Attachment XI

Ester Oils

Esters as Lubricating Oils

It has long been known that the lubricating power of natural hydrocarbon lubricating oils can be improved by an addition of natural fatty oils. In special cases, automobile and aviation engines were lubricated only with natural fatty oils, such as castor oil. However, it was always found that no satisfactory and permanent lubrication of these engines could be obtained with natural fatty oils because such oils are not sufficiently stable to heat. This is due to the thermal sensitivity of the secondary hydroxyl group of glycerine in an acid environment. Since fatty oils, on the other hand, are much better than hydrocarbon oils with respect to resistance to pressure and reduced wear, it became necessary to prepare synthetic esters which combined good lubricating power with satisfactory thermal resistance. An additional requirement was that the oils must exhibit a good viscosity-temperature relation, that is, a V.I. above 120, and a low cold test, that is, a solidification point below -50°C.

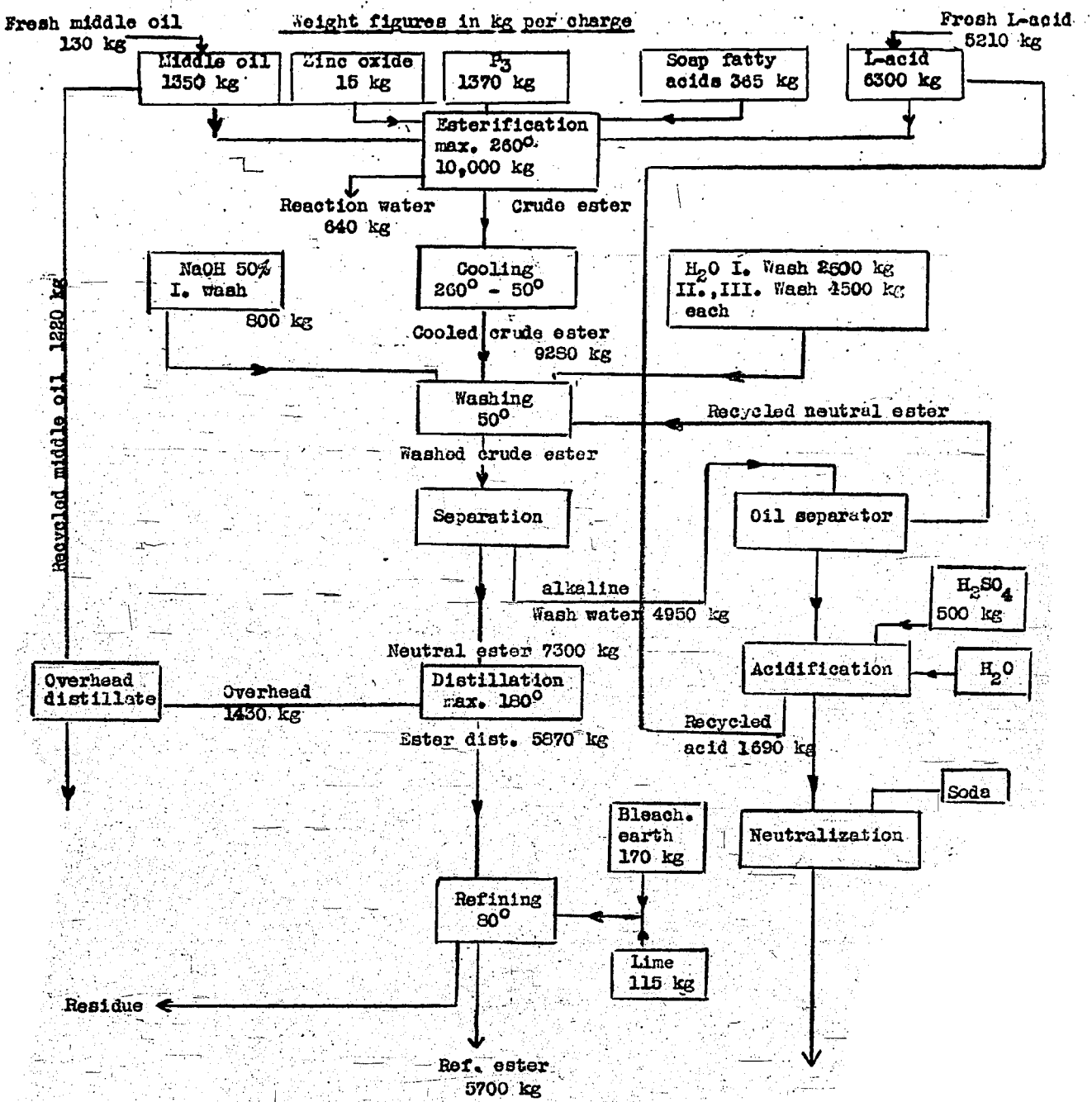
For this reason the synthesis of esters and their engine tests were started in 1938 by Dr. Zorn in Oppau and Dr. Löwenberg in Leuna. The work was continued in Leuna in 1939, 40 and 41. The esters prepared and tested during this period are listed in the following tables. A critical sifting of the material, based on relations between chemical constitution and lubricating properties, will follow in another report.

Those who chiefly participated in the preparation, development and testing of the ester lubricating oils were Dr. Löwenberg and Dr. (Miss) Rössig, assisted by Dr. Metzger and Dr. Ganicke.

(Signed) Zorn

Ester 486 (1940 Jato)*

1 charge = 5.7 tons End product in 15 Working hours



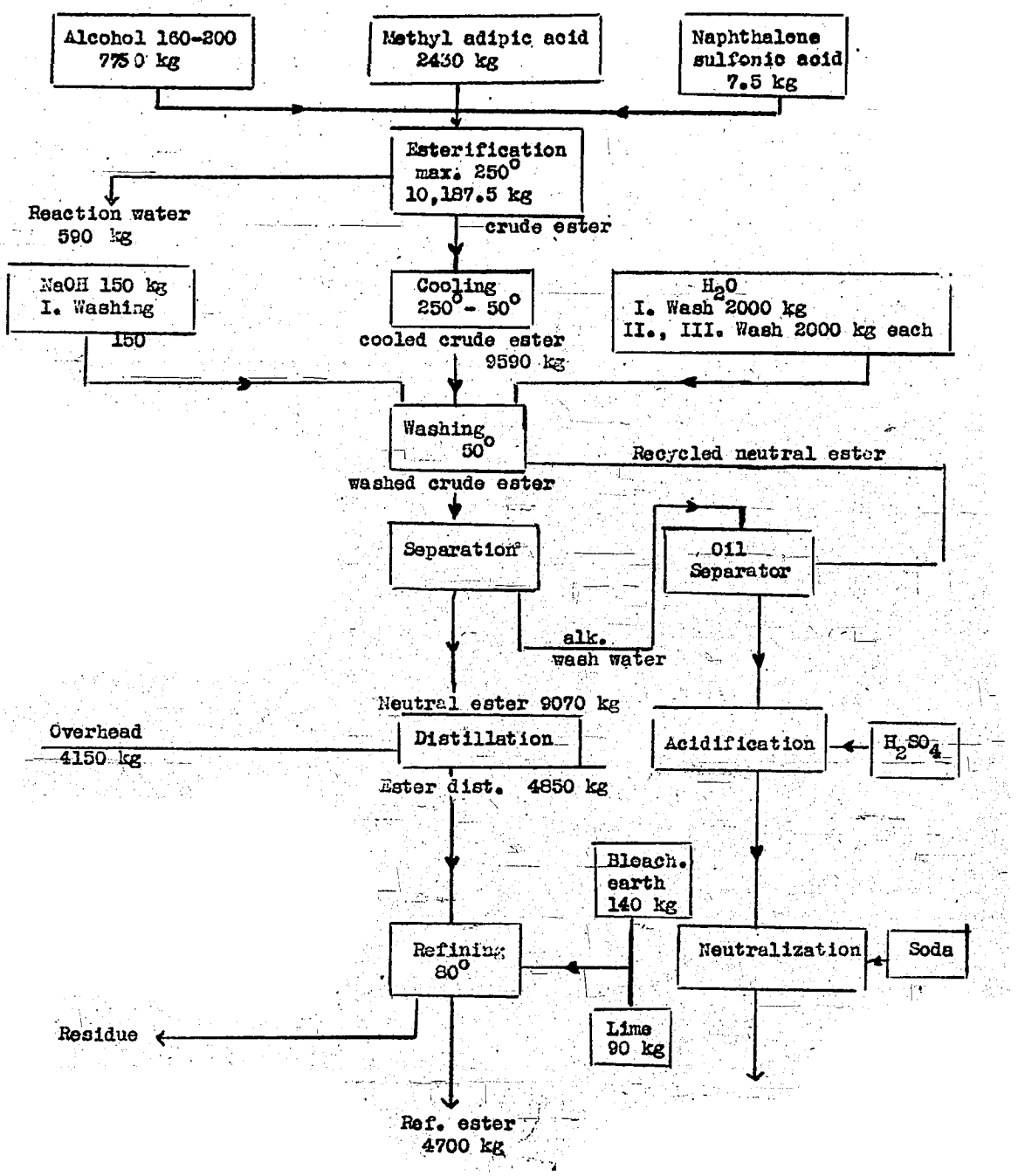
Flow diagram for Ester plants Me 1016

* Jato = Tons (metric) per year.

Ester 504 (1310-3100 Jato)

1 Charge = 4.7 tons End product in 15 Working Hours

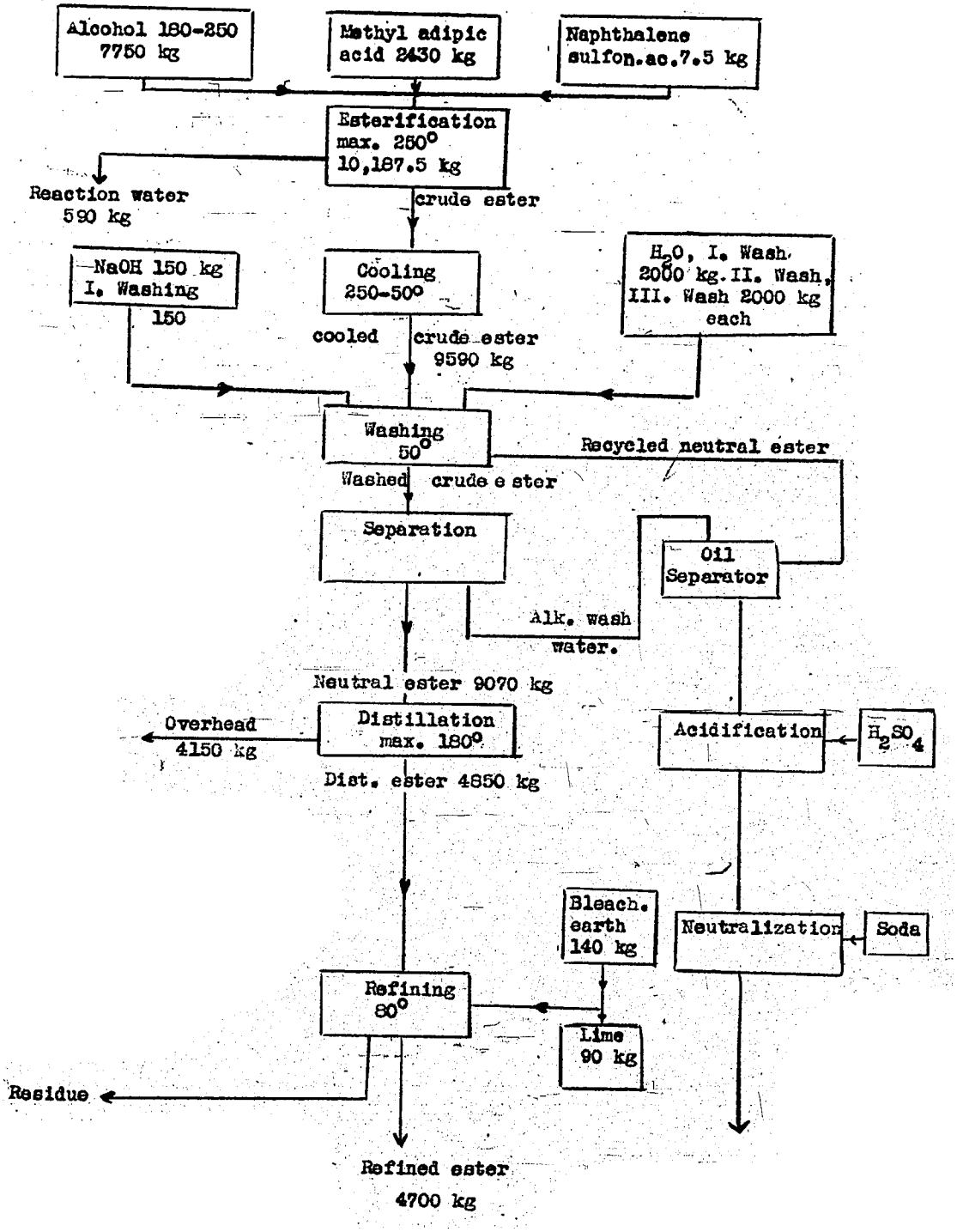
Weight figures in kg per Charge



Ester 515 (3360 Jato)

1 Charge = 4,7 ton End Product in 15 Working Hours.

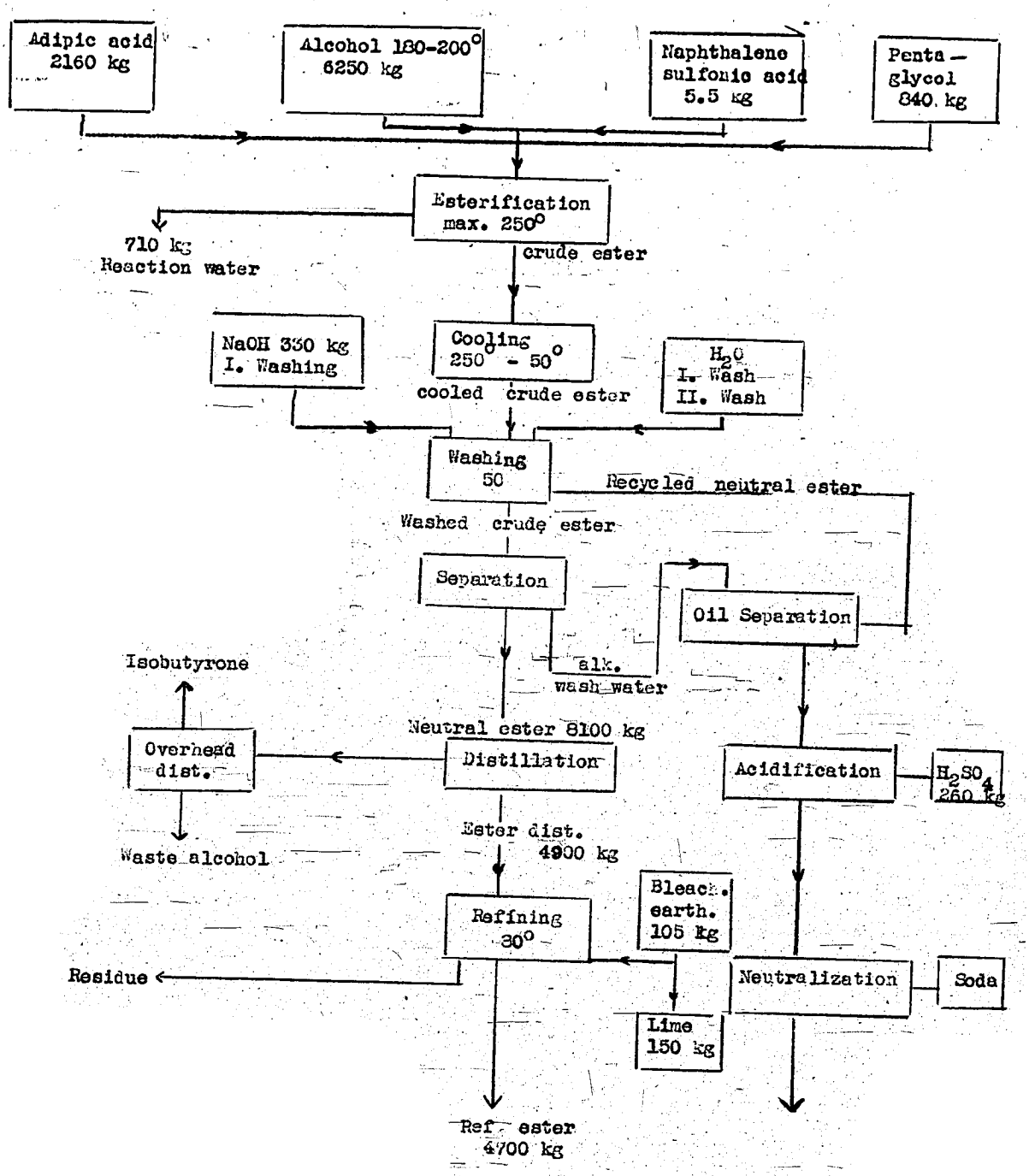
Weight Figures in kg per Charge



Ester 623 (500 Jato)

1 Charge = 4.7 ton End product in 22 Working Hours.

Weight figures per charge.



Standard Oil Company (Indiana)

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API-TOM Reel 135, Attachment XI, Table XVII
Physical Properties of High Molecular Phthalate Esters

Sequence No.	Date of Prep.	Different Esters			Sp.g. 20°C.	Viscosity in centistokes & °Engler 20	38	50	99	m	VI	Solid Point	Flash Point
333	11-19-39	LA 140-165 +	Phthalic acid		1.007	60.4 7.98	27.6 3.77	—	3.92 1.300	4.293	6	-55°C	197°C
		iso C_8 Alc. +	"	"	.990	121 15.93	38.8 5.18	— —	5.04 1.396	4.101	43	(-42) -48	178
93	1-16-39	LA 165-250 +	"	"	.988	344.7 44.0	77.7 10.25	— —	7.075 1.571	4.180	16	-37	195
94	1-16-39	LA 200-250 +	"	"	.977	351 46.2	39.2 11.75	— —	7.34 1.594	4.265	-3	—	—

(LA = Leona Alcohol)

Requested by Information Division
Translated by CCMiller - 2/25/47