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NEWARK PLANT
PIGMENT COLOR RESEARCH REPORT

Y-489-D - CORRECTION OF MASSTONE
DARKNESS AND DULLNESS

Period Covered: 2/18/48 to 3/15/49

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NEWARK PLANT

PIGMENT COLOR RESEARCH REPORT

Final Report

Title: Y-489-D - CORRECTION OF MASSTONE DARKNESS AND DULLNESS

Period Covered: 2/18/48 to 3/15/49

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DATE SUBMITTED: 4/15/49

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DATE ISSUED: 4/26/49

INTRODUCTION

The development of Y-489-D began in 1939 at a customer's request for a light yellow having high gloss. After laboratory and semi-works study, a process was set up which involved the use of a large amount of alum and a calcium rosinate addition to achieve high gloss. Simplification studies yielded a more intense product. During 1946 and 1947 the quality OK straight performance was about 15% with most of the substandard material being dark and dull in masstone versus standard. Early in 1948 the Chemical Division assumed supervision to correct this serious quality difficulty.

CONCLUSIONS

A strong lead excess is necessary during the heat development of Y-489-D in order to produce material equal or better than standard in masstone color. A process BY-489-D embodying this discovery has been established as standard for plant manufacture of Y-489-D.

Products which darken less than current Y-489-D production on drying in varnish drier rubouts can be prepared by replacing the sodium orthophosphates with sodium pyrophosphate or by omitting the silicate.

SUMMARY

In early efforts to correct the dark, dull masstone of material made on standard formula, the conventional variables were tried, namely, increasing the salt and raising the development temperature. A mixture of sodium chromate and sodium sulfate was tried following the heat development, instead of the sulfate alone. Alum was also tried at this point. None of these variables proved consistently successful altho occasional "OK" batches were obtained. During this time there was some evidence of deterioration in the grinding step, altho all the difficulty could not be attributed to this cause alone.

During December of 1948 a number of batches were made exactly as the original standard and were supervised in detail. From this study it was definitely concluded that standard material could not consistently be made on standard formula. It was also concluded that there was no significant difference between material made in the green unit (Vat 260) or in the yellow unit (Vat 245).

At this point a semi-works study was initiated during which a number of variables were tried: longer strike time, shorter strike time, high temperature drying, method of soda ash addition, increased concentrations, omission of sulfate after the heat development and quick processing. No definite leads were obtained.

Because of the extreme urgency of the problem, work was also underway in the plant Raw Material Laboratory. During this study, it was discovered that a light, intense masstone product could be made by increasing the formulated amount of lead nitrate by 8%. This variable was immediately tried on a semi-works and plant scale. The plant production was intense versus standard, but 7% weak, red and dull in tint, and low in finish. This material was found to be too weak even for shading purposes.

From time to time the customer accepted shipments of Y-489-D which were darker and duller than standard but decided to accept nothing but standard quality after January 1949. Intensive laboratory work was started in order to determine the fundamental cause of the trouble. The effect of using extra lead nitrate was first

investigated, based on the earlier Raw Material Laboratory work. It was found that an increase of only 2% in lead nitrate consistently gave light, intense masstone products, while material made on standard formula varied considerably. Calculations showed that in the standard formula the amount of precipitants, including soda ash, after strike was just enough to precipitate all the lead. The only lead in solution during the heat development was due to the solubility of lead chloride. A 2% increase in lead, however, insured a strong lead excess during the development. This fact was borne out in actual laboratory strikes. The range of lead excesses between standard and 8% was investigated and it was concluded that as long as a strong lead excess is maintained, the color will be satisfactory. Large increases only weaken the final product without further improvement in the masstone. A 2% increase was selected as a safe figure. The lead excesses were estimated by spotting slurry filtrate on a spot paper with sodium sulfide. It was also shown that a batch deficient in lead (but not with a chrome excess) could be saved by an extra lead addition before heat developing.

Semi-Works strikes yielded light, intense products on the 2% lead excess formula and plant trial was made. Four batches were equal or better than standard in masstone but were somewhat red in tint. Reducing the salt in the strike yielded a green tint shading batch which was used in a blend of shippable quality. The Production Division resumed supervision of plant manufacture.

Although material equal to standard was obtained by blending production made on the 2% lead excess formula, it was observed that the lots became dark versus standard on drying in the varnish drier rubout. Investigation showed that material made on standard formula also darkened. Laboratory strikes showed that the replacement of the orthophosphate with a somewhat smaller amount of pyrophosphate greatly improved the darkening tendency as did the omission of the silicate. The customer was also aware of this deficiency. Inasmuch as he felt that it had little practical significance for his application, no plant work along this line was attempted.

EXPERIMENTAL DETAILS

DSN-49-18 Semi-works study.

DSN-49-19 Plant study.

NB-1332 Laboratory work.

REFERENCES

The following references summarize nearly all the work done on Y-489-D since its original development and may be referred to for the background of the present formula:

KN-39-254 Laboratory and semi-works study.
KN-40-65 History and process description.
KN-40-163 Plant work to improve standard.
KN-40-232 Attempts to improve color and gloss.
KN-41-260 Plant development.
KN-42-278 Progress report on Y-489-D and Y-529-D.
KN-43-124 Plant development.
KN-43-136 Use of Zinc Resinate.
KN-44-14 Sick list and simplification study.