Digital Radio Opens New Horizon

by G V Joshi

RADIO broadcasting is preparing for its quantum leap since frequency modulation (FM) was developed in 1940s and 50s .

The leap will be to digital broadcasting in which music and information will be sent as a series of zeros and ones, as in a computer.

The digital broadcasts would have the same high quality of sound — free from static and hiss— as digital compact discs (CD) and digital audio tapes (DAT) . CDs and DATs are now replacing gramophone records, both extend play and long play ones. The old 73-revolutions-per-minute records have already reached the museum stage.

Digital music systems like CDs represent music as a series of numbers. To record music for a CD, for example, it is sampled 44,100 times a second and the sound level at each instant is represented by a number written as strings of Os and Is. Such digitisation has some great advantages in eliminating noise during recording or during transmission.

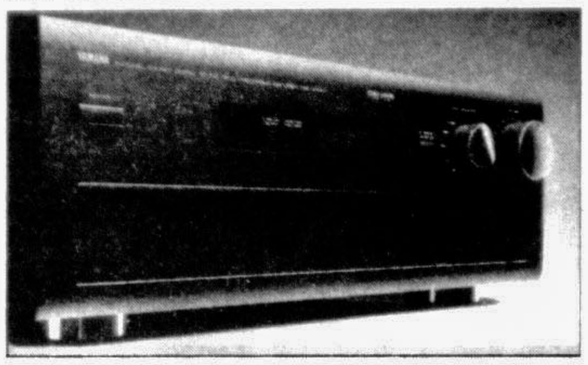
A digital radio station would need far less power for its signal to be understood by a receiver above the noise. A digital radio transmitting system with a power output of 1 KW would be able to cover the same region as a FM station transmitting 50 KW. The reduction in electricity bills will, therefore, be enormous.

Drawback

A major drawback of digital transmission is that it requires a lot of space on the radio-frequency spectrum, and such space is in short supply these days due to too many radio stations transmitting their programmes on nearby wavelengths. In other words, the separation between transmitting wavelengths of two radio stations has to be wider than what it is today.

A CD with 44,100 samples a second, represents each sample by a 16-digit string of Os and Is. There are two such signals, for each stereo channel, for a total of about 1.4 million Os and Is that have to be transmitted each second. That would require a band width of frequencies several times wider than that required for an FM station operating at present.

The key to making digital radio feasible is data compression, which eliminates redundant information so that fewer bits (Os and Is) have to be transmitted. At the receiver, the completes information can be reconstructed through a simple computer programme. One technique is to send only the difference for one sound sample to the next. For example, if three consecutive sound



A digital amplifier

levels are 1002,1003 and 1004, then instead of transmitting the full numbers, the system can transmit the first number as 'a', and the subsequent ones as a +1 and a +1+1 again.

However, and such replacement of the analog systems currently used in Amplitude Modulation (AM) and FM broadcasting, in which the music or speech is represented as continuous electromagnetic waves that imitate the musical sound wave, is not likely to begin until late 90s. But technology and business concerns are already showing interest.

An organisation of stereo-equipment manufacturers and research institutes as well as broadcasters from Europe has already developed and demonstrated a highly sophisticated digital radio system from a combination of space-based satellites and land-based transmitting towers.

Three companies in the United States are introducing services in which digital music will be transmitted to homes not through transmitting towers but through cable TV lines.

Three more companies have applied to the US government for allotment of frequencies to begin transmission of digital music to homes and car radios through satellites in the next couple of years. The US government is exploring the possibility of creating a worldwide digital satellite radio service.

Transitional crisis

The transition to digital radio is going to be long and controversial. This is like High Defination Television (HDTV) which provides sharper pictures than the existing models and is about to be introduced soon.

The system of digital radio service, when introduced will make billions of radios with AM and FM band obsolete, The other problem relates to the introduction of a common system for the entire world. As of today, there are a number of system like PAL, SECAM and NTSC for TV transmission. While India uses one, the US uses anther. The result is that TVs and VHS tapes made in the United Staees do not work in India and vice versa. There are a few models which can work in both countries, but they are more expensive.

Unless a common understanding is reached and that too very soon, European, Japanese and American engineers will develop separate systems to help their own industries.

When radio transmitting studios use CDs for their programmes either in AM or FM, much of the quality is lost.

PTI Science Service

Mr GV Joshi is a science writer based in Pune.

Militarism Promotes New Toys

by Carol Jahnkow

Even teddy-bears are out. Transformers, nuclear war games and Army Barbie are in.

Between 1982 and 1987, total sales of war toys in the United States increased 700 per cent. However, according to the February 1989 issue of *Toy and Hobby World*, US sales of action figures (GI Joe, He-Man, Transformers) decreased 33.5 per cent between 1987 and 1988, from 173 million to 115 million units.

Simultaneously, sales of toy guns and accessories increased 8.3 per cent, from 12 to 13 million units.

In the new TV video games category, the National Coalition on Television Violence (NCTV) reports that 85 per cent of existing software for these games is violent-themed. Atari, one of the largest manufacturers of video games, was asked by the Army to adapt its "Battlezone" game to train gunners for M-2 tanks. "Peace Women" features soldiers chasing Greenham Common Peacecamp women around the screen on a motorcycle.

These toys and games are promoted through both television advertising, and cartoon programmes that are little more than half-hour advertisements. In 1987 Mattel, Inc. was widely criticised for using its interactive children's TV show, "Captain Power and the Soldiers of the Fortune" for misleading ads and products promotion. Critics ranged from the National advertising Division of the Council of Better Business Bureaus to several congressional representative on key regulatory committees.

The NCTV has estimated that the average US child sees some 800 ads and 250 episodes of war cartoons a year and watches at least 12,000 acts of televised violence a year. Children's shows three times more violent than prime-time shows. Play performs a vital role in shaping how and what children learn. The toys given to children communicate adult values by indicating what adults feel is important.

Dr Arnold Godstein of the University of Syracuse points out that "playing with war toys legitimises and makes violent behaviour acceptable ... Probably only a small number of children will commit heavy-duty violence but a large number get desensitised and will pick up harmful behaviours."

War toys reinforce racism, sexism and oppressive stereotypes that US children begin learning almost from birth. Many of the so-called "evil" characters are of foreign origin, which either accents or dark complexions.

A protest over the obviously Arab "Namad" doll, one of the evil characters in the Rambo line of toys, led to its discontinuation by the manufacturer. "Evil" characters also often have some physical difference, such as a hook for a hand or an eyepatch, indicating to children that people who are different are "bad".

While female characters in the toy lines generally get things done by using physical attractiveness, or "feminine wiles," toy manufacturers are also beginning to develop militaristic toy images for young girls.

Mattel's new "Army Barbie" hit the PX (stores on US base for armed service personnel) shelves in July 1989 and is now entering the general market. In the summer of 1990, Barbie also debuted as an Air Force pilot, and the following year as a chief petty officer in the Navy.

Dressed in her uniform, Barbie will serve, says Mattel, as "a reality-based doll... representing goals and aspirations of little girls." Barbie will not only capitalise on the financial success of military toys by providing a female counterpart, but will also sell a military image to girls who will be growing up in the 1990s — when achieving "manpower" goals will be a significant problem for US military recruitment.

Sale and promotion of these toys and their accessories, including bedsheets, notebooks, underwear, pajamas, shoes and bubblebath has saturated children's culture, both within the US and internationally.

Anti-war toys campaigns have been carried out in a number of countries, from Poland to Puerto Rico. A group in Yugoslavia organised events with street theatre and puppet shows, where people traded in their war toys.

Some countries, such as Sweden and Finland, have already banned war toys. But the Swedish ban does not include futuristic or space war toys, which now dominate the market.

Each year, the International Days of Protest Against War Toys are held on the last Friday and Saturday in November. To increase the effectiveness of campaigns against war toys, there must be more international networking.

US activists have little information on research or activism in the Third World on imports, advertising and sale of war toys. Nor does the NCTV have access to data on countries outside North America.

The War Resisters League's Stop War Toys Campaign assists groups throughout the US to oppose the growing number of war toys and cartoons. Concerned with the long term effects of socialising children with war toys, they have stated, "No society interested in attaining peace and justice can allow such a militarisation of the young to go unchallenged." Depthnews.

Carol Jahnkow coordinates the Values Through Toys Programme of the Peace Reso-urce Centre and is active with the War Resisters League and the Pacific Campaign to Disarm the Seas.

Deep Tubewells Promise More Food Production

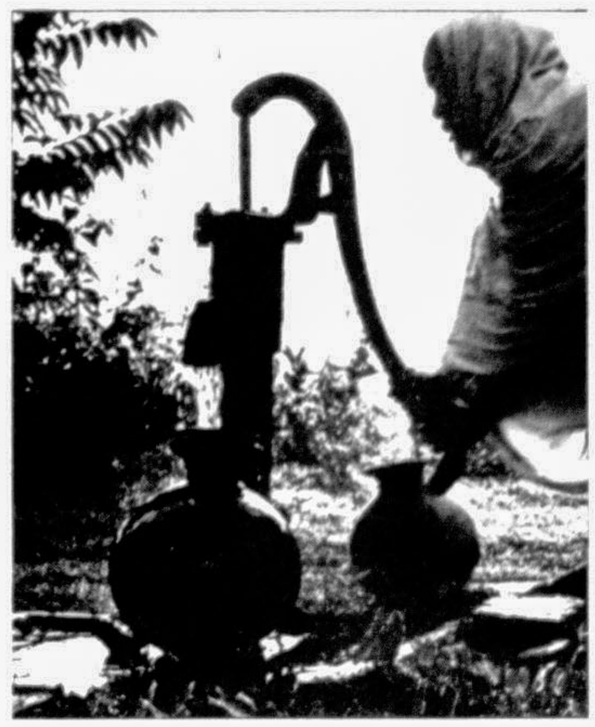
by Ahmed Hossain Shah

UNDER the 4th term food production plan which is designed to attain self-sufficiency by the end of the Fourth Five Year Plan, our country plans to increase land irrigated by mechanical lift device to about 5-7 million acres i.e. 2-3 million hectare. This plan involves a significant increase in the numbers of tubewells in the country in use. It is important that the economic of the various devices be understood, both to design appropriate development policy, and to plan for orderly implementation.

In Bangladesh, deep tubewells are generally installed and operated by BWDB as DTW Project-I, and by BADC and DTW Project-II, BADC rented farmer groups at a subsidy that has exceeded 90 per cent. Due to the very high cost of deep tubewells, it is generally accepted that a policy of complete market prices would be too great a burden on farmers who depend on such tubewells for their water requirements. In cooperation with the World Bank-IDA, our government has agreed that deep tubewells should be sold at a price that would equate the price of water with that from shallow tubewells. So far, it is reported that official price for selling a deep tubewell to the water users' groups is Tk 1.75 lakh for two cusec water and Tk two lakh for above two cusec water.

It can be explained here that when farmers complain about the high cost of irrigation, they are probably really complaining about the difficulty of getting credit for irrigation. There can be no doubt that irrigation brings handsome profits to the farmers, especially at the present heavily, subsidized rate (e.g. North Bangladesh DTW Project, TKG with its newly 810 DTWs including 10 test tubewells at the north-east corner of the country (latitude 26°15').

There is a difference between a good crop of HYV grown with irrigation and other "rabi" crops or a poor crop of "khesari", where irrigation is not available. The farmers receiving irrigation from official sources are highly privileged persons. There are many ways and means in which efficiency can be increased such as : (a) operation of pumps for longer hours; (b) better maintenance and repair of pumps; (c) lining of distribution channels; (do restriction of paddy cultivation to soils which can be properly cultivated and (e) irrigation at critical stages of crop growth. With smooth technical and economical deep tubewell operation, we may attain self-sufficiency in food with a target of 200 metric tons.



A deep tubewell being used in rural area

Laser Surgery: a Welcome Treat for Patients

LASER scalpels have brought great relief to many Chinese patients.

With a laser scalpel, removing the blood vessel tumor the size of a broad bean from six-year-old Zhu Jia's right eye took only ten minutes at the Tongren Hospital here.

Laser surgery — using Yttrium Aluminum Garnets (YAG) — is also used in the treatment of many other diseases like cataract, glaucoma and cancer of the stomach and esophagus.

China has 300 laser surgical facilities in big city hospitals. It hopes to have more by manufacturing the laser with local components by Zhou Peidi

"Laser based on YAG crystals shows better qualities in surgical operation compared with other kinds of laser, say, carbon dioxide laser," says Qiu Honghua, head of the Beijing-based North China Research Institute of Electro-Optics.

The radiation wavelength of carbon dioxide laser makes it practically impossible to deliver the energy into the patient's body through flexible optical fiber. But the light beams of YAG laser can be easily connected with optical fiber.

The excision of stomach polypous, for instance, can be made through a small cut on the skin. Some operations — like the treatment of piles — can be made on an out-patient basis.

"This is important in this country which has a limited number of hospital beds," says Mr Qiu.

There are more than 60,000 hospitals and clinics in China. In cities, four beds are generally available for every 1,000 persons. Nationwide, the average is about two for every 1,000 persons.

There are 300 laser surgical facilities in China, in big hospitals in major cities like Beijing, Shanghai and Guangzhou. Now there are plans to equip more hospitals with laser facilities.

Instead of importing all the laser equipment needed, the government plans to set up technical centres that can develop quality laser crystals, manufacture laser medical equipment and provide a variety of services such as personnel training, the supply of spare parts and the repair and maintenance of equipment.

With US $1.95 million from the United Nations Development Programme (UNDP), the North China Research Institute of Electro-Optics started last June a three-year research programme to develop, design and manufacture quality YAG laser scalpels.

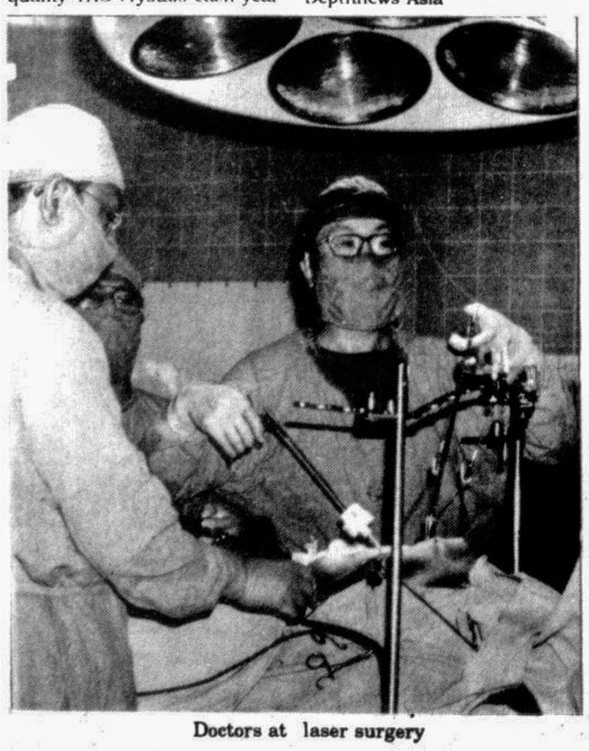
The 1,500-person institute has spearheaded laser research in China since 1960 and is engaged in research and production of laser. So far it has produced 100 laser scalpels made of ruby, carbon dioxide, helium-neon and YAG crystals.

When the three-year project ends in June 1994, the institute hopes to produce 700 quality YAG crystals each year — estimated local demand for the laser crystals.

Under the UNDP project, the institute is expected to manufacture the components to make a YAG laser scalpel. As the prototype for the institute's future product, the scalpel will be more sophisticated and reliable than any other YAG laser surgical equipment presently used in the country.

The UN Industrial Development Organisation is helping the North China Research Institute of Electro-Optics contact scientific and industrial institutes abroad. It is arranging study tours so that Chinese engineers can go abroad and choose a good model for their prototype scalpel and also look for an institute to train their personnel.

Under this arrangement, 55 Chinese engineers and technicians will train abroad. Eight foreign experts, in turn, will be invited to China as consultants on the latest development in laser technology. — Depthnews Asia



Doctors at laser surgery

Shanghai Volkswagen Shifts to High Gear

Zhao Qinghua writes from Beijing

TOYOTA and Nissan cars have long dominated the streets of major Chinese cities.

But in the last couple of years, the Japanese dominance has been successfully challenged by a mid-sized automobile — the Shanghai Santana — made by China with German technology.

Japanese cars still outnumber Santanas and other similarly-made models in the country. But with strict government restrictions on car imports and a growing number of Japanese cars out of service, the situation may be reversed in a few years.

The road signs seem to say so for the Shanghai Volkswagen Automotive Company Ltd., which makes Santana-brand cars. It is a joint venture between Volkswagen A G of Germany and the Shanghai Automobile and Tractor Corporation of China.

Shanghai Volkswagen has already set its eyes on the overseas market. For a start, it will export more than 1,000 cars to Southeast Asia in 1991.

Set up in 1985, Shanghai Volkswagen is the first of three major car manufacturing centres China had planned to build before the end of the century. There is the first Motor Works Volkswagen Co., a Sino-German joint venture in Changchun, northeast China. Inaugurated last February, it will produce "Golf" and Jetta" cars. Another company is the Aeolus-Citroen Automobile Co., a Sino-French joint venture in Wuhan, central China, that will make Citroen-brand cars.

By the end of 1990, Shanghai Volkswagen had produced 70,816 cars, which are operating in all parts of China. With a 1.8-litre engine and front-wheel drive, the Shanghai Santana has met the challenges of China's variable weather and road conditions, from the roof of the world in Tibet to the northernmost part of the country in Heilongjiang province.

Shanghai Volkswagen now has an annual production capacity of 60,000 cars and 100,000 engines. However, constrained by China's foreign currency quotas for importing spare parts, the company has been operating under capacity. Last year, it produced 18,537 cars and sold all of them.

The car market in China has picked up since the middle of last year. Market surveys show cars to be in short supply this year. To supply the shortfall, Shanghai Volkswagen has made plans to increase its production to 30,000 cars in 1991, reaching 1,20,000 in 1995. In 1992 it will take over the 3,000-man Shanghai Automobile Works, maker of

Japanese cars still outnumber Santanas and other similarly-made models in China.

Shanghai-brand automobiles.

"There is a big market potential for Volkswagen Santana cars in Southeast Asia," says Burkhard Welkener, deputy managing director of Shanghai Volkswagen. "We are using Shanghai as a bridgehead to recover this market which we lost two decades ago to other carmakers," he says.

Volkswagen holds 50 per cent of the total investment in the joint operation, which has total fixed assets equivalent to DM500 million or US$270 million.

Shanghai Volkswagen is located in Anting Industrial Zone in northwestern suburbs of Shanghai. It has more than 3,000 employees, including 27 from the Volkswagen group.

Most production facilities were completed in 1989. The first engine assembly line was designed by Audi Company of Germany for the assembly of short engines.

A trial robot, donated by Volkswagen AG, has been installed. But, because of China's low labour cost, company officials prefer manpower to robots, Mr. Welkener says.

The assembly shop with a daily capacity of 200 cars consists of overhead and ground conveyors, totalling 585 metres in length, the longest and most advanced of its kind in China. On this line 90 cars can be assembled simultaneously. The designed daily capacity of the line is 259 cars, or 75,000 cars annually. At present, the daily volume is controlled at 78 with one work-shift only.

The company has the most highly-automated paint shop in China, which can work more than 60,000 cars a year. Cavity waxing has ensured cars of an outstanding level of anticorrosion.

Since 1989, Shanghai Volkswagen has introduced a quality-quantity-maintenance team organisation, cutting the number of workers required to produce one car from 20 to 6.5.

Developing domestically-made auto-parts is the most important task of Shanghai Volkswagen. With the participation of 197 domestic suppliers, the integration of locally-made parts with foreign supplies has made headway. By the end of 1990, 833 locally-made parts had been approved as up to Volkswagen standard, reaching an integration rate of 73 per cent.

Home-made parts include key components, such as the body, the engine and the gear box, and more than 500 others, including the transmission assembly, the starter motor, the rear window glass and the drive shaft. Company officials expect that both front and rear axles will be produced locally by the end of this year.

Formerly, steel sheet, castings and forgings were imported from Germany. Now Shanghai Volkswagen is using steel sheet from the Boashan Steel Works in Shanghai and forgings and castings from local factories and the No. 2 Automobile Works in Hubei province, central China.

Shanghai Volkswagen aims to achieve a localisation rate of 83.3 per cent and reduce imported parts by 70 per cent by the end of this year, according to factory management.

A Volkswagen quality check has determined that Shanghai makes the best Santana cars among five locations outside Germany that make the same model. In China, Shanghai Santana has won a "National Advanced Car Award."

Shanghai Volkswagen is free to choose the best workers in Shanghai at relatively low pay, he says.

— Depthnews.

Science Briefs

New Liquid Separation Equipment

A British researcher at the University of Leeds is refining new liquid separation equipment that may save around 75 per cent of the time and energy used by conventional mixer/settlers, reports *British Commercial News*.

The processes involved in transfering a solute from one liquid to another are two-fold: first the liquid containing the solution, the heavy phase solvent, must be thoroughly mixed with the recipient liquid or light-phase solvent, a process which requires vigorous agitation, and second, for the two solutions to separate into light and heavy liquids, the mixture must be left to settle.

The contactor/separator developed at the University of Leeds comprises a horizontal cylindrical vessel which has two semi-circular pipe sections, joined together to form a gullwing along its axis.

In the base of the vessel, below the gullwing, is a line of nozzles through which the light-phase liquid is injected (via an external pump) into a pool of the heavy-phase solvent lying at the bottom of the vessel.

The jet action of the solution passing through the nozzles agitates the heavy-phase solvent, mixing the two together and causes a semi-hydrocyclone in each half of the gullwing. The rotating action on the hydrocyclones separates the two phases by centrifugal force, the lighter phase moving to the ends of the gullwing, from where it moves into the body of the vessel, where it can be collected.

Dead Algae Solution Decontaminates Water

Dead plants and organisms — primarily algae — have been found to be very effective at adsorbing heavy metalions, according to a report in the journal *Chemistry in Britain*.

According to a scientist at the New Mexico State University at Las Cruces, the proprietary process produces a biological ion-exchange resin, the journal said in a report.

Algasorb, patented by Bio-Recovery systems — a company founded by the scientist Professor Dennis Darnall — adsorbs heavy metal ions from solutions because of their binding, or biosorption, to various functional groups in or on the algal cells.

Algasorb is produced by caging algae in a silica gel polymeric material. The caging protects the algal cells from being destroyed by other microorganisms and results in the formation of granules. Algasorb functions very much like a commercial ion exchange and can be packed into columns.

When contaminated water is flushed through the column, any heavy metal ions will be hooked onto the Algasorb.

When the Algasorb is saturated the metals can be stripped away and the Algasorb reused, the journal said.

The journal has quoted Darnall as saying that Algasorb is particularly effective at removing heavy metals from waters containing organic residues and is being tested for removal of uranium ions from groundwater.

Recycling Used Telephone Poles

Used telephone poles will be recycled in Louisiana in the United States using microorganisms developed at Louisiana State University at Baton Rouge and licensed to Microterra Inc., a wholly owned subsidiary of publicly traded Myo-Tech., reports the journal *Chemical and Engineering News*..

The journal said old telephone poles, which had been treated with creosote and pentachlorophenol, will be shipped to a plant that Microterra plans to build at Hodge, Louisiana. At the plant they will be reduced to chips and piled into a compost area.

The microorganisms developed by LSU biologist Ralph Portier to degrade creosote and pentachlorophenol will then be applied. Once bioremediation is completed, the cleaned wood will be sold to paper mills for production of crude paper.