The BROADCASTER

Newsletter of Telecom Broadcasting

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INSTALLING TH558 TUBE, DARWIN

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.

Written and photographic contributions are welcome. All material should bear the contributor's name and location and be directed to:

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EDITORIAL

One of the articles in this issue concerns the replacement of open wire coaxial transmission lines with underground coaxial cables. This is one of a number of examples where radio engineering technology has passed through a full circle over a period of time. When the A Class stations went to air in 1923/25 the aerial was located close to the transmitter and fed by a single cage feeder. In 1932, when a new station was built for 6WF, the aerial was fed via a buried 100 ohm rigid coaxial line comprising concentric copper tubes.

When 3GI, 4QN 2NR and 7NT were commissioned 1935/36 two wire balanced 600 ohm lines were employed but when 4QS went to air in 1939, a rigid 80 ohm coaxial line was installed above ground on concrete piers.

In 1942, a six wire 200 ohm open wire unbalanced line was installed at 2BL, and for the next 50 years this was the standard type for MF stations throughout Australia.

In 1993, 50 ohm coaxial cables replaced the 200 ohm open wire type, so reverting to technology first introduced 60 years ago, but using a flexible line instead of the rigid type.

JACK ROSS
Editor

Front Cover: Thomson-CSF TH558 tube RA Darwin.

Contributors to this issue:

Les Rodgers	Karina Ishak	Terry Wooster
Des Allen	Bill Nicholas	Les Chidgey
Tony O'Brien	Graham Baker	Lloyd Jury
Mark Stevens	Graham Shaw	Derek Prosser
Tom Glass	Tom Pascoe	Jack Ross

Les Rodgers

JUST BRIEFLY . . .

We are now well under way with construction activities at the starkly beautiful, but inhospitable location of Mount Barrow near Launceston in Northern Tasmania. This construction is part of the first publicly tendered contract let by the NTA for construction of broadcasting facilities in Australia. Most people would agree that this is one of the most challenging broadcasting construction projects ever undertaken in Australia, firstly because of the very tight timetable and secondly because of the extremely difficult weather and access conditions.

If approval for the construction of facilities at Mt Wellington near Hobart is received from the Parliamentary Standing Committee on Public Works in the near future, work will also advance on this project, which is in some respects even more difficult. These two projects, together with their associated translators represent the last phase of the Government program for equalisation of commercial television services in Australia. In essence, virtually all of the Commonwealth owned television broadcasting facilities in the Eastern States, which were developed over the last thirty four years, will have been replaced or upgraded under this and associated programs and it is very satisfying that we will be fully completing this major undertaking with the projects in Tasmania.

These facilities have been constructed to world class standards as will be the case in Tasmania. We should all be justifiably proud of our efforts on these re-engineering projects which involved innovative designs and great dedication by our people. Our challenge for the future is to maintain our innovation and win more contracts in the environment of intensifying competition.

As this is the last issue of *The Broadcaster* for 1993, may I wish all readers a very happy Christmas and a bright and prosperous New Year.

LES RODGERS

STATION ROLL CALL

ABAD7 ALICE SPRINGS

Television came to Alice Springs on 16 December 1972 with the commissioning of ABAD7.

Because of its remote locality with no microwave links, the ABC programs were prerecorded in Adelaide the previous week on 2 inch video tape. The ABC Radio News was put to air with still pictures on the screen.

The program was fed to an 800 MHz Rohde & Schwarz 0.5 km link was a 1.2 m dish mounted on the DCA tower on top of the MacDonnell Range on the western side of Heavitree Gap. The UHF signal fed a 5 watt Elit UHF/VHF translator. The service was transmitted using an antenna with eight corner reflectors with an ERP of 25 watts to the town of Alice Springs to the north, and to the Joint Defence Space Research Facility at Pine Gap to the south west of the transmitter.

With the coming of colour in 1975, it was deemed that the UHF link transmitter was not suitable for transmission of colour programs. Monochrome program would be broadcast until the microwave system reached Alice Springs in 1979. The tapes coming up from Adelaide were in colour but the colour burst was removed in the Ampex 2 inch video tape machines in Alice Springs.

Live program from Brisbane with Darwin news service went to air on 24 August 1979.

On 9 November 1979, the service was upgraded using an NEC TBU 1220 100 watt transmitter feeding eight corner reflector aerials on top of the new Telecom microwave tower. This gave an ERP of 225 watts. In 1985, program feed was provided via Aussat satellite.

TERRY WOOSTER

8AL ALICE SPRINGS

Station 8AL-originally 5AL-commenced transmission on 30 November 1948 with a power of 50 watts on 1530 kHz from a site behind the old Post Office in Railway Terrace, Alice Springs. Programs came via the 1500 km overland trunk route from Adelaide.

On 6 October 1955, two Philips 1648 transmitters, derated from 200 watts to 50 watts were installed in main/standby configuration. In April 1959, the service was relocated to Gap Road, about 2 km south of the town centre. Main and standby T type aerials were provided.

During 1968, the power to the aerial was increased to 200 watts. There was a basic studio on site where local programs of interest were recorded and sent to Darwin where they were later broadcast down the track to Katherine, Tennant Creek and Alice Springs. During the day, programs originated in Darwin but during the night, they were provided from Adelaide. Switching was controlled from Darwin using a caihlo circuit.

In November 1978, the service was relocated to its present site on the Stuart Highway 8 km south of the town. The site and the 46 m mast are owned by Commercial station 8HA which started broadcasting on the site during 1971.

During this relocation, two STC 4SU25A 1 kW transmitters with combiner were installed to provide an aerial power of 2 kW. Broadcasting staff installed a dual frequency coupling hut to feed both services on the 8HA vertical radiator.

With the coming of the microwave system to Alice Springs in 1979, the program line from Darwin changed from open wire to radio bearer.

On 23 February 1983, the station frequency was changed to 783 kHz.

The STC transmitters were recently replaced by a pair of Nautel ND1 1kW transmitters in parallel mode.

TERRY WOOSTER

QUEENSLAND TAB FM NETWORK

In September 1992, Telecom Broadcasting took another major step in taking on the competition in the open market with the design supply, installation and maintenance of broadcasting services.

Lobbying by Brian Cleary and Bob Hinrichs resulted in the Totalisator Administration Board of Queensland requesting a proposal for the establishment and maintenance of 16 FM broadcast transmitting stations for which the TAB at the time were seeking licences.

Telecom Broadcasting presented a proposal along with other interested parties for the complete implementation of the project. Following last minute negotiations on Christmas Eve 1992 to clear up some points of details, the TAB advised Telecom Broadcasting that it had been successful in securing all the work associated with the project.

TAB Installation team. L to R. Ray Walker, Peter Cusack, Tony O'Brien, Paul Bulfin, Paul Lamprechet, Alex Mislin, Tony Delisser, Rob Sampson.

In early January 1993, a project team was established consisting of Mike Dallimore, Customer Engineer, National Office; Tony O'Brien, PTT02, Brisbane Office and Rob Sampson, STT02, Brisbane Office.

Negotiations commenced immediately with the TAB concerning engineering detail, with NTA and Telecom regarding site sharing, and policy detail.

The brief was to provide rebroadcast facilities at 16 sites throughout Queensland.

The area to be covered stretched from Thursday Island near the tip of Cape York Peninsula, to Weipa and Normanton near the Gulf of Carpentaria, west to Mt Isa and south to St George and Goondiwindi near the Queensland/NSW border.

Program was to be relayed using the satellite "Ominicast' service and sourced from 4TAB, the TAB's racing station in Brisbane.

Initial negotiations were undertaken with the National Transmission Agency for approval to share the National facilities infrastructure at the majority of sites. Three sites were a combination of NTA and Telecom involving separate sharing agreements with Telecom's planning and development and property leasing authorities.

At Yeppoon, on the central Queensland coast where no suitable NTA or Telecom facilities were established, sharing was negotiated with WIN Television.

Investigations carried out on a number of different transmitter manufacturers' products, resulted in CTE, marketed by Rohde and Schwarz in Australia being finally recommended.

New or upgraded combiners were required at 15 sites to meet the requirement of adding the TAB service to the existing National service.

At Emerald and Mt Isa, the antenna systems required upgrading.

Provision and installation of the satellite receiving facilities were examined using timing, cost and quality as the specification criteria.

As a result of these findings, Acesat Satellite Corporation

Satellite receiving dish Thursday Island.

Pty Ltd were nominated as sub-contractor to provide 3 and 3.7 metre dishes with suitable rating for all sites, six of which were in cyclone prone areas.

During February and March, the project team were shifted into high gear to finalise all the required activities of equipment supply, surveillance and maintenance contract and the many and varied negotiations with all concerned parties before a firm contract was signed with the TAB in late March.

The TAB's required timetable was to have the network installed and operating prior to the winter racing season in Brisbane which gains momentum during May.

It was agreed that all but two services would be commissioned by the end of May. These two services were subject to equipment delivery timing problems.

Equipment racks were assembled in Brisbane for each service to accommodate the transmitter, consisting of 30 watt exciter and 100 watt, 500 watt or 5000 watt PA, dependent on the service.

Patching facilities and satellite receiver were also housed on this rack.

On 4 May, construction staff departed from Brisbane and began work with the first service going to air on 7 May at

Gladstone. During the following 12 days, staff commissioned and put to air 12 services with four becoming operational on 19 May.

The Thursday Island and Weipa sites were by far the most difficult from a logistics point of view. They were put into service the following week.

It is a credit to all concerned that the first 14 services were on air ahead of the target dates ranging in time from 1 to 12 days. The Emerald and Mt Isa stations were completed and put to air on 9 July and 10 June respectively. The Emerald station is a 5 kW service.

The construction and commissioning staff consisted of two teams of two. They comprised Paul Bulfin STT01 and Ray Walker TT02, and Neville Kretschmann STT01 and Tony Delisser TT02 who carried out the major part of the work.

Rob Sampson STT02 and Paul Lamprecht TT02 handled the southern border stations at Goondiwindi and St George.

Additionally, Peter Cusack STT01 and Alex Mislin TT02 were strategically placed in central Queensland on other work, and were able to assist in getting some services to air on time where satellite facilities were delayed.

To meet and better the scheduled on air target dates, Construction, District and MIC Operations staff provided a fine example of people working together with enthusiasm and commitment in providing a quality product to the complete satisfaction of the client.

TONY O'BRIEN

TAB FM transmitter installation Gladstone.

500 watt combiner Blackwater TAB service.

100 watt combiner installation Gladstone TAB service.

ANTENNA MAINTENANCE

The antenna system at Radio Australia, Carnavon, comprises four antennas each employing broadband folded half wave dipoles. They are supported by self supporting towers and were designed and installed by the Brown Boveri Company during 1975.

Each antenna consists of an active curtain of 16 folded half wave dipoles arranged in four bays and four stacks. The horizontal sections of the dipoles are constructed in the form of multiple-wire cages. A passive non-resonant reflecting screen is provided a quarter of a wavelength at the geometric mean frequency, behind the dipoles.

The antennas cover the bands 6, 7, 9 MHz; 7, 9, 11 MHz; 11, 15, 17 MHz and 15, 17, 21 MHz.

Maintenance of these four antennas is usually needed as a result of action by the wind. Wind causes movement in the antenna web. This movement causes fatigue and fatigue results in breakages. Breakages can result in arcing and burnt components. The wind from the Indian Ocean carries with it moisture which condenses on the wires, ropes and insulators leading to corrosion, and for the insulators, loss of insulating properties, build-up of temperature and overheating.

The wire ropes of the antenna suspension system are stored on the drums of the winches. At maintenance time, each antenna is lowered and the winch ropes treated with special penetrating lubricant to permeate the very core of the rope. This is to allow movement between the rope strands as tension is applied and released, minimising friction, heating and damage to the individual elements in the rope as it flexes. Each rope, as it is wound back on its drum during the final antenna raising, after completion of

One of the four by four antenna curtains.

Preparing to patch-in replacement copper wire lead.

maintenance work is carefully coated with specially made grease to seal out the blown sand and salt of the coastal environment, trapping the lubricant for the period between overhauls.

The antennas are held aloft by winches and cables mounted on cages which levitate with counterweights in the form of concrete blocks to precisely balance the weight of the antenna, allowing the whole three dimensional construction to move and bend with the breeze as though it were part of a bamboo thicket. The breeze at Carnavon is rarely still, frequently brisk and often, as a cyclone passes nearby, cataclysmic.

As the antenna is blown by the wind the floating supports become active and the support ropes move with the sheaves at the top of the towers. The portion of the rope passing over the pulleys is in constant movement over a


Insulators coated with high voltage silicon grease compound.

small arc, continually flexing. Before fatigue sets in, the sections of rope in the vicinity of the pulley must be moved to a new non-flexing position. This is achieved by cropping the end of the winch rope at the point of attachment to the antenna structure. Because of the size of the rope, tools powerful enough to crimp the terminations are not available in the field. The practice adopted to terminate the rope is hand splicing. An alternative method of terminating ropes is being investigated using epoxy resin compounds to avoid the cost of bringing experts from Perth for the splicing.

Broken wires in the transmission line sections of the antenna pose the biggest danger and fault liability of the antennas. Copper in an exposed environment oxidises, loses body and with vibration, becomes brittle. Broken wires usually result in the splicing-in of replacement modules of the antenna. Such modules are made up in readiness for replacement and are carefully spliced into the unit taking care to exactly replace the correct length to maintain structural integrity. New sections are jointed in place with precisely machined crimping sleeves.

The time comes after several repairs when components have been jointed in, when it is preferable to replace the whole unit, whether this is a dipole set, section of transmission line, spreader bars or fibreglass support rods. Replacement parts are taken from stock or manufactured to suit on site. When long runs of transmission line are being manufactured, these are constructed on a special purpose level table which is longer than the item being made. Some components measure nearly 100 metres in length and the technique ensures components are made to close tolerances.

Insulators that have become unserviceable or are beginning to show signs of degradation are replaced, others deemed to be satisfactory are cleaned and allowed to continue in service. The main failure mode for the insulators is erosion or corrosion of the glaze due to the heating effect of the RF currents on moist salt deposited from on-shore winds. The insulators at the lower end of the vertical RF feeders are most likely to be affected. Several remedial actions have been tried with current practice being to coat the insulator with a layer of high impedance silicon based grease.

The RF power is delivered to the appropriate antenna along one of four transmission lines. If all three transmitters are scheduled for service, there is a great deal of power - up to 650 kW - transferred from the transmitters. Such power in 300 ohm impedance lines means high voltages and considerable RF radiation, all of which obviously is invisible. To warn staff and visitors of impending dangers when transmission is about to commence, each antenna is fitted with flashing warning beacons and a siren to attract attention. Remains of birds' feet attached to the transmission lines bears a grim witness that local wildlife does not heed the start of transmission warnings, and is a powerful reminder to staff in relation to their duty of care.

When the station was established after damage to Radio Australia Darwin in 1974, it was constructed in record time. The plans at the time indicated a temporary station was being built to last 5 years. The manufacturer of the antennas gave a life for their product of 10 years. With now almost 18 years of service, decision will soon have to be made when to stop repairing and when to replace.

LES CHIDGEY


Antenna lowered to ground for maintenance.

RETIREMENT

FAREWELL FUNCTION - LEON SEBIRE AM

On 24 June 1993, colleagues, representatives of industry and government, executives of broadcasting organisations and friends attended a farewell/dance at Le Chateau in Melbourne on the occasion of the retirement of Leon Sebire AM, General Manager Broadcasting.

Stan Moon, former Secretary of Telecom acted as MC for the evening. Speakers included John Bigeni, Controller of TV Technical Services, Australian Broadcasting Corporation; Vic Jones, General Manager, National Transmission Agency and Brendan McManus, General Manager, Telecom Division NEC.

A musical interlude was provided by Karina Ishak and Brian Cleary accompanied on the piano by Graham Smith.

Those in attendance included Roy Badrock, Bill and Marion Beard, Ros Berry, John Bigeni, Robin and Margaret Blair, John and Joye Bray, Graham Broad, Dick Butler, Greg Candy, Jack Carnell, Max and Dawn Chadwick, Brian and Val Cleary, Nim Clements, Bruce Cook, Lou Cossetto, Mike Dallimore, Graham and Rayma Davey, Meganne DeMoura and Anthony Gardiakos, Harry DeSouza, Carl and Bev Dillon, Kathy Dimitropoulos and Chris Buckley, Frank and Lee Dujela, Bill and Jennie Edwards, Gordon Evans and Eva Campi, Alf Forster, Brian and Colleen Foster, Gary France, Tom Glass, Roger Greenwood and Andrea Oribin, Wulf Grey, Aiji and Akiko Harada, Keith Hardie, Tom and Eileen Harrison, Alan Hayes, Brian and Wendy Hey, Bob and Laura Hinrichs, John Hodgson and Jan Wishart, Vic Jones, Esther Joseph, Ed Ledachowicz and Joanne Trower, Peter and Lorraine Lester, Sandra Mannings, Greg McAdoo, Robert and June McKinnon, Rod and Joan McKinnon, Brendan and Mary McManus, Terry McManus and Karin Ishak, Stan and Laura Moon, Glen Moore, Kevin Morgan, Alan Newton, Olga Pappas and Joe Pacciotto, Bill Pike, Bill and Muriel Pollock, Henk Prins, Victoria Ridgeway, Les and Val Rodgers, Jack Ross, Terry Said, Yohani Saldin, Gopalan Sampath, Brett and Bonnie Sebire, Graham and Ralene Shaw, Graham Smith, David Soothill, Ken Spicer, Mike and Sheila Stevens, Ross and Pam Thyer, Laurie and Margaret Vaux, John and Joy Webb, Jim Wilkinson, Ken and Robyn Wood and Alan Wright.

Les Rodgers (L) about to present Service Medallion to Leon Sebire AM.

Les Rodgers, Acting General Manager Broadcasting made a presentation of a number of gifts as well as a Telecom Service Medallion. He expressed best wishes and thanks on behalf of Telecom and wished Leon and Jenny all the best in retirement.

JACK ROSS

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 of 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 by Norm Stone on broadcasting services in Tasmania in the July issue of *The Broadcaster* was of considerable interest to me, having spent a working lifetime in the broadcasting industry in Tasmania dating back to 1930 when I started work as a Junior Technician at 7HO , which at the time had a 50 watt transmitter designed and constructed by Ron Hope the station Chief Engineer.

I was associated with the Tasmanian branch of Commonwealth Electronics Pty Ltd from the time it began operation at Derwent Park near Hobart until closure in 1970's. The company headquarters were located at Baulkham Hills, Sydney and manufactured transmitters, turntables, and tape recorders for the Postmaster General's Department for use at National Broadcasting Service stations and at ABC studios where at the time, the technical facilities were controlled by Departmental staff.

The company was formed in Sydney in 1950 by Ron Hope, Alan McKenzie and Bob Zucker with a factory of modest proportions. After getting facilities operational, a factory was established at Derwent Park with myself and John Dodds as additional Directors. We were later joined by Dave Hildyard.

Many readers will be familiar with the company products which included "Minifon" and "Ultra Minifon" hand held transceivers, single channel radio telephone systems, airport radio equipment including beacon transmitters, MF broadcast transmitters, tape recorders, turntables and others.

The Hobart factory produced the CE turntables including the die-casting operation in large numbers and they sold well, being used in professional recording studios, Commercial station studios, ABC studios and overseas broadcasting station studios.

The portable CE tape recorder well known to Technicians at ABC studios, was designed in response to a PMG's Department specification for use by ABC staff at the 1956 Olympic Games. They were in service at most major studios. The tape transport mechanism of these recorders was powered by a spring-driven motor fitted with a speed governor. They moved the 1/4 inch tape at a speed of 71/2 inches per second. The valve amplifiers were powered by dry cell batteries. Performance met CCIR specifications in the range 50 to 7500 Hz. Electronics for the records was undertaken by the Sydney factory staff while Hobart staff were responsible for mechanical design, manufacture of the complete unit and the acceptance testing.

The Sydney factory produced a range of transmitters for MF broadcasting stations including twin 50 watt units for NBS stations at Tennant Creek and Katherine in the Northern Territory which went to air during 1960. Higher power units were supplied for other stations.

In 1969, Commonwealth Electronics Pty Ltd became part of the Philips organisation and the name changed to CE Electronics Pty Ltd. The Hobart factory closed in 1972 and the Sydney operations transferred to a Philips complex at Brookvale where it operated for a while before closing down.

Although Commonwealth Electronics Pty Ltd has, like many radio manufacturing organisations disappeared from the industry, and its equipment no longer operational, it is pleasing to recall, that in this year of 1993-the 70th Anniversary of the establishment of broadcasting in Australia - that the company made a significant contribution to the advancement of the technology.

BILL NICHOLAS

TV MONITORING SYSTEM

HIGH POWER UHF COMBINER MONITORING

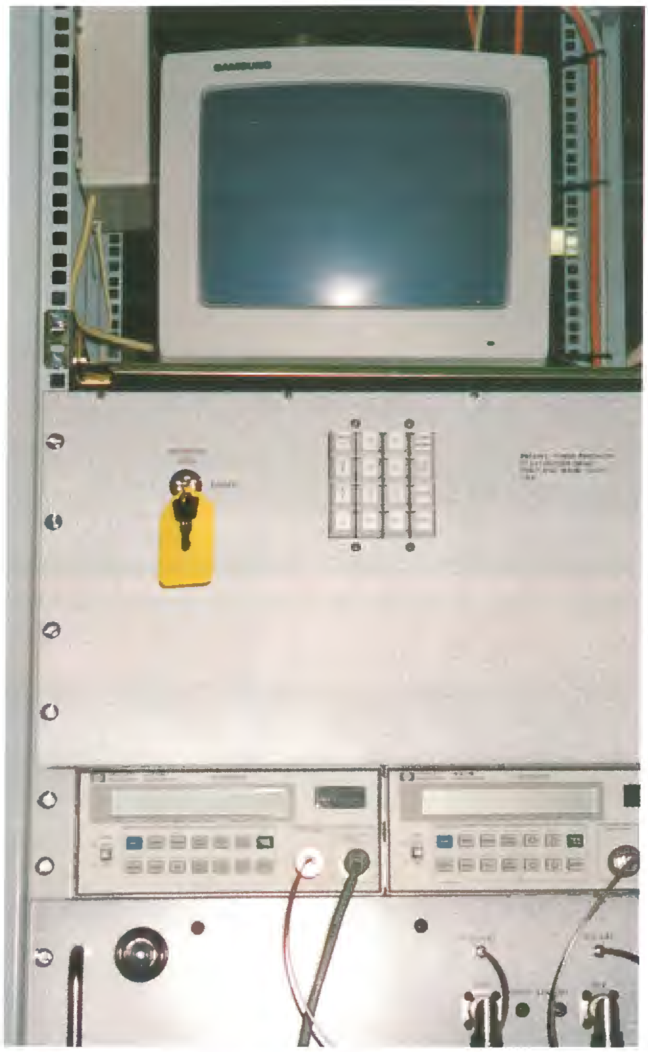
Over the last couple of years, a Microprocessor-based Transmitter/Combiner/Antenna Monitoring and Control System, manufactured by the US Company, Passive Power Products, has been installed and is operating at each of seven high power multiple service UHF broadcasting sites - Toowoomba, Newcastle, Wollongong, Canberra, Latrobe Valley, Shepparton and Ballarat. These systems monitor reflected power levels at selected points in the UHF transmission systems and, if a fault is detected, immediately close down the transmitters to prevent damage to any of the station equipment.

The first four of another 15 PPP systems, are about to be delivered for installation at UHF broadcasting sites at Cairns, Townsville, Mackay, Rockhampton, Wide Bay and Southern Downs in Queensland; Orange, Dubbo, Wagga Wagga, Taree and Narrabri in New South Wales; Swan Hill, Albury, Bendigo and Western Victoria in Victoria.

The PPP Systems are capable of controlling the transmitters and also the coaxial switches which configure the antenna and combiner arrangements. In the event of an antenna problem, the station can be switched to half antenna operation, and power directed to the dumping load if necessary.

Two power meters detect and measure power from several directional couplers, cycling through all the monitoring points approximately once every second. A microprocessor then calculates the forward and reverse power and VSWR for the particular monitoring point. These values are compared with pre-set VSWR and overpower values. Depending on the result of the comparison, the system either allows the station to continue operating, or brings up an alarm to warn of high VSWR or transmitter overpower, or takes action to close down one or all UHF transmitters, according to the type of the fault. The conditions leading to transmitter shutdown(s) were negotiated between Telecom, the National Transmission Agency and major commercial television station operators.

KARINA ISHAK



PPP monitoring and control system Black Mountain, ACT.

Denis Richards (L) STTO2 Cooma and Mark Morschel PTTO1 Sydney at Black Mountain installation.

Russian cargo plane carrying transmitter, Darwin airport.

Crated transmitter being moved into vault area of transmittter building. Ted Hurn, Steve Sheppard and Thomson-CSF staff supervising operations.

Transmitter moved into final position.

TWO NEW 250KW TRANSMITTERS

Two Thomson-CSF TRE transmitters were recently installed at the Radio Australia transmitting station, Cox Peninsula near Darwin. These are the first of a new range of high power broadcast transmitters to be produced by the recently combined Transmitter Divisions of ABB and Thomson-CSF in Europe.

The transmitters are capable of producing 250 kW carrier output in the range 5.95 to 26.1 MHz and operating in the AM, Dynamic Carrier Control and Reduced Carrier SSB modes.

Only one vacuum tube is provided in the transmitter, this being a 500 kW rated Thomson-CSF TH558. The 2 kW drive power required by the final tube is produced by a multiple device broadband solid state amplifier.

The mains power supply requirement is 3 phase 400 V and the transmitter has a 50 ohm unbalanced output. On site, the transmitter is supplied with a balun to convert the output to 300 ohms symmetrical to suit the existing balanced transmission lines and antenna selector matrix switch.

A feature of this new generation transmitter is the method by which modulation is produced.

The main high tension supply to the final tube is synthesised by connecting in series up to forty eight separate 700 volt DC power supplies. These power supply modules are controlled by a dedicated microprocessor system through individual fibre optic links.

The main power transformer consists of 3 phase 400 volt primary winding and forty eight individual three phase secondary windings feeding the power supply modules.

The incoming audio modulation is digitally sampled and converted into a high speed control strategy to turn 'on' and 'off' IGBT switches in each power supply module.

Each module is fault protected and the transmitter can continue to operate with up to seven of the modules out of service.

A major advantage offered by this system is the improvement in overall efficiency of the transmitter when compared to other modulation techniques, with a guaranteed efficiency of 73% being obtained.

The transmitter is capable of producing 500 kW PEP in the SSB mode.

Rather than operate in a linear mode, the final tube continues to operate in the highly efficient Class C bias state and SSB is generated by synthesis using separate frequency and amplitude information.

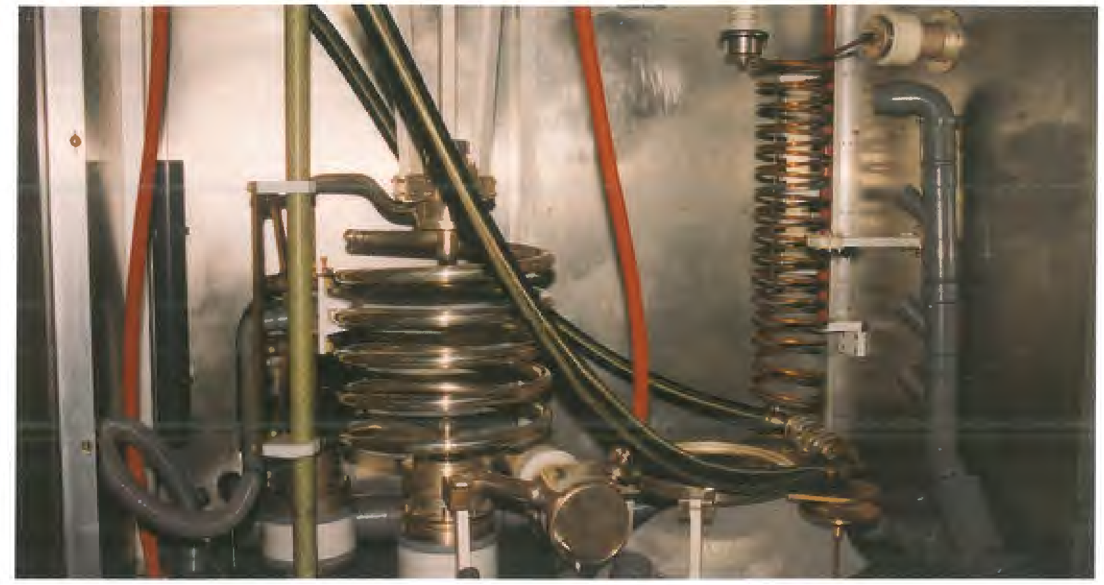
The transmitter is normally tuned automatically. There are fourteen tuned elements in the transmitter and each is controlled by a servo motor and an optical coupled absolute position indicator which provides digital feedback to the control system.

A second group of frequencies are memorised as the transmitter operating frequencies and frequency change is normally accomplished by selection of these memory channels.

The transmitter is controlled through a number of dedicated microprocessors having individual responsibility for various functions within the transmitter.

A video colour display module is incorporated in the transmitter control panel which indicates the transmitter status. Alarm messages appear as part of the display. Alarm events are logged in the controller memory and can be scrolled through for maintenance purposes. In the event of a fault, plain language messages are displayed in conjunction with faults to assist in fault resolution.

GRAHAM BAKER



Part of RF section prior to installation of tube.

11kV switchgear and 11kV/400V step-down transformer.

Heat exchanger unit.

OUR BROADCASTING PIONEERS

MR E J (JIM) WILKINSON

Jim Wilkinson joined the Postmaster General's Department as Junior Mechanic-in-Training in 1937, following education at University High School, Melbourne.

On completion of training, Jim began his career in broadcasting at the Melbourne ABC studios working on new Lonsdale Street studios to replace the Russell Street studios. An interesting feature of the new equipment was a program switching facility employing motor uniselectors.

He continued studies with the intention of passing the Open Engineer's Examination, and having gained passes in Transmission and Natural Science subjects, was posted to the office of the Divisional Engineer, Radio as an assistant to engineering staff. At the time, work had commenced on the design of the International High Frequency Transmitting Station, Shepparton (later Radio Australia) and Jim became involved in the project. His first task was establishment of cabling diagrams and jumpering schedules for the control circuits associated with the automatic transmitter-to-aerial switching, and for aerial reversing and slewing schemes.

Jim Wilkinson.

He moved to the site during 1942, and as he had by then gained passes in the remaining subjects of the Open Engineer's Examination he was advanced as Acting Engineer and assigned to field work concerned with the tuning of the aerials, testing of transmission lines and the commissioning of the external plant facilities.

On both the Government and Industry sides, the project acted as a magnet for technical people who wished to become associated with such an exciting and massive radio engineering project carried out at a time when the nation was heavily committed to the War effort and the consequent difficulties in obtaining skilled staff and necessary materials, components and equipment.

Jim later became involved in the provision of VHF radio navigation facilities for the Department of Civil Aviation. This was one of the last activities in which the PMG's Department carried out this type of work before the DCA established its own technical organisation.

With Government decision to begin trials with Frequency Modulation broadcasting, Jim was a member of the group responsible for undertaking a program of tests using a transmitter built in the Melbourne Workshops and installed at Jolimont, on the site occupied by the Central Office Radio Section headed by Horrie Hyett, Supervising Engineer.

Following this work, he transferred from the Victorian administration to Central Office working on AM and FM projects before becoming the first Divisional Engineer Radiotelephone Systems. Beginning with single channel and mobile VHF systems of 12, 24 and 60 channels followed by 960 channel systems, and planning for the Sydney-Cairns SEACOM microwave system.

Jim made a brief return to the Victorian Administration prior to the Melbourne Olympic Games to assist with upgrading of Radio Australia, Shepparton facilities including provision of air cooled modulator valves to replace water cooled types and new aerial switching facilities.

Back in Central Office, he then became associated with planning of the Radio Australia Booster Station to be installed near Darwin to improve signal strength of Radio Australia transmissions into South East Asia target areas by employing 250 kW transmitters.

About that time, TV was undergoing great expansion throughout the nation and Western Australia was linked with the eastern States by a broadband microwave system, so this was a busy period for Jim in Central Office.

In 1968, he was appointed Assistant Director General, Radio and spectrum management became an important part of his responsibilities.

Three years later, Jim became the Australian Broadcasting Control Board's Director of Engineering and in 1976 transferred to the Postal and Telecommunications Department as First Assistant Secretary Radio Frequency Management. With the P & T Department he became deeply involved in ITU activities as Admin Councillor and Leader of Australian delegations to WARC, CCIR meetings and Plenipotentiary Conferences. It was a great honour when he was the first Australian to be elected Chairman of a CCIR Plenary Assembly. He also became involved with satellite developments, especially BSS.

When the Australian Broadcasting Tribunal began the Cable and Subscription Television Inquiry, Jim was appointed part time member and in 1983 transferred from the P & T Department to the ABT to become Engineer Member.

In 1984, he resigned from the ABT to have a last burst as a working Engineer as Programme Controller, South Pacific Telecom Development Programme based in Suva, Fiji, where a great deal of work was associated with satellite options.

Since returning to Australia he has been associated with Imparja TV Pty Ltd, a satellite delivered TV service and with The Republic of Nauru in its planning of telecommunications and broadcasting. Other activities have included involvement with AM and FM Commercial stations and representing Consumer Organisations at Standards Committee meetings on telecommunications and broadcasting consumer equipment standards.

In 1978, Jim was awarded the Imperial Service Order, and during 1979-80 served as President of the Institution of Radio and Electronics Engineers, Australia.

JACK ROSS

MT HOPEFUL TOWER

NOW YOU SEE IT, NOW YOU DON'T!

Perched high on a mountain ridge approximately 40 kilometres south of Rockhampton in Queensland, were two large broadcasting towers. The newest and stronger of these was built in 1990 to replace the other as part of the Federal Government's Equalisation Program.

The original 152m high tower was built in 1963 as part of the Phase 3 Television expansion into the regional areas of the country, and was designed to support Band 2 antenna array (National TV) and a Band 3 array (Commercial TV). A light weight leg mounted FM antenna array was added during the early 1980's.

After extensive analysis of a number of upgrading proposals, it was concluded that it would be more economical to construct a new tower to accommodate all of the Band 2, Band 3 and UHF services required for Equalisation at this site. Consequently, after commissioning the new tower and cutting across all services, the original tower was to be removed.

Tower disappearing over mountain side.

Band 3 column on the ground.

Induced collapse was determined to be the most economical method of demolishing the tower. With the transmitter building and new tower on one side and the commercial transmitter building within reach on the other side, there remained only one corridor available to collapse the tower. This was to the northwest and required the permission of the Queensland Department of Lands, responsible for the mountain side upon which the tower was to collapse.

The use of explosives to induce the collapse was not favoured as the risk of initiating an undesirable collapse mechanism by misfires or undersized charges, causing the tower to fall outside its corridor, was considered relatively high. Also, the large charges necessary to cut the tower leg sections created problems of containing metal fragments travelling at extremely high velocities. Consequently a more controlled method of collapsing the tower was sought from experts in the demolition industry.

Early on 24 August 1993, after 2 days of site preparation, the collapse was initiated and the tower gracefully bowed to progress by keeling over and progressively wrapping itself into the mountain-side in a cloud of dust.

The collapse of the tower was induced by the careful removal of some of the primary members in the bottom portal and jacking one tower leg enough to upset the tower stability. A favourable wind aided the process and the tower was reduced to a crumpled mass of steelwork layed out over a length equivalent to its original height within a period of 15 seconds from the activating of the jacks and completing the final cut. Another three weeks of work was necessary to remove the remains. The WIN-TV cable duct, located in close proximity to the tower, was protected throughout the work with steel plates and crushed rock.

The demolition method allowed the collapse initiation to be fully controlled. The tower behaved as predicted, landing on the centreline of the corridor. Although the procedure was relatively simple, a lot of planning and preparation was necessary. This included three-dimensional computer modelling to accurately predict the behaviour of the structure at each phase. Video cameras were used to record various aspects of the collapse event to enable a better understanding of the collapse mechanisms of such a structure.

TOM GLASS

ANTENNA UPGRADE

Radio Australia Shepparton commenced operation in May 1944 with two 100 kW transmitters, one 50 kW transmitter and twenty four single band antenna systems. In 1960/61, the station had a major upgrade of transmitters, antennas and the installation of an antenna matrix switch. After this upgrade, thirty six single band antennas were available for use via the matrix switch. The next major phase of work was in 1991 when a 500 kW matrix switch was installed to provide for seven transmitter inputs and twelve antenna outputs. Eleven of these outputs were connected to two-position field switches which allowed for connection to twenty two of the single band antennas.

Early in 1992, work was put in hand to upgrade the antenna system by:

- The installation of five new multiband curtain antenna systems complete with support structures.

- The installation of five new transmission line systems, complete with steel supporting poles to feed the new antennas.

- The installation of slewing facilities on the J Group of antennas.

- The removal of all antenna systems no longer required.

A contract was placed with TCI for the supply of five multiband antennas and associated transmission lines, with the antennas comprising:

- PX1-type HR2/3/0.4 with operating band 9-14 MHz, on boresight of 030 degrees.

- PX2-type HR2/3/0.4 with operating band 6-12 MHz, on boresight of 030 degrees.

- PX3-type HRS4/4/0.5 with operating band 9-18 MHz, on boresight of 050 degrees and operational slew positions 030-050-070 degrees.

- PX4-type HRS4/4/0.5 with operating band 6-12 MHz, on boresight of 070 degrees and operational slew positions 050-070-090 degrees.

- PX5-type HRS4/4/0.5 with operating band 11-22 MHz, on boresight of 070 degrees and operational slew positions 050-070-090 degrees.

Of the thirty six single band antennas that were available in 1961, only six J Group antennas are still being used. The others have been replaced by the five new multiband antennas. The slewing facilities now available on the J Group of antennas comprise:

- J6-6 MHz band antenna on boresight 350 degrees and operating slew positions 335-005 degrees.

- J9-9 MHz antenna on boresight 342 degrees and operating slew positions 329-355 degrees.

- J11-11 MHz band antenna on boresight 342 degrees and operating slew positions 329-355 degrees.

- J15-15 MHz antenna on boresight 342 degrees and operating slew positions 329-355 degrees.

- J17-17 MHz band antenna on boresight 342 degrees and operating slew positions 329-355 degrees.

- J21-21 MHz band antenna on boresight 342 degrees and operating slew positions 329-355 degrees.

One of the features of the new installation is that transmission line support poles have been fabricated from tubular steel sections. The original poles were timber and were subjected to termite attack. Also, water absorbed by the timber during rain resulted in variation in VSWR.

Work began in November 1992 with clearing of facilities from the South Paddock followed by survey work to fix the locations of masts, guy anchor footings, antenna tie-down ropes and transmission line pole positions.

This was followed by the installation of concrete footings by a local contractor. In all, over ninety truck loads of concrete were required to complete the work.

The six masts and transmission line poles were erected under contract by EPT. Two of the masts were ex-Radio Australia, Cox Peninsula, and were upgraded by replacing bolts and repainting. The other four were new structures purchased for the project.

One of the three slewing switches.

Control cabling and power cables were laid out to the slew switches by station technical staff.

Two lines crews erected the antennas, a Victorian lines crew led by Dave McCormack and a Western Australian lines crew led by Alan Johnson. Help was also obtained from the local Engineering Services Section. These crews all worked long hours and did a magnificent job.

The entire project has been a credit to all contractors and Telecom Broadcasting staff, and the station now has a top class antenna system.

The final part of the project will be to remove the antennas in the A and P Groups which are no longer required, and also, to remove the old matrix switch which provided sterling service for some 30 years.

MARK STEVENS

BELLENDEN KER TV

REPAIRS TO POWER LINE TOWERS

The National Television site to service Cairns and the surrounding hinterland, is situated at the peak of Bellenden Ker, just north of the town of Babinda in far north Queensland. The station is 1000 metres above sea level, and about seven kilometres from the sea. The entire area is National Park rainforest, and is World Heritage listed. The locality is among the wettest in Australia, with an average annual rainfall measured in metres (around 4,000 mm at the foot of the mountain, while at the transmitter building the average is around 7,000 mm per annum). The highest recorded rainfall for 24 hours at the station has been 1170 mm.

Access to the site is gained by means of an N.T.A. owned cable way 5.4 km in length with passenger car attached, similar to those used in the alpine regions of Europe. Authority mains power to the site is provided via an N.T.A. owned 22 kV, one megawatt, three phase power line which runs parallel to and about 100 metres to the north of the cable way. This is supported by steel transmission towers along its length.

Telecom Construction staff dismantling part of transmission line tower as helicopter prepares to lift away a section.

The constant high humidity, coupled with corrosive salt laden air caused by prevailing winds from the adjacent Coral Sea has a detrimental effect on steel work associated with this station and constant maintenance and repair work needs to be undertaken. Recently, replacement of several sections of the Power Line towers became necessary, and the expertise of Telecom Broadcasting Construction staff was employed for this task.

CO2 Ian Tyers welding at the top of one of the power line towers.

Due to the innaccessible locations of the power line towers, the need to protect flora and fauna from damage, and the need to complete the work during infrequent favourable conditions, replacement tower sections were fabricated and transported to site at the bottom station of the access cable car. When the weather was favourable, Construction staff travelled by cable car to the nearest convenient point to the relevant towers and then climbed down to the ground and moved all required tools and equipment across country to the power line tower. As the offending sections were removed, the services of the Bureau of Emergency Services Bell 402 helicopter were employed to lift away the old section to the foot of the mountain and then deliver the replacement section for fixing in place. As with similar jobs of this nature performed by Queensland Construction staff, the job was completed on schedule, with no environmental damage.

DES ALLEN

View of the access cableway with the red cable car in transit.

GOSCHEN TV MAST

WINDS LIGHT TO VARIABLE - MAST MOTION LARGE!

Reaching 202m about the wheat fields of Goschen in north-western Victoria, stands a relatively new broadcasting mast. This structure was erected in 1991 to support the Band 1, Band 2, Band 3 and UHF services required as part of the Federal Government's Equalisation program in Victoria. The original 152m mast is ultimately to be removed.

The top 20m of the new mast consists of a 5 sided high power UHF antenna array. Shortly after installation of this antenna it was noted that the whole antenna column developed dynamic oscillations on days of light winds. In certain conditions the amplitude of the oscillations became disturbingly large with the top guy level of the mast becoming excited also. Oscillations frequently continued to varying degrees for lengthy periods until there was a significant change in wind speed and/or direction.

Through observation of wind speed and direction relative to the antenna motion it was soon concluded that this phenomenon was being caused by a form of wake excitation commonly known as 'vortex shedding'. The phenomenon is most commonly linked to slender bluff-bodied structures with a circular cross-section. The air flow around the bluff-body at critical wind speeds creates a cycle of vortices forming and shedding on alternate sides behind the body. The associated alternating net wind drag forces cause the body to oscillate perpendicular to the wind direction and when combined with along-wind motion, produce an elliptical motion. The critical wind speeds for the initiation of this motion is dependant on the diameter of the bluff-body. The motion is degraded by high levels of air turbulence.

Although the 5 sided UHF array approximates to a circular cross-section, its relatively irregular profile was originally considered to create enough turbulence to negate vortex-shedding effects. However, it is apparent that in relatively light air flows with low turbulence, common at the Goschen site, vortex-shedding effects dominate.

It is thought that this low turbulence is associated with stratification of air flow, typically over flat terrain in conditions where thermal activity due to solar heating is minimal. At Goschen these conditions are common, particularly early and late in the day. Although the antenna oscillations were not having a significant effect on the broadcast signal, a solution had to be found to minimise the fatigue effects on the UHF support column.

The magnitude and frequency of the oscillations relative to the wind speed and direction were confirmed using specially developed instrumentation. A set of orthogonally orientated accelerometers were installed at both the top and bottom of the UHF antenna column, and anemometer/wind direction units were mounted clear of the structure on two sides below the antenna.

After some investigation a solution was developed utilising two Tuned Liquid Damper (TLD) units installed at the top of the antenna column to absorb the energy of any induced motion. One TLD was tuned to the vortex-shedding excitation frequency and the other TLD tuned to the closest natural frequency of the total mast structure to the excitation frequency. The combined effect is to eliminate approximately 90% of the resonant motion and hence reduce the number and amplitude of the loading cycles to within acceptable limits.

The TLD's consist of galvanised steel cylindrical tanks, doughnut shaped in plan to allow access through the middle. The tuning is a function of tank diameter, liquid depth and positioning and size of internal baffles. The total mass of liquid required to achieve effective damping is a function of the mass of that section of the structure being excited.

The installation of the TLD's was not an easy feat. The sealed TLD's had to be lifted and fastened to the top assembly of the antenna, which is no more than 1.2m wide at its widest point. This was achieved using a specially developed 3m high 5 sided lifting frame mounted on the top assembly of the antenna. The frame supported a monorail which projected from one face.

As the UHF antenna broadcasts a number of services including Prime and Vic-TV, broadcasting outages were restricted to approximately 1:00am to 6:00am - hours of darkness. Bear a thought for the team working in a wind 200m above ground, at night, mid winter, with barely room on the top of the antenna column to place two feet. Notwithstanding these difficulties, the two TLD's were installed over three nights, including the assembly, rigging and dismantling of the lifting frame.

Original 152m mast (L) and new 202m mast at Goschen.

Since then, a quick degradation of any induced motion of the UHF antenna column has been observed, confirming the TLD's are working as predicted. Further monitoring using the instrumentation is proceeding to better quantify the fatigue life of the structure.

TOM GLASS

TRANSMISSION LINES

5AN/5RN PIMPALA-TRANSMISSION LINES PUT UNDERGROUND

When 5AN/5CL Adelaide were transferred from Brooklyn Park to a new site at Pimpala, a 168 m dual frequency radiator was erected with both transmitters feeding into the radiator. The station was officially opened on 20 September 1961 with 5AN operating with 10 kW STC 4-SU-36E main and 2 kW standby transmitters while 5CL operated with 50 kW STC 4-SU-38 main and 10 kW STC 4-SU-36E standby transmitters. The 5AN transmitter was later replaced with a 50 kW STC 4-SU-38DL main unit and 5CL call sign recently changed to 5RN in line with Radio National programming format.

Power was fed from each transmitter by means of separate above ground coaxial lines of nominally 200 ohms characteristic impedance, terminating at the coupling hut at the base of the mast. The lines comprised four earthed conductors, one at each corner of a 280 mm square, and two bridged centre conductors forming the inner of the coaxial line supported about 38 mm apart on glazed brown porcelain insulators. Conductors were 7/14 gauge hard drawn copper wire.

The coupling system employed two units provided for matching the characteristic impedance of each transmission line to the resistive component of the aerial at the appropriate frequency, two selective units each designed to be resonant to the frequency of its corresponding coupling unit and anti resonant to the other frequency provided in series with the output of each coupling unit, and an aerial tuning unit in which the power from the transmitters was combined, providing reactance elements which tuned out the aerial reactance at each frequency.

The transmission lines performed well from a technical point of view over more than 30 years but unfortunately the station property is now surrounded by housing, is alongside a busy road and is no longer staffed on a full time basis with Officer-in-Charge residing on the site.

The transmission lines each carrying 50 kW of RF power were only approximately three metres above ground level, and in the interests of public safety, decision was made to replace the above ground coaxial lines with 75 mm diameter air dielectric coaxial cables of 50 ohms characteristic impedance enclosed in buried concrete box culverts. The cable which is type HJ8-50 Heliax series has inner and outer corrugated copper conductors with an outer jacket of black polyethylene. Peak power rating is 320 kW so each cable operates well within capability.

Because of change in the line impedance, impedance matching changes had to be made at each ends of the lines. Each of these four new impedance matches had individual problems requiring individual solutions. Fortunately, most of the problems were anticipated in advance by the usual modelling techniques and computer analysis. Guiding the computer at times required considerable skill and experience to solve the many problems.

One of the major problems during installation of the new facilities was to undertake the changeover with the least amount of disruption to both of the services which operate for 24 hours daily and are Adelaide's major high power National MF services. Safety of the workforce was top priority at all phases of the operation. The new facilities were brought into service at the end of May 1993.

TOM PASCOE

Jim Finch (L) and Mick Elliott on site during progress of the work.

QUALITY ASSURANCE

The pathway to Quality requires attention to two key aspects:-

- Quality Assurance
- Continuous Improvement

Quality Assurance implies defining and documenting all the activities of the business and then following these documented procedures quite rigidly each time the activity is performed, to make sure that any waste and/or rework is eliminated from the process.

Various descriptions are given to this process as alternatives to the term "Quality Assurance". Common examples are "stabilise the processes" and "have the processes under control" but the term "Quality Assurance" really says it all. It is a proven way of assuring that a consistently good product or service is provided each time the activity is performed.

It is important to remember here that what is a "quality product" or a "consistently good product" can only be determined by the customer - the person receiving the product. The customer is the first and final judge of quality.

Following the same procedures each time the activity is performed will ensure that a consistent product (or service) is provided every time, eliminating waste, rework and duplication of effort - three very large contributors to unnecessary costs.

Telecom Broadcasting is establishing Quality Assurance of its processes at the present time, by documenting the work practices used in all areas. When complete, this process will allow certification to AS 3901 the relevant Australian Standard for this type of business, indicating that all work procedures are in place and being followed.

When AS 3901 is gained, improvements will be continually sought to the way activities are performed. This is the continuous improvement aspect of Quality. It is important though, that the work activities (processes) be under control prior to attempts being made to improve them. Much time, money and effort would be wasted by attempting to improve processes that are unstable.

When process improvements are made after Quality Assurance is achieved they will result in one or more of the following:

- better service to the customer
- a reduction in the cost of providing the service
- provision of a wider range of services

At all times Quality must be completely transparent to the business processes that are being performed. Quality is not a different task that is done. Rather, it is a different way that the normal work processes are done, so that the waste, rework and complexity that are inherently present in the normal processes are removed, allowing significant savings to occur.

The way Telecom approaches and measures continuous improvement is described by the Telecom Continuous Improvement Matrix.

This matrix encourages investigation of seven specific areas of the business and also allows the extent of use of quality principles in these areas to be measured, thus providing an overall rating of continuous improvement.

Use of the matrix as a measuring gauge at regular intervals will then show the extent of continuous improvement throughout the business.

GRAHAM SHAW

8RN DARWIN

NEW STATION FACILITIES FOR THE TOP END

The oldest Medium Frequency broadcasting station in the Top End of the Northern Territory originally known as 8DR Darwin, started off as an Army Amenities station installed by Postmaster General's Department staff in February 1945 and operated by Army personnel. It was later handed over to the Department and incorporated in the National Broadcasting Service in March 1947 following relocation and upgrading work to suit ABC programming requirements.

Over the years, the service has been very reliable and rarely let the listeners of Darwin down without good reason. In the northern coastal tropics of Australia there are many good reasons for concern such as frequent direct lightning strikes, high winds, cyclones, persistent heavy rains, power failures etc. The station has coped with all these problems and recently the corroded steel radiator was replaced to improve chances of survival should another cyclone hit the area.

During mid July 1993, the old mast was dismantled and a new one erected, freshly painted and equipped with hazard lighting and top loading wires. Whilst all this work was in progress, the broadcast service was maintained using a TEBS mast and aerial coupling unit close to the transmitter building, and transmitter power set to 1 kW.

For the old mast, it meant the end of 30 plus years of faithful service which is surely a great credit in the tropical environment it has endured for so long. It was first erected at the Blake Street Telecom site in 1959 and later moved to the Douglas Street tidal and swampy site in 1965.

The first overall system installation at Douglas Street in 1965 consisted of two Philips transmitters in main/standby configuration feeding the aerial via an above ground unbalanced 200 ohm transmission line suitably matched to drive the mast base.

Having survived cyclone Tracy in December 1974, the first change was to replace the above ground feeder with a buried 50 ohm coaxial feeder about 1976. A year or two later, the two transmitters were replaced by a pair of 1 kW STC 4-SU-125 units operating in a parallel configuration producing 2 kW to the aerial.

In 1987, the station was equipped with facilities to broadcast the new Radio Regional stereo program that the ABC Darwin studios were starting to produce. Unfortunately, AM stereo did not become as popular as originally thought, and the ABC management made some changes to their broadcasting format. This was made possible by extra FM transmitting services provided at the Hudson Creek site.

About a year later, the Darwin Metropolitan Service which replaced Radio National became known as 8DDD and started transmitting from the FM transmitter at Blake Street. The 8ABC-FM Stereo shifted from Blake Street to an FM transmitter at Hudson Creek leaving 8DR to become the broadcaster of Radio National which was, and still is mono program. Thus, many of the modifications and adjustments made to the 8DR transmitter/aerial complex to introduce the C-Quam stereo system became unused.

As a result of the change to Radio National and to keep in line the ABC's policy, 8DR became 8RN which despite all of the changes, still has an important role to play, and later this year the Douglas Street transmitting complex will undergo many more significant changes.

The greatest changes will occur when modifications are made to introduce a second 2 kW MF service in the form of 8TAB on a frequency of 1242 kHz which is nearly double the frequency of 8RN on 657 kHz.

Another buried feeder between aerial will be required together with a dual frequency aerial coupling unit.

Inside the transmitter building, changes will be necessary to accommodate new solid state transmitters for both services. For Radio National, decision was made to stay with the previously established policy of using two transmitters always 'on' and operating in parallel mode. On the other hand, the NT Racing Commission who are the providers of the 8TAB program have opted for a single transmitter running at slightly under maximum power capacity.

Original 40m mast being dismantled.

The transmitters for both services are to be made by Nautel of Canada. Station 8RN will use two ND1's plus combiner whilst station 8TAB will use one ND2.5 transmitter.

With all this sort of new work going on, the broadcasting site at Douglas Street will continue to operate and fulfill its important task of service to the community of Darwin and surrounding district.

TOM PASCOE

VLW PERTH

Station VLW located at Hammersley near Perth, was commissioned on 1 December 1939 to provide an Inland HF service to remote areas of Western Australia.

Co-sited with 6WF, it operated with a power of 2kW into aerials on frequencies of 9560 and 11830 kHz. The aerials consisted on single wire dipoles and reflectors suspended between Oregon masts.

The equipment operated in its original configuration through the 1940's, but by the mid 1950's, consisted of rebuilt RF and PA stages driven by ex-Services AT13 transmitters tuned to the two operating frequencies.

By 1950, the need for improved reception in some areas led to the purchase and installation of an additional HF transmitter. It was a water cooled 10 kW unit of STC manufacture and operated on frequencies in the 11 and 15 MHz ranges with call sign VLX.

VLW and VLX continued to operated until replaced by new STC transmitters in a new building during 1962/63. This plant, still in use, consists of two 10 kW units STC 4-SU-48B and one 50 kW STC 4-SU-61. The 50 kW transmitter is the only one of its type still in service in Australia. The modulator consists of two Machlett ML6427 valves in Class B push-pull, modulating two RFPA Machlett ML6427 valves in Class C push-pull giving the required 50 kW.

Improved aerials were provided for the new transmitters, two 10 kW units on 6 and 9 MHz, and two 50 kW units on 9 and 15 MHz. Each consisted of one or two dipoles, with curtain reflectors, suspended between 40 m guyed masts. It was also around this time that the VLX callsign was discarded, the services from then on being known as VLW9 and VLW15 operating on frequencies of 6140, 9610 and 15425 kHz.

DEREK PROSSER/LLOYD JURY

VLW main 6 and 9 MHz aerial systems.

VLW 10kW, 6 and 9 MHz transmitter, STC type 4-SU-48B.

VLW 50kW, 15 MHz transmitter.