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REPORT NO. 776

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PARLIN LABORATORY REPORT

SUBJECT: CAN STABILITY OF 242 LINE ENAMELS.

PERIOD: DECEMBER 1935 - FEBRUARY 1937.

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PARLIN LABORATORY REPORT NO. 776

SUBJECT: CAN STABILITY OF 242 LINE ENAMELS.

I - INTRODUCTION

When the 242 Line was developed and factory production started, a one gallon sample was taken from each batch of material manufactured at Parlin and stored in pint cans to determine the can stability of the enamels. Samples were also made up in the laboratory of the white enamels in the 242 Line. The finished black enamels in the 242 Line were not included in these tests.

Previous work has shown that zinc oxide in the presence of RL-233 resin produces a grit formation in the enamel. The purpose of these can storage tests were to determine how long the 242 Line could be stored without appreciable grit formation. The viscosity of the enamels was determined at various intervals over the storage period to show any effect of aging on viscosity.

It should also be mentioned that the 242 Line white enamels, 242-009 and 242-0094 were originally formulated with a PX/Resin/plasticizer ratio of 10/9/1. This ratio was changed to 10/7/3 when factory production actually started. Practically all of the enamels included in these tests were manufactured on the 10/7/3 ratio. Shortly after production of the 242 Line had been started the ratio of PX/Resin/Plasticizer was changed to 10/9/3 $\frac{1}{2}$ to improve the flexibility of the enamels. The colors other than whites have been on the original Px/Resin/Plasticizer ratio of 10/5/5 $\frac{1}{2}$.

All of the work included in this report was done using RL-233 with an acid number of approximately 5 and the resin manufactured by the fusion method. At the present time the RL-233 is manufactured by the fusion method with an acid number of approximately 1.

The purpose of this program is to determine the extent to which the 242 Line can be stored in cans with the idea in mind of releasing the material to the Refinish and Export trade if can stability permits.

II - SUMMARY AND CONCLUSION

1. The 242 Line enamels containing zinc oxide may be stored at room temperature (average 75°F) for a period of 12 months with but very few instances of grit formation; these instances are not to the extent of making the material unfit for use. Small quantities of grit were noticed in several samples after storage of 9 months. These same samples were satisfactory for use after storage of 12 months.

2. Enamels in the 242 Line that did not contain

zinc oxide did not show any grit formation after 12 months' storage at room temperature.

3. None of the enamels in the 242 Line exhibited any great increase or decrease in viscosity on storage. The white and green enamels showed practically a constant viscosity throughout the year. The blue and maroon enamels increased in viscosity during the year's storage, this increase, however, was not to the extent of affecting the working properties of the enamels or to the extent of making a change in the thinner ratio necessary. In general all of the other tinting enamels and finished colors decreased slightly in viscosity over the period of one year. Apparently as far as viscosity is concerned, the 242 Line is satisfactory for use after storage of 12 months at room temperature.

As a result of these can storage tests, the 242 Line may be considered satisfactory after storage periods of at least 12 months in climates similar to that in this part of the country. As shown by accelerated can storage tests, at elevated temperatures, the can stability of the 242 Line containing zinc oxide would be reduced considerably.

At the present time the RL-233 used in the 242 Line has an acid number of 1 as compared to an acid number of 5 of the RL-233 used at the time this series of tests were made. Accelerated can storage tests have indicated that this reduction in acid number will greatly increase the can stability of the 242 Line enamels containing zinc oxide.

The viscosity data given can only be considered to show trends since there have been a number of solvent and other changes since the storage tests were started.

III - EXPERIMENTAL

One gallon samples were taken from each factory batch of 242 Line tinting and finished enamels from the time the 242 Line was started in production until approximately the middle of February 1936. The samples were then taken over a period of several months. Each of the one gallon samples were canned into eight pint cans and placed at room temperature for storage. The original viscosity and the viscosity at various intervals during the year was determined and recorded. At the same time each sample of enamel was thinned and a pour made on a glass plate to show any grit that may have formed.

During the period over which the samples were collected the composition of the white tinting enamel changed from a PX/Resin/Plasticizer ratio of 10/9/1 to 10/7/3. This change was made to improve the flexibility of the enamels. The other color in the 242 Line had a ratio of 10/5/5 $\frac{1}{2}$. The

formulas for the white tinting enamels and a formula representing the other colors are given below.

242-009 WHITE TINTING ENAMEL (10/9/1 Ratio)

B-570	48.60	Mix			
PB-14	16.60	thoroughly			
H-80	2.71				
H-12	2.60	Add			
H-78	1.49	and			
H-68	7.70	mix			
H-111	1.47				
RC-233	18.83				
	100.00%				
			<u>Solids</u>		<u>Ratio</u>
			PX	14.69	10.0
			Resin	13.16	9.0
			H-111	1.47	1.0
			W-133	10.76	7.3
			Theo.	40.08%	
			Anal.	39.71%	

242-009 WHITE TINTING ENAMEL (10/7/3 Ratio)

B-570	45.20%	Mix until			
PB-141	20.72	uniform			
H-80	3.50				
H-18	1.10	Add			
H-78X	2.60	and			
H-68	7.70	mix			
T-3603	1.19				
H-22	1.75	Add			
H-111	1.59	last			
RC-233	14.65				
	100.00%				
			<u>Solids</u>		<u>Ratio</u>
			PX	13.65	10.0
			BRG-76756	10.24	7.0
			H-111	2.63	
			H-22	1.75	3.0
			W-133	10.75	7.35
			Theo.	40.00%	
			Anal.	39.34%	

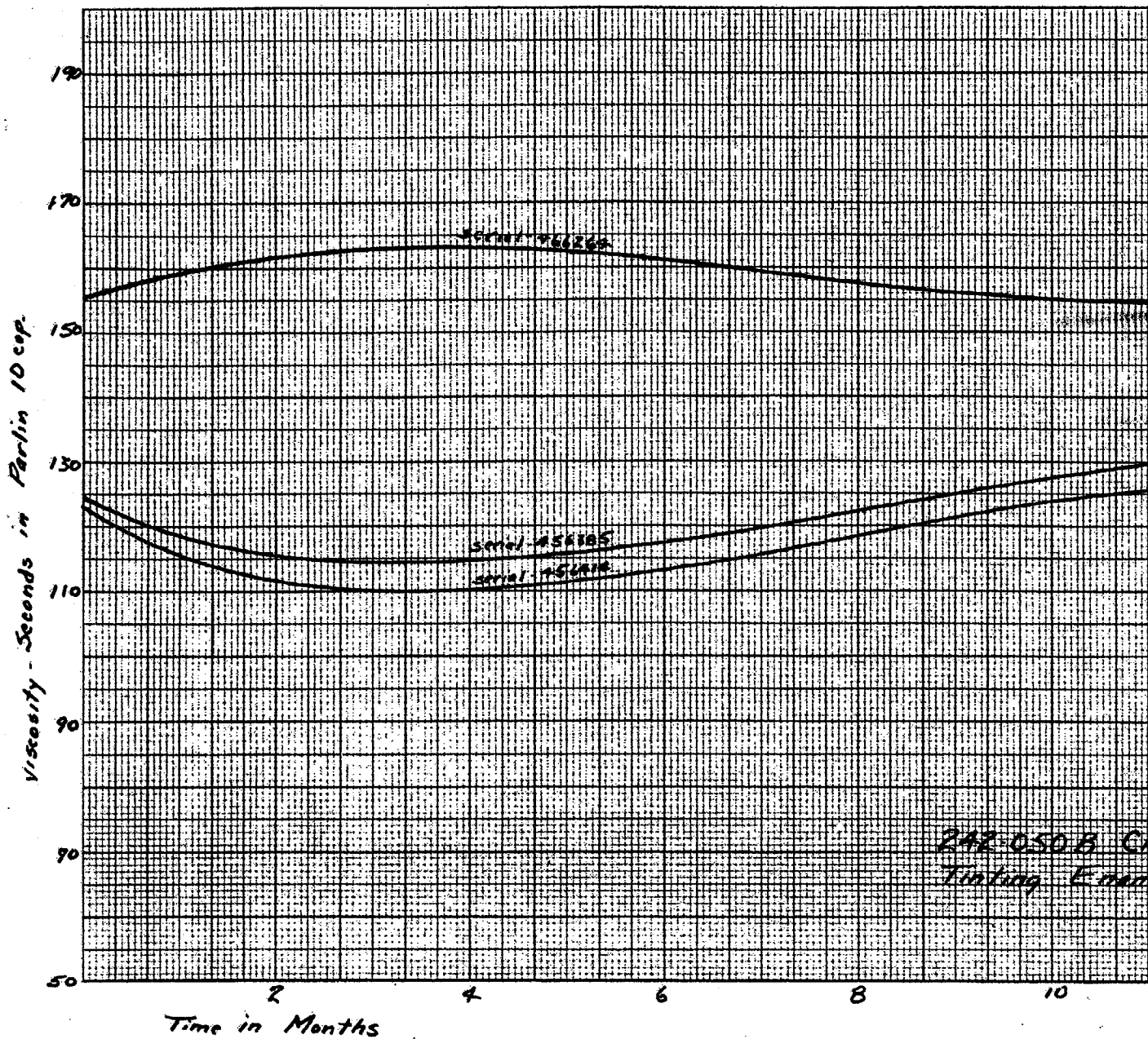
242-070 LIGHT GREEN TINTING ENAMEL (10/5/5¹ Ratio)

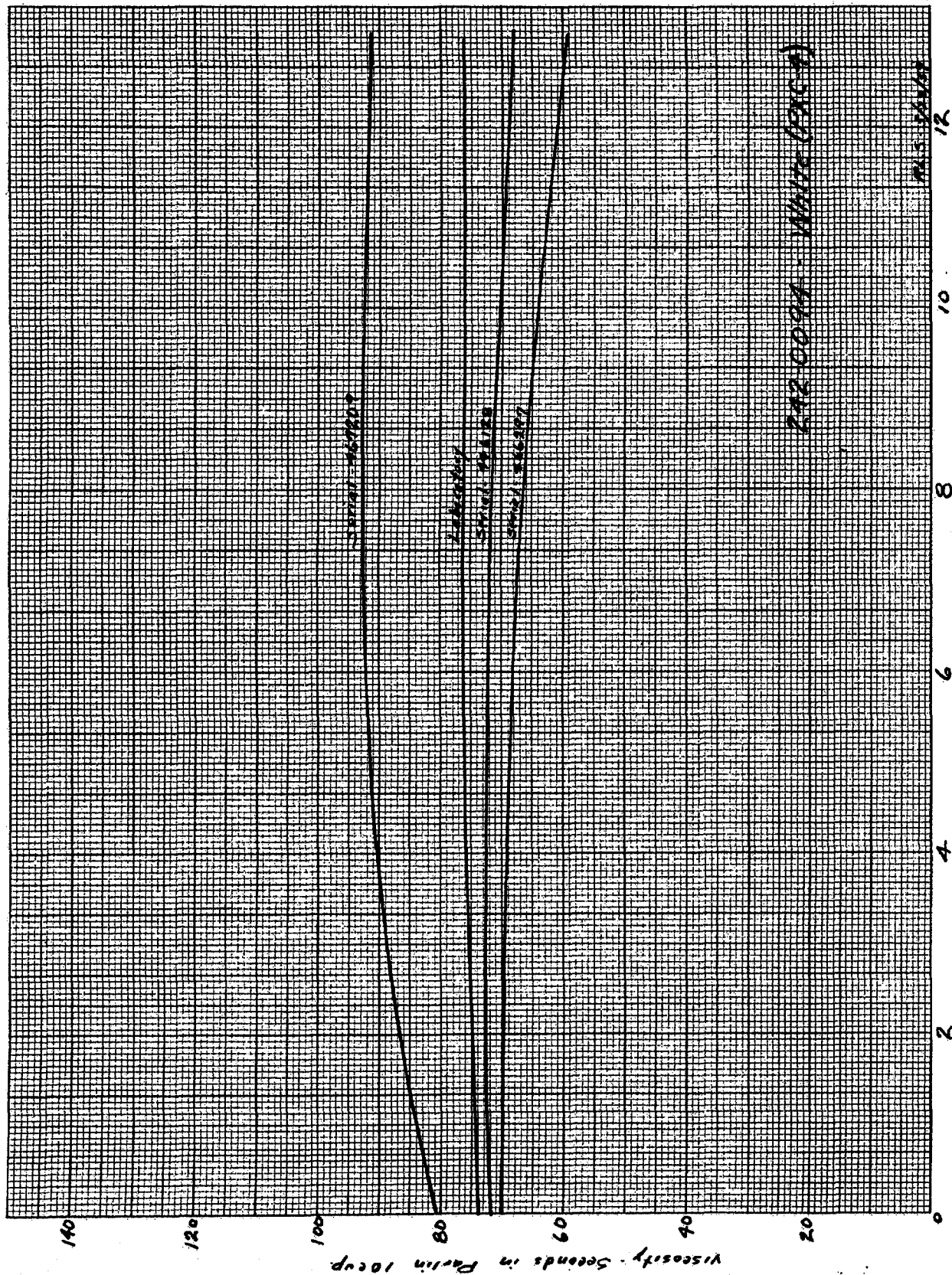
W-781	8.60				
RC-233	6.00	Mill Base			
H-80	2.90				
T-3603	5.60	Take Out			
T-3603	3.27				
H-78	1.30				
H-12	2.40				
H-68	7.70				
H-111	4.75				
H-22	3.08				
RC-233	4.00				
B-304	50.40				
	100.00%				
			<u>Solids</u>		<u>Ratio</u>
			PXC	14.10	10.00
			Resin	7.03	5.00
			H-111	4.75	3.38
			H-22	3.08	2.16
			W-781	10.70	7.60
			Theo.	39.66%	
			Anal.	38.48	

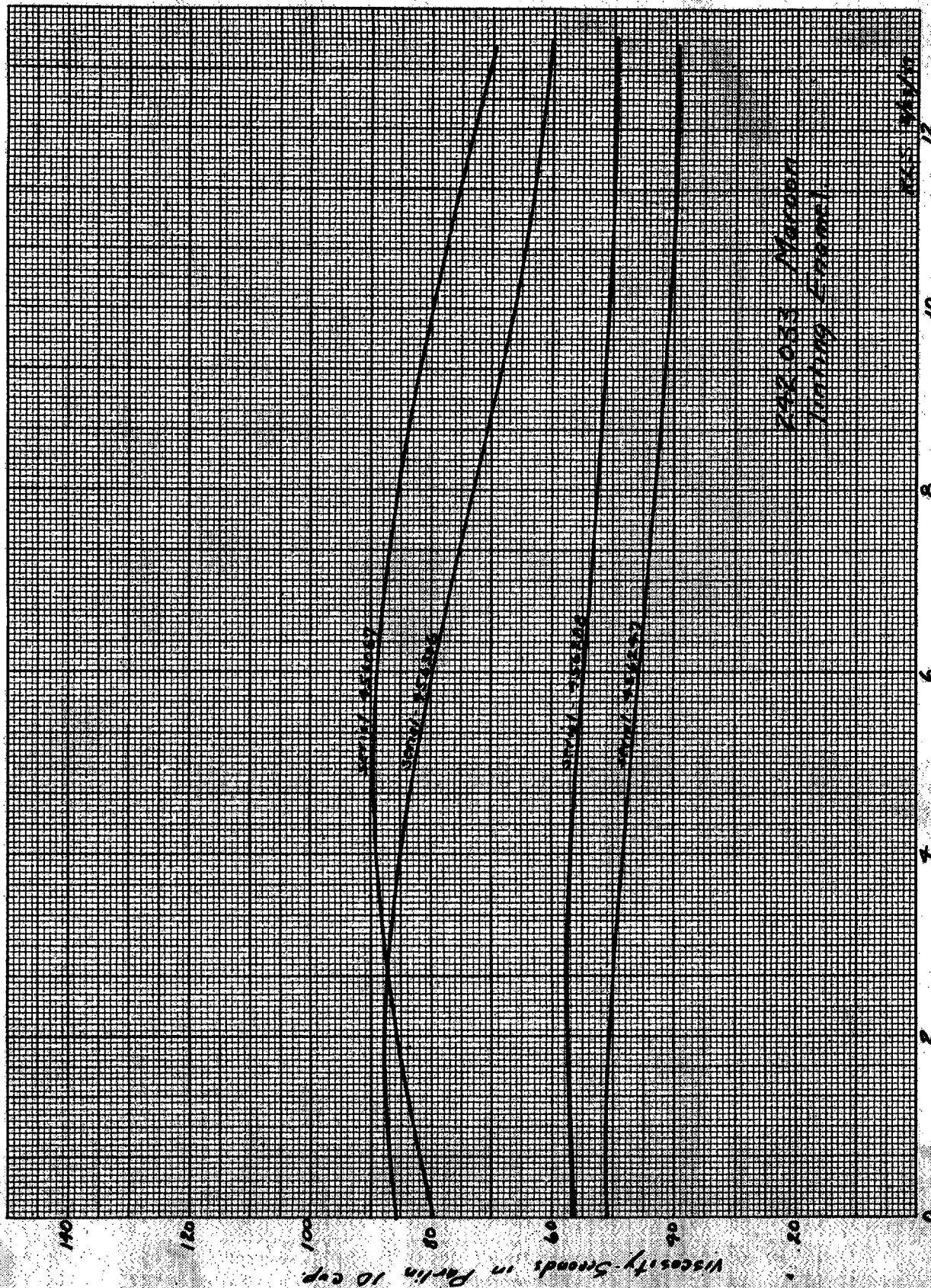
All of the viscosities were determined at 28°C. although at the present time the standard practice is to make the determination at 25°C.

The attached tables give the viscosities of a number of representative tinting and finished colors in the 242 Line. The general trend of viscosities of the various tinting enamels and finished colors is shown in the attached curves.

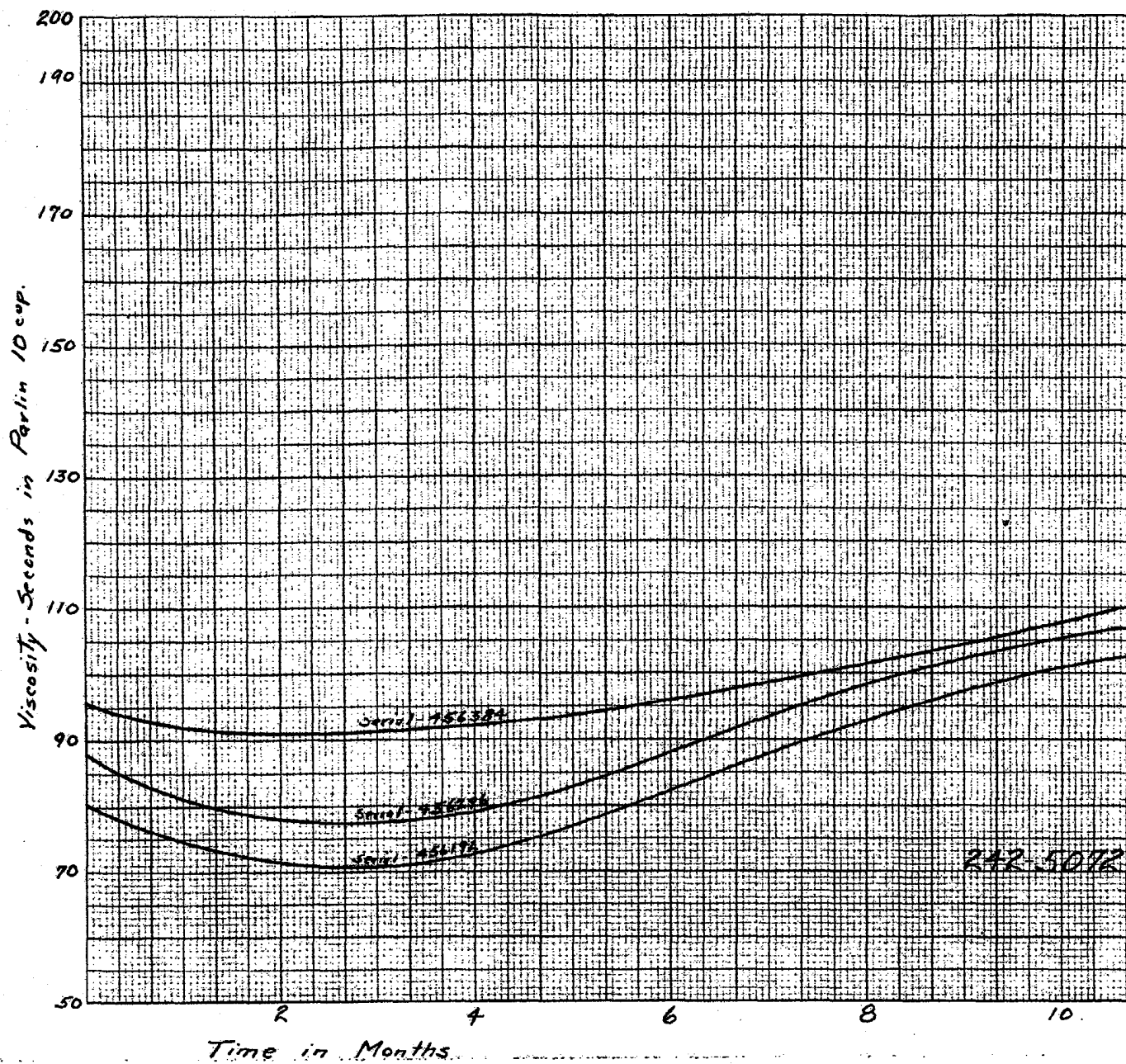
RLS:VRS

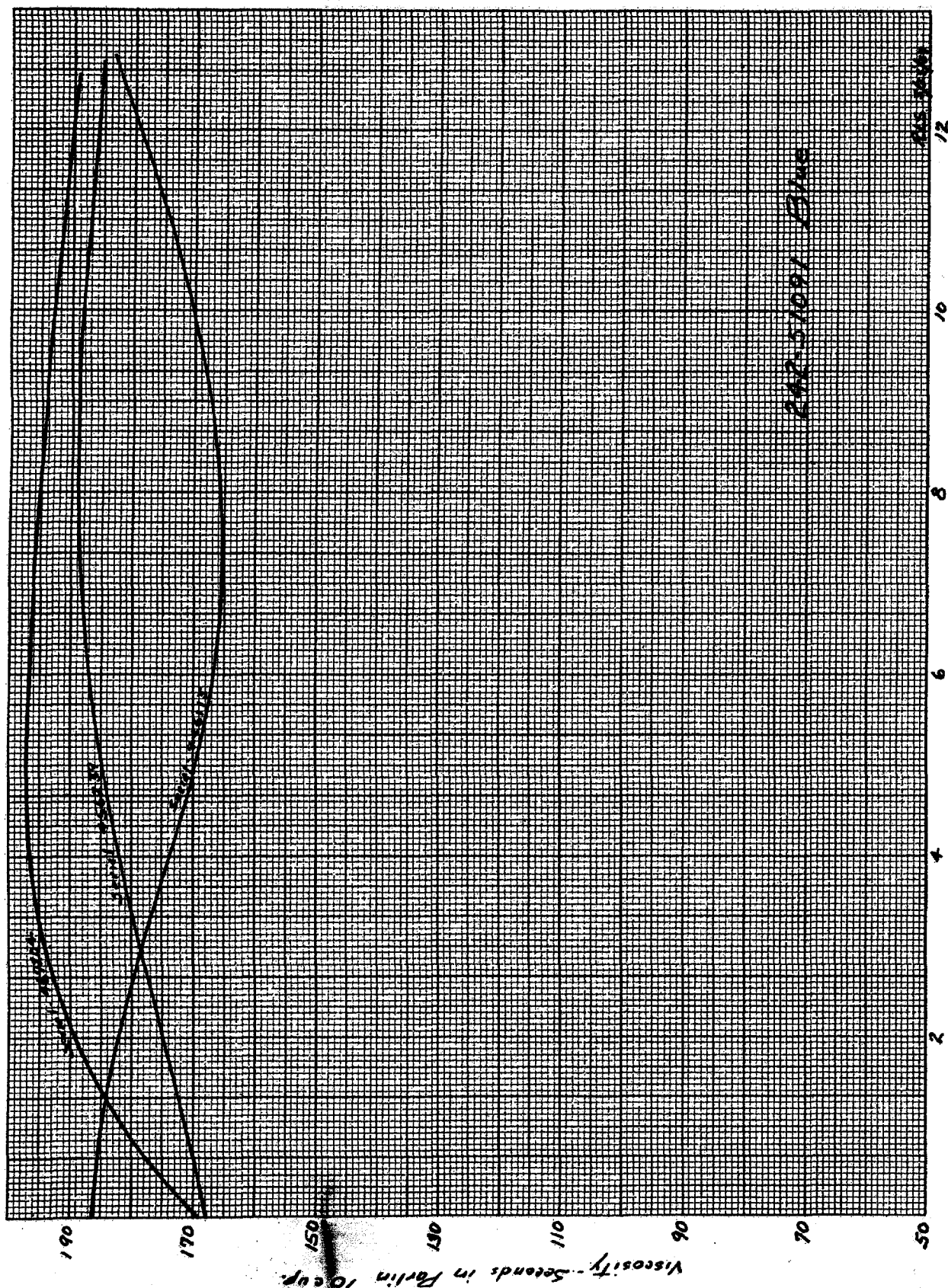




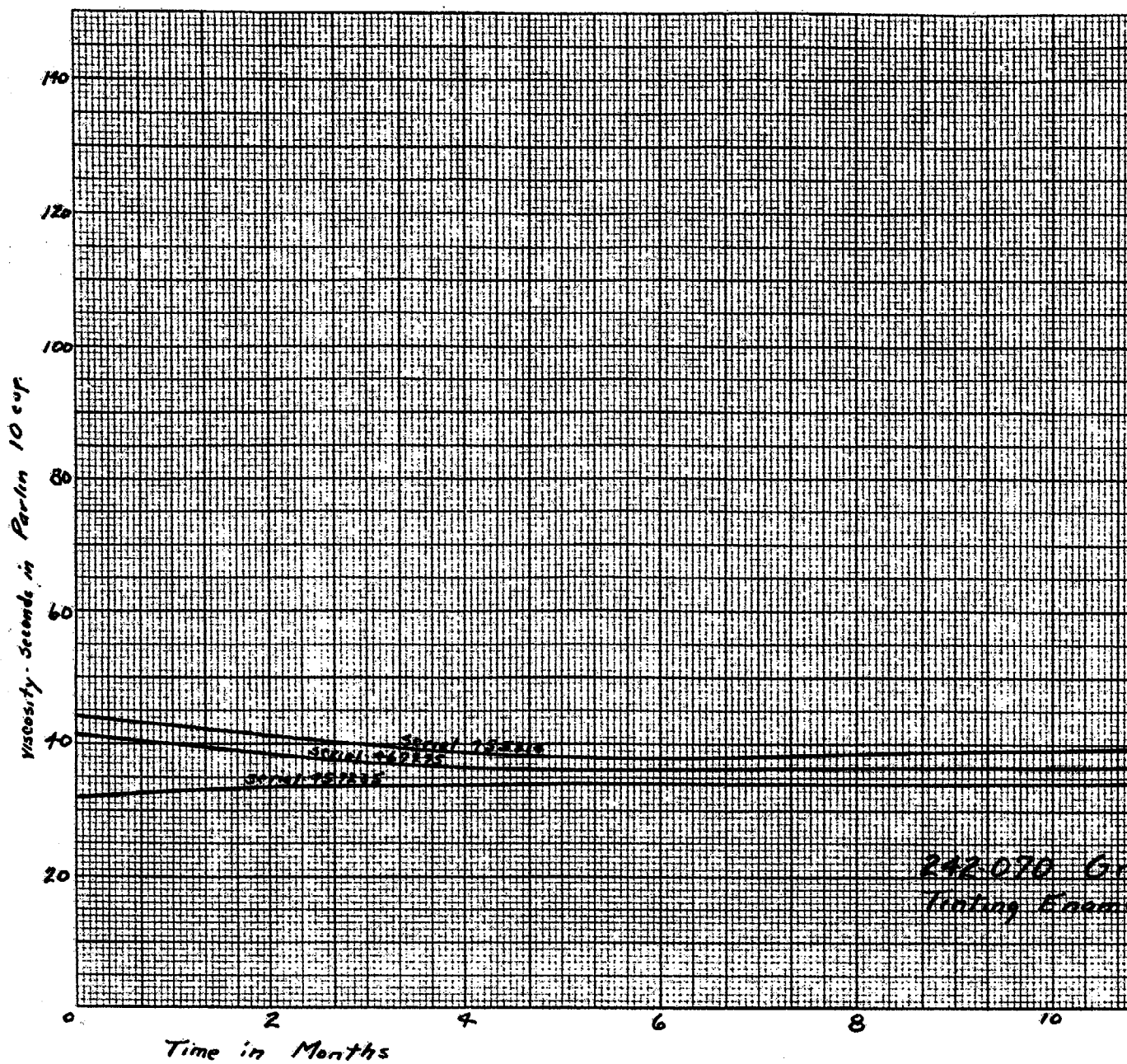


242.053 Maroon
 (unlabeled Enamel)

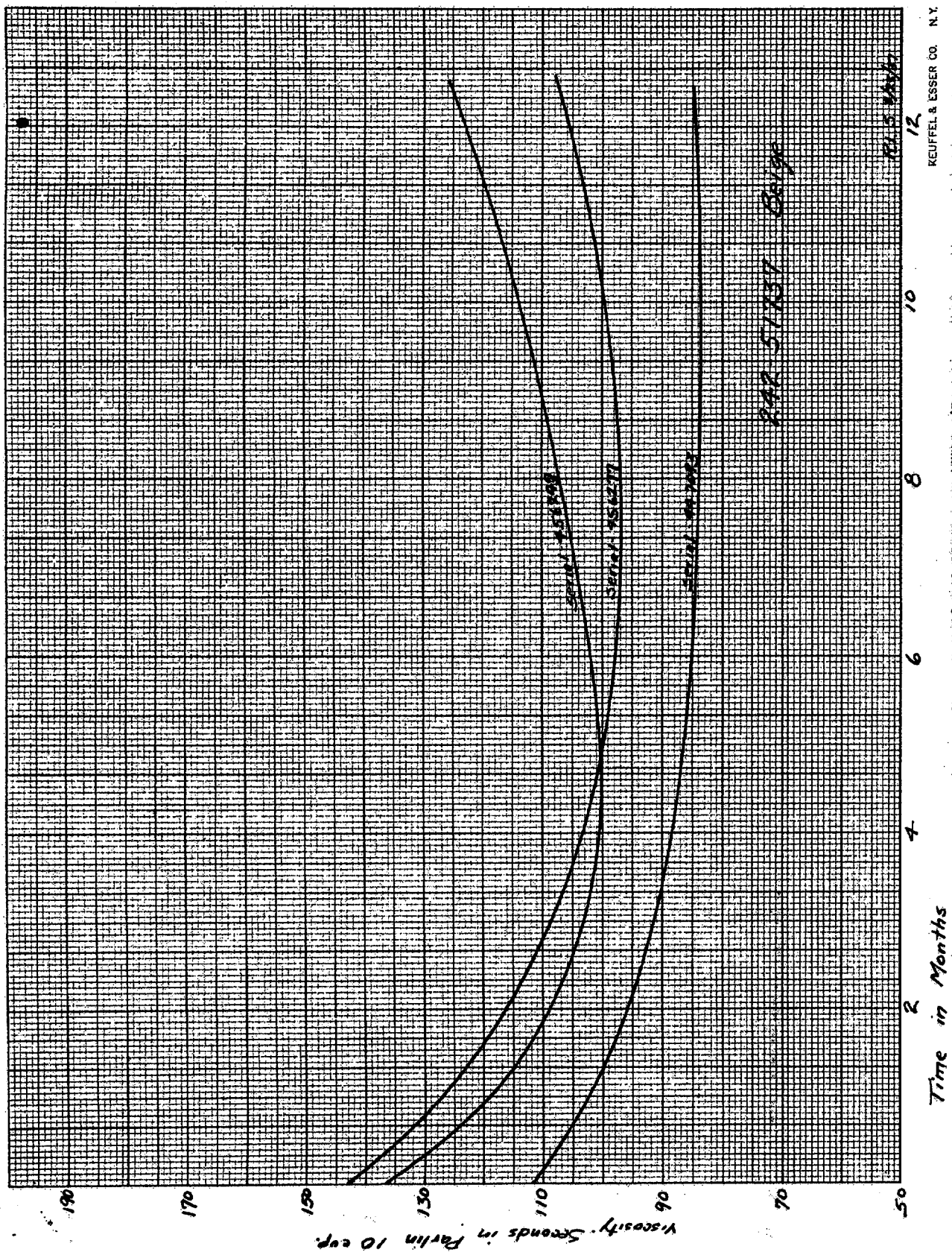




KEUFFEL & ESSER CO. N.Y.



DUP030000872



VISCOSITY DETERMINATIONS

1936

FORMULA	SERIAL	CUP	DATE AND NO. SECONDS									
			12/2/35	12/9/35	12/16/35	12/30/35	1/14/36	2/17/36	8/18/36	11/13/36		
242-51621	47-7368	15 C.	24"	25"	25"	26"	26"	27"	-	-		
242-009	47-7402	15 C.	33"	33"	33"	34"	35"	38"	-	-		
242-0094	46-7009	10 C.	80"	78"	81"	86.5"	82"	90"	75"	97"		
242-020	46-5002	15 C.	31"	30"	30"	32"	39"	30"	-	60"		
242-040	46-5061	15 C.	13"	13"	12"	12"	12"	12"	-	20"		
242-064	46-5226	15 C.	17"	17"	18"	17"	18"	18"	-	33"		

FORMULA	SERIAL	CUP	12/24/35	12/31/35	1/7/36	1/24/36	3/13/36	4/13/36	6/13/36	9/19/36	12/23/36	11/1/36
242-009	46-6236	10 C.	101"	108"	101.5"	102"	98"	84"	83"	84"	-	80"
242-0093	46-7245	10 C.	81"	85.5"	90.5"	95"	92"	88"	81"	82"	-	74"
242-0094	46-7209	10 C.	83"	78.5"	81"	82"	81"	72"	71"	71"	-	73"
242-0094	46-6297	10 C.	71"	71"	77"	76"	72"	68"	67.4"	68"	-	65"
242-020	46-7280	10 C.	197"	193"	175.5"	175"	168"	144"	126"	125"	-	115"
242-033	46-6288	10 C.	83"	76.5"	72"	85"	89"	85"	61"	80"	-	75"
242-0372	46-6250	10 C.	126"	121"	130"	139"	149"	135"	129"	150"	-	132"
242-040	46-7253	10 C.	340"	277"	392"	265"	259"	210"	212"	190"	-	-
242-050	46-6264	10 C.	155"	144"	161.5"	168"	158"	153"	149"	158"	-	152"
242-063	46-7210	10 C.	52"	55"	48"	52"	52"	51"	45"	45"	-	43"
242-064	46-7254	10 C.	95"	83"	86"	87"	80"	78"	73"	69"	-	67"
242-070	46-7275	10 C.	43"	43"	42.5"	43"	41"	38"	38"	38"	-	-
242-073	46-7256	10 C.	79"	74.5"	74.5"	79"	80"	73"	66.6"	67"	-	-
242-077	46-7255	10 C.	84"	87"	88"	92"	81"	80"	76"	70"	-	68"

FORMULA	SERIAL	CUP	1/4/36	1/13/36	1/20/36	3/13/36	4/13/36	6/13/36	9/19/36	11/16/36
242-0093	46-6353	10 C.	80"	70"	66"	73"	69"	61"	62"	60"

FORMULA	SERIAL	CUP	DATE AND NO. SECONDS									
			12/24/35	12/31/35	1/7/36	1/24/36	3/13/36	4/13/36	6/13/36	9/19/36	11/16/36	
242-51949	46-7203	10 C.	205"	216"	213"	216"	0	220"	220"	233"	187"	
242-51091	46-7204	10 C.	168"	185"	179"	190"	195"	162"	180"	190"	81"	
242-50703	46-7233	10 C.	100"	91"	96"	95"	90"	84"	79"	81"	144"	
242-51252	46-7230	10 C.	169"	177"	177"	191"	186"	173"	158.4"	155"	110"	
242-6731	46-7234	10 C.	106"	110"	112"	118"	117"	110"	102"	102"	67"	
242-5314	46-7236	10 C.	100"	86"	80"	88"	75"	81"	68.6"	68"	85"	
242-51737	46-7232	10 C.	120"	99"	97.5"	95"	95"	78"	80"	80"	75"	
242-6525	46-7235	10 C.	94"	92.5"	91"	93"	86"	85"	77"	76"	76"	
242-50962	46-7229	10 C.	91"	107"	91.5"	90"	84"	77"	77"	74"	85"	
242-50721	46-7257	10 C.	136"	98"	93"	118"	124"	105"	145.4"	143"		

FORMULA	SERIAL	CUP	1/11/36	1/18/36	1/27/36	2/13/36	4/13/36	6/13/36	9/19/36	11/16/36
242-51949	45-7124	10 C.	151"	171"	150"	158"	160"	159"	176"	181"
242-50721	45-6150	10 C.	68"	80"	93"	78"	93"	81"	83"	-
242-0372	45-6066	10 C.	114"	109"	108"	98"	104"	80.4"	78"	83"
242-033	45-6067	10 C.	86"	81"	85"	81"	Lump	47"	55"	62"

FORMULA	SERIAL	CUP	1/18/36	1/27/36	2/3/36	2/18/36	4/15/36	6/16/36	9/19/36	11/13/36
242-0093	45-7093	10 C.	101"	106"	96"	100"	96"	92"	93"	92"
242-0093	45-6233	10 C.	103"	98"	100"	103"	103"	90"	84"	88"
242-020	45-6276	10 C.	115"	117"	98"	102"	95"	87"	80"	95"
242-51737	45-6277	10 C.	134"	138"	107"	118"	105"	95"	90"	82"
242-50271	45-6247	10 C.	83"	80"	75"	83"	89"	76"	90"	41"
242-070	45-5314	10 C.	45"	47"	41"	41"	40"	38"	40"	86"
242-50721	45-6192	10 C.	79"	77"	74"	82"	96"	78"	75"	74"
242-51621	45-6153	10 C.	99"	91"	85"	85"	80"	74"	70"	55"
242-033	45-7170	10 C.	74"	83"	86"	86"	81"	50"	52"	

FORMULA	SERIAL	CUP	DATE AND NO. SECONDS						
			1/23/36	2/8/36	2/18/36	6/16/36	9/19/36	11/13/36	2/16/37
242-009	46-6287	10 C.	165"	150"	160"	141"	142"	133"	133"
242-077	45-6275	10 C.	65"	62"	61"	57"	53"	56"	54"
242-0372	45-6248	10 C.	104"	87"	91"	81"	80"	84"	87"
242-077	45-6210	10 C.	79"	75"	76"	60"	56"	60"	62"
242-51737	45-6243	10 C.	135"	118"	120"	105"	106"	103"	113"
242-033	45-6306	10 C.	56"	57"	57"	51"	39"	48"	44"
242-50721	45-6296	10 C.	90"	77"	96"	76"	90"	92"	98"
242-033	45-6247	10 C.	30"	52"	50"	43"	35"	36"	37"

FORMULA	SERIAL	CUP	1/23/36	2/8/36	2/18/36	6/16/36	9/19/36	11/13/36	2/16/37
242-009	45-6287	10 C.	165"	150"	160"	141"	142"	133"	133"
242-077	45-6275	10 C.	65"	62"	61"	57"	53"	56"	54"
242-0372	45-6248	10 C.	104"	87"	91"	81"	80"	84"	87"
242-077	45-6210	10 C.	79"	75"	76"	60"	56"	60"	62"
242-51737	45-6243	10 C.	135"	118"	120"	105"	106"	103"	113"
242-033	45-6306	10 C.	56"	57"	57"	51"	39"	48"	44"
242-50721	45-6296	10 C.	90"	77"	96"	76"	90"	92"	98"
242-033	45-6247	10 C.	50"	52"	50"	43"	35"	36"	37"

FORMULA	SERIAL	CUP	1/21/36	1/29/36	2/8/36	6/16/36	9/9/36	11/13/36
242-51252	45-6195	10 C.	91"	102"	120"	85"	91"	88"
242-6525	45-6246	10 C.	118"	115"	116"	96"	95"	102"
242-50721	45-6192	10 C.	78"	72"	72"	79"	77"	85"
242-51923	45-6193	10 C.	117"	118"	106"	103"	114"	121"
242-073	45-6309	10 C.	77"	84"	200"	75"	80"	72"

DATE AND NO. SECONDS

FORMULA SERIAL CUP

	1/29/36	2/8/36	4/22/36	6/16/36	9/19/36	11/16/36	2/16/37
242-064	70"	67"	63"	60"	56"	58"	60"
242-51091	172"	155"	155"	161"	184"	176"	195"
242-023	55"	50"	48"	45"	49"	43"	49"
242-050	115"	117"	111"	114"	117"	124"	128"
242-51252	95"	89"	87"	79"	78"	80"	84"
242-073	83"	75"	67"	65"	69"	67"	72"
242-0093	68"	64"	68"	64"	60"	61"	71"
242-070	46"	45"	41"	41"	43"	43"	0

	2/13/36	4/22/36	8/11/36	9/19/36	11/16/36	2/16/37
242-51252	106"	103"	90"	93"	96"	94"
242-51737	100"	100"	85"	87"	84"	81"
242-51949	167"	179"	176"	183"	192"	208"
242-0094	71"	70"	65"	63"	63"	70"
242-51252	130"	120"	101"	108"	103"	107"
242-9089	56"	57"	65"	44"	50"	51"
242-51091	182"	186"	157"	167"	170"	141"
242-6731	120"	123"	118"	131"	127"	88"
242-6525	99"	85"	84"	83"	83"	99"
242-50962	114"	95"	91"	95"	97"	100"
242-50721	93"	97"	88"	92"	105"	100"
242-6731	123"	136"	123"	136"	138"	146"

RLS:MCN
3/24/37