

"CONFIDENTIAL DU PONT TECHNICAL INFORMATION"

REPORT # D.S.C. 66-5

CC: J. W. NESTOR, WILM., F&F	CC: S. N. KELLY, TOLEDO
F. H. BEADLES, " "	G. F. OSBORNE, DETROIT SALES
C. F. KALB, " "	G. I. MULHOLLAND, FLINT DEV.
E. T. BREUER, " "	LAB.
C. W. THEOBALD, " "	O. H. BULLITT, JR., MAR. LAB.
R. B. DAVIS, " "	R. W. LAURRELL, " "
J. F. VOZZELLA, " "	R. E. PIKE, " "
P. J. GRAHAM, EXP. STA. WILM.	C. N. SWINEHART, " "
F. S. BAKER, TUCKER	J. W. BASTIAN, " "
C. E. CORRELL, TOLEDO	J. E. RALPH, ESD, LOUVIERS BLDG.
R. A. DE WALL, CHICAGO	W. H. EDWARDS, PHILA. PLANT
N. I. DRESS, PHILA. PLANT	H. F. ETHER, " "
P. O. PEASLEY, SO. SAN FRAN.	R. H. VINING, " "
C. H. THOMPSON, FORT MADISON	W. B. CALLAHAN, " "

File: 1705

Marshall Laboratory
July 15, 1966

REFERENCE COPY
NOT FOR CIRCULATION

E. I. du PONT DE NEMOURS & CO.
FABRICS AND FINISHES DEPARTMENT
DIVISIONAL PLANTS CHEMICAL GROUPS

330-LINE DISPERSIONS
COMPUTERIZED REFORMULATION
DISPERSION STABILIZATION CONCEPT

(C1)
RETURN TO
MARSHALL LAB. LIBRARY

7/25/66

PREPARED BY: M. H. SCHAFER
DATE ISSUED: JUNE 15, 1966
PROJECT: P-63, DISPERSION STABILIZATION CONCEPT

ABSTRACT:

Capabilities of the major portion of the program for computerized reformulation of products to a 330-line formulating basis are demonstrated by the satisfactory processing of over 50 formulas. Special formula notes are now being incorporated and the entire program will be validated by mid-August. Objectives of speed, economy and accuracy of reformulation, as well as standardization of formula format and language are being accomplished. Initial application will cover the reformulation of the 2,143 product formulas included in R. L. #188, currently circulating for approval.

RETURN TO
MARSHALL LAB. LIBRARY

330-LINE COMPUTERIZED REFORMULATION

TABLE OF CONTENTS

	<u>PAGE</u>
I. INTRODUCTION -----	1
OBJECTIVES -----	1
SUMMARY -----	1
FUTURE ACTION -----	2
II. DISCUSSION -----	3
ADDENDUM I -----	5
ADDENDUM II -----	6
ADDENDUM III -----	8

INTRODUCTION:

The objective of the Dispersion Stabilization Concept (DSC) program is to replace multiple lines of convention dispersions with a single line of dispersions. It was recognized at inception of this program that a quick, efficient and cheap method for handling en-masse revisions of formulas to a 330-line basis would be requisite to achieving overall commercialization objectives.

Formulating Guidelines (FGL) developed by G. C. Fox in September, 1965, outlined procedures for the conversion to 330-line of products containing 42, 732 and 743-line dispersions. Standardized orders of addition, direct conversion factors and manufacturing directions were defined and made available to the various Plants and Laboratories for use in formulation and reformulation. At that time J. I. Ralph, E.S.D. Programmer, was contracted to write a computer program for the UNIVAC 1107 based on the logic covered in the FGL.

OBJECTIVES:

1. Inform management of impending completion of a major objective consistent with and necessary to DSC commercialization objectives.
2. Provide a permanent record and present for review the programming notes and logic which will be used during reformulation.
3. Indicate the benefits of formula format and language standardization which are achieved through computer reformulation.
4. Advise of support being given to the objectives of other groups in the F. & F. Department.
5. Inform other groups of our reformulation program, so that if integration of their technological advances with ours is considered beneficial to overall F. & F. objectives, the appropriate action may be taken.

SUMMARY:

Capabilities of the computer program to be used in revising formulas to a 330-line formulating basis is demonstrated.

All of the major logic used for defining standard manufacturing directions, orders of addition and conversion factor are programmed, debugged and validated.

The minor logic - directions and instructions which are applicable to specific formulas - are outlined in this report and are currently being programmed. De-bugging and validation of this phase will be completed by mid-August and, at this time, the program will be ready for use.

First commercial application of this program will be the revision of those formulas included in Release Letter #188. Approval of this Release Letter is expected by early September. Further application is scheduled for the first quarter of 1967 at which time, commercialization of the remaining Colorants in the 330-line formulating gamut is planned.

Where possible, technological advancements in other areas have been integrated with our own efforts to provide F. & F. with optimum overall benefits.

An additional program is currently being written which will enable generation of color vector data for use in instrumental shading. This program will be inter-faced with the reformulation program to yield simultaneous output of the revised formula and COS data.

Marshall Development Laboratory, Applications Section, is cooperating in preparing up-dated Formulating Practices and Tables. All conversion factors used in the reformulation program are being checked against the Standard Library of Constants prepared by the Applications Section.

FUTURE ACTION:

(1) Preparation of formulas for use in final de-bugging and validation of the entire computer program. These formulas will include tests for all of the program notes to be used during reformulation.

(2) Formulate plans to coordinate the various Plants, Plant Laboratories, Development Laboratories and Groups with respect to timing, manpower and hardware requirements.

(3) Support work being done by other groups in F. & F. when possible, through integration with our own program.

(4) Provide assistance in writing the COS vector generation program.

(5) Inter-face the COS program with the reformulation program to yield simultaneous generation of the revised formula and COS data.

(6) Maintain the reformulation program for future applications in areas other than 330-Line.

PREPARED BY:

M. H. Schaffer
M. H. SCHAFFER

APPROVED BY:

W. B. Callahan
W. B. CALLAHAN

MHS:jp
7/15/66

APPROVED BY:

C. N. Swinehart
C. N. SWINEHART,
SUPERVISOR DIVISIONAL PLANTS
CHEMICAL GROUP

DISCUSSION:

The major logic involved in the program to computer reformulate current formulas to a 330-Line formulating basis has been programmed. Conversion factors, standard manufacturing directions and orders of addition, which represent logic to be applied to all revisions, have been de-bugged and validated. The satisfactory processing of approximately 50 formulas through the computer has demonstrated program capabilities.

Several minor details which were not originally considered up to this stage in the program are listed in Addendum I and II and will be programmed accordingly. A blank formula card follows Addendum II for use in referencing formula line numbers cited in this Addendum.

To achieve satisfactory conversion of formulas it is necessary to include not only general logic as described above, but also information which is pertinent to specific formulas. These specific directions, instructions and footnotes have been categorized in Addendum III and include equipment cleaning instructions, filtering instructions, filling instructions, labelling and warning notices and special footnotes and manufacturing directions.

These special notations were discussed with Jay Ralph at a meeting held on June 8, 1966 at the Philadelphia Plant. The logic for these notations has been developed and is currently being written into the computer program.

In addition to maintaining specific notations, use of the computer program enables up-dating of those formulas which through multiple revisions have become non-standardized.

The notations which are being programmed are in accordance with FP-08, Formula Writing Guide. However, some changes in formula format and language have been made to afford F. & F. with a more accurate meaningful and completely standardized formula.

Validation of the entire program will be complete by mid-August. The initial application will be during early September at which time approximately 2,000 formulas (R.L. #188) will be re-formulated.

Further application is scheduled for the first quarter of 1967 when commercialization of the remaining Colorants in the 330-line formulating gamut is planned. Initial estimates indicate that an additional 2,500 formulas will be involved in this application.

One of the objectives of the D.S.C. program is to provide F. & F. with optimum overall benefits. To accomplish this objective we are integrating, wherever feasible, the objectives of other groups into our own efforts.

A program is currently being written by W. S. Armstrong, under the guidance of Mr. Ralph, to generate color vector data for all formulas, except metallics, being computer revised. These vector data will be used for instrumental shading. The COS program will be attached as a sub-routine or loop to the central reformulation program. This will allow simultaneous generation of the revised formula and the COS data.

The Color Operations Section indicates that generation of this vector data on the C.O.S. Control Data G-15-D Computer would take approximately 1,500 computer hours and under normal work load would require at least six months. The same operation will now require less than 2 hours total computer time and an estimated span of 10 days. Our second en-masse reformulation (2,500 formulas) will also have the same time and manpower savings effect and therefore will cut approximately a potential years effort down to less than a month.

Although the reformulation program was written to accomplish the objective of 330-line reformulation, the basic program can be used for other large-scale type reformulations. Slight modification would probably be required, but the basic logic and program itself is available. The program will be maintained by the Statistics Section of the Divisional Plants Chemical Group for further application.

ADDENDUM I

330-LINE COMPUTERIZED REFORMULATION

PROGRAM DE-BUGGING NOTES ON MANUFACTURING DIRECTIONS
AND ORDERS OF ADDITION

- (1) Any 7 cards appearing after the "Total" line will not be reproduced. (C. A. Carpenter indicates Philadelphia will handle insertion of T-Code breakdown).
- (2) All 9 cards following the "Total" line will be reproduced. The 6 card which immediately precedes the first 9 card will also be reproduced since it introduces the 9 cards which follow it, e.g., a tinting strength test is punched on 9 cards and is introduced with a 6 card which denotes that a tinting strength test is to follow.
- (3) Any 6 cards following the "Total" line will not be reproduced. This is pending a review to determine if all information usually appearing at this position on a formula can be programmed to be included in a different position on the revision.
- (4) Footnotes for special additives and gloss notations will be standardized. This is currently underway.
- (5) The notation - "Agitate all dispersions before using and add slowly" - will appear in the initial manufacturing directions just above the first ingredients line.
- (6) Correction in order of addition of solvents so that thinning solvent appears last. - That solvent in the formula which is closest to the beginning of the "solvent subtraction list" appearing in the formulating guidelines, will be placed on the last 7 card preceding the "Total" line. - This will enable the strongest solvent to be used if additional solvent above formula amount is required to obtain viscosity. Oxygenated solvents and alcohols are not included in this determination.
- (7) Two (2) decimal places will be used for all amounts in the ingredients column.
- (8) If RC-305 appears in the ingredients column after revision of a formula to a 330-Line basis, an RC-574 alternate will be inserted in the Alternate 2 column.

ADDENDUM II

330-LINE COMPUTERIZED REFORMULATION

PROGRAMMING DETAILS FOR SPECIFIC FORMULA LINE NUMBERS

- (1) Line 101 - Code and Name - Duplicated.
Date - Insert the date on which the formula is processed through the computer.
- (2) Lines 202, 203, 204 - Duplicated.
- (3) Line 205 - Reviser - Name to be determined. Will be followed by a slash (/) and the word Univac, e.g., M. H. Schaffer/Univac.
 - Formula Distribution - Duplicated.
 - Plant - Entire field duplicated and followed by a slash and the initial "P" (Philadelphia). This slash P is tentative and will depend on where ditto masters are duplicated.
- (4) Line 206 - Previous Formula - Computer will search column 76 (control column). A notation appearing in this column will denote that the formula is a "temporary" and a "T" followed by a dash (-) will be placed prefixing the date. The date appearing on line 101 of the input cards will be inserted in this field. Suffixing the date, the Plant field from line 206 of the input cards will be duplicated.
 - TC Distribution - Duplicated.
 - Approvals - Initials to be determined.
- (5) Line 307 - R.F.I. - "Revise to use 330-line dispersions" will be inserted. This notation will be suffixed by the letters "R. L." and the applicable release letter number.
- (6) Line 208 - Duplicated.
- (7) Line 529 - Same as Line 101.
- (8) Line 230 - Patent Markings (COS) - "COS" will be inserted for all non-metallics
 - Viscosity - Duplicated.
 - Fineness - Duplicated.
- (9) Line 231 - Containers - Duplicated.
 - Gallon Weight - Already programmed. Adjusted gallon weight of the revised formula taken from the "Total" line will be inserted.
 - ICC Information - Duplicated.

101	CODE	NAME			DATE	
202	CUST.		LOC.		RFG & D.	
203	END USE				COLOR	
204	FORM.		R.L. - I.		M.B. & P.	
205	REVISER		A. DIST.	CE F J L M P S T	PLANT	
206	PREV. R.		T.C. DIST	CE F J L M P S T	APPR.	
307	R.F.I.					
208	S.T.P.		QUAL. STD.		COL. STD.	
309	I					
310	N					
311	T					
312	E					
313	S					
314	T					
315	I					
316	N					
317	G					
318	O					
319	N					
420	VOL. SOL.	%	FIG. VOL.	%	WT. SOL.	%
321						
322	O					
323	T					
324	H					
325	E					
326	R					
327						
328						

529	CODE	NAME			DATE	
230	PAY. MAR.		Visc.		FINE.	
231	CONT.		GAL. WT.		ICC. INFO.	
		INGREDIENT	SC	ALT. #1	ALT. #2	
32	M					
33	I					
34	N					
35	G					
36	R					
37	E					
38	D					
39	I					
40	N					
41	T					
42	S					
43	N					
44	G					
45	A					
46	M					
47	O					
48	U					
49	R					
50	N					
51	T					
52	I					
53	A					
54	N					
55	D					

56						
57						
58						

DUP030001652

ADDENDUM III

**330-LINE COMPUTERIZED REFORMULATION
PROGRAM NOTES AND LOGIC
SPECIAL DIRECTIONS, INSTRUCTIONS AND FOOTNOTES**

I. EQUIPMENT CLEANING INSTRUCTIONS

- (1) VH-5379 - Presence of this ingredient in any Line requires a 6 card after total (terminal direction) - "Formula contains VH-5379. Flush equipment thoroughly before using for batch of another code".
- (2) Slight Bleeders - 42-308, 42-310, 42-386, 732-386, 32-5243, 32-5540, 42-511, 42-519, 732-519, 743-519, 42-612, 330-1612, 732-612, 743-612, 42-646, 42-664, 42-689, 34-803, 42-860 - Presence of any of these mill bases requires a 6 card after total - "Slight Bleeder - Clean equipment before loading a non-bleeder".

II. FILTERING INSTRUCTIONS

- (1) 29-Line - All formulas in this Line require a 6 card after total - "Filling Instructions - Strain through 100 mesh wire".
- (2) W-244 and W-436 - Presence of either one requires the insertion of an asterisk notation next to all mill bases and colorants greater than 2.0#/100 gallons and the footnote - "All colorants must be filtered through 100 M Cuno or equivalent before adding to batch."
- (3) 81-Line-Sun-X Products - Scan 81-Line. Presence of the word Sun-X on formula line 101 requires a 6 card after total - "Filter through a minimum of 12 layers of felt".
- (4) All Lines - Scan for "150" in any 6 card after total. Presence requires a 6 card after total - "Filter through 150 mesh filter." "150".
- (5) 933-Line - Presence of G-822, VM-822 or VM-F-30707 in 933-Line requires a footnote - "With mixer running, add slowly through metal funnel containing copper screen. All equipment must be bonded and grounded." - and a 6 card after total - "Filter through 100 mesh screen. Patent applied for."

III. FILLING INSTRUCTIONS

- (1) 63 and 65-Lines - All 63 and 65 Lines require a 6 card after total - "Test and fill without delay."
- (2) 780 and 781-Lines - All 780 and 781-Lines with an N baking schedule require a 6 card after total - "Caution - Adjust to lower side of viscosity limits before filling."

IV. LABELLING AND WARNING NOTICES

- (1) Lead Warning Notice - Scan all Lines except 700 thru 799 Lines for the word "lead" in any 6 card after total. Presence requires a 6 card after total - "Labelling - Requires Lead Warning Notice."
- (2) 717 and 752-Lines - Scan for the code "VG-5671" in any 6 card after total. Presence requires "Label Containers - Note-Add 2% by weight of VG-5671 Clear Doping solution and mix thoroughly before screening."
- (3) H-41 - The presence of H-41 in amounts of 4% or greater on total product weight requires a 6 card after total - "Apply a methanol sticker on all containers." The presence of H-41 in amounts less than 4% on total product weight requires a 6 card before total (last stage direction) - Do not use more than 3.9% of methanol on total batch weight.

V. EXACT WEIGHT AND NO SUBSTITUTE NOTATIONS

- (1) Exact Weight - H-600, VH-5684, VH-5534, 348-18323, H-580, VM-7790, VH-1833, VH-5379, 732-912 - Presence of any of these ingredients requires a footnote - "Weigh Accurately".
- (2) Exact Weight - H-172, H-173 or VD-5822 - Presence of any of these ingredients requires a footnote - "Weigh Accurately" except in 91, 93 and 181-Lines. (See Section VI, Note 4)
- (3) No Substitute - H-202, H-624, RC-305, RC-547, 42-224 - Presence of any of these ingredients followed by an asterisk requires a footnote - "No Substitute."

- (4) Exact Weight - H-554 in 45-Line, H-505 in 81-Line, G-752 in 701-Line, 732-10863 in 706 or 707-Lines - Presence, as described, requires a footnote - "Weigh accurately".
- (5) Exact Weight - Presence of G-770 or H-505 in amounts less than 2.0#/100 gallons require a footnote - "Weigh accurately".
- (6) H-224 - Presence in 704 or 1704 Lines requires a footnote "Loading Critical. Check by 2 operators."
- (7) Maintain Formula Proportion - 32-10228, 32-17980 - Presence requires a footnote - "Maintain Formula Proportion."
- (8) VH-1260 - Presence of VH-1260 in 752-Line in amounts of 1.0#/100 gallons or greater requires a footnote- "Weigh Accurately." - in amounts less than 1.0#/100 gallons requires conversion of lbs. to grams and the footnote - "Add exactly --- grams of VH-1260 per 100 gallons of product."
- (9) No Substitute - Presence of 32-5840 with an asterisk in 752-Line requires a footnote - "No Substitute."
- (10) Maintain Formula Proportion - Presence of 743-17111 in 781 or 793-Lines requires a footnote - "Maintain Formula Proportion."

VI. SPECIAL INSTRUCTIONS:

- (1) G-71 and H-607 - G-71 does not appear in a formula without H-607. When G-71 is present it should be given an order of addition number 12 and H-607 an order of addition number 13. Both should have an asterisk and the footnote - "Add exact amounts. Do not add G-71 unless H-607 is available. Must be added one after the other."
- (2) G-434 - (a) Presence without a companion solvent - Use order of addition number 12 and the footnote - "Slurry with a portion of the thinner solvent before adding."
(b) Presence with a companion solvent - Use order of addition number 12 for G-434 and number 13 for the companion solvent - Insert asterisks for both and the footnote - "Slurry before adding."

- (3) W-110, W-121, W-181, W-1021 - Use order of addition number 6. Presence requires deletion of the first manufacturing direction and insertion of - "Add slowly with mixing. Mix 1 hour or until smooth."
- (4) H-172, H-173, VD-5822, RC-3140 - Presence of all of these together in 91, 93 or 181-Lines requires:
 - (a) footnote symbols for H-172, H-173 and VD-5822 and the footnote - "Not subject to 5-50 Rule."
 - (b) if thinning solvent is H-257 insert a 6 card before total - "Use H-596 if more than formula amount of H-257 is required."
- (5) H-555 in 672-Line - Presence requires deletion of first manufacturing direction and insertion of - "Add and mix 15 minutes. Do not mix longer than 15 minutes or allow to stand after mixing."
- (6) H-601 in 707-Line - Presence of H-601 with an asterisk in 701-Line requires a footnote - "Bring H-601 to room temperature before adding."
- (7) W-422 - Presence requires a footnote - "Add very slowly with mixing."

VII. MISCELLANEOUS

- (1) 710-Line - Scan all 6 cards after total for:

- (1) "Nainsook"
- (2) "15"
- (3) "30"

Presence of "Nainsook" requires 6 card after total - "Nainsook filtration required." Presence of "15" requires 6 card after total - "All shipments of this product must be labelled or stamped 15 gloss." Presence of "30" requires 6 card after total - "All shipments of this product must be labelled or stamped 30 gloss."

- (2) Package Shade - Presence of at least 3 mill bases in a row with the same asterisk requires search of the following two 6 cards for the word "Package". Presence of "Package" requires footnote - "Package Shade". Absence of "Package" requires footnote - "Weigh Accurately."

VIII. GLOSS ADJUSTMENT NOTATIONS

The presence of any of the below listed flatting base codes in the product lines indicated, requires the insertion of two (2), 6 cards immediately before the "Total". The first 6 card will contain the statement - "To lower gloss use X." - where X stands for flatting base code. The second 6 card will be left blank and the applicable gloss raising notation, as present in the original formula, will be keypunched at Philadelphia and inserted in the Tab Card deck.

FLATTING BASE

PRODUCT LINE NUMBERS

32-5297	152, 158, 170, 171, 196, 710, 717, 752, 762, 796, 799.
32-8128	82, 112, 151, 158, 170, 171, 191, 196, 656, 657, 701, 752, 762, 796, 799.
732-929	752
732-938	752
732-939	752
W-1021	799
732-10863	707
745-10016	707, 711, 715, 717, 752, 772, 796, 798, 799
G-768	751
VM-F-30707	H-799