Trip Report

Destination: Lansdale Tube Plant, Lansdale, Pa.
Dates of Contact: June 2 and 3, 1955
Persons Contacted: G. Pratt
H. Colgate
D. Payne

Distribution: M. Beeler
M. Geger
C. Logan
P.F.E. Marapodi
J.C. Nonnekens
M.J. Oseroff
W. Rublack
E.F. Schilling
V. Srepel
W. Tifft

The purpose of this trip was to observe the Lansdale techniques for the processing of Apple bulbs. The procedures and materials used have been changed considerably. These changes and the present techniques are described below.

I. Equipment

A. Photo Resist Flow Water:
The following cycle times were noted in the flow coating operation of the Photo Resist material.

1. 10 sec. rotation in the dispense position
2. chuck swings up while rotating and comes down to drain position (total time 65 sec.)
3. 10 sec. rotation in drain position
4. 30 sec. drain at 75° angle. No wobble.

B. Phosphor Slurry Flow Coater:
It was noted that the procedure for flow coating the phosphor slurry was very much different from that previously used. The important modifications are as follows:

1. 15 sec. rotation at a reduced speed (12 RPM) in the dispense position (100° angle)
2. chuck swings up while rotating and comes down to drain position (total time 40 sec.)
3. 15 sec. drain at 75° angle, no wobble

C. Developer:
Using the revolving bulb type developer, the initial surge of water is impinged upon the corner of the bulb. Each washing operation is performed according to the following specs:

1. 10#/in^2 pressure thru 5/8" dia. nozzle
2. de-ionized water at room temperature
3. point of water impact is between the lower two anode buttons.
4. developing time of 1 min. in all cases

D. Drying Apparatus:

The standard (Philco) riser is used in all cases. It is a 5/8" tube with 8 evenly spaced 1/8" dia. holes. This ~~enters~~ sets in the bulb 6 inches from the hat seal. Electrodried air (R.H. ≈ 2 to 10%) is used in all applications except:

1. 10 to 20% R.H. air for MgO photo resist } why ?
2. 25 to 35% R.H. air for back lacquer

E. Removing of Aluminum

Philco has a device that enables a 2% KOH solution to be pumped into the bulb (face up) to the desired level. The solution is drained and replaced by a de-ionized water rinse. The device enables the aluminum to be removed from 3 bulbs at once. The danger of splashing the screen with the caustic is virtually eliminated.

Ordered - no action —

F. Oven Bake

The factory Lehr is no longer used at Philco. Since a Lehr bake, after the MgO, would cause a flake-off, a new oven is used which has a slower rate of temperature increase. for MgO only — OK. —

This bakes out - film, Backlac, P.V.A. + MgO.

G. BH-6 Lamps

Philco is using 60#/in² pressure for the BH-6 bulb cooling air. They obtain an average life of 40 hours under these conditions. We are currently using 20#/in² as per suggestion of Mr. J. Pomperett of G.E.'s Cleveland Works.

II. Materials

A. Photo Resist Materials:

Reference to the latest Philco specifications dated 5/25/55, on file in Apple Specification Book, shows that the filming solutions now contain approximately 50% of the dichromate originally used as per instructions dated 2/17/55. In addition, the blue line photo resist contains approximately 2-1/2 times the solox as does the photo resist used for the green and the red lines. Philco claims to obtain harder, more durable lines using this process. However, the density of these lines is such that two separate applications of each color is warranted in order to obtain the desired density. The reduction in amount of dichromate enables Philco to more or less standardize their exposure time. at least twice the time

B. Phosphor Slurry Materials:

Reference to the latest Philco specifications dated 5/25/55 shows that:

1. The use of the unactivated green (Willenite) in the green slurry has been eliminated.

2. The percent of Zinc Sulfide in the blue slurry has been increased from 33% to 45%.

In doing this Philco hopes to obtain a brighter tube. They are now able to control the brightness of both the blue and the green phosphors and thus more able to conform to the regulations of the I.C.I.

?

to

3. The PVA in all phosphor slurries has been eliminated. The slurries now consist of only solox, water and the respective phosphor. The solids to liquid ratio remains appreciably the same. ? It does?

The reasons behind eliminating the PVA in the slurries are probably as follows:

a. the slurries can be stored for a longer period of time

b. a phosphor recovery program can more easily be introduced

c. slurries can be prepared more easily and at a lower cost True

III. Procedures for Bulb Preparation

A. Green Line

1. Beginning with clean bulbs (regular wash and rinse plus 10% HF slosh and rinse)

2. Let stand neck down for 15 min. without air dry

3. Filmed with green photo resist (200 ml)

4. Forty (40) minute dry - electodried air

5. Expose bulb for 4 to 5 minutes

6. Flow coat phosphor slurry (green 130 ML)

7. Twelve (12) minute dry - electrodrfted air

8. One (1) minute wash (de-ionized water)

9. Seventeen (17) minute dry - dry screen? - This I have always recommended.

10. Repeat steps 2 thru 9 for the second green application

11. Fifteen (15) second rinse (de-ionized water)

B. Blue Line

Repeat steps 2 thru 11 using respective photo film and phosphor without 15 second rinse. Use 80ml of phosphor slurry.

C. Red Line

Repeat steps 2 thru 9 using respective photo film and phosphor. Use 80ml of phosphor slurry.

Note: All phosphor slurries are put up in 1 gallon jugs and rolled for only 10 minutes before use. This (quote Philco) gives more and larger agglomerations of phosphor particles in solution. — agglomerates can not be controlled.

In performing the double application of each color, the bulb is to be rotated 180° between the first phosphor application and the second application of photo resist material. This enables the procurment of a more uniform screen.

D. Kasil

1. Clean inside cone of bulb with isopropyl alcohol - ? Why ?
2. Add standard 1% Kasil solution
3. Put bulb through standard Lehr bake cycle.
4. Repeat step 2 followed by air dry
5. Add 7400ml of 1% Kasil solution

E. Film — waste of time - add only 6400 ml.

6. Siphon off 1000ml and add 0.65ml. of front lacquer
7. Drain water after 2 minute cast time followed by air dry

F. Aluminize

8. Aluminize 3 times
9. Clean aluminum from cone before oxidation ← finally smartened up.
10. Apply back lacquer (80ml) - dry 2 hours with air of about 30% R.H.

G. MgO

11. Add MgO photo resist and dry for 70 minutes — This allows screen to pick up an undeterminable amount of water.
Note: let stand in room (no dry) for 15 minutes before exposing or dry film with non-electrodried air (15 - 20%)
12. Expose and apply MgO slurry and dry for 25 minutes. ↖ un important. It's now screened.

H. Clean

13. Clean bulb of MgO residue on cone
14. Bake (not using Lehr) slower rise in temperature — Agree
15. Repeat step 13

I. Paint and Finish

16. Paint inside of bulb according to specs.

17. Hat seal

18. Paint neck according to specs.

19. Final bake and anneal

20. Gun - evacuate - seal

Then you have the Phosphor on the face with nothing to hold it.

Note: A new procedure is under consideration for stages D thru I. The two major changes are: a standard bake before the first Kasil application and a standard bake after aluminizing. This cycle has not been accepted but may very well be the next major process change. A 0.3ml film instead of a 0.65ml film is also anticipated

This will remove film Back lacq. won't blister the Aluminum but the subsequent applications will.

J. Preparation of Phosphor Slurries

The preparation of the phosphor slurries should be carried out as follows:

1. Add solox to 1 gallon Waring blender

2. Use speed #1 and quickly add the water

3. Turn off blender and check solution for turbidity. If turbid the solution should be discarded, if not;

4. Add the desired color phosphor and blend for 2 min. at #1 speed for green and #3 speed for blue and red slurries

5. The following phosphors are used in the preparation of the slurries:

   a. Green Slurry - DuPont Q65-2839

   b. Blue Slurry - DuPont Q64-2660 55%
      DuPont Q20-2684 45%

   c. Red Slurry - DuPont 520

K. Developing

Each phosphor line should be developed just as the screen becomes dry. If overdried a less dense screen will result. Bulls.

The importance of this will be investigated and reported at a later date.

IV. Miscellaneous

A. The aforementioned process is said to increase the brightness of the Apple tube from 39 to 86 units on an arbitrary scale designated by Philco. and measured & reported by Philco.

B. Excellent control of the flow rate of drying air is obtained at Philco through the use of rotameters. I think that's wonderful

C. An extensive phosphor recovery program is being carried out between Philco and Sylvania. To date, the recovery of the blue and the green phosphors look promising but the red phosphor recovery has met with little success. too bad.!

D. Philco has done a great deal of research on the use of zinc selenide for the red phosphor. They have found that the maximum screen efficiency using zinc phosphate occurs at a screen weight of approximately 3 mg/cm^2. The same screen efficiency is not obtained using zinc selenide until a screen weight of 8 mg/cm^2 is obtained. This fact has dampened their hopes for zinc selenide since a screen weight of 8 mg/cm^2 is out of the question. This is so far wiong it aint funny.

It should be noted here that our engineers are not in complete agreement with the former statement. Philco's error may be explained in their experimental procedures.

E. Use of special air activated clamps instead of the original manual type, for the positioning of the Apple bulb in the exposure machine, should be further investigated. These may be purchased from the Summit Tool and Mfg. Co., Toledo, Ohio. might cut down Bump checks.

F. It was suggested by H. Colgate that G.E. strongly consider the processing of our own masters if work on the Apple tube is to be carried on. This suggestion was made without disclosing any information whatsoever as to how the present masters are processed.

Nice of Mr. Colgate —

V. Conclusion

The Philco personnel have devised techniques which enable them to produce a tube with considerable increase in light output. This tube, although better from the standpoint of brightness, has an objectionable amount of contamination. Work is being done to eliminate this cross-contamination and it is hoped that suitable progress can be made in this area.

too bad!

Further investigation of the above procedures will be carried out at G.E. to verify the findings of the Philco Corp.

William J. Noroski Jr.

William Noroski
Color Tube Chemical Design
CATHODE-RAY TUBE SUB-DEPARTMENT

/fmd
5-13-55