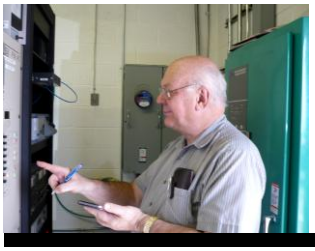

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Radio Warstories

The Story of An Interesting Match Between Transmitter and Phasor

By Ron Nott

[November 2010] Returning to the scene of his late night encounter with the wild javalinas on Catalina Island, Ron Nott finishes his story about an interesting repair job.

You may have read my description of my trip to Catalina Island, off the coast of Southern California, in which the hazards of the wildlife that live there were discussed. This time I would like to provide the rest of the story about the reason for the visit there - and how we solved the problem.

AN UNEXPECTED INSTALL PROBLEM

I had come to the transmitter site for what was then KBIG, a 10 kW station which had decided to replace their old Gates transmitter with a new Collins 820-F. The trouble was that when the local engineers connected the transmitter to the phasor input, the coils in the output network would overheat to the point of grossly distorting the copper windings and melting the Micalex spacer bars.

My task was to figure out what was wrong and fix it.

Once on site, we began studying the problem. After hours of pondering and questioning the chief engineer and contract engineer, it dawned on me that we should check the impedance match from the transmitter into the phasor. Lo and behold, the phasor input was 82 Ohms +j zero.

That, in of itself, might not seem like it should have been a problem, especially since the old Gates transmitter output, like many of that era, had been easily adjusted to match this impedance. However, the new transmitter was not quite so nimble out of the box. It expected to see 50 Ohms – quite a large difference – as no one had thought to inform the factory of the actual load.

NOT QUITE A MATCH

The FCC Rules were amended about 1950 to state that any AM transmitter type accepted after that date had to suppress all spurious emissions down to a very low level.

While Collins Radio had continued to manufacture the old faithful 21E and 21M transmitters until the mid 1960s, the time had come to introduce a new transmitter line that conformed to the new FCC specifications. To do this, the output network consisted of five L sections, transforming the plate impedance (1,000 Ohms in the case of the 820-F) to 50 Ohms +j zero.

So when the Collins output was connected to the 82 Ohm phasor input, a serious mismatch existed – one that was not easily tuned out – and resulted in cooking the coils in the output network.

LOOKING FOR A MATCH

While there were two ways to make the match (change the input of the phasor or the output of the transmitter), changing the phasor input network was not a real option. Changing the Common Point by over 40% would essentially trigger the need for a whole RF proof. On the other hand, changing the transmitter output network was not trivial either.

When the transmitter output was tuned to frequency in final test at Collins Radio, the network had to be broken at two points and bridged into a 50 Ohm dummy load. This was done using a General Radio 916 RF impedance bridge. The components had to be adjusted at each break point, then they had to be adjusted directly from the tubes (two 4CX5000s in parallel) for 1,000 Ohms plate load impedance, not a simple process by any means.

At least I had worked in the final test section at Collins when this transmitter was introduced, debugging it, and learning how to tune the output network.

BACK TO THE DRAWING BOARD

We put the old Gates transmitter back in service, and the next morning I called the plant in Dallas. At that time, Collins employed a brilliant RF network engineer named Fred Damm. He had designed the original network, so he did some math and came up with new numbers for the bridging procedure for an 82 Ohm load.

Then I needed some test equipment. Fortunately, Collins had a branch at Newport Beach, CA, so I took the short flight back to the mainland and then drove there to pick up a bridge and an RF generator.

The guys in Dallas told me to “simply” do the bridge measurements into common point of the antenna system. Unfortunately, up in San Francisco there is this big 50 kW signal called KCBS on the same frequency that came across the ocean water like a bomb. There was no way the test equipment could compete with that. What to do? Finally, I soldered three 27 Ohm carbon resistors in series and when measured with the bridge, they were close to 82 Ohms. So I tuned up the network into that load.

A MUCH HAPPIER MATCH

Afterward, when we had reconnected the Collins to the phasor input, the transmitter was happy and according to the meters was 84 percent efficient. (Actually, I suspect that one or more meters (probably

the Common Point TC ammeter) were a bit out of calibration as that was extremely high efficiency for that transmitter.)

We let the station run for a half hour with high modulation, then shut it off and quickly removed the cover of the RF output network. The coil temperatures were barely about the ambient, so we were very happy. I was very happy to leave because it was winter and, although not really cold, the humidity was near 100% and the motel rooms were not heated!

The fun part was that I got to take several rides in the Grumman Goose seaplanes between Long Beach and the island. And I must say it was a real pleasure to work with those engineers at KBIG.

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Ron Nott is celebrating his 50th year in broadcasting. The founder of Nott Ltd can be reached by email at ron@nottltd.com

Return to The BDR Menu