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# NEWARK PLANT
# PIGMENT COLOR RESEARCH REPORT

Final Report

ZINC YELLOW, K-539-D
CENTRIFUGE WASHING CONDITIONS - GCAL YIELD.

Period Covered: FEBRUARY 15 to MAY 10, 1944.

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NEWARK PLANT

PIGMENT COLOR RESEARCH REPORT

Final Report

Title: ZINC YELLOW, Y-539-D
CENTRIFUGE WASHING CONDITIONS - GOAL YIELD.

Period Covered: FEBRUARY 15 to MAY 10, 1944.

SUBMITTED BY: A. D. REIDINGER
A. D. Reidinger

DATE SUBMITTED: 5-12-44

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V. Chalupski June 6 1944

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## INTRODUCTION

In KH-44-15, the goal yield for Y-539-D, K-1948, processed with press washing, was reported. Since consideration is being given to washing this Zinc Yellow by flooding and separating in a centrifuge, it was also necessary to determine the yields to be expected from this procedure. A study has also been made of the effect on ZnO and $CrO_3$ losses of such conditions as pH and temperature of wash waters and time of stirring. In addition, preliminary work has been done on a method of countercurrent washing by which use of fresh water is greatly curtailed and loss in yield reduced.

## SUMMARY AND CONCLUSIONS

Average yield of a charge of Y-539-D, using the equivalent of 1677 lbs. Zinc Oxide and washed by a laboratory technique employing filtering funnels, which duplicates the conditions of centrifuge washing, was 4247 lbs. on the "as is" basis and 4235 lbs. anhydrous basis. This is comparable to 4350 lbs. obtained when the pigment was washed on the funnel, equivalent to press washing (See KH-44-15).

Time of stirring the Zinc Yellow slurry with the wash waters was varied from 3 hours to 30 minutes without noticeable change in efficiency of washing, as indicated by the chloride content of the pigment. Yields were also unaffected.

Higher temperature of wash water (above 80° F.) did not result in lower chloride content as might be expected. Yields suffered a pronounced reduction especially in the range from 110 to 150°F. due to increased solubility of ZnO and $CrO_3$. Previous experience has indicated that with water colder than 80°F., removal of chlorides is slowed down perceptibly.

The number of wash waters was varied from three now used to meet the present specification of 0.05%Cl to a total of five waters. Chlorides were reduced from 0.03% obtained with three waters to 0.01% with one additional flooding. A loss in yield amounting to roughly 1% (actually 1.18%) occurred. No further reduction in percentage of chlorides resulted from a fifth pass but the yield was lowered as by the previous washing.

The pH of the wash water was found to be an important factor in influencing losses due to solubility of ZnO and $CrO_3$. ZnO losses increase slightly through the range of 7.0 to 6.35 and become considerably higher at 6.05 and below. $CrO_3$ losses are at a minimum in the range of 6.65 to 6.05. Optimum yields were obtained between 6.65 and 6.35 which is the range normally resulting when no adjustment of the pH of the wash waters is made.

Filtrate losses and usage of water were materially reduced by a system of countercurrent washing studied in cooperation with I.E.D. A considerable proportion of the yield loss which occurs with the centrifuge type of washing was prevented by the recirculation of the effluent from the second and third passes for use in

the first and second washings respectively. This involves dilution of the original strike slurry which would make use of the filtrate as a by-product more uneconomical. Recovery is only slightly less if this step is omitted and only the third pass effluent recirculated.

Chloride content of the finished products was just at the limit of 0.05%. The following are yield figures for the equivalent of plant charges of 1077 lbs. of ZnO washed by different methods:-

| | | |
|---|---|---|
| Centrifuge type washing | | |
| With fresh water | - | 4265 lbs. |
| Third pass effluent recirculated (First pass undiluted) | - | 4321 " |
| Second and third pass effluents recirculated | - | 4332 " |
| Press type washing | - | 4390 " |

EXPERIMENTAL DETAILS

Notebooks 908 and 1044.

The effect of three passes through the centrifuge which are required in the plant for satisfactory washing, was duplicated in the laboratory by dilution of the pigment slurry to about one pound solids per gallon, stirring this suspension and then filtering on a funnel. The wet cake was then repulped at the same concentration, filtered and repulped for the third washing.

Charge was one tenth of K-1948 on a gram basis.

| Exp. | Subject | Yield Gms. | Losses in Wash Waters(GMS) ZnO 1st. | 2nd | 3rd | 4th | 5th | Losses in Wash Waters(GMS) $CrO_3$ 1st | 2nd | 3rd | 4th | 5th | $SO_4$ | $SO_3$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 908-20 | Temperature of wash water | | | | | | | | | | | | | |
| | 80°F | 424.7 | 0.54 | 0.84 | 1.04 | - | - | 7.21 | 3.66 | 3.29 | - | - | 0.02 | |
| | 110°F | 420.0 | 0.58 | 0.92 | 1.15 | - | - | 9.87 | 4.86 | 4.62 | - | - | 0.03 | |
| | 150°F | 404.5 | 0.74 | 1.34 | 1.54 | - | - | 11.52 | 8.63 | 7.97 | - | - | 0.04 | |
| 908-22 | Time of stirring with wash waters (min.) | | | | | | | | | | | | | |
| | 1st 2nd 3rd | | | | | | | | | | | | | |
| | 90 30 30 | 425.1 | Total | 2.55 | | | | Total | 12.67 | | | | 0.03 | |
| | 90 30 30 | 424.6 | " | 2.61 | | | | " | 12.67 | | | | 0.03 | |
| 1044-76 | Number of wash waters | | | | | | | | | | | | | |
| | 3 | 424.9 | | | | | | | | | | | 0.035 | 0.084 |
| | 4 | 419.9 | | | | | | | | | | | 0.01 | 0.085 |
| | 5 | 415.0 | 0.59 | 0.85 | 0.95 | 1.00 | 1.08 | 6.78 | 3.21 | 2.94 | 2.82 | 2.78 | 0.01 | 0.080 |
| 1044-74 & 75 | pH of wash waters | | | | | | | | | | | | | |
| | 7.0 - 6.9 | 418.9 | 0.58 | 0.36 | 0.28 | - | - | 6.93 | 6.20 | 6.20 | - | - | | |
| | 6.9 - 6.8 | 423.4 | 0.56 | 0.62 | 0.47 | - | - | 6.78 | 4.20 | 4.25 | - | - | | |
| | 6.9 - 6.55 | (424.3 | 0.63 | 0.98 | 1.00 | - | - | 7.15 | 3.32 | 3.06 | - | - | | |
| | (std. formula) | (424.6 | 0.61 | 0.88 | 0.96 | - | - | 6.63 | 3.17 | 1.02 | - | - | | |
| | 6.4 | 424.5 | 1.04 | 1.44 | 1.37 | - | - | 6.01 | 2.82 | 2.97 | - | - | | |
| | 6.05 | 418.1 | 2.23 | 3.08 | 3.43 | - | - | 5.86 | 3.05 | 3.52 | - | - | | |
| | 5.70 | 395.6 | 5.72 | 5.76 | 6.94 | - | - | 7.94 | 5.54 | 7.20 | - | - | | |
| 1044-73 | Counter Current Washing | | | | | | | | | | | | | |
| | Control with fresh water | 426.5 | Total | 2.30 | | | | Total | 12.855 | | | | 0.045 | |
| | Third effluent re-circulated | 432.1 | " | 1.04 | | | | " | 9.636 | | | | 0.055 | |
| | Second & third effluents recirculated | 433.2 | " | 0.72 | | | | " | 8.569 | | | | 0.05 | |