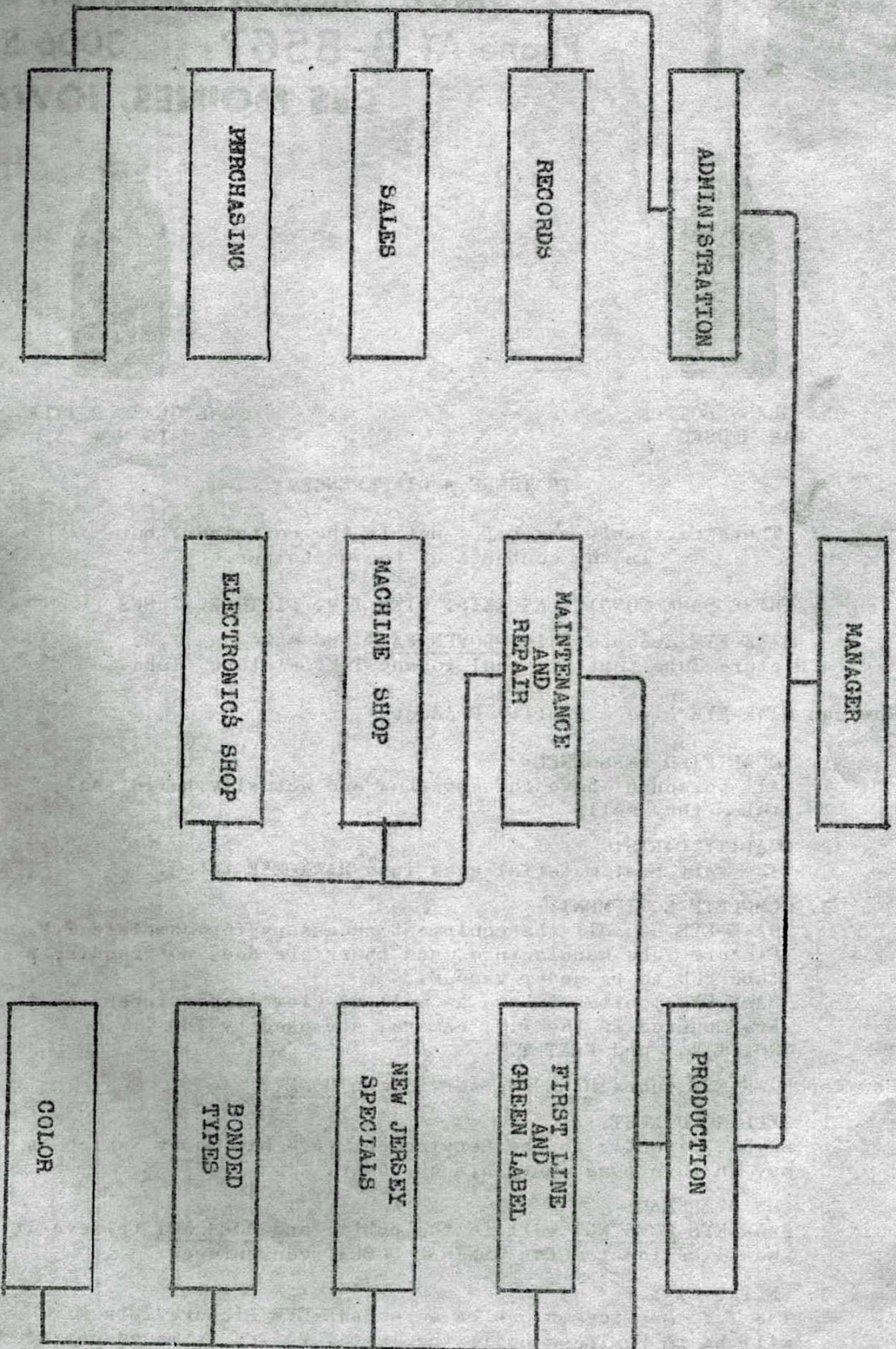


HAWK-EYE PICTURE TUBE MANUFACTURING



HAWKEYE PICTURE TUBE MANUFACTURING

OPERATING PROCEDURE

Items of procedure herein are published and prescribed for the information and guidance of all concerned.

I. PURPOSE - To establish comprehensible procedure for each of the numerous operations performed in the conduct of this organization.

II. SCOPE - Procedure will cover all essential functions, both administrative and technical.

III. ADMINISTRATION -

1. BUSINESS AND WORKING HOURS:

a. Business hours are from 7:00 AM to 6:00 PM Monday through Friday, and 8:00 AM to 5:00 PM on Saturday.

b. Employee hours are as prescribed by the employer, and agreed upon by employee.

2. INVENTORY AND STOCK CONTROL:

Control of supplies, and stocks of items for sale depends on regularly scheduled inventory. As dictated by amount of supplies expended, and sales items sold, administration will schedule inventory of material on hand as follows:

a. All supplies essential to picture tube processing - Every fifteen days.

b. Stock of tubes for sales - Every fifteen days.

c. Miscellaneous items for sale - Every thirty days.

d. Administrative supplies (Stationery, Forms, Cleaning Material, etc.) - Every thirty days.

3. RECORDS ANALYSIS - Production records such as Processing Logs, Inventory and Sales, and such other records as may be informative will be regularly studied and analyzed for information suitable for use in improving overall operations.

4. INSPECTION OF PICTURE TUBE DUDS - When presented for exchange on purchase of picture tubes, Duds will be carefully examined for flaws or faults before allowing credit on purchase.

IV. GENERAL

1. PICTURE TUBE PROCESSING -

Skill and proficiency of operating personnel is acquired through instruction, study and application of fundamental methods made available from many sources. However, for general information to those concerned, the complete cycle of Picture Tube Processing includes the following operations:

- Dud Inspection
- Airing (Releasing Vacuum)
- Flaring
- Washing and Rinsing
- Screening (Includes several associated operations)
- Laquering
- Coating (Internal)
- Aluminizing
- Gunning
- Ovens (Including several operations in sequence)
- Getter Firing
- Coating (External)
- Aging or Seasoning
- Basing
- Final Test and Inspection

2. CLEANLINESS -

Cleanliness is essential to satisfactory results in each step of picture tube processing. Dirt, excess grease, broken glass, and in fact no substance detrimental to the production of a satisfactory tube should be allowed to accumulate on or around equipment. It is the responsibility of each individual who operates machinery to "CLEAN IT UP" as soon as its use has been completed, or on closing for the day.

3. USE OF TOOLS AND EQUIPMENT -

Since time is of inestimable value in operations of all kinds, it is brought to the attention of all concerned that the prompt return of even a small hand tool to its prescribed place will require perhaps less than a minute. If not returned, multiply this minute by several times and it will indicate the greater time the next person will expend (Waste) in searching for the needed tool. Therefore, the following procedure is prescribed:

Tools not an essential part of a specific step in processing, but occasionally required for maintenance or adjustment of machinery, will be placed in a central location as convenient and accessible to all equipment as is practical.

Having completed use of a tool it will be immediately returned to its proper place and thereby making it available to the next person needing it.

Processing operations and machinery requiring special tools, chemicals, etc., will dictate the proper place for them.

The preceding items of procedure are also applicable to installations where tools are required and arranged at the "Finger Tins".

4. PROCESSING LOG SHEET -

Processing positions will be provided a board containing log sheets. The operator will enter applicable and proper information pertaining to the particular step of processing. A copy of the log sheet is inclosed herewith, and contains sufficient instructions to guide the operator in making useful entries. If necessary, verbal instructions will be given to supplement those of the log sheet.

OPERATING PROCEDURE

V. PROCESSING OPERATIONS

1. REMOVING SAFETY PANELS FROM BONDED TUBES -

PREHEATING - Bonded tubes will be placed in oven, heated to a temperature of 300 degrees F. Tubes to remain at this temperature level not less than one hour.

REMOVAL OF LAMINATION - On completion of heating period the bonded tube will be placed on the vacuum stand (work stand) and the safety glass separated from the glass tube by use of a piano wire as a device for cutting the hot adhesive between the tube and safety glass.

CLEANING AND INSPECTION - Having separated tubes and safety glass, tubes will be thoroughly cleaned and inspected. Results of inspection will determine acceptance or rejection of the tube for further processing.

RECORDS - Entries on an operation log provided will include:

Number or quantity successfully processed

Incidents contributing to Rejects, etc.,
Flaws discovered by cleaning and inspection, implosion, etc.
A brief explanation will be entered in the Remarks column on the log, and signed by the individual performing the operation at the time. No prescribed form of report is necessary. The following may serve as an example: "3 August 1964, 10:20 AM - Tube imploded during separation of tube and safety glass. Tube preheated to 300 degrees F. This was second tube under processing of a total of 25, and the only failure of the group."

2. BONDING - (See next page)

BONDING

PREBAKE OVEN. * Maintain a temperature of 250 degrees for 30 minutes before putting tube in oven to heat.

SETTING CLAMPS. - Select tubes to be bonded and check clamps to make sure they are properly set for the size panel to be bonded (19" or 23"). Using Allen wrench, loosen screws on the only two positions that clamps may be set, either 19" or 23".

CLEANING PANEL AND TUBE FACE. - Set panel in jig, clean the inside with a strong detergent from panel cleaning tank. Wipe dry with a white towel. Do the same with tube face and sides. Next, place tube and panel in prebake oven. Bake 45 minutes or more at 250 degrees.

PREPARATION OF RESIN AND HARDENER. -

HARDENER. - Pour hardener into glass jar provided and marked. Second mark from bottom for 19" tube, and Third mark from bottom for 23" tube.

First clean jar with water, and dry out with a white cloth. Following this, pour hardener to that mark indicated for the size tube to be bonded. Next, resin having been heated to 190 degrees will be drained into a 32 ounce paper container previously marked as follows: 1 1/2 inches from the top for 23" tube, and 2 5/8 inches from the top for 19" tube. Use lead pencil only, for marking container. Ink will dissolve with the resin.

PREHEATED TUBE AND PANEL ASSEMBLY. - Remove tube and panel from oven, place in jig, and adjust tube with clamps so shim of desired thickness slides between clamp and panel. After spacing is complete, adjust panel so it is fairly square with the tube. Using two clamps opposite each other, and adjusting them simultaneously is usually the best method to set spacing between panel and tube.

POURING. - Pour selected amount of hardener into the resin, adjust timer to 60 seconds, and mix. When timer stops adjust an additional 30 seconds and mix until timer stops. Inspect mixed resin for any bubbles on top. If any, use a tongue depressor and remove them. To pour, rest edge of container on side of tube, pour mixture down side between tube and panel. **POUR FROM BOTH SIDES OF THE CONTAINER.** On emptying the container, if necessary, adjust clamps so the mixture comes within 1/8 inch of panel edge.

When tube cools and liquid hardens, remove from clamps.

PICTURE TUBE PROCESSING
SEALING MACHINE

DESCRIPTION -

The sealing machine is equipped with two sets of burners, one located each side of the tube flare. Fuel used for the burners is a combination of natural gas and oxygen. The natural gas is piped in from normal utilities source, and oxygen from the usual tank supply. Regulation of the mixture is accomplished by a "Mixer Valve", itself regulated by oxygen regulator on the tank, and a pressure regulator in the gas line.

The Sealing-Head or Tube Holder revolves. An "ON - Off" switch controls "Starting and Stopping".

Gun Sealing Heads vary in size according to tube types, 110 degree RCA, 110 degree Sylvania, 90 degree, and Color tubes. The head in use is raised or lowered by loosening thumb bolts and moving the assembly.

A tube is inserted in the sealing head, and adjustment made according to tube type and gun for the length of tube neck.

A two position "Preheat" oven is used for heating the gun and flare to 400 degrees Fahrenheit prior to placing on sealing machine. Two positions allow sufficient time for the 400 degree temperature to be attained with the period required for sealing one tube.

OPERATION -

Gas is turned "On" and burner ignited, Oxygen regulator is adjusted, and flames are concentrated on sealing head which is heated before tube is placed in holder. Preheating the head prevents cracking of the gun (also preheated) when inserted in the brass sealing head. Once sealing begins, heat in this area is usually sufficient.

Flame adjustment. - Flame should be "Bushy" and not sharp because the sharper the flame, the smaller the area or band of glass is heated.

As the flare becomes hot it stretches downward. Thus, a wider heat band will produce more soft glass "stretching" down to touch the gun button, and thereby resulting in a nice, heavy, thick glass wall joining the button.

SEALING MACHINE, Cont'd).

For best results in sealing, the gun must be centered in the flare so the melting flare glass, as it falls, will touch completely around the button at the same time.

When the flare glass touches button seal, the flame is left on this spot until the glass is sealed completely around the button. The flame is now dropped to cut off glass flare. After cutoff, if necessary the flame is concentrated on the glass button until it (flame) produces a "White Glow" in glass weld all around the button.

(NOTES: If the flame is not held on the button long enough to produce the "White Glow" in the weld, the gun will crack after it has cooled. The crack will be in the neck, down to the button, and back into the neck.

If flame is left on the weld too long after producing the "White Glow", the tube will crack after it cools. The crack will be through the button, into the wires, and upward into the neck glass.

The flame is kept directly in line with the button, and not moved away until glass seals with the button.

Position of the flame is raised and lowered with adjustment wheel).

Immediately after the satisfactory "White Glow" has been produced, the burner is turned down to a "real bushy flame"; and tube is allowed to cool.



EXHAUST OVENS

OVEN A:

Five positions, numbers 1 to 5 inclusive.

Positions 4 and 5 will accommodate any size picture tube, including 27 inch and Color tubes.

Positions 1, 2, and 3 will accommodate sizes to, and including 24 inch tubes but have not yet been adapted to 110 degree and Color tubes.

OVEN B:

Ten positions, numbers 6 to 15 inclusive. All accommodate sizes to include 23 inch but will not accept long, 70 degree tubes due to limited height adjustment of holding racks. Modification is considered impractical because of decrease in demand for such tubes.

OVEN PROCEDURE:

Tubes, having been previously "Gunned", are placed in suitable positions of the ovens. Racks (Tube holding) are then individually adjusted, each with tube exhaust stem well into the rubber seal of the diffusion pump and pinch-off coil. Next, the pinch-off coil is raised to the "gun seal", and tightened.

Heater supply wires are then connected to the tube heaters.

In oven A the heater voltage supply lines consist of #4 aluminum wire, each conductor of a pair terminates with a brass nut serving as a friction clamp to both hold and connect with the heater wires of the picture tube.

The heater supply lines of Oven B are provided with clips for connecting to the heater wires of each tube. This oven employs a pinch-off coil adapted for connection of 110 degree RCA solid wire pins, and connections on which to put the heater clips.

After pinch-off coils are adjusted, and heaters are connected, the sealing nut is tightened on exhaust stem to seal tube with the diffusion pump. Next, water must be turned on (each oven) to cool the diffusion pump. After water has been turned on for cooling pumps, each position is turned on Mechanical Pump first, and Diffusion pump next.

(NOTE: After five minutes, a check could be made, using a spark coil to locate any broken seals or cracks in the glass. At present this check is not performed).

Gas is turned on, "Fully Open", by manual valve in series with each burner, and lighted with a match. Oven doors are then closed.

Temperature is allowed to increase to 450 degrees F or above. At this level, a switch is closed, activating a thermostatically controlled solenoid in the line of each burner. This system maintains a temperature of approximately 775 degrees F (412.7 degrees C).

The 775 degree temperature is maintained -

30 Minutes for 21 inch or smaller tubes

60 Minutes for 24 inch or larger tubes

On completion of this period, the solenoids are switched off, and the valves on each burner turned so flame is reduced. When oven has cooled to 600 degrees F, valves are turned completely OFF.

On further cooling to approximately 400 degrees F the Bombarder is turned "ON" and allowed to warm up for at least ONE minute. On warm up, Bombarding power is turned on for TEN minutes.

(CAUTION: Both bombarders should NOT be used simultaneously).

After five minutes bombarding, heater voltage is turned on and applied in the following sequence:

- 1st - 5 volts for 5 minutes (or remainder of bombarding)
- 2nd - 7 volts for 5 minutes
- 3rd - 9 volts for 5 minutes
- 4th - $12\frac{1}{2}$ volts for $1\frac{1}{2}$ minutes
- 5th - 7 volts for 5 minutes

Heater voltage cycle complete and voltage switched "Off".

Immediately following, tubes are "Pinched Off" according to schedule.

OVEN B Has automatic heater voltage retention. Pointer knob on panel of unit is turned clockwise to $5\frac{1}{2}$ volts, and as previously mentioned, the heater voltage cycle begins after five minutes of bombarding, the "Wall Switch" is thrown to ON position but automatic switching unit remains OFF until bombarder has completed its cycle, and oven doors are raised just sufficiently to observe heaters and whether or not all are lighted, and pinch-off coils are OK. With these satisfactory, the switch on automatic switching unit is turned ON, and Pointer Knob adjusted to $7\frac{1}{2}$ volts. The unit switches through the heater voltage cycle, and into the Pinch-off cycle during which individual pinch-off coils are disconnected manually as the pointer reaches points marked by position numbers.

When all tubes are pinched off, automatic switching unit is cut OFF (Both switching unit and wall switch). Each pump and diffusion pump is individually turned Off.

Oven doors are now raised about ten inches to cool tubes for approximately 15 minutes, then raised completely and kept open.

When tubes have cooled sufficiently for removal from oven, each pinch-off is filed, using a sharp, three-cornered file, tube is broken clear from stem, and removed, then placed on rack.

"Getter" flashing apparatus is now connected to bombarder on Oven A. The suitable coil for the individual getter is installed. BOMBARDER OUTPUT METER SHOULD NOT INDICATE MORE THAN 100 MILLIAMPERES ON "HALO" GETTER, and 75 MILLIAMPERES ON OTHER TYPES.

OVEN A Is all manual. Heating and cooling tubes, using the same procedure as for Oven B. Bombarding is the same, but using manual switch for heater voltage:

5½ volts for 5 minutes while bombarding. After bombarder is shut off, turn heater voltage to:

- 1st - 7½ volts for 5 minutes
- 2nd - 9 volts for 5 minutes
- 3rd - 12½ volts for 1½ minutes
- 4th - 7 volts for 5 minutes

Pinch-off Switch, under panel, to "Low Temperature for 2 minutes, then "High Temperature for 1½ minutes.

COLOR TUBES Are pinched off on "Low Temperature" only, one tube at a time. Pinch-off coil is approximately 3/8 inch down from base of tube. Switch is turned "On", and after 2½ minutes, pinch-off is observed by "looking down from top, door open sufficiently to observe. Pinch-off coil can be lowered at such time by using adjustment shim. When glass has "Pulled in", making a seal but not a "Bubble" in pinch-off, lower pinch-off coil approximately 3/16 inch to ¼ inch and leave coil turned on for another minute, then disconnect wire to pinch-off coil.