V C Campbell

TRIP TO SYLVANIA TUBE PLANT, SENECA FALLS, N.Y. MAY 22, 1952

Purpose of Trip: To study their method of sparking tubes with emphasis on electrostatic focus types.

Persons contacted:

W. C. Toner	Plant Manager
Dick Stone	Produce Engineer responsible for Exhaust and Bulb Baking
Lou Rappa	Product Engineer responsible for Basing through Test
Paul Hauke	First shift Test Supervisor

The impression I received after talking with the people listed above and observing thevarious operations is that they know no more about the problem of focus anode leakage on electrostatic focus types than we do. Their Initial Test focus anode leakage shrinkage is about 2%, with occasional epidemics up to 5%, BUT, they make this test with 16KV on the second anode at a limit of -10 microamperes. In the factory we test at 20 KV with a -10 microampere limit, while in Product Acceptance the test is made at 17.5 KV with a -15 microampere limit.

The major advantage that they posses is in their Exhaust setup. Their inline ovens are electrically heated, and the heating elements extend all the way down to the necks of the tubes which consequently are heated to almost the same temperature as the funnels and cones. This permits most of the gas to be driven from the necks during Exhaust, a condition which we do not achieve. Our study of the problem has indicated that this is the major cause of our high rate of leakage.

Sparking is accomplished in two ways. In the so-called "old method", after the getter has been flashed and the base baked on, the tube is placed face down on a turntable in a sparking cabinet. A shorting socket which is free to rotate is placed on the tube base. This socket is grounded. An Ecco sparker of a smaller type than we use is mounted so that the electrode rubs against the neck. The anode is left floating. When the cabinet door is closed, the tube rotates and the sparker moves up and down directing the spark all along the neck. This is done for thirty seconds. A timer turns off the sparker and stops the rotation at the end of this cycle. The operator then opens the door and attaches the negative lead from a D C sparker to the anode. The D C sparker delivers an output of 22.5 KV, with a timer and relay interrupting the voltage every second to provide a crude but simple pulsing circuit. The operator flips a toggle switch, closes the door and DC sparks the tube for ten seconds. This is not stopped automatically, but the operator counts the clicks of the pulser, and turns it off after the tenth click.

In this newer method of sparking which is not yet fully released for production, the sparking is done on the same roller skate conveyor on which the base baking is done. After the bases are baked on, a process by the way which is done in the amazingly short time of four minutes, the tube which is sitting face down on a pallet is pushed into a sparking enclosure. This enclosure is a wooden housing covering the conveyor with swinging doors at each end. Although the base has been baked on the tube neck, the wires

have not yet been clipped, and they are wound together to short all the electrodes. A coil of copper tubing is placed over the tube neck, resting on the cone and extending to about one inch below the base. This coil is grounded. A lead from an AC sparker which is mounted atop the housing is clipped on the tube wires which are shorted together. The tube is then sparked for thirty seconds. The copper coil around the neck is then removed and the tube DC sparked as described above. The AC sparker in this case looks very similar to our hand spark coil. It was purchased from Central Scientific in Cambridge, Mass. Model #80730. Cost $10.00. From their experience so far they feel it can be used indefinitely without overheating. They find this no better than the old sparking method except that it involves less tube handling.

They do not seem to know what good, if any, the DC sparking does for the tube. It's one of those things started in the past which is being continued as a matter of habit. I inquired as to whether they had any information about shrinkage if either the AC or DC sparking were eliminated, but no one seemed to know.

It was difficult to get much information from my guides, whether due to lack of familiarity with the operations or hesitancy to divulge any "trade secrets". My opinion is that they just weren't aware of all the problems involved.

Several other things I observed during my tour were:

Getter flashing: Tubes are flashed face down just prior to base baking. The tube is placed face down on a pallet on a roller skate conveyor and the getters flashed one at a time by rotating the pallet manually and lining up the getter in front of the R.F. coil. They use a straight flash and flash each getter in seven seconds.

Base baking: As noted previously, when basing on the roller skate conveyor, the baking is accomplished in four minutes. I could not learn what temperature they were baked at. Six tubes are baked at a time. They also have another setup similar to ours utilizing a basing conveyor, and here the baking is done over a 15-20 minute cycle. A positioning gauge is used to line up the base properly with the anode button.

Soldering: The wires are clipped off after sparking and just before soldering. The tube is placed face up in a spring loaded holder which is free to swing and dipped successively in a flux pad, solder pot, and ammonia and water bath. They use 40% tin, 60% lead solder as compared with our 35% tin, 65% lead composition.

Testing: 21" tubes are tested mainly on a two position rotating type test set. A male loader removes the tube from the ager and loads the tube in the test set. The tester, normally a girl, meanwhile is testing a tube in the other position, and when through, rotates the tube cubicle, returning the tested tube to the loading point, and bringing another tube into the test position. A monoscope pattern is used to test focus and resolution, but this is done so rapidly that it is difficult for me to see how they can pass valid judgment on the focus quality. Other testing procedure seems similar to ours.

Focus anode leakage, as mentioned above, is checked at 16KV on the second anode, and stray emission and breakdown at 18KV. The number of tubes to be polished is apparently very small, mainly because they screen without heat, and the faces can be easily cleaned right after screening.

General: No special precautions are taken as regards neck cleaning, electropolishing of gun parts, careful handling of mounts at sealing when processing electrostatic focus types. The one factor which helps them tremendously in my estimation is the excellent neck baking received in Exhaust. This alone goes a long way towards reducing their gas and leakage problem.

S. S. Sadowsky
FACTORY ENGINEERING
Syracuse Tube Works
May 23, 1952

SSS:ib

cc: RH Berg--BTW
WH Buck
GF Callahan
VC Campbell
GL Case
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LE Record
Engineering (13 +)