Diamond Jubilee

For Woolerton’s Wireless Wonder

In late June 2003 Rob Mannion G3XFD, fulfilled a long held ambition to visit the Woolerton short wave broadcasting station in Shropshire. Although no longer owned by the BBC, it still transmits the World Service...and many other programmes too!

The former BBC Woolerton h.f. transmitter station, which celebrates 60 years service in October 2003, is located right on the Shropshire/Herefordshire border, directly alongside the main A49 Hereford to Shrewsbury Road and has always fascinated me. During my days with the former Independent Broadcasting Authority (IBA) I was privileged to visit all of the “Wartime Three” high power short wave transmitters...except Woolerton. Anyone - let alone a radio enthusiast - could not fail to be impressed at the 300 plus acre site which seems to dominate the area alongside the A49. Indeed, whenever I’ve stayed at the Woolerton Travelodge - only separated from the massive antenna farm by the main Hereford to Shrewsbury railway - I find it amusing to hear the familiar tones of the BBC World Service coming from the front door intercom system’s loudspeaker as the station transmits programmes on frequencies ranging from 6 to 21MHz.

So, after many years of admiring the station from a distance...I was delighted to visit the installation along with Kevin Niece G7TZC/M3NGS, Editor of Short Wave Magazine. Kevin and I weren’t to be disappointed...we had a truly fascinating day.

I should also mention that Tex Swann G1TEX/M3NGS, who along with his other work, acts as the PW transmitter Engineer (STE) for his shift. All the Woolerton team were available to visit the Woolerton visit...Dave Porter G4OYX. Of course, the prime mover of the event, was Senior Transmitter Engineer (STE) Dave Porter G4OYX. Dave, a dedicated professional Engineer since the early 1970s is seen posed alongside his car, Fig. 1. I couldn’t resist photographing the G4OYX callsign number plate, and the ‘reception’ notice. Dave is one of the few Radio Amateurs who regular operates 300kW plus a.m. transmitters!

I’ve even tried to photograph the site from the very popular v.h.f. site at Clee Hill which is about 16km (10 miles) away. It didn’t work, the mast can be seen, but the telephoto pictures lose the details of the antenna systems. Incidentally, the transmitter buildings directly behind Dave G4OYX, are interesting as they’re of war Second World War vintage. Unusually for broadcasting, the whole site had to be engineered without the use of basements and underground work because of the very high water table. (Water can be found literally less than one metre down on this site!). The ‘Utility’ style of the brickwork provides a strong clue to the origins of Woolerton. And in fact, the site came into existence directly as a result of the ‘Radio War’.

However, before I go any further I must pay tribute to my favourite, and extremely valuable, reference source...BBCEng 1922 - 1972, (BBCEng) by Edward Pawley. This absolutely superb, fascinating to read book (now a standard reference work) is unfortunately now out-of-print but can be purchased second-hand (Nothing can persuade the BBC to re-publish it). Whilst mentioning BBCEng...if any of our readers has a spare copy for sale...Kevin G7TZC from GMW would like to hear from you! (I was fortunate enough to buy mine from a reader who answered my advert for a copy in PW during 1990).

It’s also worth noting that BBCEng pays tribute to the work of Radio Amateurs in Chapter 5, (entitled Short Wave Broadcasting). Here the author...
lists many well known Amateur pioneers who were also on the staff of the BBC itself.

However, in sharp contrast to the present day BBC (who paid scant tribute to the pioneers during the recent 70th anniversary of the short wave services) Pawley provided a well written tribute to the pioneers. He particularly draws attention to the work of Gerald Marcuse G2NM. It was G2NM who, after he'd established regular h.f. contacts with another Amateur in Bermuda, had the idea of broadcasting to the Empire.

From that initiative...with special permission from the then Postmaster General...the reliability of short waves for one of the largest short wave transmitting stations - Skelton - in Cumbria is made up from two separate transmitter units on one large site. These joined the pioneering original (now closed and demolished) Daventry transmitter and numerous other temporary short wave sites - mainly at existing transmitters).

Although often referred to as 'The Big Three...in practice Wooterton, Rampsham Down in Dorset, are in reality four. This is because the other station - Skelton - in Cumbria is made up from two separate transmitter units on one large site. There are other temporary short wave sites - mainly at existing transmitters).

The wartime supply of the transmitters caused (to quote BBCEng) "Some anxiety...and by January 1943 only one had arrived...but the remaining five were delivered in time for the station to open on 17th October 1943". The tipping underestimation regarding the "anxiety" somewhat disguises the tragedy behind the prolonged delivery of the transmitters.

The true facts are chilling...because the ship carrying the originals from the USA was in a convoy attacked by German U-boats and was sunk. My research indicates it took another five separate attempts to get all the RCA transmitters to the UK...by sending them in individual shipments. A classic example of not carrying all your eggs in one basket.

Fascinating History

Wooterton, the main subject of this article, has a particularly interesting history. And part of this was due to the high water table on the site. Unable to use Marconi transmitters - which required basement 'crypts' to house the valve cooling plant - the BBC ordered 50kW transmitters from the Radio Corporation of Americas (RCA) in 1942. The wartime supply of the transmitters caused (to quote BBCEng) "Some anxiety...and by January 1943 only one had arrived...but the remaining five were delivered in time for the station to open on 17th October 1943". The tipping underestimation regarding the "anxiety" somewhat disguises the tragedy behind the prolonged delivery of the transmitters. The true facts are chilling...because the ship carrying the originals from the USA was in a convoy attacked by German U-boats and was sunk. My research indicates it took another five separate attempts to get all the RCA transmitters to the UK...by sending them in individual shipments. A classic example of not carrying all your eggs in one basket.

Antenna Arrays

The original antennas at Wooterton had 26 separate arrays for world coverage. They were supported between 15 stayed lattice masts ranging in height from 48 metres (158ft) to 99 metres (325ft).

The illustration, Fig. 2, is from a contemporary black and white postcard, originally owned by my Grandfather Fred Durnford 2FD, and now in my collection. It depicts a typical beam antenna array of the period, but at Daventry in 1937. (A photograph of the same installation appears on plate VII between pages 42 and 43 in BBCEng).

The modern antenna systems in use at the station comprise single band, dual band and four band arrays working within the station's 6 to 21MHz frequency coverage. However, there is one 'odd man out' antenna fitted between all the h.f. antennas...and this is the medium wave radiator for the BBC local service for Shropshire. Although - when viewed from the nearby roads - the antennas look incredibly complicated...Dave G4OYX soon removed the mysteries. In fact he made sure we understood that nothing on site was complicated...it's just larger, and uses higher power when compared to our own transmitters and antenna systems.

Put simply...the antennas use arrays of 'stacked' wire dipoles arranged above each other. The system is then fed and phased so that maximum forward gain is provided. They are also extremely difficult to photograph, although Kevin G7TZC in the Fig. 3 (inset), made an excellent attempt!

Each array has a reflector curtain mounted one quarter wave on the operating frequency behind it. The Four band arrays can be directionally skewed electrically (by altering the 'phasing') to a maximum of 30°, whilst the single and dual band arrays can achieve between 10 to 15°. Dave commented that it might not seem much...but enabled (for example) the beamed coverage to be changed from Czechoslovakia (Now the separate countries of The Czech Republic and Slovakia) to the former Yugoslavia. The antennas are fed by open wire feeders, Fig. 4. All antenna switching and slewing is carried out remotely by a system in the main antenna service for Shropshire.

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interest seemed at the same level as the high voltage r.f. above us...as the occasional cracking we could hear coming from the massive working arrays high above our heads!

Power Supplies
The power supply for the station was originally usually taken from the then public supply, but three 750hp diesel alternator sets were installed for emergency purposes. The turbo-charged diesel units were fully capable of powering the station on full load when working together.

Nowadays Wooferton is a very much valued customer of the regional electricity supply company. The supply comes in via the station's own substation from the S38V10KV distribution network.

Many Programmes
Many programmes, from a wide variety of countries and service providers are transmitted from Wooferton - and some of them proved to be a surprise! For example, although I realised there was a great deal of co-operation between broadcasters...I had no idea that Wooferton could sometimes be transmitting Radio Netherlands (RN) service (either in English or Dutch) to assist, while maintenance takes place in Holland.

The station has also had a long association with the Voice of America service which started in 1942. Indeed, for a period in the 1960s and 1970s the transmitter was heavily involved with VOA services. Obviously, the main work is for the BBC, as Wooferton is contracted to transmit on behalf of the BBC.

However, we also found out that along with carrying a number of religious broadcasters' programmes...an International short wave service for Wales is transmitted!

While we were at the station some transmissions were being beamed to Iraq. It was fascinating to see the control room where programme links, and feeds were being monitored. The equipment here is ultra-modern and we were even able to change the beam direction on one (not on the air!) antenna array within a few seconds. It’s even possible (via satellite and computer links) to get received signal field strengths from monitoring points many thousands of miles away!

Land-lines can be used for incoming services from the BBC’s Bush House Centre...but nowadays a great deal of material comes via satellite links. In the control room Kevin and I were able to see many miniature (i.e.d.) TV screens associated with satellite links where — along with the television pictures - sound programme links are also transmitted.

Marconi Stalwarts
Although Wooferton has more recent, almost state-of-the-art - high power valued transmitters in its magnificent main hall. Fig. 2, some of the older Marconi ‘Senders’ are remarkable.

Incidentally, the term ‘Sender’ is a historic term for transmitters dating from the early days of broadcasting. The BBC’s ‘Senders’ were then numbered from one onwards.

Sender 92, Fig. 8, was actually ‘on the air’ as Kevin photographed it...and we could see the high power valves under load - with the anodes and screens of the triodes and tetrodes glowing. The ‘evaporative’ water cooling system was entrancing to watch...but we were kept well clear of the e.h.t. by safety glass panels.

What’s truly remarkable about Sender 92, a Marconi BD 272 250kW (Senders 91 to 96 are all of this type) is that they were installed in 1964. And nearly 40 years later thanks to Marconi (and not least the dedicated station staff who seem to have to be plumbers as well as radio engineers!) these magnificent units are still running...very well indeed. Inside they’re a mixture of very simple transmitter technology (very reminiscent of pre-war Amateur Radio) re-engineered for very high power and reliability.

As you might expect...TVI precautions had to be taken! However, it’s interesting to read in BBCEng that even in the old Band I and III 405 v.h.f. TV days...the filters fitted by the BBC staff were very effective. And this was despite the station being located in an area suffering from low field strength TV reception from the Sutton Coldfield (near Birmingham) television transmitter.

Tradition Ends
A great tradition came to an end when the BBC sold off their transmitter sites. The sell-off in March 2007 was part of the move to provide funding for the introduction of digital broadcasting services.

The short wave broadcasting sites were actually sold to Merlin Communications International Ltd during the first week in April 1997, in a Management/Staff buy-out deal. The long and medium wave transmitters, along with v.h.f. and u.h.f. sites were sold to another company, Castle Transmissions Service (Now Crown Castle).

However, both companies still transmit BBC programmes on behalf of the corporation.

In October/November 2002 Merlin was sold to Vesper Thornycroft (VT), and are they’re now known as VT Merlin Communications Ltd. Of course, VT are well known for their long history in defence equipment and shipbuilding for the navies of the world. I didn’t let this go un-noticed in PW...commissioning John Worthington GW3COI to produce a cartoon showing an old Royal Navy frigate being used as a floating BBC World Service transmitter!

Following our visit to Wooferton I’m now planning to present the original cartoon - suitably framed - to the station’s staff as a ‘Thank you’ for the wonderful day out! I’ve always taken an interest in the site...but whenever I drive past Wooferton in future...I’ll remember my visit with Kevin, and the wonderful chance to understand the work of a dedicated group of people.

Fig. 6: The photograph shows part of the antenna beam slewing system and although it may not be obvious...the pole and wires in the immediate foreground form a Pawsey stub familiar to Radio Amateurs (See text). Photo Kevin Nice G7TZC.

Fig. 7: The main transmitter hall at Wooferton. Unusually, because of the high water table...the transmitters do not extend below floor level (see text). Photo by Kevin Nice G7TZC.

Club Visits To Wooferton
Pre-arranged visits (Please see note in the text referring to heart pace-makers and the high field strengths which can be encountered on the site) by organised groups to Wooferton are possible...provided enough notice is given and the number of people in each party is limited. In the first instance Club Secretaries and others involved in organising such visits are asked to apply in writing to the Engineering Manager Barry Alding, Merlin Communications, Wooferton, Shropshire SY8 4AW. And from what I’ve heard about the club visits...you’ll have a whale of a time!

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