Tech Tips

Protecting the Inside of Your Coax/Antenna

By Bob Groome

[SACRAMENTO, California - February 2004] Stations with antennas located in a lightning prone area or with antennas driven by transmitters that can sustain an arc for more than few seconds may find nitrogen is not the best way to safely keep the antenna interior dry. In fact, using nitrogen can lead to antenna or coax failure!

Manville "Whitey" Bro (Courtesy: DuPont Co.)

Sam Garfield, CEO of Technical Broadcast Consultants (and SBE VP) directed me to Dr. Manville "Whitey" Bro, a senior chemical design engineer at E.I. DuPont.

In a conversation with Bro, whose research made the copolymer Teflon® FEP (fluorinated ethylene propylene) from the precursor PTFE, he explained the problem with using the product with nitrogen.

CHEMICAL BACKGROUND

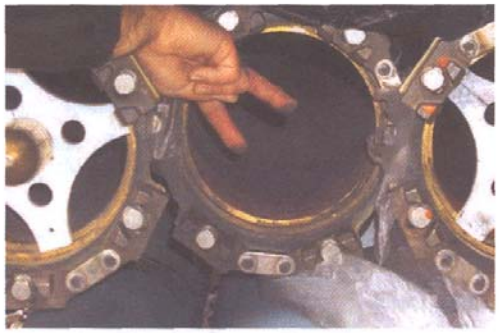
It turns out that when PTFE is heated to 500° C or so, hundreds of thousands molecules of Teflon react; CF_2 becomes double bonded CF_2. If nitrogen is used to pressurize the coax/antenna system, this double bonded CF_2 then will become CF_3 (a gas) and C (carbon), visible as soot. The chemical equation is:

$CF_2 + CF_2 + N$ + high heat = $HF + CF_2O$ (carbonate Fluoride) + C (*carbon*)

Clearly, no one wants carbon inside their coax or antenna. The results are, to put it mildly, potentially catastrophic.

A better way is to use dry air: $CF_2 + CF_2 + O_2$ + high heat = $HF + CF_2O + CO_2$ (a less damaging gas)

During an arc, the heated air expands quickly and possibly will open the pop-off value. This will allow more air to move through the system. Actually, this is good, as it will provide more oxygen molecules to bond with the CF_2 and make more CO_2. When the oxygen is depleted, C is the by-product.



Carbon Deposits (Courtesy: Sam Garfield)

So, depending on the duration of the flash over or arc, some carbon will still form in the presence of dry air, but not nearly as much as in the presence of nitrogen. In addition, the by-product of the arc itself may produce carbon.

It appears you cannot stop the production of carbon completely, but this recommended step will reduce the amount of its production in your antenna system, should it experience a sustained arc.

ANTENNA PRESSURIZATION

Antenna manufacturers like Jampro recommend that if nitrogen is used to test pressurization and/or used to purge moisture from an antenna, it should be replaced by dry air when the procedure is completed.

Here is a relatively easy way to replace nitrogen in a closed coax/antenna system: First, adjust the dehydrator to over 15 psi. This will cause the pop-off valve(s) in the antenna to purge the excess air. Then, the dehydrator will kick back in, adding more dry air as it attempts to maintain the 15 psi, blowing air through the entire system. You should maintain this mode of operation until all of the nitrogen is out of the system, and then reduce the dehydrator pressure to about 3 psi.

A reminder, though: If the pop-off valve has been removed, you will have to open and reseal this manually. Additionally, Garfield mentioned real caution should be taken when using the air dehydrators of today's design. The reason is poor input air filtration; additional filtration of the output dry air is highly suggested.

The bottom line: For long and reliable service from your antenna, it is best to use dry air for maintaining pressure in the system.

Teflon is registered trade mark of the DuPont Corporation.

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