VC Campbell

REPORT OF VISIT TO RCA'S MARION
INDIANA TV TUBE PLANT NOVEMBER 8, 1951



Persons contacted: W. Warrender, Plant Manager
A. Dickensen, Kinescope Manager
J. Spooner, Superintendent
H. Swanson, Chem. & Met. Engineering
A. Cooper, Factory Engineering
A. Raczynski, Factory Engineering

The day was started with a general discussion of metal tube manufacturing with Mr. Warrender. Specific emphasis was placed on cone sealing and subsequent operations where faulty bulb assemblies or other causes might result in high shrinkages. They are currently manufacturing 19" round metal, 17 and 21" rectangular metal and 20" rectangular glass tubes. They are making both types of electrostatic tubes as well as the magnetic types so that about seven different types are being run concurrently. They have refused to accept any but spun 20" bulbs and have simplified their fixture and handling problems by so doing.

Mr. Warrender estimated the capabilities of the Marion plant at about 150,000 to 200,000 16" metal tubes per month if it were turned loose on this one type. Only one cone sealer was operating on 21" during our inspection but we were informed that their cone supplier was having difficulties and they were not receiving them at the rate they desired. In the absence of 21" material they were running 19" round metal which had been scheduled.

They have hit a peak of about 25,000 21" rectangular metal tubes per month. While they have not made as good an overall glass shrinkage for the 21" as they obtain with the 17" (8%) they have gotten it down to about 18% and feel that 10% or even the 8% is obtainable. Using these glass shrinkage figures and the cone sealing schedule it appears that they will supply about 15,000 21" metal tubes in November.

Their experience has shown that the best shrinkage at cone seal does not give the best overall glass loss. They find that if they make up bulb assemblies they have to make them into tubes quickly or they lose a sizable portion of them. This is their explanation of part of our high losses on their bulbs and a reason for their not desiring to sell any more. They were quite emphatic on this latter point. No inquiry was made into the purchase of completed tubes from them.

The plant is made up of an old building used by Farnsworth supplemented with new construction designed to fit the equipment need. The older building structure houses the receiving and shipping sections, stock room, warehouse and maintenance shops. The new buildings contain the cafeteria, labs, Kinescope manufacturing and parts manufacturing equipment. They have a total of about 350,000 square feet of building space available including power house, cafeteria, etc.

Their factory supervision organization consists of seven general foremen (beside maintenance) and about twenty-five foremen. First shift general foremen include one for parts and mounting, one for bulb preparation and one for seal to pack. The second and third shift have no parts and mounting general foreman. Their factory engineering group is divided

into three sections, chemical, glass and type. Each of these sections has its own supervisor.

They have been quite insistent on running three balanced shifts in their plant and have provided no storage area anywhere on the manufacturing floor. Their overhead conveyor system (which consists entirely of the Richard-Willcox zig-zag variety with adjustable hangers as used at Lancaster) is broken up into a series of small loops. I think it would be wise to obtain some of these hangers from RCA for test purposes. They seem quite adaptable and are easy to use. Each point in the manufacturing process where a bulb is removed from a conveyor to a machine represents a transfer point to a new conveyor loop.

In general, the equipment used at Marion is the same type as built and used by RCA at Lancaster--modified only to the extent required for new tube types.

The water treatment system is installed in the same building as the power house. They have a total of five 3000 gallon storage tanks and seems to be about 1000 feet from point of usage. Initial tests on the water indicated it to be very hard containing up to 1000 ppm inorganic material. The problem of making good water from this was given to Morris-Knowles Engineering of Pittsburgh who designed the equipment later supplied by the Chchrane Company of Philadelphia. Total cost of their water purification and treating system was about $350,000 but they have had no manufacturing problems which could be traced to bad water. They feel it is money well invested.

The following are the 21" metal rectangular fabrication techniques along with RCA processing methods.

SANDBLAST

All metal cones are placed through Pangborn sandblast equipment. Aluminum oxide grit is used. The cones receive less blast treatment than G-E cones experience. The vertical portion of the face sealing lip receives the most critical attention in the sandblast operation.

DICHROMATE TREATMENT

Some tests have been run to eliminate this operation with varied success. The cones are sprayed in individual spray booths and then stacked on pallets and sent to bakeout. They are next dichromated by sponge wiping at the loading position of the Surface Combustion lehr. The bake cycle involves fifteen minutes at 410-420°C after which the cones are washed. The dichromate on the neck sealing surface is not primarily to improve neck losses but it is felt that it promotes an oxide bond which resists air leakage through the oxide layer.

NECK SEALING

Rotary 8 head sealing equipment is used at a forty second index. The sealing cycle comprises the following:

2 positions radiant preheat fires
2 positions sealing--1301-A burner tips--12/position
3 positions annealing - gas and radiant burners

Shrinkage at this station was reported to be less than 2%.

FACEPLATE SEALING

Rotary 16 head sealing equipment is used at eighty second index. The bulbs are supported at the face sealing lip by vertical notched support fingers, two on each of the long sides and one at the center of each end. The supports also act as restraining fingers. The sealing cycle is as follows:

4 sealing positions with split manifolds--sixteen burner tips on inside and twenty-five on outer manifold (1301-A jets)
2 positions ringburner sealing (peak temp. 1125°C)
8 positions anneal in electric radiant oven

The anneal curve measured 1" above face is as follows:

| | | |
|---|---|---|
| Pos. | 1 - 590 | 5 - 560 |
| | 2 - 600 | 6 - 555 |
| | 3 - 600 | 7 - 545 |
| | 4 - 590 | 8 - 530 |

The face sealing jets are positioned 1" from the corners of the cone giving 4" separation from the long side of the cone. The jets are elevated 13° from the under side of the sealing lip. The bulb assemblies have only 1-1/2" - 2" clearance on the corners as they pass through the annealing ovens.

EXHAUST OVENS

RCA has six straight line exhaust ovens of thirty-two positions which operate at two minute index on 21" metal exhaust cycles. The bulbs are peaked at 395-400°C with eighteen minutes over 300°C and eight minutes over 350°C. The exhaust ovens are electric radiant with both side and top heating elements.

AGE

Aging is done on an overhead conveyor including the sparking operations. The schedule is as follows:

| | | |
|---|---|---|
| Hot Shot | 13 volts 56 seconds | |
| Age | 14 min. 9 V | |
| | 7 V | |
| | 600 V DC | |
| | -140 V DC | |
| Spot Knock | 8 sec. @ 22.5 KV | ) |
| Spark | 32 sec. @ 24 KV | ( All base pins connected |
| Spark | 33 sec. with Tesla Coil | ) |

The Spot Knocker consists of a Picker 50 KV x-ray power supply. The first spark position is powered by four 8 sec. applications of 24 KV 60 cycle sine wave voltage. No details were available on the Tesla coil.

21" METAL SHRINKAGE

Face Sealing - 1% broken funnels
1-1/2% bad seals (poor blows)
1/2% machine failures

Conveyor (cooling losses) - 3% cracked faces
2% cracked necks

Screen Inspection - 2% cracked faces
(includes bulb wash) 2% defective faces
3% cracked necks

Bakeout - 4% cracked faces
3% cracked necks

Exhaust - 1% cracked faces

The following pertinent data was obtained not necessarily related to metal tube operations:

(1) Screen bakeout

Surface Combustion lehr - 1-1/2 hour cycle peaking at 350°C

(2) Gun Sealing

16 position rotary equipment at twenty second index.
Stem preheat at 165°C
Position 1- load
Position 2- type branding
Positions 3-5- radiant preheat Selas burners
Positions 6-7- Hard fires #626N burner tips (2)
Position 8- Sealing 4-burner manifold #1142 burner tips
Position 9- Sealing 6-burner manifold #1142 burner tips
Position 10- Cut off 4-burner manifold #1142 burner tips
Positions 11-15- Anneal radiant Selas burners
Position 16- Unload

Losses reported gun seal and exhaust were 1-1/2% cracked seals, 1% broken tubulations and 1% cracked necks.

(3) Silicate Stains

No silicate preventive covering is applied to bulb faces. Any silicate on the bulb faces is cleaned off prior to

bakeout. Any metal tubes that reach test with objectionable silicate on the face are broken up since RCA has no provision to rework this defect. These losses aggregate 1%.

(4) Litton Lathes are used to re-cone all metal bulbs. The quantity re-coned per lathe averages 100/shift/operator on 17" metals and sixty-five pieces on 21" metals. The bulbs are flame annealed on the lathes for two minutes. The use of annealing pots is intended in the near future. Subsequent neck losses from this operation average 20-25%.

(5) RCA is in the metal tube business to stay, regardless of contrary-wise rumors. Losses on 17" rectangulars are stable at 8% and RCA expects to be able to reduce 21" losses to this point.

(6) RCA sealing equipment uses gas and $O_2$ economizing techniques which should be placed in use at G-E. When an empty head indexes into a sealing position the gas + $O_2$ supply is reduced until again needed.

WFH:ib

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SYRACUSE TUBE WORKS
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