

cc - H. L. Plummer-Wilm. D-8005
D. V. Gregory-Plant
R. A. DeWall "
I. L. McGinnis-Lab.
C. R. E. Merkle "
S. J. Roskowky "
Russell Morgan-Lab.

Marshall Laboratory
June 27, 1951

"INDEXED"

6/29/51

RETURN TO MARSHALL LABORATORY LIBRARY

LABORATORY MEMORANDUM REPORT NO. 361

SOYA OIL SURVEY

REFERENCE COPY
NOT FOR CIRCULATION

INTRODUCTION

1. This survey was started in Dec. 1950 to investigate the possibility of replacing soya oils with linseed.

The objectives for this survey were:

(a) To take advantage of a cost savings (0.243¢/lb.) existing at that time in favor of linseed oils (H-19).

(b) Such a replacement would also aid in maintaining initial drying properties with smaller amounts of cobalt drier which was under government control.

2. However, since that time, the cost differential on the oils has gradually reversed itself (.0174¢/lb.) in favor of soya oils (H-59) and the cobalt drier availability has improved considerably.

SUMMARY

1. There were 13,733,341 lbs. of H-59 soya oil consumed during 1950 in the following products:

<u>Products</u>	<u>No. of Items</u>	<u>Amount of Oil</u>
Resins	(27)	11,992,625
Varnishes	(11)	203,369
Bodied Oils	(3)	699,246
Miscellaneous	(4)	222,134
Unaccounted for		615,987
Total		13,733,341

N35425

2. There were also 879,210 lbs. (solids basis) of purchased special bodied and treated soya oils consumed during 1950. These oils are bought and used for the manufacture of specific lines of product as follows:

<u>Code</u>	<u>Title</u>	<u>Amount (Solids)</u>	<u>Products Used In</u>
H-190	Processed Soya ADM #50	1100	Lacquers
H-193	Blown Soya Bean Oil	23,159	"
H-194	Soya Bean Lacquer Oil (SL-200)	9,657	"
H-552	HB Soya Bean	43,827	"Dulux" Flat Enamel, etc.
H-612	Ardol "v"	154,184	T. & C. House Paints
H-613	" "	156,813	" " "
H-616	"Soyagel"	491,470	Interior Flat Wall Paints
Total		879,210	

3. Soya oil has been used in combination with Chinawood oil in orthodox varnish type products as a linseed alternate chiefly because of lower costs, and in most cases is readily interchangeable with linseed oil without effecting quality as indicated in Table II attached.

In the case of most soya oil alkyds, this oil is used for quality reasons and cannot be readily replaced without affecting such properties as baking discoloration and color retention. However, there are some cases where the corresponding linseed analog can be used without quality sacrifice.

Details

(a) Attempts have been made to account for all the oils consumed, but since the amounts used in experimental production and the stocks of resin and varnish intermediates on hand at end of year are not readily available, approximately 4% of the oil consumed was not traced.

(b) The resin consumption is analyzed by line numbers in which the resin is used, and tabulated accordingly.

(c) No attempts were made to show a similar breakdown for the varnish type intermediates because:

1. The amount of oil involved is less than 2% of the total consumption.
2. As pointed out in Table II, practically all of these formulas already show a linseed alternate or a linseed alternate could be easily developed.

The production figures are in gallons unless otherwise stipulated.

MARSHALL LABORATORY

BLM:alg
6/27/51

[Handwritten Signature]

TABLE II

RESULTS

Code	1950 Production Gallons	wt./ Gal.	Total lbs. resin	% Solids	% Oil	% Oil/ Lb.	Total lbs. H-59 Consumed	Linseed Alternate Yes	Remarks
RC-193	368,600	8.33	3,070,438	83%	62%	.51	1,505,923	"	RC-141
" -212	19,268	8.35	160,888	55%	40%	.27	35,395	"	Used in lacquers
" -268	23,833	8.86	211,160	100%	62%	.62	130,919	"	Used in Speed Easy
" -262	303,800	8.13	2,469,894	55%	45%	.25	617,474	"	during 1950 (now
" -305	117,729	8.28	974,796	55%	43%	.24	233,951	"	buying from nesco)
" -311	422,484	8.20	3,464,369	60%	52%	.312	1,080,883	"	
" -315	363,833	7.52	2,736,024	50%	65%	.33	902,888	"	
" -397	1,443	7.93	11,443	50%	48%	.24	2,746	"	
" -427	104,540	8.25	862,521	70%	63%	.44	379,509	"	Has been obsoleted
" -433	61,135	7.87	481,132	50%	50%	.25	120,283	"	RC-141
" -436	55,380	7.71	426,980	48%	52%	.25	106,745	"	
" -453	966,641	8.01	7,742,794	60%	52%	.312	2,405,752	"	
" -454	11,311	7.45	84,267	41%	48%	.20	16,853	"	
" -461	782,360	7.54	2,128,494	50%	66%	.33	702,568	"	RC-511
" -462	700,528	7.78	5,450,108	60%	60%	.36	1,962,039	"	RC-512
" -464	352,847	7.60	2,681,637	55%	67%	.37	992,206	"	RC-514
" -491	1,078	8.46	9,120	55%	37%	.20	1,824	"	
RC-3075	133,781	8.06	1,078,275	50%	48%	.24	172,524*	"	2/1 - Soya/DCO
" -3078	183,021	8.00	1,647,189	50%	50%	.25	156,229*	"	"
" -3088	15,856	8.23	130,495	55%	46%	.25	32,624	"	"
" -3085	21,962	8.20	180,088	55%	46%	.25	45,022	"	Being replaced with
" -3091	46,598	8.13	378,842	55%	45%	.25	94,711	"	RC-262 in most
" -8211	6,376	7.65	42,400	45%	40%	.18	7,632	"	products
" -8453	46,274	8.01	370,655	60%	52%	.31	114,903	"	
RCI-351	245	7.96	1,950	70%	68%	.48	936	"	
RAC-282	1,421	8.05	12,292	75%	51%	.38	4,671	"	
" -283	1,622	8.56	13,884	75%	52%	.39	5,415	"	
							<u>11,992,625</u>		

BLM:alg
6/21/51

TABLE #II

VARNISHES - BODIED OILS - SPECIAL OILS & MISCELLANEOUS

Code Varnishes	1950 Production Gallons	Wt./ Gal.	Total Lbs. Varnishes	Solids %	Oil Ratio	H-59 %/Lb.	Total H-59		Linseed Alternate Yes No	Remarks
							SBO Consumed 1950	Formula #1		
VC-810	45,313	7.42	335,769	51%	10/7 H-59	.04	13,431	Formula #1	"	
VC-913	90,428	7.36	665,550	50%	12-1 H-7/H-59	.02	13,311	"	"	
VC-950	137,219	7.25	994,838	45%	4-1 H-7/H-59	.07	69,639	VC-5443 Formula #1	"	
VC-1329	64,310	7.35	472,679	52%	H-7/H-59	.04	18,907	Formula #1	"	
VC-2020	21,896	7.21	157,870	40%	10-1 H-7/H-59	.09	14,208	"	"	
VC-4017	51,244	7.43	388,173	47%	5-2 H-7/H-59	.02	7,763	"	"	
VC-5062	3,625	7.50	27,188	62%	12-1 H-7/H-59	.09	2,447	"	"	
VC-5339	94,714	7.37	698,042	55%	4-3 H-7/H-59	.03	20,941	Formula dated 3/4/48 VC-5443	"	
VC-8142	46,838	7.43	348,006	54%	5-6 H-7/H-59	.09	31,321	"	"	
VC-8175	10,149	7.11	72,159	46%	4-7 H-7/H-59	.15	10,824	"	"	A Linseed alt. can be developed HGS.
VC-8810	1,931	7.47	14,425	60%	3-2 H-7/H-59	.04	577	"	"	A Linseed alt. can be developed HGS.
Bodied Oils										
VO-969	318,548	7.75	2,468,747	100%	100% H-59		2,468,747	"	"	Used in resins VO-8000 HGS VO-5053
VO-5331	4,494	7.85	35,278	100%	2/1 H-59/M7		23,514	"	"	
VO-5362	21,916	8.00	175,328	100%	2/1 H-59/H-7		116,884	"	"	
H-59						% H-59/ Gal.	2,609,145			
670 line	440,632					.20	88,126			Tints only (H-19)
69 "	201,000					.20	40,200			"
168 "	76,528					.20	15,306			"
471 "	109,096					.720	78,502			Flint formulation ?
							222,134			
Special Oils										
H-190	Processed Soya ADM #50		117	85%			100			Used in lacquers
H-193	Blown Soya Bean Oil		23,159	100%			23,159			"
H-194	Soya Bean Lacquer Oil - GL-200		9,657	100%			9,657			"
H-552	H.B. Soya Bean - 80%		54,784	80%			43,827			" " Dulux" flat enamel, etc.
H-612	Ardol - "W"		154,184	100%			154,184			" Cannot be replaced
H-613	" "		156,813	100%			156,813			" Quality reasons (drying) WFS
H-616	Soyagel - 70%		702,100	70%			491,470 879,210			" Tints only (with H-699 Linogel)

CONCLUSIONS

Line	1950 Production	No. of Products	Average		Total Lbs. Resin Used	% Oil in LB Resin	Total Lbs. Oil Used
			Lbs./ Gal.	%/LB			
25	105,700 Gals.	15	2.60		274,820	.51	140,158
26	17,934 "	22	.96		17,217	"	8,721
28	215,968 "	60	3.00		647,904	"	330,431
58	712,117 "	22	2.35		1,673,475	"	853,472
64	13,526 "	10	1.40		17,536	"	8,943
80	48,354 "	2	1.82		88,004	"	44,882
32	188,112 Lbs.	3		Misc.	49,539	"	25,264
37	230,322 "	9		.313	72,091		36,766
39	956,066 "	19		Misc.	163,397	"	83,332
596	17,238 "	2		.18	3,103	"	1,582
603	4,502 Gals	1	2.87		12,921	"	6,589
639	1,692 "	3	1.49		2,521	"	1,286
RK-332	950 "	1	2.92		2,774	"	1,415
Total					3,025,302		1,542,841

RC-212

Lacquer Clears	17	{ 35,395
243	1	
283	4	

2

RC-262

Line	1950 Production	No. of Products	Lbs./ Gal.	%/Lb.	Total Lbs. Resin Used	% Oil in Lb. Resin	Total Lbs. Oil Used
32	2,773,269 #	16		Misc.	564,489	.25	141,122
58	8,122 Gals.	58	.54		4,397	"	1,096
67	738 "	1	1.33		981	"	245
68	23,000 "	7	.50		11,500	"	2,875
69	1,068 "	1	.42		449	"	112
80	15,684 "	1	.58		9,097	"	2,274
88	389,112 "	7	.55		214,012	"	53,503
635	207,165 "	13	1.68		348,037	"	87,009 (Replaced with RC-461)
639	5,999 "	1	1.69		10,138	"	2,535
655	12,838 "	2	4.32		77,060	"	19,265
656	3,209 "	3	2.58		8,279	"	2,069
81	22,729 "	6	Misc.		111,354	"	27,239
82	2,680 "	1	4.46		11,953	"	2,988
151	23,508 "	5	3.50		82,278	"	20,570
752	27,905 "	5	3.33		92,924	"	23,231
754	193 "	2	1.28		247	"	62
764	50,110 "	10	2.58		129,284	"	32,321
RK-	1,487 "	2	Misc.		6,908	"	876
					1,683,477		419,388

RC-268

23	35,616 lbs.	1		.19	6,767	.62	4,128
24	52,068 lbs.	1		.20	10,413	"	6,455
387	772 gals.	1	2.24		1,729	"	1,072
548	1,633,543 lbs.	2		.10	163,354	"	101,279
					182,123		112,935

BLM:afg
6/22/51

RC-305

<u>Line</u>	<u>1950 Production</u>	<u>No. of Products</u>	<u>Average</u>		<u>Total Lbs. Resin Used</u>	<u>% Oil in Lb. Resin</u>	<u>Total Lbs. Oil Used</u>
			<u>Lbs./ Gal.</u>	<u>%/Lb.</u>			
23	35,616#	1		.15	5,342	.24	1,282
24	52,068#	1		.16	8,331		1,999
32	58,901	7		Misc.	5,594		1,452
69	465	1	.97		451		108
82	807	1	4.15		3,349		804
704	1,103	2	Misc.		4,283		1,028
707	13,344	6	Misc.		3,698		888
715	1,124	1	.09		101		24
725	70,243	3	Misc.		79,425		19,062
727	49,232	3	1.44		56,124		13,470
732	507,474#	14		Misc.	83,090		19,941
745	2,331	1	4.55		10,606		2,545
752	23,872	10	Misc.		15,379		3,691
754	31,418	24	.14		4,399		1,056
764	29,368	3	3.22		94,565		22,696
765	11,313#	1		.18	2,033		488
1082	155	2	2.70		264		63
					377,033		90,677

BLM:aig

6/25/51

4

RC-311

<u>Line</u>	<u>1950 Production</u>	<u>No. of Products</u>	<u>Average</u> <u>Lbs./</u> <u>Gal.</u>	<u>%/Lb.</u>	<u>Total Lbs.</u> <u>Resin Used</u>	<u>% Oil</u> <u>in Lb.</u> <u>Resin</u>	<u>Total Lbs.</u> <u>Oil Used</u>
26	6,176	2	1.32		8,152	.312	2,542
28	146,952	19	Misc.		287,320	"	89,644
32	1,026,063*	11		Misc.	240,423	"	75,012
39	609,889	4		.202	130,821	"	40,816
58	8,381	59	4.34		36,372	"	11,348
86	28,540	1	3.90		111,306	"	34,727
88	389,112	?	4.30		<u>1,673,183</u>	"	<u>522,033</u>
					2,487,577		776,122

RC-315

32	176,891*	4		Misc.	102,173	.33	33,717
39	38,619*	3		Misc.	13,803	"	4,555
67	738	1	.82		605		200
595	2,975	1		.221	657		216
596	960,161	1		.196	188,476		65,403
612	101	1	3.77		381		126
615	46,416	15	3.61		167,562		55,295
631*	395,655	25	3.74		1,479,750		488,318
655	119,625	6	2.60		311,025		102,638
657	11,867	6	3.00		35,061		11,748
661	900	1	3.66		<u>3,294</u>		<u>1,087</u>
					2,302,787		763,403

* This represents an estimate of (10) mos. production before changing to RC-464.

BLM:aig

6/25/51

5

RC-433

<u>Line</u>	<u>1950 Production</u>	<u>No. of Products</u>	<u>Lbs./ Gal.</u>	<u>%/Lb.</u>	<u>Total Lbs. Resin Used</u>	<u>% Oil In Lb. Resin</u>	<u>Total Lbs. Oil Used</u>
32	375,255#	3		Misc.	217,482	.25	54,371
92	14,218 Gals.	18	4.70		66,825		16,706
94	808 "	6	4.45		3,596		899
97	18,812 "	1	4.30		80,892		20,223
162	11,060 "	4	4.27		47,226		11,807
182	510 "	1	4.25		2,168		542
797	140 "	3	4.95		<u>693</u>		<u>173</u>
					418,882		104,721

RC-427

28	817 "	1	5.21		4,257	.44	1,873
37	507,424#	2		.021	106,904	"	47,038
87	117,159 Gals.	2	5.21		609,966	"	268,385
603	50,747	4	3.29		<u>166,958</u>	"	<u>23,461</u>
					888,085		390,757

RC-436

RK-147	57,964 Gals.	1	7.36		426,615	.25	106,653
--------	--------------	---	------	--	---------	-----	---------

RC-454

32-5265	129,718#	1		.463	60,059	.20	12,012
---------	----------	---	--	------	--------	-----	--------

BLM:aig

6/25/51

6

RC-453/8453

Line	1950 Production	No. of Products	Average		Total Lbs. Resin Used	% Oil in Lb. Resin	Total Lbs. Oil Used
			Lbs./ Gal.	% Lbs.			
25	59,708	1	.96		57,320	.312	17,884
26	31,462	15	3.29		103,510	"	32,295
28	53,794	10	Misc.		58,984	"	18,411
32	12,583,729#	62		Misc.	3,129,850	"	976,442
39	225,084#	4		Misc.	48,096	"	15,006
58	717,188	29	Misc.		1,178,948	"	367,832
64	381,196	9	Misc.		811,474	"	284,269
67	9,406	1	1.34		12,604	"	3,932
69	495	1	2.90		1,407	"	439
80	48,354	2	Misc.		93,511	"	29,176
81	78,835	41	4.00		314,011	"	97,596
82	7,344	5	Misc.		15,133	"	4,721
85	10,066	1	2.88		28,990	"	9,045
86	29,548	17	Misc.		95,453	"	29,781
90	7,529	1	3.22		24,243	"	7,564
104	1,766	9	4.50		7,604	"	2,371
151	1,840	1	3.64		6,698	"	2,090
168	794	3	1.76		1,397	"	436
596	3,218#	1		.196	637	"	198
613	43,968	6	Misc.		87,991	"	27,420
615	677	1	1.83		1,238	"	386
656	17,534	6	Misc.		39,543	.312	12,337
657	6,286	2	3.22		20,241	"	6,315
764	94,988	6	2.45		232,721	"	72,609
1063	923	1	1.06		978	"	305
RK-	80,307	4	Misc.		446,015	"	139,157
RAK-	1,043	4	Misc.		6,076	"	1,895
RAC-	3,043	2	3.31		10,072	"	3,142
RAF-	256	1	6.56		1,679	"	524
					6,927,424		2,163,543

BLM:alg
6/25/51

7

RC-461

<u>Line</u>	<u>1950 Production</u>	<u>No. Of Products</u>	<u>Lbs./ Gal.</u>	<u>%/Lb.</u>	<u>Total Lbs. Resin Used</u>	<u>% Oil in Lb. Resin</u>	<u>Total Lbs. Oil Used</u>
32	4,626,227#	10		Misc.	968,406	.33	319,574
37	48,264#	2		.187	9,025	"	2,978
66	281	1					
596	5,079,449#	1		.047	238,733	"	78,782
603	53,096	6	1.60		84,955	"	28,035
639	22	1					
689	269,739	1	2.14		558,087	"	<u>184,169</u>
							613,538

RC-462

28	929	2			1,226	.36	441
32	5,576,208#	30		Misc.	985,031	"	354,611
58	53,492	18	4.65		248,738	"	89,546
80	726,809	21	4.50		3,270,641	"	1,177,431
81	980	1	1.76		1,724	"	621
639	17,940	3	4.01		71,939	"	<u>25,898</u>
							1,648,548

BLM:aig

6/25/51

RC-464

8

<u>Line</u>	<u>1950 Production</u>	<u>No. of Products</u>	<u>Lbs./ Gal.</u>	<u>%/Lb.</u>	<u>Total Lbs. Resin Used</u>	<u>Total in Lb. Resin</u>	<u>Total Lbs. Oil Used</u>
32	8,856,758#	47		Misc.	1,172,529	.37	433,836
60	26						
596	32,393#	1		.136	3,181	"	1,176
631*	80,000	11	3.50		280,000	"	103,600
633	207,165	12	1.71		354,253	"	131,073
639	81,687	5	Misc.		35,861	"	13,269
670	440,642		1.31		530,081	"	<u>196,130</u>
							879,084

* This represents an estimate of two (2) months production as the change from RC-315 to RC-464 was made Nov., 1950.

RC-491

RK-451	978	1	2.93		2,866	.20	573
--------	-----	---	------	--	-------	-----	-----

RCT-351

39	1,918#	1		.387	742	.48	556
----	--------	---	--	------	-----	-----	-----

RAC-283

23	6,617#	3		Misc.	4,690	.39	1,829
----	--------	---	--	-------	-------	-----	-------

PRC-R-73744

RK **	18,340	1	6.11		112,057	.31	34,737
-------	--------	---	------	--	---------	-----	--------

Revised to use RC-453 as of Oct. 1950.

** Estimated production

BLM:aig

6/25/61

DUP030003251

9
RG-3075

Line	1950 Production	No. of Products	Average		Total Lbs. Resin Used	% Oil in Lb. Resin	Total Lbs. Oil Used
			Lbs./ Gal.	%/Lb.			
42	4,466#	1		.33	1,474	.24	354
92	134,702	16	Misc.		628,246		150,779
94	16,318	9	Misc.		72,476		17,394
97	3,528	5	Misc.		15,294		3,671
162	1,987	4	3.04		6,040		1,450
182	3,424	4	Misc.		13,161		3,159
752	6,898	1	2.87		19,797		4,751
797	32,456	16	5.00		<u>162,280</u>		<u>38,947</u>
					918,768		220,513*

* 147,010 (soya)
73,500 (DCO)

RG-3078

92	280,529	MISC.	4.90	1,374,641	.25	343,660*
----	---------	-------	------	-----------	-----	----------

* 240,562 (soya)
103,098 (DCO)

RG-3085

This resin is used in miscellaneous automotive products.

RG-3088

32 #	46,379	1		.262	12,151	.25	3,038
63	8,678	1	2.38		20,654		5,164
656	3,177	1	5.00		<u>15,885</u>		<u>3,971</u>
					48,690		12,173

BLM:alg
6/25/51

10

RC-3091

<u>Line</u>	<u>1950 Production</u>	<u>No. of Products</u>	<u>Average</u> <u>Lbs./</u> <u>Gal.</u>	<u>%/Lb.</u>	<u>Total Lbs.</u> <u>Resin Used</u>	<u>% Oil</u> <u>in Lb.</u> <u>Resin</u>	<u>Total Lbs.</u> <u>Oil Used</u>
764	58,717#	5		.31	18,202	.25	4,500

RC-8211

32	8,342#	1		.62	5,172	.18	930
39	119,127#	1		.15	2,869		513
81	7,413	2	3.90		28,911		5,204
63	2,491	1	2.13		5,306		955
656	735	1	4.35		3,197		575
1082	966	1	3.54		<u>3,226</u>		<u>580</u>
					48,681		8,760

BLM:aig

6/25/51