The BROADCASTER

Newsletter of Telecom Broadcasting

No. 25 March 1993

REPLACING MAST BASE INSULATOR

THE BROADCASTER

The Broadcaster is the in-house newsletter of Telecom Broadcasting and is published three times a year to inform and recognise the people who make up this organisation.

Articles appearing in *The Broadcaster* do not necessarily reflect the views of the management of Telecom Australia.

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EDITORIAL

I did not expect the article on termites in the last issue to create so much interest. I had six callers – all from Commercial station staff – telling of their experiences.

One Chief Engineer told how termites attacked the transmitter building at a remote site. He went out to the site one night to do some routine tests and after unlocking the door and on opening it, the door collapsed in a heap of rubble on the floor. No one had been to the transmitter in a month, and in that period termites had eaten out the door frame so that only a thin veneer of plywood remained.

Another told of experience at a country Victorian studio. A fault had developed in a cable linking the control booth with the announcer's console. On opening up the chase, he was horrified to find that termites had eaten out the cable insulation and that the chase was a home for rats. Several rats left the chase at high speed and one ran up the leg of a lady announcer who was busily making an announcement. She screamed at the top of her voice, overmodulating the transmitter which promptly shut down, causing urgent alarm bells to ring throughout the studio building.

JACK ROSS

Front Cover: Replacing base insulator 5AN/5RN Pimpala.

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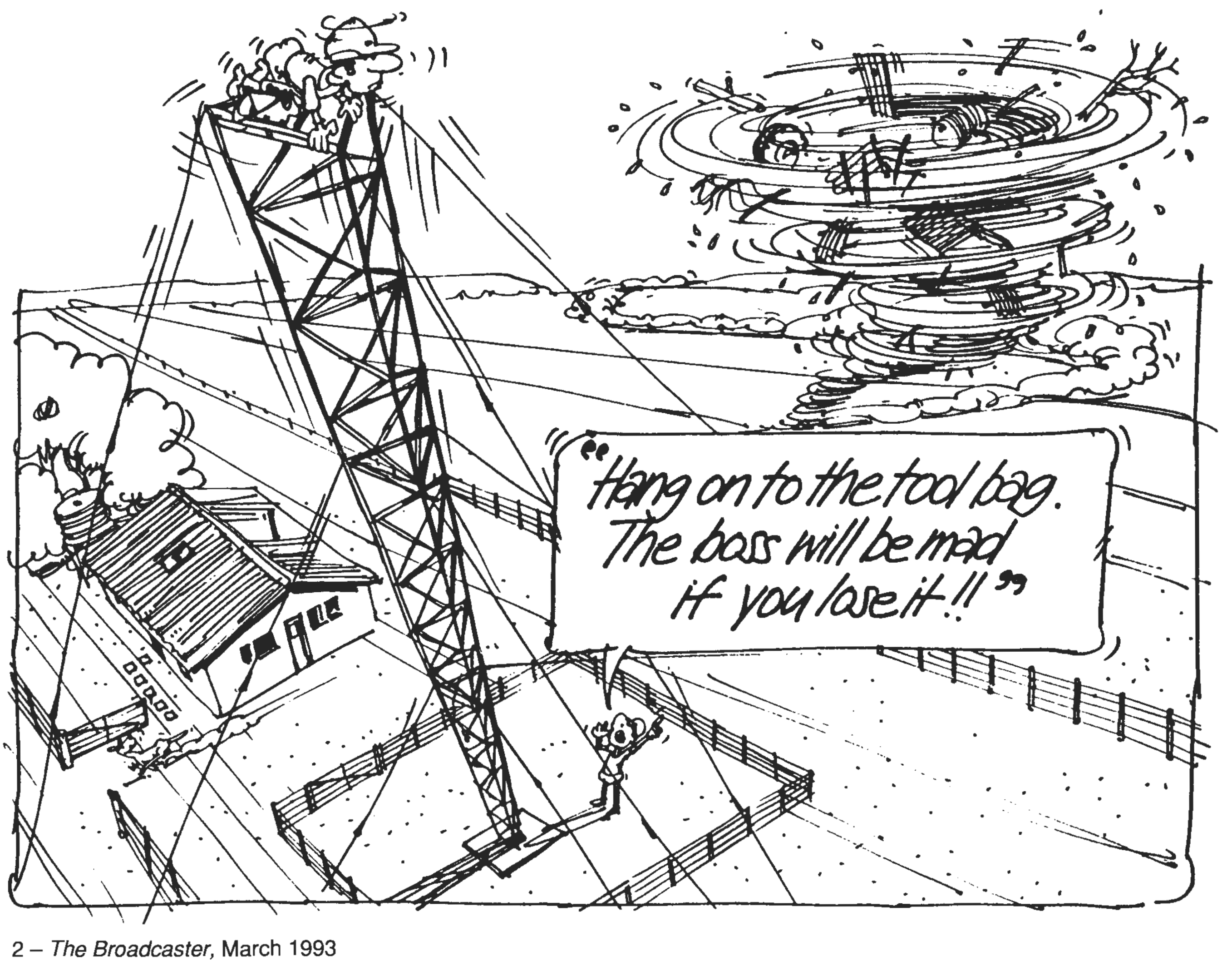


Leon Sebire.

FROM MY DESK

One of the most exciting new developments in broadcasting is Digital Audio Broadcasting (DAB) which has the potential, in the next few years, to make all other forms of sound broadcasting obsolescent.

DAB has been under development in Europe for some years. It offers excellent reception, even with a simple aerial, multiple radio services without the traditional problems caused by multi-path transmissions, and an audio quality comparable with that of Compact Disc. It is equally suited to satellite or terrestrial delivery using quite low transmitter powers compared with the traditional forms of broadcasting. Recent advances in micro-chip technology are now facilitating the development of DAB receivers which will be in the market place within the next few years.

A major breakthrough for DAB occurred at the World Administrative Radio Conference early in 1992 when appropriate radio frequency spectrum in the vicinity of 1450 MHz was allocated on a world wide basis for satellite delivery of DAB services.

In years to come, Australia will probably have a mix of satellite and terrestrially delivered DAB services, happily co-existing and using identical multi-channel receivers and very simple receiving antennas. Even for satellite reception dishes are not envisaged and the most likely form of antenna will be a single foil strip-line encapsulated in a flat plastic disc possibly of about 12cm diameter.

The rate of implementation will, of course, be dictated by consideration of how to make the conversion from existing FM and MF services to the radically new DAB concept. Obviously there is an enormous investment in existing broadcasting hardware which is unlikely to be simply written off because a better and cheaper transmission system in on offer. Development in this area will undoubtedly attract great interest in the next few years.

Leon D Sebire
GENERAL MANAGER

STATION ROLL CALL

ABRS3 LOXTON

Station ABRS3 is located at Loxton not far from the Murray River and about 240 km north east of Adelaide. Loxton and nearby town Berri are in the centre of a rich irrigation area that covers more than 100 square kilometres. Orchards and vineyards cover the spacious river flats. The area is one of the major centres of wine production in South Australia.

The station was commissioned on 20 January 1971 and employs two 10 kW AWA transmitters type TVB-10A operated in parallel mode. The antenna system is an RCA/COEL dual channel split phased array of screen backed dipoles with 0.5 degree tilt and radiating vertically polarised signals. It is mounted on a 168 m guyed mast and fed by a 50 ohm heliax type HF-7 cable.

The mast is erected on a wind blown sand dune and settlement problems occurred soon after erection following heavy rain. However, the problem was overcome by sealing the immediate area of the base to direct the water well away from the mast thrust block.

The mast also supports the antenna and feeder of commercial station RTS5A which has a separate building on site to house transmitter and studio facilities. The commercial service began operation of 26 November 1976.

An FM service was placed in service on 1 June 1982 with an NEC 10kW transmitter operating on 105.1 MHz. Programs for this service and the TV service are provided via satellite.

In 1991, the Riverland Broadcast District was amalgamated with the Adelaide District and is now an outpost of the new district. Presently, a staff of three look after equipment in the district, but with plans being developed for the installation of new equipment, the day is fast approaching when on-site staff will disappear.

PETER MATTHEWS

5MV BERRI

Station 5MV Berri is located 250 km north east of Adelaide. It began operation on 31 July 1957 to provide a broadcast service to the Upper Murray River area of South Australia. The area later became known as the Riverland.

Originally a trade name for premium quality citrus fruit grown in the area under irrigation, the name "Riverland" grew in popularity and came to describe the River Murray Valley between Renmark and Waikerie.

Land near the river was carved up into fruit blocks and the people who worked on them became known as "blockers". The Riverland is now the largest producer of wine and dried fruit in South Australia.

Situated 3 km north east of Berri, the station building and equipment were originally identical with a sister station 5PA Penola in the south east of the State. The transmitters were a pair of Philips 2000 watt units operating in main/standby configuration. They were replaced in June 1976 by two STC 1000 watt transmitters in parallel mode.

The antenna consists of a 40 m lattice steel radiator originally linked to the transmitter by an open wire 200 ohm line. An underground coaxial cable later replaced the open wire line. The standby antenna is a T type supported by two 25 m towers.

When commissioned, the station operated on a frequency of 1590 kHz, but in 1988 the frequency was changed to 1305 kHz.

A regional studio associated with 5MV is maintained by the ABC in Renmark but the majority of the program originates in Adelaide.

Like most early stations, an OIC lived in a house on site when it first went to air, but the station is now maintained by staff located at the ABRS3 TV station at Loxton.

MICHAEL MACKINTOSH

NEW 4QR TRANSMITTER

MOBILE RADIO-BROADCAST STYLE

Metropolitan Radio transmitter 4QR Bald Hills has been equipped with a pair of 25 kW solid state Nautel transmitters to replace the STC 50 kW type 4SU-38 valve transmitter which had been in service since 1963.

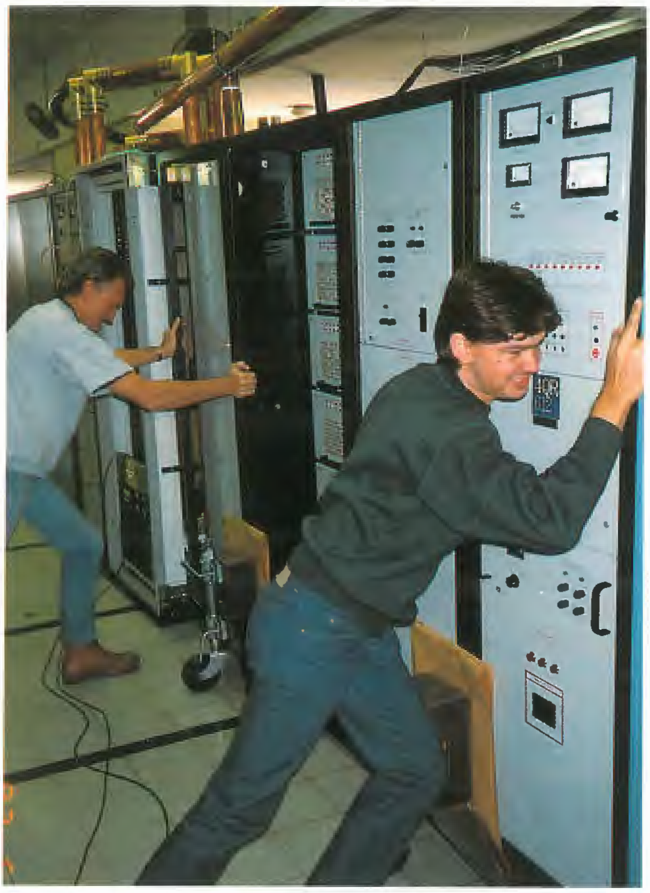
The station was established in response to the ABC's request for two program outlets in all State capital cities. It was commissioned on 7 January 1938.

Other transmitters which commenced about the same period were 5AN Adelaide, 6WN Perth and 7ZR Hobart. Prior to that, Sydney with 2FC and 2BL, and Melbourne with 3LO and 3AR, were the only capital cities with two outlets. These stations had been established from the commencement of broadcasting in Australia in the early 1920's. Program for the new 4QR transmitter was provided from facilities installed in the School of Arts Library building in Stanley Street, South Brisbane by PMG's Department technical staff.

The station began operation from the Central Automatic Exchange building in Elizabeth Street, Brisbane using a 55 m self supporting base insulated tower on the roof of the building, and being fed via a 50 ohm rigid coaxial feeder from a 500 watt transmitter.

Because the radiator was located not far from General MacArthur's Headquarters in the AMP Building in Queen Street during the War years, there was concern by the authorities that the tower could be used as a beacon during an enemy attack, so decision was made to shift 4QR out of the city and to dismantle the tower.

Since 1948, the station has shared a common 198 m radiator with 4RN (previously 4QG). In 1963, the radiator was modified to enable 4QR power to be increased to 50 kW.



Grant Beaumont (L) and Paul Valentine pushing transmitter B into position.

The original transmitter was later replaced with a 10 kW water cooled model using a pair of SS1971 triodes in parallel as the final RF amplifier. This transmitter remained in service until the STC 50 kW main and 10 kW standby units were put into operation. The transmitters were modified in 1987 to allow operation in stereo mode.

The decision to replace the aging 50 kW transmitter created a few problems. Firstly, the new transmitter was to be located where the old one stood, and secondly the service had to continue uninterrupted. Broadcasting staff devised methods to overcome these problems and started our first move into "Mobile Radio".

Each transmitter was mounted on a steel plinth and brackets fabricated to mount caravan jockey wheels to these plinths.

L to R. Paul Valentine, Grant Beaumont and Barry Downing checking final position of transmitter B.

The new Nautel transmitters with coaxial switch rack were then installed in front of the existing transmitter with flexible earths and enough cable length to allow the move. Commissioning tests were completed in early May and the new transmitter then cutover into the aerial. Apart from a control relay failure, no operational problems were encountered.

The old transmitter was officially turned off and dismantling started on 20th May. Those transmitters were certainly built to last – just like a battleship. Nothing light or flimsy. Front panel covers of 3/16 inch steel, meant each cabinet had to be gutted just to move it. After a lot of hard yakka, the area was cleared and the new transmitter move began.

The ABC agreed to run at 25kW for four days so transmitter A was put to air and transmitter B with the coaxial rack was moved into place. Transmitter B was then put to air while transmitter A was rolled in. At 5 a.m. on 12 June 1992 the new transmitter was put into service with 50 kW into the radiator on 612 kHz and another era for 4QR had begun.

Staff involved in the exercise included Richard Womack, Dave Boreham, Paul Valentine, Paul Davies and Grant Beaumont.

GRANT BEAUMONT

SWITCHBOARD EXTENSION COX PENINSULA

Work was recently completed to extend facilities on the 11 kW switchboard at Radio Australia Cox Peninsula to accommodate two Thomson CSF 250 kW transmitters, due for commissioning later this year.

The original switchboard was installed when the station began operation in 1965 to provide for three 250 kW Collins 821A transmitters and station ancillary services but the type of OCB's installed at the time are no longer available, and new types had to be provided for the extension.

Power for the station is provided at 66 kV from the power generating station in Darwin by about 18 km of overhead construction and submarine cables in the Darwin Harbour. A sub-station at the transmitting station reduces voltage to 11 kV for supply to the switchboard. Considering the high incidence of lightning strikes in the area, the service is fairly reliable. It is estimated that less than 0.02% of transmission hours failure result from mains power failure. However, overhead lines and the submarine cables were extensively damaged during Cyclone Tracy in 1974 and considerable work was required, particularly in restoring the submarine cable section of the route.

The extension of the switchboard to cater for the two additional OCB's was contracted to Australian Construction Services and included the provision and termination of 11 kV cables between the switchboard and each new transmitter, about 60 m from the building housing the switchboard.

The extension was designed and manufactured by GEC-English Electric. the company were able to retrieve the original manufacturing drawings of the existing switchboard from their records and utilise a provision in the monitoring cubicle at the end of the existing switchboard to extend the 11 kV busbars to the new OCB cubicles. Because of design changes with modern OCB's, the extension is quite different in appearance from the original switchboard.

The installation was completed in one day and as the switchboard is divided into two sections, it was possible to maintain transmission from the two transmitters supplied from the end of the switchboard which was not to be extended.

The high voltage cables are installed but terminated only at the switchboard end. The transmitter end of the cables will be terminated when switchgear for the new transmitters is installed. A cable to facilitate monitoring of the status of the new OCB's has also been installed.

GRAHAM BAKER

New 11 kV OCB switches.

The station power switchboard.

POWER PLANT

LOCAL POWER GENERATION

During the 1930's, when rapid expansion of the National Broadcasting Service took place in country areas, a number of high power transmitting stations were located in areas where no commercial mains power was readily available. To meet the needs of the transmitting equipment during operational hours, and for staff residences during off-air periods, local power generating equipment was provided. Stations so equipped were 2CR Cumnock, 6WA Wagin, 3WV Dooen and 4QN Clevedon.

The plants at all four stations, except for some local minor variations, were identical. They comprised six cylinder Ruston and Hornsby 6VCR diesel engines designed for 180 horsepower at 600 rpm. The diesel engines were directly coupled to alternators designed and manufactured by the Brush Electrical Company. The alternators, type NS72 were rated at 133.5 kVA and produced a three phase line voltage of 415 volts. The Brush type 70S exciters were capable of producing 1.6 kW at 81 volts. The plant was built at the Ruston and Hornsby works in Lincoln, England over the period 1934-35.

The engines were started with the assistance of compressed air at 300 pounds per square inch contained in one cylinder per engine. The air cylinders had a capacity of 11 cubic feet with the compressor being driven by a Ruston and Hornsby Vertical Power Starter. The machine used petrol as fuel and the cylinder jacked was water cooled.

The engine sets were mounted on massive concrete beds. Typical sizes were 17 ft (5.2 m) long, 6 ft (1.8 m) wide and 6 ft (1.8 m) deep, insulated from the building floor with blocks of cork.

The engines were designed to run economically and cleanly on either refined, crude or diesel fuel oils, the only alteration necessary being the timing of the fuel injection. The point of injection varied somewhat with the nature of the fuel used, but in all cases took place before the end of the compression stroke.

The fuel was passed through a De Laval centrifugal separator to separate out any water which may have been in the fuel.

In the case of 2CR Cumnock, three external fuel tanks were provided. They were of standard corrugated iron construction similar to water tanks and were fitted with a sloping roof top and spiked cap. Size of each tank was about 8 ft 2 ins (2.5 m) in diameter and 6 ft 2 ins (1.8 m) high. They sat in a trench away from the station building.

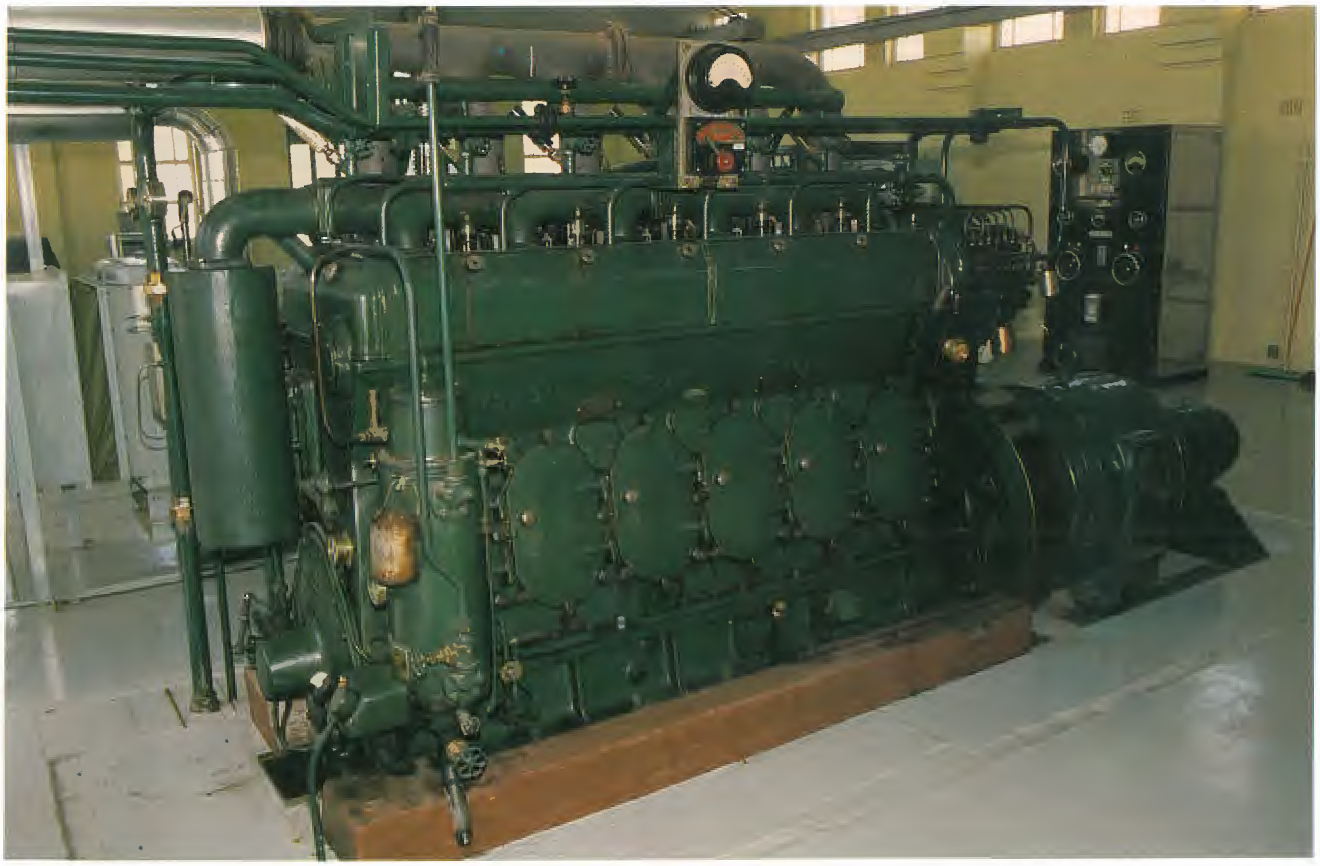
The supply of fuel to these isolated stations was not without its problems. For example, at 4QN, the fuel was railed to a railway siding and then taken by truck to the station. In order to cover the "wet" season, which often caused the station to be isolated for a long period, an extra 2000 gallons of fuel in 40 gallon drums was bought in just before the rains. The station needed at least three months supply to operate over the period. The station was eventually provided with its own fuel tanker and was able to bring in supplies direct from Townsville.

For supply of power to meet the domestic needs of residences, mast lights and local external lighting after shut down of the main generating plant, a small auxiliary 7 horsepower Lister diesel generating set was provided.

In addition to the transmitter technical staff, mechanics were employed to operate and maintain the power plant at each station.

All of these power plants have now been removed, with the exception of 2CR where one complete set remains in situ. However, as it does not meet the requirements of modern day transmitting equipment, it is not considered an operational unit. Other power plant serves this role.

DAVE TAYLOR



The 6 cylinder Ruston and Hornsby diesel generating set. Part of the original 2CR Cumnock 1937 installation.

OUR BROADCASTING PIONEERS

MR J (JACK) GRIVELL

John (Jack) Grivell was born on 6 September 1901 at Magill, a suburb near the Adelaide foothills.

He joined the Postmaster General's Department on 22 November 1915 as a Telegraph Messenger at the local Magill Post Office. After two years delivering telegrams he was promoted to the position of Postman, and in 1921 transferred to Maitland on Yorke Peninsula as Postal Assistant.

Jack Grivell.

It was during his period as Postman in the eastern suburbs that he established an association with Alfred Traeger who later became famous for development of the Pedal Wireless for the Royal Flying Doctor Service.

Traeger who had studied at the South Australian School of Mines qualified as Electrical Engineer and was a member of a group of wireless experimenters in Adelaide carrying out developmental work in wireless telegraphy and telephony. Jack roamed the foothills of Adelaide taking field strength measurements while Alf operated the transmitter.

This introduction to wireless fired up his interest in technology, so he decided to study for transfer out of the postal area of the Post Office into engineering. He was successful in an examination and received appointment as Mechanic Grade 1 on 19 June 1924.

This was an exciting period for Jack to become involved in Post Office engineering activities. A Class station 5CL and B Class station 5DN were being established in Adelaide and when transmissions began, Post Office mechanics were involved in the provision and testing of Outside Broadcast circuits to enable the stations to broadcast programs from churches, halls, racecourses and other places. Station 5DN alone, had program lines connected to the Elder Conservatorium of Music, the Adelaide Town Hall, St Peters Town Hall, Picadilly Cafe and six churches within a few months of going to air.

In 1926, he was promoted to Mechanic Grade 2 and two years later transferred to Yorketown where he worked until 1937 before transferring to 5CK Crystal Brook as Foreman Mechanic Grade 1. The station was the first regional National Broadcasting Service station established in South Australia. It was commissioned on 15 March 1932 and at the time, was the most powerful transmitter in the State. Jack was the third Officer-in-Charge and followed Bill Whisson and Morris Wallace. He and his family moved into the cottage which had been erected on the site for accommodating the OIC. In more recent times, the station became unattended and the residence was sold and removed from the site.

The station was one of the tourist attractions on a package tour known as the Gulf Trip and Jack obtained a lot of satisfaction in escorting the visitors over the station and explaining the operation of the transmitter. Jack left his mark on the station property by planting many trees during his term there, and today, these trees give the station a character admired even more so by today's visitors.

Later, during the War years, he was promoted to take charge of the Gawler district where he was involved in the provision and maintenance of communication facilities for the munitions establishment at Smithfield and for a large Army Camp at Sandy Creek.

In July 1955, Jack transferred to the ABC studios, Hindmarsh Square where he took control of the Department's technical staff. He was involved in the introduction of new technology into the studios including tape recorders, condenser microphones, new style amplifiers and the first transistorised program switching equipment into the studios of the National Broadcasting Service.

When responsibility for the the technical aspects of the studios was transferred to the Australian Broadcasting Commission in 1964, Jack transferred to the ABC and remained in charge of the studios until retirement early in 1966.

At the time of transfer of the studios, there were six network studios and four production studios each with individual control booths with facilities involving the use of some 20 amplifiers in each, a switchroom containing 105 amplifiers and 8000 transistors and diodes used for program switching, tape recording facilities comprising 12 high quality console recorders and 115 portable recorders and replay machines, together with facilities for handling complex outside broadcast and public address requirements of Royal Tours and Festivals.

Throughout his life, Jack was active in the community in church work, in Scouting and on school councils. He died in his 70th year in 1971 after a short illness.

JOHN GRIVELL

ARGYLE DIAMOND INDUSTRY

Argyle situated in the north eastern corner of Western Australia is well known today as the site of a large diamond mine. However, it is also a point of historical interest for surveyors and radio engineers, as in 1921 it was one of two sites used to fix the South Australian-West Australian border – the 129th Meridian. The other site was at Deakin, not far from Eucla. The exercise was noteworthy in that it was the first longitude determination to be made with the help of wireless signals completely girdling the earth. By arrangement with authorities in the US and France, wireless signals travelled some 16000 km from a high power transmitter at Annapolis in the US, and more than 14000 km from transmitters in Lyons and Bordeaux in France.

Diamonds were first recorded in Western Australia in 1895 when stones were discovered by prospectors panning for gold in the Pilbara region. In 1977 diamond lodes were discovered in the Ellendale province and two years later an extremely rich diamond field was found in the Argyle area.

Commercial mining commenced in 1983, and in 1986 some 29.2 million carats of diamonds were produced, making Argyle mine the largest volume producer in the world, responsible for one third of the total world output of natural diamonds.

Satellite receiving dish with transmitter building and mast in background.

The common perception among the buying public has been that good quality diamonds are "white" (colourless). However, some three quarters of all Argyle stones are coloured, the most common hues being yellow and brown. Other gem colours include pink, green, blue, red and purple. Argyle is already famous for its deep pink diamond which have become the mines "signature".

The radio facilities on the site to provide for the needs of the local population are a far cry from those used by the survey party 70 years ago. There are Regional and Radio National mono FM services, a Commercial FM service and National UHF and Commercial UHF TV services.

A selection of rough, sawn and polished diamonds. (Courtesy Argyle Diamonds.)

The transmitters comprise 100W Telefunken FM for Regional Radio, 100W NEC FM for Radio National, 100W Microset FM for Commercial FM, a 900 series manufactured NEC UHF transmitter for ABC service and an Australian manufactured transmitter for the Commercial UHF TV service.

LAURIE HATCH

Aerial view of the Argyle Diamond Mine and processing plant. (Courtesy Argyle Diamonds.)

40 YEARS OF TECHNICAL TRAINING

Forty years ago, technical staff of the PMG's Department were normally recruited from high school after approximately 10 years of general education. They commenced as Technicians-in-Training (TIT). The first three years of training were common to all trainees and included electrical theory and telephony. This training was mostly in a PMG's Department Training Centre, but some subjects were completed in a Technical College. Year 1 of their course involved full time training, but in years 2 and 3, about 80% of their time was on the job, performing general telephony duties. It was in their third year that people with a suitable aptitude were selected to specialise in radio for the final two years of their course. At that time, radio within the Department was limited to sound broadcasting, but both the studio and transmitter equipment of the NBS were installed, operated and maintained by Departmental staff. Training in the Training Centre for all students included in-depth coverage of radio principles and sound broadcasting equipment. Work experience was gained in the full range of radio duties.

In the late 1950's , the formal training was reduced to four years, and radio training for selected people was commenced in year 2. Still, all trainees covered the same syllabus. By this time, television broadcasting had commenced, and the ABC had established its own technical staff, firstly for their television studios and later for sound broadcasting. Also, line-of-sight radiocommunications for single and multiple telephone channels and television distribution was increasing. The radio syllabus was modified to eliminate studio details and include a general coverage of the new technology. Trainees obtained practical experience in sound and television broadcasting and radiocommunications in consecutive years before being allotted to a permanent position.

A significant change in the technical training scheme occurred in the mid 1960's. All trainees completed a common course for the first two years but, in following years, specialist training was selected by the trainees designated work area from an extensive series of five day training units. The training could be designed to suit each student's expected duties.

The next major change in technical training resulted from an analysis of training in the early 1970's. Two levels of technical training were created. Some people were recruited as Apprentice Telecom Tradesmen (ATT). They completed common training of one and a half years and off-the-job practical training before being assigned to their field Divisions. While working in their allocated disciplines, they received relevant specialist training selected from a series of nine day training modules before qualifying as Telecom Tradesmen. The modules included radio principles, pulse techniques, sound and television broadcasting and single and multi-channel radiocommunications.

The second level of training led to a qualification as a Technical Officer which was generally equated to that of Senior Technician. Technical Officers were given broad training over a number of disciplines so as to develop their diagnostic skills. Several methods of obtaining this training evolved. Telecom Officers-in-Training (TOIT) were selected from Technician ranks to complete bridging training. This was initially a correspondence course in Telecom time covering a broad range of subjects at approximately Certificate course level including mathematics, electrical theory and equipment principles. Later, the same course was provided by attending a Telecom Training centre.

The next change in the technical training system occurred in the late 1970's. The Tradesman designation was phased out and the Technician resurrected. Detailed study guides were produced to assist Telecom tradesmen to study in order to pass a barrier examination so that they could progress to the top salary increment of a Telecom Technician. Trainees were recruited as Apprentice Technicians (Telecommunications). After completing one and a half years of basic training they were allocated to field Divisions. An additional avenue for training was provided by selecting mature aged people who had at least one year experience as Technicians Assistants to become Technicians (Telecommunications)-in-Training (TTIT). TTIT's completed one year intensive training approximately equivalent to the basic training of an AT. Recruitment of people with part of full Certificate course qualifications for a Technical College continued. These people were designated Trainee Technical Officers (TTO). The TOIT training system was maintained so that suitable Telecom Technicians could progress to become Technical Officers.

In the early 1980's, associated with a reorganisation of the Training Section, Field Training Officer positions were created in a number of field Divisions though Broadcasting did not support a formal Field Training Officer until late in the 1980's. Suitable people were also selected as casual instructors and given methods of instruction training so that they could effectively conduct specialised training in the field.

Towards the end of the 1980's, a national survey of Telecom Australia people involved with radio equipment installation, operation and maintenance identified that equipment training aimed at two levels of operation was desirable. One level catered for the needs of first-in maintenance people and the second level provided for the more detailed requirements of specialist radio people. Also, It recognised that people required training directed at specific equipment rather than a generalised coverage of all types of equipment. A series of modules were developed for principles and radiocommunications satisfying these requirements but only cosmetic changes were made to broadcasting modules. These modules were implemented in some, but not all States, at the time.

The beginning of the 1990's brought a restructure of the technical grades to provide seven levels of Technical Officer. People can be recruited into this structure at Level 1 with no previous experience or at Level 2 if they have completed two stages of an Associate Diploma (Electronics). Progress through the levels is via the normal staff selection process and depends on formal training, accredited on-the-job training and relevant work experience. The formal training can be conducted by a recognised training organisation such as Telecom Training Services or a TAFE College. Much of the "core" training to meet the requirements of this scheme is conducted by Telecom Training Services using computer managed learning.

The trend with training in general and radio training in particular is for efficiency and economy. Since most maintenance with modern equipment is by unit change and people have such a wide range of equipment types and tasks, they do not have the time or the need to delve into system operation. They expect training to provide information that will allow them to quickly complete their duties. The limited number of people who require greater levels of expertise for design and difficult fault diagnosis usually need to obtain their knowledge by personal study, research and experience.

JOHN NAUMANN

Temporary guy in parallel with main guy.

Main guy being uncoupled.

The personnel hoist.

GUY REPLACEMENT

5AN/5RN RADIATOR

During March-April 1992, the insulated guys supporting the 168 m MF radiator at 5AN/5RN Pimpala were replaced. The replacement of the guys was the first in a series of guy replacement projects extending over a period of 12 months. Other structures on the program included 5CK Crystal Brook, 5SY Streaky Bay, 6WA Wagin, 2BL/2RN Liverpool and 3LO/3RN Sydenham.

There are a number of reasons for replacing the guys on MF radiators, including;

- Electrical and mechanical damage to the insulators.
- Corrosion of the guy strand material.
- Increase in the number of services and/or transmitter powers requiring greater insulation.

All of the structures on the current program for guy replacement have exhibited either extensive surface corrosion of the strand material or obvious and visible damage to the insulators or in some cases, both.

At the Pimpala site, the guys exhibited only moderate surface corrosion even though the site was not far from the sea, however the insulators closest to the mast were known to be badly damaged. Having now replaced the guys at this site, we have confirmed that most of the insulators close to the mast showed signs of pitting and burning and in some cases, pieces of porcelain were missing from them. The remainder of the insulators showed burn marks in various locations. One guy section was cut open for a preliminary inspection which revealed that, although the galvanising on the internal strands had deteriorated, there were no signs of extensive corrosive damage.

In relation to the process of changing the guys, the procedure which is followed is basically the same for each structure. Initially for a sectionalised mast, the section point bracing steelwork is installed with the upper part of the mast resting on the sectionalising insulator. In this situation, the bracing steelwork prevents any shear forces being transferred to the insulator. With this steelwork in place, all the guy tensions are released to the pre-defined temporary or construction tensions.

A temporary guy is then installed parallel to the guy that is to be removed and while the tension in the temporary guy is increased, the tension in the guy which is being replaced is released. The insulated guy is then removed and the replacement is simply the reverse procedure. During the change-over process, the mast deflection is measured from two directions as a check on the tensions which are being applied.

The Pimpala project was of particular interest for several reasons. Firstly, this was the first time that an approved lifting system has been used by Telecom Broadcasting for the hoisting of personnel and secondly, the mast base insulator was replaced prior to the final tensioning of the mast. The base insulator replacement involved jacking the mast approximately 150 mm to allow the removal of the insulator and pivot point. The weight of the mast including the downthrust from the guys was calculated to be around 100 tonnes in its raised position.

Additionally, this was the first project for which Telecom Broadcasting assembled a National team. This team now has the responsibility for completing the current series of major reguying projects and the efficiencies to be gained from this method of operation are already evident.

MIKE DALLIMORE

Replacement base insulator being pulled into position.

Mast being lowered on to new insulator.

Damaged original guy insulators.

ADELAIDE STUDIOS

INTRODUCTION OF THE TRANSISTOR

When the PMG's Department took over the technical facilities of 5CL Adelaide from Central Broadcaster Ltd in 1930, almost all of the studio equipment was powered by batteries. This included the outside broadcast (OB) equipment with its heavy 6 volt lead acid accumulator and three heavy duty 45 volt dry cell batteries.

Some relief came in 1936 with single and four microphone input OB amplifiers built for mains operation. The equipment was designed by Laurie Billin who had been Engineer for upgrading works carried out on 5CL transmitter soon after it had been taken over by the Department..

This OB equipment remained in service until about 1957, when the transistor appeared on the scene, and broadcasters began to look at ways in which advantage could be taken of the new technology. Solid state technology was seen as having considerable immediate advantages for OB equipment and steps were taken to construct a suitable amplifier.

Assistance was available from two sources. Ross Treharne of the Weapons Research organisation in Adelaide offered a collection of circuits and notes on audio amplifiers, and a copy of a Research Laboratories Report on development of a transistorised OB amplifier was obtained. A breadboard amplifier was constructed for evaluation purposes but it was not quite up to expectations. The input stage using an OC71 was very noisy and the output stage using two OC72 transistors had insufficient output.

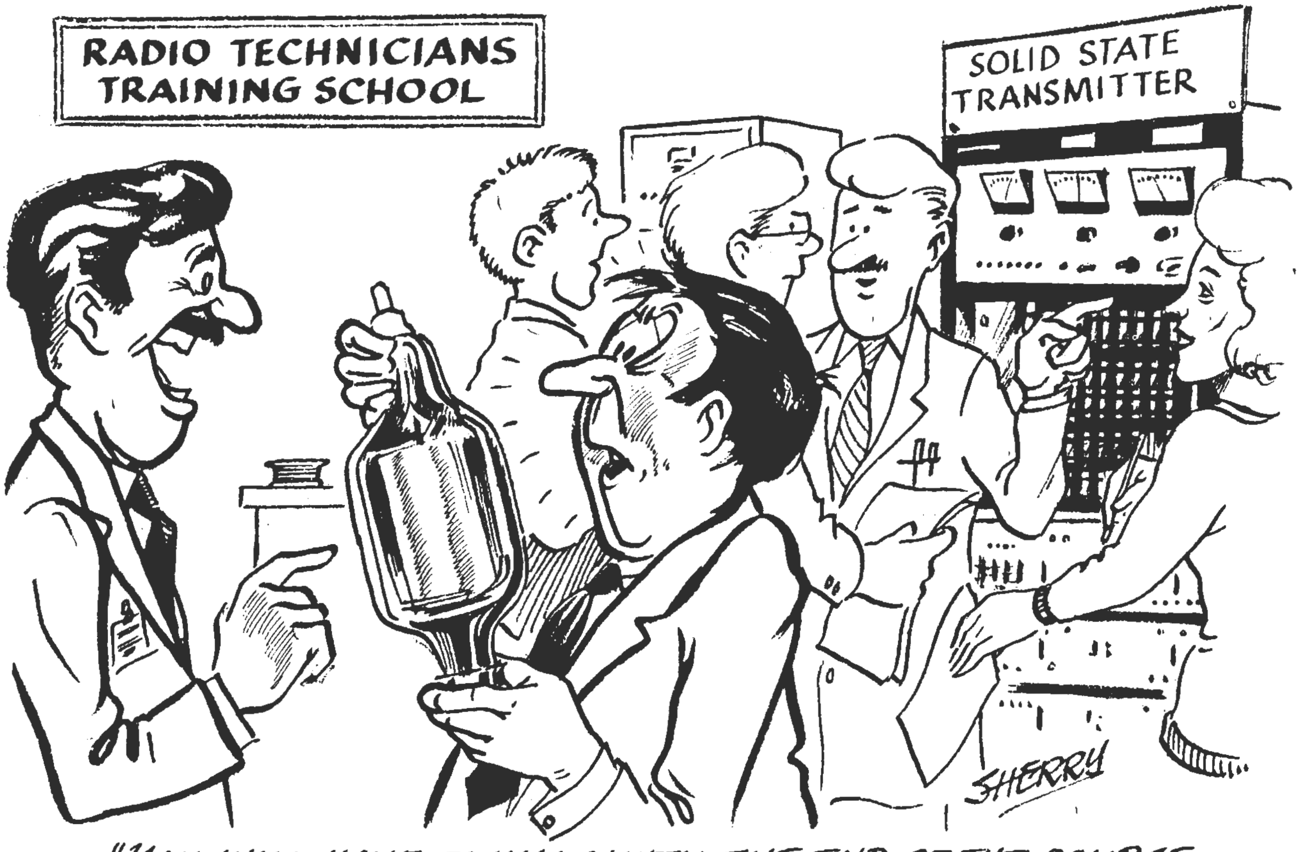
Other types were then trialled. OC45 types were installed for the input stage, and after changing base resistors, an optimum collector current of 1.3 mA gave approximately 10 dB improvement in noise. A change in the output stage using OC26 types gave the required output power without being extravagant with the 9 volt battery consumption.

Ziguras Hermanis, one of our skilled technicians, was then given the task of packaging the equipment into as small a space as possible. He eventually can up with a superb product. The case was 200 mm high, 150 mm wide and 125 mm deep. It had a sloping panel 150 mm by 150 mm and accommodated a VU meter and two input volume controls. The OB technicians were delighted, and even boasted that the two microphones took up more space in the carrying case than the amplifier.

While the amplifier was in its final stage of development, Brian Perkins, Divisional Engineer, was planning for a solid state studio switching system. Early experiments on a 10 IN and 5 OUT matrix using OC77 types showed that the idea was workable and it was put into service for three months before Brian presented a paper at the IRE Convention in Melbourne during May 1959. He detailed the proposed 30 program outlets, selecting from 100 sources by using 20 push buttons for each outlet, arranged in a 'tens' and 'units' selection to control the positive or negative base voltages applied to the two switching transistors per connection i.e. 6000 transistors for the full matrix.

The only major disadvantage suggested for the use of transistor switching at the time, was the high cost compared with other methods. However, the cost was eventually justified on the basis of considerably less maintenance and much improved reliability.

CLIFF MOULE



"YOU WILL HAVE TO WAIT UNTIL THE END OF THE COURSE TO LEARN ABOUT A VALVE!"

KELSO MAST

FELLING OF MAST USING AN UNUSUAL TECHNIQUE

About 1430 hours on Wednesday 11 March 1992, a newsworthy event took place at 7NT Kelso located near the entrance to the River Tamar on the central north coast of Tasmania, when one of the two directional aerial system masts was felled using technology not previously employed in this type of work. The exercise was witnessed by local residents, an ABC TV news crew and interested broadcasters.

The work was carried out by Able Blasting, a Melbourne based expert demolition crew using 'flame cutting' explosives to blast through the steel link plates on two guy anchors. Actually, the mast only succumbed after a second attempt. At the first try earlier in the day, the demolition crew apparently under estimated the quantity of explosive needed (or the strength of the steel used) and the blast only partially burnt through the plates.

The 152 m structure designated locally as mast '0', was the original omnidirectional radiator erected for the station which was commissioned on 3 August 1935 with a 7 kW water cooled transmitter constructed with 20 mm thick polished marble facia panels. At the time of construction, the radiator was the tallest in Australia. It was guyed at four levels with guys terminating on two anchor blocks for each of the three guy radials.

The station was the first National Broadcasting Service regional station established in Tasmania following take over in 1930 of 7ZL Hobart, then owned by Tasmanian Broadcasters Pty Ltd.

A second radiator, designated locally as mast '1' was erected in 1966 giving the service a directional pattern.

Mast '0' had to be condemned because of extensive corrosion of the steelwork around the mast guy pins at the top guy fixing points, making it structurally unsound.

The new mast installation was commenced one week later under contract by EPT Pty Ltd and was completed by the end of April.

BRIAN HEY

Extent of flame cutting following first attempt.

Mast on the way down.

Ground contact established.

Almost there!

MYSTERY VIBRATIONS

Have you ever been in relatively close proximity to a broadcasting structure, heard a rattling noise or similar vibrating noise, and wondered what it was? If you have and your curiosity is aroused, then the following may be of interest to you.

The noises we refer to may be experienced on all sizes and types of broadcasting structures, but tend to be most common on guyed masts. From further observations you may conclude that the vibration may be dependent on the wind speed and/or the wind direction. However, on some tall structures vibration has been heard when there is little or no wind at ground level.

The vibrations we talk of are caused by the action of the wind on the parts of the structure. In essence, the wind creates turbulence around the component (structural or otherwise) which causes it to flex then spring back again. Constant wind at the critical speed can cause this action to continue and the component will resonate or vibrate.

The manner in which components vibrate is dependent on their shape and the wind turbulence created by them. Some tend to vibrate in the direction of the wind, some oscillate

Vibration has caused washer to cut into pin. Note elongated hole in washer and wear on pin.

across the wind direction, while others may vibrate torsionally about their longitudinal axis. Combinations of these vibrations are not uncommon and often lead to a complex elliptical motion. Such terms as wake excitation, incident turbulence, galloping and lock-in are used to describe the cause and resulting mechanism for wind-induced vibration.

Shape, structural stiffness and mass have the greatest influence on the potential for a component to be excited by the wind. Circular shaped objects are most commonly associated with wind-induced vibration. Such components as guys and feeder cables commonly suffer from wake excitation. Generally, the smaller the diameter, the lower the critical wind speed necessary to cause vibration. With guys, the stiffness is a function of the tension in the guy and its length.

A recent example of guy vibration involves a Medium Frequency (MF) radiating mast structure. One of the four guy levels regularly exhibited a high frequency vibration in approximately 10-15 knot winds. The energy of this vibration was such that the top 40 m of mast was excited, with individual structural components humming. A rattling could be heard coming from the guy insulator assemblies in the middle and upper sections of the windward guy. These were found to be washers on the pins which secured the guy segments to either side of the guy insulator assemblies. In one case, the vibration had caused the washer to cut a slot into the pin and in another case the centre hole in the washer was dramatically elongated. Wear on load bearing areas of the pins was also significant.

The effects of such vibrations are generally not critical in the short term. However, the potential for fatigue failures in

Wind-induced vibration has caused fatigue failure of stainless steel cable clamp.

the medium to long term is high. An example of this is the failure of individual outer wires of stainless steel wire rope used in the guys of a MF mast structure located in a marine tropical environment. The stainless steel strand was originally chosen for its corrosion resistance properties, but the effects of the combination of stress corrosion (common in certain grades of stainless steel) and fatigue due to wind induced vibration became evident after only 12 years of service.

Another example is the fatigue failure of feeder cable clamps due to wind induced excitation of the cable. These clamps are pressed from sheet stainless steel and require

Wind-induced vibration of structure caused hammering of connection bolts.

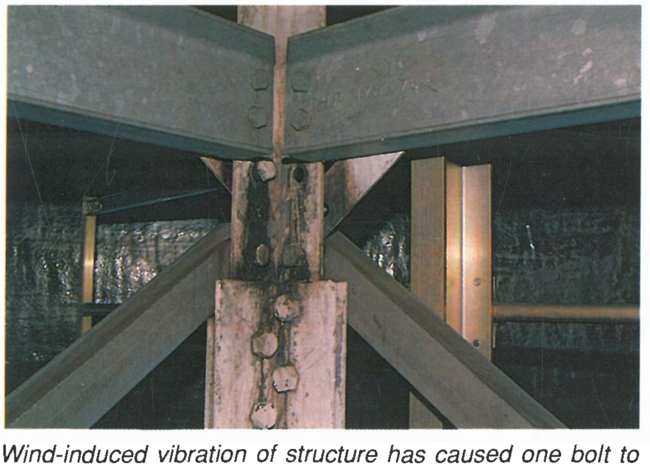
some further cold working to effectively clamp the cable. This, in combination with stress concentrating design features, added to the problem. The installation of more clamps at closer centres may have been beneficial; however, the use of clamps with lower fatigue potential would be more satisfactory, Alternatively, a cable runway which better shields the cables could also provide an acceptable solution.

The solution to such vibration problems are largely dependent upon the cause. Ideally a change in the shape of the component will change its characteristics, as will a change in its stiffness or mass, but this is not always possible.

In the case of the vibrating MF guys referred to above, the extent of the problem was not known until the top guy strings were replaced due to cracked insulators and corroded guy components. Fortuitously, the replacement guy strings do not currently exhibit any vibration problems. Although the guy strand is of equivalent size, the replacement insulator assemblies are heavier, effectively changing the stiffness characteristics of the guy, and are of a different shape – giving different drag characteristics.

There are various ways of changing the characteristics of a guy which suffers from vibration. Such techniques as changing the guy tension, or its effective length by installing a plucking guy onto the middle of the guy (not practical on MF structures) may be effective. Energy absorbing devices called dampers may also be effective in decaying an induced vibration more rapidly.

Natural structural damping exists in all structures and generally increases as energy absorbing mechanisms develop under higher loading conditions i.e. slippage in the bolted joints of a lattice tower. This situation is likely to be infrequent under normal conditions; however, structures with an antenna array enclosed within a large radome are likely to create wake excitation of such a magnatude that structural connections slip frequently. Damage in the form of hammered bolts, elongated holes and/or fatigue cracking can result.



Wind-induced vibration of structure has caused one bolt to drop out and nuts to loosen on others.

A complex mixture of vibrations resulting from a number of modes of vibration have been known to cause interesting effects on broadcasting structures. Bolts have been known to rotate in their holes through the cyclic action of the connecting members. Nuts can loosen, undo and drop off, leaving the bolt to succumb to the action of gravity shortly afterwards.

Solutions to problems of this magnitude are generally not simple, but by instrumenting the structure and measuring the characteristic motion, the natural frequencies and causes can be determined. Auxiliary damping can be specially designed and installed. In other cases, some aerodynamic changes to the radome may be possible to produce non-uniform air flow over its height, therefore minimising the chance of the wind exciting the structure in the critical mode.

Suffice to say, careful design at the outset is not always successful in identifying and eliminating complex forms of wind-induced vibration. Therefore, the monitoring of structural performance is advisable.

TOM GLASS

RETIREMENT

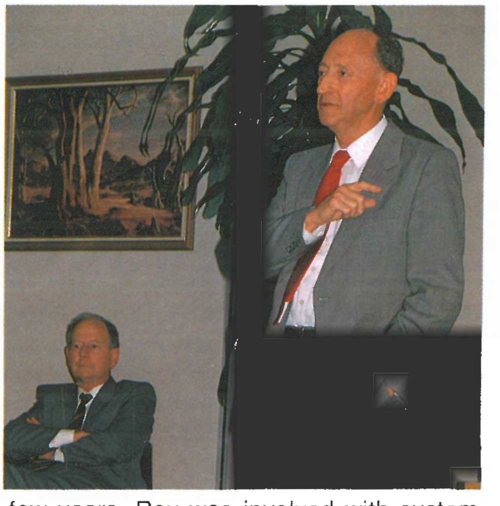
ROY BADROCK – MANAGER NATIONAL OPERATIONS

Roy Badrock, Manager – National Operations retired on 27 November 1992 after 43 years service with the Postmaster General's Department, Telecom and AOTC.

Roy commenced with the PMG's Department in Melbourne as a Technician-in-Training in 1950. After completing his training in 1955 he worked as a Technician, Senior Technician and Supervising Technician in various areas of Broadcasting in Victoria.

During the period 1955-1962, Roy studied engineering at the Royal Melbourne Institute of Technology on a part time basis, graduating at the end of 1962. Early in 1963 he commenced as an Engineer Grade 1 at the Central Office Radio Section at Jolimont.

Roy recounting reminiscences while General Manager Leon Sebire listens.



Over the next few years, Roy was involved with system design, equipment development and provision for a wide range of small and medium capacity radio bearers throughout Australia. In 1969 he transferred to the Transmission and Line Planning area where he spent the next 2 years involved in planning the expansion of the national broadband bearer network.

Returning to the fold in 1971, he commenced an association with Broadcasting that remained unbroken until his retirement. During the period 1974 to 1985 Roy held at various times the Central Office positions of Supervising Engineer MF Broadcasting, Television New Works, Radio Australia Operations and National Operations.

Early in 1986 he was promoted to Assistant Director Operations (subsequently redesignated Manager – National Operations with the advent of AOTC in 1991). As head of Broadcasting Operations in the National Office, Roy was the interface with our major customer the NTA, on broadcasting operational matters.

He informed and advised the NTA on serious technical problems within the NBS, advised them on the technical implications of sharing at National stations by other services, established and managed the broadcasting equipment replacement program and managed the major maintenance and test equipment provision programs.

The General Manager Broadcasting, Leon Sebire, presented Roy with his Service Medallion, a temperature controlled soldering station and cordless drill at a function held in Melbourne on 27 November 1992. He expressed his best wishes and thanks on behalf of AOTC and Roy's many friends and colleagues.

Roy was one of our longest serving and most experienced Broadcasters. We wish him well in his retirement.

SANDRA MANNINGS

MANAGEMENT

TOTAL QUALITY MANAGEMENT

Total Quality Management has become the catchcry of the 90's. Almost everyone has heard of it and almost everyone is doing it.

But what is it? What is Quality?

How do you manage it?

Where do you go when you have finished it?

The principles of TQM are based on simple logic that says, "Do it properly the first time."

Doing any task correctly the first time would appear to be very easy, but it is generally accepted that Australian industry can only get it right the first time on about 70% of all attempts. The other 30% is either reworked (duplication of effort) or complete waste, resulting in large (and unnecessary) cost increases.

TQM attempts to address this problem by having:

- all work tasks (processes) properly defined,
- all tasks documented so that they can be done consistently and correctly every time, and
- all pèople trained to do their tasks.

When these three attributes are in place in a company or organisation, the company is operating in a "Quality Assurance" mode. That means that the customers who buy the company's products can be confident that the products will consistently meet their requirements.

This is the real meaning of "Quality" in the TQM context.

The way in which a company shows to the outside world that it has Quality Assurance, is by passing an inspection by an independent judge (called an assessor) against a set of rules (called Australian Standard AS 3900). The company is then certified to this Australian Standard.

Telecom Broadcasting is aiming to achieve certification to AS 3902 by December 1993.

To enable this to happen, several people are already working on the preparation of the documents that describe our processes, and the "library" system that will hold these documents.

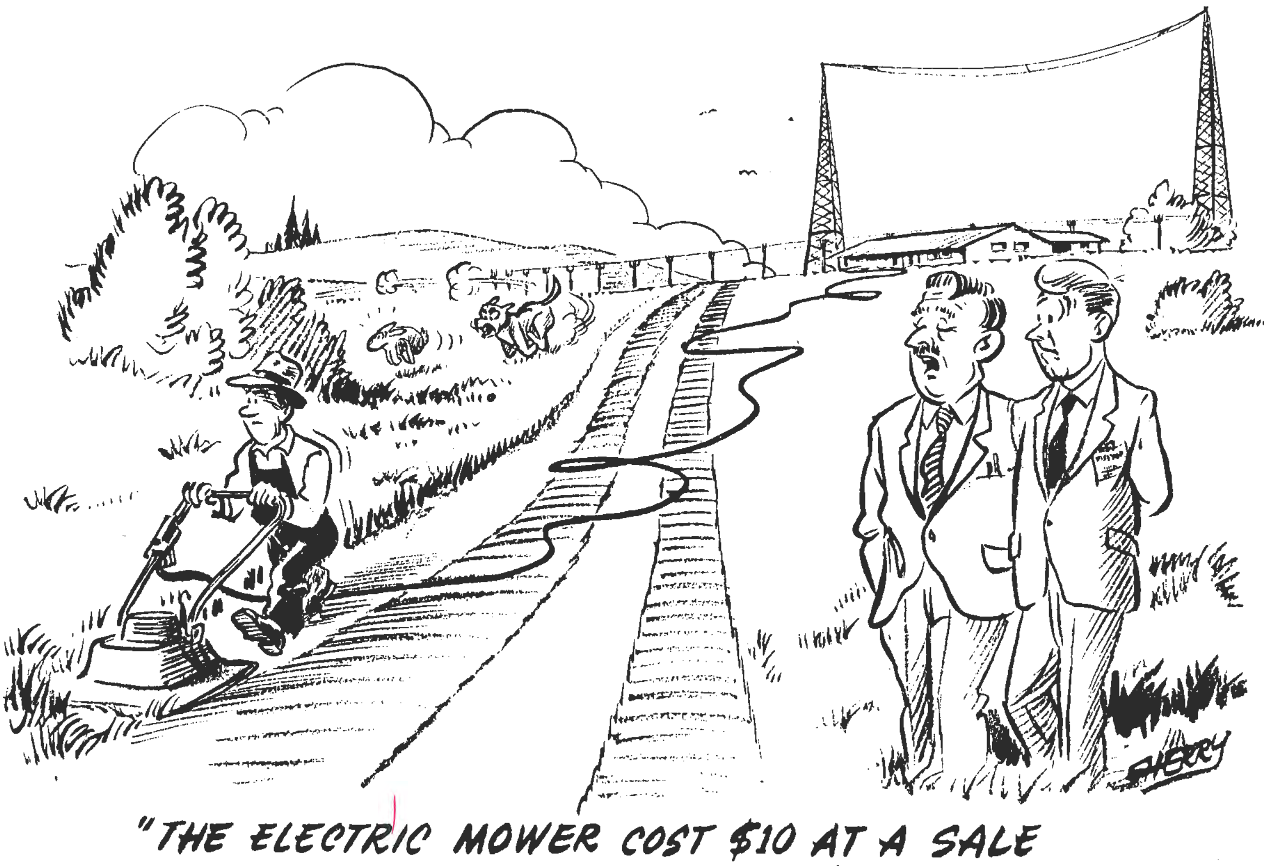
In addition, 80 people have received training at Mudgeeraba and Hastings on the principles of TQM and how this new way of managing our broadcasting business can be implemented. Sixteen Process Improvement Teams have formed and are working on 16 of our important processes to provide Quality Assurance for Broadcasting, and to actually improve the processes further to reduce the waste and rework, and therefore reduce the costs of performing the work. This is of course very important when operating in a competitive environment.

Hence TQM has the potential to make any business more efficient, more competitive and more profitable.

And perhaps most important of all is the realisation that TQM never finishes! The work of improving the day to day tasks carries on, with these Quality principles interwoven permanently into the business processes of the company – making it a "Quality Company".

Total Quality Mánagement principles form an important part of all management courses these days as it is believed that TQM is the single biggest opportunity for improvement in Australian organisations in the 1990's. In addition, seminars are becoming a popular means of training staff. Typical of seminars was the one conducted by the Graduate School of Management of the University of Melbourne during February 1993. Major topics included TQM principles, concepts and practices; benchmarking processes as part of TQM; Planning and achieving best practice; Leadership of the TQM process and Relating TQM to profits.

GRAHAM SHAW



"THE ELECTRIC MOWER COST $10 AT A SALE BUT THE FLEX COST $400!"

LETTERS TO THE EDITOR

Contributors to Letters to the Editor are reminded that full names and addresses must be supplied. Letters should be brief and to the point. Long letters may be edited. The Editor's decision in respect to the suitability of letters for publication in *The Broadcaster* is final and no correspondence on the Editor's decision will be entered into.

SIr,

The article in the March 1992 issue of *The Broadcaster*, referring to the artistic talents of Jack Hargreaves first Officer-in-Charge of Radio Australia Shepparton was of particular interest to me, not only because of my former association with Radio Australia but I am now a resident of Portland where Jack painted some 80 scenes and features in the district.

Readers might also be interested to know that in addition to Jack, his son-in-law Frank Markham former Shift Leader and grandson Steve Markham former Technical Officer and now Administrative Officer with Telecom all served at Radio Australia, Shepparton.

I am enclosing a few photographs by courtesy of Steve, of paintings done by Jack about 1934. Copies are held in the local History House, in an album donated by Steve.

Many of the subjects which Jack painted can be readily located today, and in fact the Historical Society has wherever possible, paired the Hargreaves' prints with latter day photographs of the same scene or subject.

BOB BROWN

Boats at Ocean Pier, Portland.

John Hargreaves' horse rig used on telephone installations in the Portland area.

Half a house. Has not changed in appearance since 1934 when the water colour was made. Portland John Hill's School.

View of lighthouse on North Bluff.

PIONEER SCHOOL

MARCONI SCHOOL OF WIRELESS

The history books will probably record that the title "Australia's Pioneer Radio Training Institution" belongs to the Marconi School of Wireless conducted until its closure

The school building.

by Amalgamated Wireless (A'asia) Ltd. It was the first fully equipped school to undertake instruction in radio when it opened its doors in 1913 with George Apperley as Chief Instructor to train marine operators.

During the first World War the majority of operators for the transports carrying Australian troops to the various battlefields were trained by the school. The school was well equipped with the most modern ship's spark wireless telegraphy equipment in use at the time.

When broadcasting was inaugurated in Australia in the early 1920's, a great many receiving sets were home-made or made by small backyard businesses, but as time went on, demand for factory made sets increased and skilled workers were needed to build and service them.This called for specialised instruction, and the Marconi School commenced night classes for radio mechanics.

By 1932 it was evident that more specialised courses were needed to cater for rapid developments in technology, not only in home receivers, but for studios, transmitters, talking pictures and other areas. Courses were completely rewritten and new courses added to the curriculum. Included were courses for the Radio Engineer, the Radio Technician, and the Radio Mechanic.

The Radio Engineer's course covered a period of five years' instruction and training with the first two years being conducted by correspondence and the last three years being mainly practical instruction with the student being full time at the school or at various centres of AWA radio engineering activities.

The Radio Technician's course was designed to enable students to qualify for the PMG Broadcast Operator's Certificate, a necessary condition for employment with a commercial broadcasting station.

Early classroom.

The Radio Mechanic's course covered a period of 15 months and was designed for receiver servicemen.

Many other training establishments soon became active to meet the increasing demand for radio technical staff. The Marconi School of Wireless was joined by the Australian Radio College, Australian Radio Engineering Academy, International Correspondence School, and other private bodies. In addition, various technical colleges, the PMG's Department and the Services conducted schools or classes for training radio engineers, technicians and mechanics.

In the 1950's and 1960's the Marconi School diversified due

Ship's wireless equipment training centre.

to industry demands to train television technicians and servicemen. However, with the production of highly reliable solid state receivers, the demand for training servicemen rapidly declined.

When the government decided to establish the Australian Maritime College at Launceston, AWA was not keen to continue to operate the school as it was no longer profit making. In the early 1980's, decision was made to transfer the function of training marine radio operators to the new government college. With the support and participation of AWA much of the course material, even some of the students and responsibility, was transferred to the College during 1982/83, so bringing to a close a training school that had served the radio industry for some 70 years.

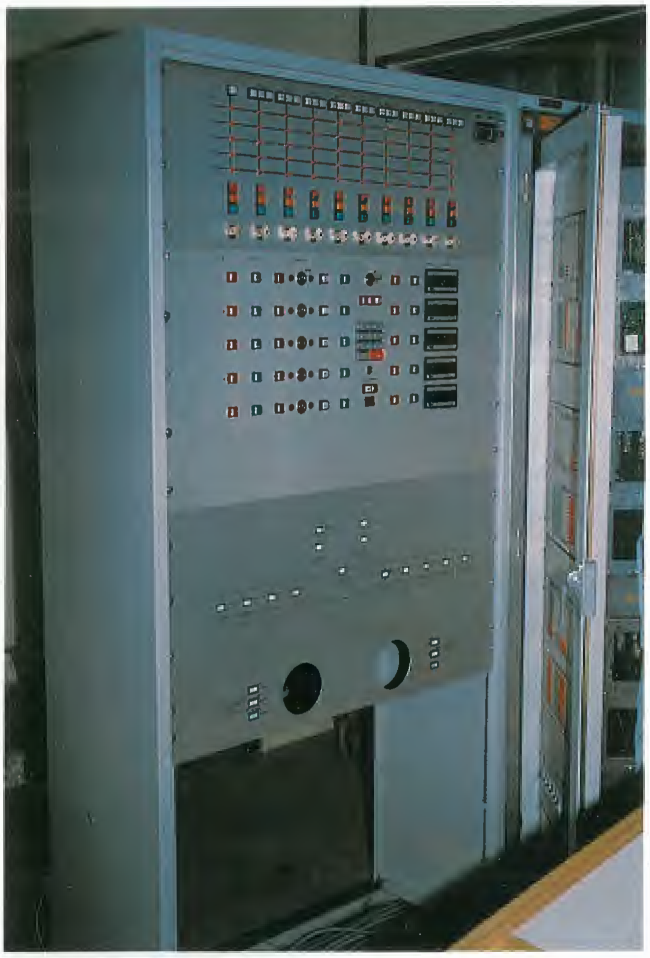
BILL OWEN

EXTERNAL PLANT EXTENSIONS COX PENINSULA

To cater for the installation of two additional 250 kW transmitters at Cox Peninsula, some extensions of external plant facilities have recently been undertaken. The works include extension to the antenna selector matrix switch and the provision of transmission lines.

Extension of the Brown Boveri antenna selection switching system involved the installation of 20 new switches to extend the matrix configuration from 3x10 to 5x10, installation of a new control cubicle for the operation and status monitoring of the additional switches, installation of additional control cabling and the relocation and modification of the control and mimic panel in the station control room.

The provision of extra PLC modules and new operating software will be installed when commissioning is undertaken later in the year. The installation of the 20 new switches



Control and indicating panel for antenna selector switch and power system during installation.

also required the removal of 10 fixed connection cross points in the matrix.

The new switches use different motor drive and manual operation systems compared with those previously installed. The physical dimensions and internal operation of the switches are however, identical to those installed in 1971 and 1982.

To connect the new Thomson CSF transmitters to the antenna selector matrix switch, two additional transmission lines were constructed from the transmitter building. The

Mixing of concrete on site using modified delivery truck. Dave Arrattz on truck and Ray Hunter with front end loader.

lines employed surplus CO-EL components left over from the log-periodic antenna installation that had been in service before being destroyed by Cyclone Tracy in 1974.

A modified concrete delivery truck was used for mixing concrete on site, as no batching plant was available. Sand, screenings, bagged cement and water were added manually.

PTFE feed-through insulator discs were fitted at the switch building to match those in use with other lines. Originally, ceramic lead-through insulators were employed but were replaced due to problems with arcing from dust buildup and movement of line conductors.

GRAHAM BAKER

Transmission line support frames under construction. Working lines at rear.

BROADCASTING MILESTONES

VLQ BALD HILLS

VLQ is one of two high frequency broadcasting services in operation at Bald Hills near Brisbane feeding ABC programs to inland Queensland. The other is VLM on the same site.

Installation of the VLQ transmitter commenced during 1942, with commissioning being completed on 17 February 1943. The transmitter was an STC A88OA type employing low level modulation, and two SS1971 double ended water cooled triodes in parallel in the final linear stage. The modulator was a 4212E triode with modulation being applied to the anode and screen of the modulated amplifier. High tension was provided using 866A HCMV type valves, and extra high tension was provided using six 4078A HCMV types with one spare on standby. All valve rectifiers were subsequently replaced with solid state types. In later years when SS1971 valves became difficult to obtain, 3Q213E types were employed as replacement.

The 10 kW output of the transmitter was fed to an 80/600 ohm LC network and then via a two wire 600 ohm transmission line to the aerial system comprising half wave dipoles and reflectors. The aerial systems were supported by wooden poles.

Three frequencies were employed throughout the daily transmission period. They were 7215 kHz, 9660 kHz and 7240 kHz, but about 1947, the frequency scheduling was changed with transmission being maintained on 9660 kHz throughout the full day/night period.

In 1968, a new STC 4SU48B transmitter was installed, with the original being used as a standby. All high tension supplies are provided by solid state devices and the final RF stage comprises two 3X2500A3 air cooled triodes in push-pull configuration. The modulator is also fitted with 3X2500A3 valves.

CHRIS DUFFY

Part of VLQ aerial system installed 1943 and still operational 1993.

Original STC 10kW type A880A transmitter installed 1943.

VLQ 10kW STC transmitter 4SU 48B still operational 1993.