

MEMORANDUM

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MAR 19 1951

C. R. Tube Engineering

SUBJECT: VISIT TO LANCASTER, PA. FACTORY OF RCA ON MARCH 14, 1951

Purpose of Visit: To review Quality Control Procedure used at Lancaster.

People Seen: D. Y. Smith - Plant Manager  
J. K. Burton - Superintendent, Cathode Ray Tube Manufacturing  
G. T. Thomas - Manager of Quality Control  
Harry Metcalf - Quality Control - Statistical  
Andy Krause - Quality Control - Parts and Materials  
Hampton Allen - Quality Control - Finished Tubes  
George Phelps - Equipment Development

GENERAL

The impression received was that Quality was everybody's responsibility. The Manufacturing Group was particularly quality conscious. Mr. Smith stated that he felt the Manufacturing Group leaned too heavily towards quality even to the expense of production. He mentioned cases where schedules were not met because of possible marginal quality. Mr. Thomas also had this same opinion. He pointed out that where statistically the calculated risk showed that the product could be shipped to looser quality limits the Manufacturing Group was very reluctant to do so. Mr. Burton, in a later discussion, also told me that he would not take chances with quality. He stated he'd rather try to justify a poor production showing than allow doubtful quality tubes to get into the field.

How successful this policy has been was very apparent to me when I visited their Return Tube Section later. This section was composed of two people, one test set and about 1,000 square feet of storage and work area. This section handles the re-testing and analysis of all customer returns for both Lancaster and Marion plants. In addition to "in-warranty" returns the RCA Service Organization sends back all field failures regardless of length of service and the Return Tube Section test and analyze these tubes also.

They are current on all returns and last week there were several shifts when no testing was required. This section did not work last Saturday either.

QUALITY ORGANIZATION

The Quality Control Section at the Lancaster plant is composed of four groups:

- (1) Statistical Quality Control
- (2) Parts and Materials
- (3) Processing
- (4) Finished Tubes

The Statistical Group aids in establishing the various sampling plans and control charts used by the other groups.

The Parts and Material Section are active in the parts manufacturing operation and inspection of raw materials.

The Incoming Inspection Group was well organized and fully equipped to run adequate tests. They pay particular attention to the control of the fit of various parts that are matched in subsequent manufacturing operations. A typical example is the fit of the faceplate and cone on the rectangular metal tubes. The various critical dimensions are charted and controlled within close limits. Vendors are kept informed as to trends and have been very cooperative in maintaining parts well inside print dimensions.

In the Parts Manufacturing Operation the Quality Control Inspectors approve all dies and machine set-ups before production is started. Sampling continues throughout the production run and the inspectors can shut down the operation as soon as the parts start out of control.

Phosphor color is very critically controlled. Melt lot approvals are run on each lot of material used in cone making, cathode making, heater windings, etc.

The Processing Group cooperates very closely with Factory Engineering. Whenever a process shows high shrinkage the Quality Control man works with the Engineer and Foreman until the critical items are recognized. With the aid of the Statistical Group a control chart and limits are established. When the control plan is workable it is standardized and the supervision of the plan is then the responsibility of Factory Engineering.

Control charts are in use on most of the Manufacturing Operations and a review of the charts for the past several months indicates that much shrinkage reduction has been accomplished by this method.

The Finished Tube Group is very active in the initial test area, quality sampling, hold test, life test, etc.

All testing is done by either the factory test section or Lancaster Laboratory (under Engineering). Results are charted and any trends or rejections are promptly called to the attention of Quality who informs all interested parties.

#### FINISHED TUBE PROCEDURE

Below is the general finished tube testing procedure at Lancaster:

100% Factory Initial Test for:

- Shorts - Continuity
- Cut-Off
- Breakdown
- Beam Strikes Neck
- Screen Color Difference
- Screen Condition - Rated and 4 Kv.
- Gas Ratio
- Light Output

Every two hours a sample is read and control charts plotted on the above characteristics plus

- Anode Leakage
- Grid No. 1 Leakage
- Peak Light Output
- Screen Color
- Total Cathode Current
- Modulation
- Center Resolution

Mechanical tests are performed on a percentage of the product. Pressure, wet base torque, humidity, etc. are included.

A sample of approximately 100 to 150 tubes per shift is held for 4 days and retested for cut-off, breakdown, cathode current, and gas ratio (at 500 microamps). Any indication of trouble at this test may result in shipped tubes being returned from warehouse.

Recorded readings for all characteristics are made by the Lancaster Laboratory at regular intervals.

Approximately 5 tubes per week are life tested with a percentage of the life tests extended to 5,000 hours.

After outside paint the faceplates are washed twice and two separate unlighted screen and faceplate inspections are made.

Quality Control reviews and approves all new designs before any tubes are released for shipment. After sufficient tubes have been processed to determine the shrinkage, characteristics, life tests, etc. it is the responsibility of Quality to determine if the new design should be released.

Since the Finished Tube Quality Control procedure has been standardized, a set of specifications has been requested through Mr. Waugh.

#### GENERAL OBSERVATIONS

The faceplate seal areas on rectangular metal cones are pre-beaded by applying powdered glass suspended in a binder to the seal zone and firing. The cones are sprayed and then fired face down on a rotary machine by burners arranged to heat the rim to a high temperature.

A pressure tank has been installed near the faceplate cone sealers. Two tubes per head per shift are pressure tested.

Ken Burton is being relieved of some of his duties as Superintendent and placed in charge of a group working on color tubes. George Phelps and several others are with him. They have made over a hundred tubes to date.

The magnetron operations have been transferred to Harrison.

Life test tubes that have been on extended life for over 5,000 hours did not show any screen deteriorations. They have not seen the half-moon ion burns on their tubes.

Their screen color and distribution is very good. They prefer a color temperature bogie of 8000°. They check all finished tubes in a darkened test area at rated and 4 Kv. Drying lines concern them as they develop with life.

Electrostatic tubes are in limited production. They have run quite a number of variations but are not satisfied that they have a workable solution yet.

When questioned on high heater current they had not experienced anything similar to ours. They had received a complaint from a purchaser of their heaters which later turned out to be processing difficulty. The heaters had been darkened by metal evaporation and was cleared up by a change in RF heating during exhaust. The coils were apparently too low.

Glass tubulation stems are in limited production. All stems being made are all glass. The losses are high but have been improved by more accurate control of the annealer and controlling the strain pattern. They are hand tipping on exhaust but are developing automatic tipping equipment.

A serial number is applied to each tube and shipping carton.

W. L. JONES, JR.

WLJ:edk

cc:

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