of thousands of off-the-road vehicles such as fork-lift trucks, mining vehicles and airport pick-up trucks that operate short distances and in shifts that allow periodic recharging.


Study of a small urban vehicle

In India, researchers at the Bharat Heavy Electrical Limited expect to have a prototype 40-seater van, propelled by lead-acid batteries, with a range of 75 kilometres, ready by March this year. The recharging will take about eight hours.

The aim now is to improve the energy density of the batteries to get a range of roughly 150 kilometres which should be sufficient for Indian conditions, says Dr K Ramakrishnan, director of research. BHEL scientists are also planning collaborative work on nickel-iron battery systems with the Central Electrochemical Research Institute in Karaikudi which has a major programme on electric vehicles.

A variety of new battery systems are also being investigated as potential candidates for electric vehicles to get higher energy density and power density and higher life at acceptable costs.

Some of the systems on which work has been under way are advanced lead-acid batteries, nickel-iron, nickel-zinc, and sodium-sulphur battery systems. Advanced lead-acid batteries were used to run dairy product delivery vans in the United Kingdom during the eighties. Although some of these batteries have been tested on model vehicles, scientists say performance characteristics need further improvement before they become commercially viable.

An international demonstration fleet of 100 electrically powered vans powered by an advanced version of the sodium-sulphur battery, first developed in the United States in the sixties, will be evaluated in Europe and North America later this year.

The electric vehicles will have a target range of 160 kilometres, according to a report in the journal *Automotive Engineering*. But further advances in battery technology and cost effective high power electronics for controlling the propulsion motor are needed for consumer acceptance, the journal said.

Indian scientists at CECRI have also initiated a research programme on sodium-sulphur cells. These system offer high energy densities and the main components, sodium and sulphur, are abundant and inexpensive.

In a joint programme with the Indira Gandhi Centre for Atomic Research at Kalpakkam and the National Physical Laboratory in New Delhi, CECRI scientists are working on a sodium-sulphur cell configuration built a round a solid ceramic electrolyte called beta alumina through which ions can easily pass at temperatures of around 350 degrees.

The sodium-sulphur cell has good performance characteristics and a high energy density, but it is based on liquid electrodes and its operating temperatures range between 300 and 350 degrees celsius. This leads to special problems of insulation and corrosion.

To avoid such problems associated with the high temperature sodium-sulphur cells, CECRI has also initiated work on two medium temperature sodium batteries — sodium-iron chloride and sodium-nickel chloride systems — which seem to be better candidates for electric vehicles than the sodium-sulphur cells.

Scientists expect that an electric vehicle would use up electric energy roughly equivalent to that used by an average household per year. Recharging these vehicles late at night, would help with load management, by increasing electricity use during the off-peak hours.

Researchers say the need to recharge electric automobiles would not require any major increase in the electricity supply in a country because the recharging could be done during the off-peak hours.