a peroxide value of 50.0; and third, it would appear that the same process which takes place when a fresh oil becomes rancid also takes place in another portion of the same oil which had previously acquired a relatively high peroxide value as a result of having been protected by a sextant green filter.

Just why the peroxides that have developed under a green filter do not exhibit the characteristics of those developed under full light is now being studied.

# Conclusions

- (1) Peroxides in oils increase at a uniform rate when the oils are irradiated with light from a constant source, such as CX lamps.
- (2) An oil which has been protected by a sextant green filter and

which has already developed a certain amount of peroxides will, when exposed simultaneously to light of CX lamps with a fresh sample of the same oil, continue to develop peroxides, and at the same rate as that of the fresh oil.

- (3) The induction period of an oil which has been protected by a sextant green filter is unaffected by the peroxides which were developed during protection and is equal to that of a fresh sample of the same oil.
- (4) The development of rancidity in oils that have been protected by a sextant green filter proceeds independently of the peroxides that may be already formed.
- (5) Peroxides which develop under a sextant green filter do not

increase the susceptibility of the oil to become rancid.

#### Acknowledgment

The author wishes to express his appreciation to Dr. J. A. Le-Clerc, Chief of the Cereal Section of the Food Research Division, Bureau of Chemistry and Soils, for his interest and helpful suggestions in preparing the manuscript.

#### NOTICE

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# REPORT OF REFINING COMMITTEE AMERICAN OIL CHEMISTS' SOCIETY 1936-1937

THE personnel of the Refining Committee was increased this year to 15 members. The general interest in refining problems is evidenced by the excellent cooperation given the chairman by the entire group.

The study of Soya Bean Oil refining occupied the entire attention of the committee this year. A proposed plan for the study of this problem was sent to the committee on November 3, 1936, and the work, which was later carried on by Mr. H. L. Kevern in Swift & Company's Chemical Laboratory from January 5, 1937, to March 6, 1937, followed the suggestions outlined in this plan.

The detailed particulars of the Soya Bean Oil refining tests carried on in the Swift Laboratories were furnished to the committee in a report dated April 14, 1937. The refining study led to procedures which appeared to give satisfactory results with Expeller and Hydraulic type oils. The methods which were accepted for cooperative study were as follows:

# Crude Soya Bean Refining— Expeller and Hydraulic Types

The apparatus and general procedure shall be the same as prescribed for hydraulic pressed crude cottonseed oil, with the following exceptions:

Strength of lye shall be 12° for expeller soya bean oil and 20° for

hydraulic soya bean oil. Two tests shall be made on each oil using the maximum amount of sodium hydroxide as calculated from the

formula 
$$\frac{\text{F.F.A.}}{5.2} + .54$$
 and  $\frac{2}{3}$  of

this maximum quantity of sodium hydroxide.

Expeller soya bean oil shall be agitated at 20-24° C. for 90 minutes from the time the sodium hydroxide solution is added with the agitator running 250 r.p.m.  $\pm$  10. It shall then be immediately transferred to 65° C. bath and stirred at 70  $\pm$  5 r.p.m. for exactly 12 minutes. Temperature of oil must then be 65° C.  $\pm$  2° C., adjusting the temperature of the water bath if necessary within the limits specified to obtain this final oil temperature.

Hydraulic soya bean oil shall be agitated at 20-24° C. for 45 minutes from the time the sodium hydroxide solution is added with the agitator running 250 r.p.m. ± 10. It shall then be immediately transferred to 65° C. bath and handled as directed under Expeller soya bean oil.

At the end of the slow agitation period of refining both Expeller and Hydraulic soya bean oils shall be allowed to settle in the 65° bath for one hour. Cool by setting in a cold water bath at 20-24° C. for one hour. The oil shall then be allowed to set over night before pouring off. If the oil has become

warm over night it should be chilled in a bath at 20-24° C. for 30 minutes.

The soapstock may be hardened by chilling in water at a temperature of 20-24° C. if necessary to permit draining the oil from the soapstock.

Cooperative samples of Expeller and Hydraulic soya bean oil were sent to the committee on March 22, 1937. The results obtained in this cooperative study, using the method outlined above, are given on the attached tabulations. These results may in general be considered quite satisfactory for a cooperative study of this kind.

The method suggested for Expeller and Hydraulic oils did not appear to give the most satisfactory results on Extracted oil. A longer period of slow agitation, however, led to considerably improved results, but the study of this type of oil was not considered to be of sufficient extent to permit definite conclusions.

#### Recommendations

The committee recommends (1) that the method for refining Expeller and Hydraulic soya bean oil as outlined above be suggested as a tentative method to replace the one now given in the American Oil Chemists' Society Methods; (2) that the work on Extracted soya bean oil be continued next year.

H. S. MITCHELL, Chairman.

A.O.C.S. REFINING COMMITTEE COOPERATIVE TESTS-SOYA BEAN OIL-EXPELLER-SAMPLE MARKED No. 1

Committee	Date	Free Fatty Acids	Maximu 12 Bé	m		lor ed Oil	Cole	or ned Oil	% Max. 12 Bé		Col Refla	lor 1ed Oil	Cole Bleach	or aed Oil
Member	Reported	as Oleic	Lye	Loss	Yel.	Red	Yel.	Red	Lye	Loss	Yel.	Red	Yel.	Red
C. B. Cluff R. H. Fash E. R. Barrow A. R. Gudheim W. D. Hutchins C. A. Coffey T. C. Law L. A. Spielman M. M. Durkee N. F. True H. E. Moore Lamar Kishlar H. S. Mitchell	. 4/13/37 . 4/6/37 . 4/7/37 . 4/15/37 . 4/15/37 . 4/10/37 . 4/9/37 . 4/7/37 . 4/17/37 . 4/17/37 . 4/15/37 . 4/15/37 . 4/12/37	0.60 0.70 0.60 0.50 0.60 0.48 0.60 0.42 0.52 0.78* 0.60 0.45	8.40 8.20 6.40 8.20 7.90 8.20 7.80 8.00 8.00	4.4 4.4 4.5 4.15 4.10 4.6 4.6 4.6 4.2 4.6 4.2	70 70 70 70 70 70 70 70 70 70 70	6.0 5.1 5.3 6.5 6.0 6.5 6.1 5.4 7.5	25 20 22 20 20 20 35 20 35 	2.4 1.9 2.2 2.2 2.1 2.0 1.8 2.3 2.1  1.6 2.1	5.50 5.50 5.50 5.40 5.47 5.50 5.20 5.33 5.70	5.0 4.4 4.9 4.51 4.6 4.6 4.5 5.3 4.5 4.5 4.6 4.5 4.6 4.5 4.6 4.6 4.6 4.6 4.6 4.6 4.6 4.6 4.6 4.6	70 70 70 70 70 70 70 70 70 70 70	6.2 6.2 6.2 5.5 6.1 7.1 6.2 5.9 7.0 6.1 7.1	25 20 22 20 20 20 35 20 35 	2.3 2.0 2.2 2.3 2.2 2.0 2.0 2.3 2.3 
Average		0.55 0.70 0.42	1.50	4.4 4.6 4.0	10	5.9 7.2 5.3	20	2.1 2.4 1.6	0.00	4.5 5.1 3.9	••	6.3 7.4 5.5	20	2.1 2.3 1.6
Results on Average		• •		3		• •		3		4		• •		• <u>·</u>
Results Within 0.1 of A Results Within 0.2 of A Results Within 0.3 of A Results Within 0.4 of A Results Within 0.5 of A Results More than 0.5 fr	verage verage verage verage	11 2 		4 3 2 1		4 2 ··· 2 1 4		4 2 2 		5  1 1 2		4 4  1 		7 4  i

#### A.O.C.S. REFINING COMMITTEE COOPERATIVE TESTS-SOYA BEAN OIL-HYDRAULIC-SAMPLE MARKED No. 2

Committee Member	Date Reported	Free Fatty Acids as Oleic	Maximus 20 Bé Lye	m Loss		lor ed Oil Red	Cole Bleach Yel.	or ned Oil Red	% Max. 20 Bé Lye	Loss		lor ied Oil Red	Col Bleac Yel,	or hed Oil Red
C. B. Cluff. R. H. Fash E. R. Barrow. A. R. Gudheim. W. D. Hutchins. A. D. Rich. C. A. Coffey. T. C. Law. L. A. Spielman. M. M. Durkee. N. F. True. H. E. Moore.	4/13/37 4/ 6/37 4/ 7/37 4/15/37 4/10/37 4/ 9/37 4/ 7/37 4/ 7/37 4/ 7/37 4/ 1/37 4/24/37 4/15/37 4/15/37	0.80 0.90 0.80 0.70 0.80 0.76 0.90 0.72 0.80 0.99*	4.80 4.90 4.80 3.80 4.80 4.78 4.70 4.70 4.86 5.10	5.5 6.14 5.44 5.5 5.5 5.5 5.2* 6.7	70 70 70 70 70 70 70 70 70 70	6.2 6.2 5.6 6.1 6.7 6.2 6.5 5.9 7.1	25 20 21 20 20 20 35  35	2.3 1.9 2.1 2.4 2.2 2.0 1.8  1.9	3.80 3.30 3.20 2.60 3.20 3.18 3.30 3.10 3.24 3.40	5.5.1.8.4.9.8.* 5.1.8.4.9.8.* 5.1.8.4.9.8.* 5.1.8.4.9.8.*	70 70 70 70 70 70 70 70 70 70 70	6.4 6.4 6.4 5.7 7.2 6.5 6.0 7.1	25 20 22 20 20 20 35 	2.4 2.0 2.2 2.4 2.3 2.0 1.9  2.0
Lamar Kishlar H. S. Mitchell		$\substack{\textbf{0.87}\\\textbf{0.80}}$	4.80	5.6 5.7	70 70	5.7	20 20	1.4	3.20	5.4	70	5.9	20 20	1.6
Average High Low		0.80 0.90 0.72		5.7 6.4 5.4		6.2 7.1 5.6		$2.0 \\ 2.4 \\ 1.4$		5.4 6.4 4.8		6.5 7.5 5.7		2.0 2.4 1.6
Results Within 0.1 of A: Results Within 0.2 of A: Results Within 0.2 of A: Results Within 0.4 of A: Results Within 0.5 of A: Results Within 0.5 of A:	verage verage verage verage verage	7 6 		2 2 4 3 1		3 1 1 2 1 2 3		1 3 3 1 1 1		2 1 1 2 3 1 3		1 3 2 1 1 5		3 2 1 4

# A. O. C. S. Refining Committee Tests—Soya Bean Oil—Swift & Company Laboratories

Expeller oil was used at the start of the refining test work. The F.F.A. content of the expeller oil used was 0.50 per cent and remained constant throughout the tests. The equipment used was the official type as described in the A.O.C.S. methods. The maximum lye used was calculated from the for-

mula for hydraulic pressed cottonseed oil  $(\frac{F.F.A.}{5.2} +$ 

.54 = maximum NaOH). The bath temperature for melting the foots in all cases followed the official method (75  $\pm$  2° C.). A melting time of 30 minutes was also used in all cases.

# **Expeller Oil**

The following summaries refer to attached detailed tabulation:

#### Test Series No. 1

Fast Agitation	15 minutes—20-24° C.
Slow Agitation	12 minutes—65° C.
Be' Lye Used	Amounts
12°	Maximum
14°	2/3 Maximum
16°	1/2 Maximum
20°	

Regular breaking crude cottonseed oil method was used on expeller oil with varying amounts of 12, 14, 16, and 20° Be' lyes. Unsatisfactory results were obtained as follows: (a) Very little coagulation of foots at end of agitation; (b) High loss resulting from difficulty in pouring off oil from very sloppy foots

# Test Series No. 2

Fast Agitation	45 minutes—20-24° C.
Slow Agitation	20 minutes—65° C.
Be' Lye Used	Amounts
12°	Maximum
14°	4/5 Maximum
16°	2/3 Maximum
20°	1/2 Maximum

The slow breaking crude cottonseed oil method was used on expeller oil with varying amounts of 12, 14, 16, and 20° Be' lyes. This method gave better results than the regular breaking refining method in that a better coagulation of foots was obtained with all lye concentrations except the ½ maximum, which gave very sloppy foots. A larger quantity of oil was obtained in the first pour off, indicating that the change in agitation time gave an improved foots.

#### Test Series No. 3

1091	361163	140. 0
Fast Agitation		45 minutes-28° C
Slow Agitation		20 minutes—65° C.
Be' Lye Used		Amounts
12°		Maximum
14°		4/5 Maximum
16°		2/3 Maximum
20°		-,

In this series the temperature of fast agitation in the slow breaking method used in Series No. 2 was raised from 20-24° C. to 28° C. The strength and amounts of lye used were the same as Series No. 2, with the exception that the ½ maximum was eliminated. No improvement in character of foots was noted from the increase in temperature of fast agitation. The losses were increased and the foots from 20° Be' lye were so soft, not only in this series but also in the previous series, that it was thought desirable to drop this strength for expeller oil.

#### Test Series No. 4

C.

Fast Agitation	45 minutes—32°
Slow Agitation	20 minutes—65°
Be' Lye Used	Amounts
10°	Maximum
12°	2/3 Maximum
14°	5/9 Maximum
16°	·

Even though the increased temperature of fast agitation in Series No. 3 gave poor results it was thought advisable to use a still higher temperature to complete the data. The temperature of fast agitation was, therefore, increased to 32°C. 10° Be' lye was substituted for 20° Be'. The results of these changes were, as in Series No. 3, unsatisfactory. The condition of the foots was poor and the losses high.

#### Test Series No. 5

Fast Agitation	45 minutes—20-24° C.
Slow Agitation	12 minutes—65° C.
Be' Lye Used	Amounts
10°	Maximum
12°	2/3 Maximum
140	5/9 Maximum

Previous series had indicated a possible improvement in break before the end of the slow agitation period. The time of slow agitation was, therefore, cut to 12 minutes. This change appeared to bring about an improvement in the character of the foots and gave, in most cases, a large initial pour off. It was noted, however, that only the maximum amount of lye gave a firm foots.

#### Test Series No. 6

Fast Agitation Slow Agitation	45 minutes—20-24° C. 12 minutes—65° C.
Be' Lye Used	Amounts Maximum
10°	2/3 Maximum
12° 14°	5/9 Maximum

With the exception of the substitution of 8° Be' lye for 16° Be', this series is a duplication of Series No. 5. The condition of the foots and the varying losses between Series No. 4 and Series 5 indicated the need for further change in the method.

#### Test Series No. 7

Fast Agitation	45 minutes—20-24° C.
Slow Agitation	12 minutes—75° C.
Be' Lye Used	Amounts
8°	Maximum
10°	2/3 Maximum
12°	5/9 Maximum

An increase of temperature of slow agitation from 65° C. to 75° C. gave somewhat better foots, lower losses, and fewer remelts.

#### Test Series No. 8

Fast Agitation	45 minutes-20-24° C.
Slow Agitation	12 minutes—85° C.
Be' Lve Used	Amounts
8°	Maximum
10°	2/3 Maximum
12°	5/9 Maximum
140	-,

A further 10° C. increase of temperature of slow agitation gave unsatisfactory results. This temperature brought the foots, in most cases, to the top of the oil.

#### Test Series No. 9

1 021	301169 140. 3
Fast Agitation	45 minutes—20-24° C.
Slow Agitation	12 minutes—75° C.
Be' Lye Used	Amounts
20° Be'	Maximum
Water added	2/3 Maximum
to bring to	5/9 Maximum
8-10-12-14	
Beaumes	

In this series the varying amounts of 20° Be' lye were added and the oil agitated for 30 minutes of the fast agitation period. Sufficient water was then added during the continued agitation to bring the lye strengths to 8-10-12-14 Beaumes on the theory that the addition of the stronger lye, followed by the addition of water, would bring about more satisfactory foots and lower losses. The results, however, were unsatisfactory even though it appeared that this procedure would give a good break.

#### Test Series No. 10

Fast Agitation	45 minutes—20-24° C
Slow Agitation	12 minutes—70° C.
Be' Lye Used	Amounts
10°	Maximum
12°	Slightly over Maximum
14°	2/3 Maximum
	5/9 Maximum

The temperature of slow agitation was increased 5° C. over regular (65° C.) to compare with Series No. 7 in which the increase had been 10° C. A slightly larger excess of caustic than maximum was also tried in this series. This series was accepted as indicating that there was no advantage in the use of 70° C. as against 75° C. in the slow agitation. The increased amounts of caustic did not appear to help.

#### Test Series No. 11

Fast Agitation	$45 \text{ minutes} - 20-24^{\circ} \text{ C}$ .
Slow Agitation	12 minutes—75° C.
Bé Lye Used	Amounts
10°	Maximum
12°	Slight excess over Max.
14°	2/3 Maximum
	5/9 Mavimum

The somewhat favorable results in Test Series No. 7 led to a repetition of the procedure in this series, using 10, 12, and 14° Be' lyes. It was found that the larger quantities of lyes gave firmer foots and the lesser quantities led to soft foots, requiring additional remeltings.

#### Test Series No. 12

Fast Agitation Slow Agitation	60 minutes—20-24° C. 12 minutes—75° C.
Bé Lye Used	Amounts
12°	Maximum Slight excess over Max.
14°	2/3 Maximum

Observations made in Test Series No. 7 and No. 11 indicated that a longer period of agitation in the cold might improve the foots, especially with the lesser amounts of lye. These observations were substantiated at least in part by somewhat lower losses and less pour offs on the lower lye quantities. The foots with the smaller quantities of lye were still soft.

#### Test Series No. 13

Fast Agitation	75 minutes—20-24° C.
Slow Agitation	12 minutes—75° C.
Bé Lye Used 10° 12° 14°	Amounts Maximum Slight excess over Max 2/3 Maximum 5/0 Maximum

Following the lead obtained in Series No. 12, the time of agitation in the cold was increased to 75 minutes. This resulted in better foots, a lesser number of pour offs, and lower losses. Floating foots were encountered with the 5/9 maximum lye.

#### Test Series No. 14

Fast Agitation Slow Agitation	90 minutes—20-24° C. 12 minutes—75° C.
Bé Lye Used	Amounts Maximum
10°	2/3 Maximum
12°	1 1/3 Maximum
14°	

A further increase of 15 minutes in the fast agitation time seemed to improve the foots. The breaks were good in all cases and the losses were low. Only one remelting was required in all cases except one. The increased amounts of lye appeared to help. Floating foots still remained as a difficulty in this series.

#### Test Series No. 15

Fast Agitation	75 minutes-20-24° C.
Slow Agitation	8 minutes—75° C.
Bé Lye Used	Amounts
10°	Maximum
12°	1 1/5 Maximum
14°	1 1/3 Maximum
	2/3 Maximum

It was felt that a decrease in the time of slow agitation might eliminate the floating foots difficulty. The period was, therefore, cut from 12 minutes to 8 minutes. This change appeared to stop the floating foots, but the losses were somewhat higher in spite of the apparently satisfactory condition of the foots.

#### Test Series No. 16

Fast Agitation	90 minutes—20-24° C
Slow Agitation	8 minutes—75° C.
Bé Lye Used 10° 12° 14°	Amounts 1 1/3 Maximum 1 1/5 Maximum Maximum 2/3 Maximum

The foots in this series were quite firm and satisfactory. The losses were somewhat lower than in Series No. 14. The 10° and 12° Be' lyes give the best results in this series.

#### Test Series No. 17

Fast Agitation Slow Agitation	75 minutes—20-24° C. 8 minutes—75° C.
Bé Lye Used 8° 10° 12°	Amounts 1 1/3 Maximum 1 1/5 Maximum Maximum 2/3 Maximum

This series was intended as a check on Series No. 15. It will be noted that the foots again appeared satisfactory and that the results checked fairly close. The 75 minute agitation, however, appeared to give a slightly higher loss than the longer period at the cold temperature.

#### Test Series No. 18

Fast Agitation Slow Agitation	90 minutes—32° C. 8 minutes—75° C.
Bé Lye Used	Amounts 1 1/3 Maximum 1 1/5 Maximum
12°	Maximum

It was thought that a higher temperature in the fast agitation with the longer time would give improved results. The temperature was increased from 20-24° C. to 32° C. This change led to higher losses, although the breaks continued good and the foots firm.

#### Test Series No. 19

Fast Agitation Slow Agitation	120 minutes—20-24° C. 8 minutes—75° C.
Bé Lye Used 8° 10° 12°	Amounts 1 1/3 Maximum 1 1/5 Maximum Maximum 2/3 Maximum

This series was intended to indicate whether improvement could be brought about by further increasing the time of fast agitation. This change, however, did not bring about an improvement in losses even though the character of the foots remained satisfactory.

#### Test Series No. 20

Fast Agitation	90 minutes—20-24° C
Slow Agitation	8 minutes—75° C.
Bé Lye Used 8° 10° 12°	Amounts 1 1/3 Maximum 1 1/5 Maximum Maximum 2/3 Maximum

This series was intended as a check on Series No. 16. The results were quite close, and the conclusions were at this point that a method had been found which would be satisfactory for expeller oil.

#### Test Series No. 21

Fast Agitation Slow Agitation	90 minutes—20-24° C 8 minutes—75° C.
Bé Lye Used 8° 10° 12°	Amounts 1 1/3 Maximum 1 1/5 Maximum Maximum 2/3 Maximum

The method used in Series No. 20 was tried on a tank car of oil received at the Swift & Company plant in Chicago. The results were quite satisfactory in that a good break was obtained, the character of the foots was good, and in practically all cases only one remelting of the foots was found to be necessary. The 12° Be' lye gave the best results, a fact which was also noted in Series No. 20.

#### Test Series No. 22

Fast Agitation	45 minutes—20-24° C.
Slow Agitation	30 minutes—50-53° C.
Bé Lye Used 8° 10° 12° 14°	Amounts Maximum 80% Maximum

This series was made to try out the suggestions made by Mr. Cluff that the addition of 0.50 per cent of N grade sodium silicate to 14° lye was advantageous. His suggestions as to times and temperatures of agitation were also used. This method showed considerable promise. The foots were firm and the losses low. It was felt that this procedure, however, should not be followed further at this time because of the various complications involved unless the work finally indicated that a satisfactory method could not be developed except through the addition of some substance such as silicate.

#### Hydraulic Oil

At this point the study of hydraulic oil was taken up. The sample used had a F.F.A. content of 0.80 per cent. The same general procedure was used with hydraulic oil as had been followed in the work on expeller oil.

#### Test Series No. 23

Fast Agitation Slow Agitation	90 minutes—20-24° C. 8 minutes—75° C.
Bé Lye Used	Amounts 1 1/3 Maximum
10° 12°	1 1/5 Maximum Maximum 2/3 Maximum

The method which had shown the most promise on expeller oil was selected for the initial tests on hydraulic oil. The break was quite satisfactory, the foots settled out firm for the first pour off. On remelting, however, four pour offs the foots did not resolidify. This made further oil recovery difficult.

#### Test Series No. 24

1 691 3611	CS 190, 24
Fast Agitation	90 minutes-20-24° C.
Slow Agitation	8 minutes—75° C.
Bé Lye Used	Amounts
8°	1 1/3 Maximum
10°	11/5 Maximum
12°	Maximum
	2/3 Maximum

This test constituted a check on test Series No. 23. With the exception of the 12° B' lye, the losses did not agree particularly well.

#### Test Series No. 25

Fast Agitation	90 minutes—20-24° C.
Slow Agitation	8 minutes—75° C.
Bé Lye Used	Amounts
14°	1 1/3 Maximum
16°	1 1/5 Maximum
20°	Maximum
	2/3 Maximum

14° and 16° Be' lyes gave foots comparable to those obtained with 8-10-12° lyes in the previous series. The 20° Be' lye, however, gave a better break, firmer foots, and lower losses.

#### Test Series No. 26

Fast Agitation	60 minutes—20-24° C
Slow Agitation	8 minutes—75° C.
Bé Lye Used 14° 16° 20°	Amounts 11/3 Maximum 11/5 Maximum Maximum 2/3 Maximum

The 14° and 16° Be' lyes gave unsatisfactory results. The 20° Be' lye, however, acted very well, The 30 minute decrease in time of fast agitation did not appear to be detrimental in the case of 20° Be' lye. Further tests at this point indicated that the time of fast agitation could be reduced to 45 minutes with equally satisfactory results using the 20° Be' lye, which had been shown to be definitely superior.

# **Extracted Oil**

Extracted and clarified extracted oils were next studied. The F.F.A. content of the extracted oil was 0.50 per cent and that of the clarified extracted, 0.50 per cent.

#### Test Series No. 27 (Extracted Oil)

Fast Agitation	90 minutes—20-24° C.
Slow Agitation	8 minutes—75° C.
Bé Lye Used	Amounts
8°	1 1/3 Maximum
10°	1 1/5 Maximum
12°	Maximum 2/3 Maximum

The results obtained with this procedure were quite unsatisfactory. The break was fairly good, but the foots were soft and sloppy, which indicated high losses and colors.

#### Test Series No. 28 (Extracted Oil)

Fast Agitation	90 minutes—20-24° C.
Slow Agitation	8 minutes—75° C.
Bé Lye Used	Amounts
14°	1 1/3 Maximum
16°	1 1/5 Maximum
20°	Maximum
	2/3 Maximum

The higher Be' lyes gave better results than those obtained in the previous series, with the  $14^{\circ}$  and  $16^{\circ}$  B' lyes giving the best results. The  $20^{\circ}$  Be' lye tended toward soft foots.

#### Test Series No. 29 (Extracted Oil)

Fast Agitation	90 minutes—20-24° C.
Slow Agitation	8 minutes75° C.
Bé Lye Used	Amounts
12°	13/4 Maximum
14°	1 1/2 Maximum
16°	• "

The increase in amounts of lye used did not bring about improved results over those obtained in test Series No. 28.

#### Test Series No. 30 (Extracted Oil)

Fast Agitation Slow Agitation	90 minutes—20-24° C. 12 minutes—75° C.
Bé Lye Used 14° 16° 18°	Amounts 1 1/3 Maximum 1 1/5 Maximum Maximum 2/3 Maximum

The increase in slow agitation time improved the character of the foots obtained. The majority of the losses were lower and there were fewer remelts necessary.

# Test Series No. 31 (Clarified Extracted Oil) Fast Agitation Slow Agitation Bé Lye Used 14° 16° 18° 18° 18° 18° 190 minutes—20-24° C. 12 minutes—75° C. 12 minutes—175° C. 11/3 Maximum 11/3 Maximum 11/5 Maximum 2/3 Maximum 2/3 Maximum

The procedure used in Series No. 30 on extracted oil was tried on clarified extracted oil. The foots were soft and sloppy but were not particularly difficult to handle in the remelting.

Test Series No. 32	(Clarified Extracted Oil)
Fast Agitation	90 minutes-20-24° C.
Slow Agitation	15 minutes—75° C.
Bé Lye Used	Amounts
12°	Maximum
14°	7/8 Maximum
16°	
100	

An increase in the time of slow agitation and smaller amounts of lyes appeared to give better results than obtained in Series No. 31.

#### Test Series No. 33 (All types oil)

ito. oo (All Lypes on)
90 minutes—20-24° C. 12 minutes—65° C.
Amounts Maximum 2/3 Maximum
45 minutes— $20-24$ ° C. $12$ minutes— $65$ ° C.
Amounts Maximum 2/3 Maximum
90 minutes—20-24° C. 25 minutes—65° C.
Amounts Maximum 7/8 Maximum
Oil:
90 minutes— $20-24^{\circ}$ C. 25 minutes— $65^{\circ}$ C.
Amounts Maximum
7/8 Maximum

Additional test work was carried on between Series No. 32 and Series No. 33 to determine the possibility of using 65° C. as the temperature of slow agitation. This was found to be quite satisfactory, especially with the longer period of slow agitation (12 minutes, expeller and hydraulic; 25 minutes, extracted and clarified extracted).

Test Series No. 33 was the first of several to try out the methods which observations and results had indicated most satisfactory for the several oils.

The tests as described above suggest the following tentative method for use in the refining of soya bean oil:

# Suggested Tentative Method for Refining Crude Sova Bean Oil

The apparatus and general procedure shall be the same as prescribed for hydraulic pressed crude cottonseed oil, with the following exceptions:

Strength of lye shall be 12° for expeller soya bean oil and 20° for hydraulic soya bean oil. Two tests shall be made on each oil using the maximum amount of sodium hydroxide as calculated from the formula FFA

 $\frac{1}{5.2}$  + .54 and  $\frac{2}{3}$  of this maximum quantity of

sodium hydroxide.

Expeller soya bean oil shall be agitated at 20-24° C. for 90 minutes from the time the sodium hydroxide solution is added with the agitator running 250 r.p.m.  $\pm$  10. It shall then be immediately transferred to 65° C. bath and stirred at 70  $\pm$  5 r.p.m. for exactly 12 minutes. Temperature of oil must then be

 $65^{\circ}$  C.  $\pm$   $2^{\circ}$  C., adjusting the temperature of the water bath if necessary within the limits specified to obtain this final oil temperature.

Hydraulic soya bean oil shall be agitated at  $20\text{-}24^\circ$  C. for 45 minutes from the time the sodium hydroxide solution is added with the agitator running 250 r.p.m  $\pm$  10. It shall then be immediately transferred to 65° C. bath and handled as directed under Expeller soya bean oil.

At the end of the slow agitation period of refining both Expeller and Hydraulic soya bean oils shall be allowed to settle in the 65° bath for one hour. Cool by setting in a cold water bath at 20-24° C. for one hour. The oil shall then be allowed to set overngiht before pouring off. If the oil has become warm over-

night it should be chilled in a bath at 20-24° C. for 30 minutes.

The soapstock may be hardened by chilling in water at a temperature of 20-24° C. if necessary to permit draining the oil from the soapstock.

It will be noted that the suggested method does not include Extracted or Clarified Extracted oil. It is felt that more work should be done with these types of oil. The method covered by test series No. 33, however, gave very promising results and should be tested by cooperative studies. This method included the specification of 14° Be' lye, using maximum as calculated from the formula given above and ½ maximum. The oils were agitated 90 minutes at 20-24° C. and 25 minutes at 65° C.

#### SOYA BEAN OIL REFINING-EXPELLER OIL

Method used	for Dan	ular Break	ina Cruda	Cottonesed	Oil
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15 Min	intae fo	st agitation	n—Temn	20-24° C	

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Test Series No. 1				w agitat				C T)	. «	94		. 4
	12		é——		Beaun			6 Beaum			D Beaum 2/3	
	Max.	$\frac{2}{3}$	1/2	Mar	2/3	1/2 Max.	Morr	2/3	$_{ m Max}^{1/2}$	Morr		1/2 Max.
	Amt.	Max.	Max.	Max.	Max.		Max.	Max. Amt.	Amt.	Max.	Max.	Amt.
	Lye	Amt.	Amt.	Amt.	Amt.	Amt.	Amt.		used	Amt.	Amt.	used
	used	used	used	used for	used for	used for	used for	used for	for	used for	used for	for
	for	for	for CS Oil	CS Oil	CS Oil	CS Oil	CS Oil	CS Oil	CS Oil	CS Oil	CS Oil	CS Oil
	CS Oil	CS Oil										
Per cent Lye used	8.0	5.9	4.0	6.7	4.4	3.3	5.75	3.83	2.9	4.4	2.9	2.2
Grams of Lye used for 500 grams					00.0		00.0	***	44.5	00.0		^
of oil	40.0	29.5	20.0	33.5	22.0	16.5	28.8	19.2	14.5	22.0	14.5	11.0
Grams of dry NaOH used for 500		0.00	1.00	0 100	9.000	1 500	9 105	0 104	1 604	9.150	2.082	1.580
grams of oil	3.2	2.36	1.60	3.1825	2.090	1.568	3.185	2.124	1.604	3.159	2.082	1.580
Grams of H <sub>2</sub> O used for 500 grams	00.000	07.140	10 400	30,3175	19.910	14.932	25.615	17.076	13.896	18.841	12.418	9.420
of oil	36.800	27.140	18.400	425.9	395.0	393.0	426.5	390.9	389.7	451.4	391.4	400.7
Grams of oil—first pour off	430.5	422.5	392.0	420.9	359.0	333.0	420.0	390.3	305.1	401.4	331.4	100.1
Grams of oil recovered by remelt-	22.5	40.5	81.6	30.1	74.9	83.6	25.9	79.3	82.8	15.0	77.5	49.2
ing foots	453.0	463.0	473.6	456.0	469.9	476.6	452.4	470.2	472.5	466.4	468.9	449.9
Total Grams of oil	400.0	400.0	710.0	400.0	100.0	110.0	102.1	110.2	112.0	100.1	200.0	110.0
Number of times foots were re-	three	three	five	three	three	six	three	four	six	three	five	five
melted	9.4	7.4	5.4	8.8	6.0	4.7	9.5	6.0	5.5	6.7	6.2	10.0
Loss (per cent)	5.0	5.5	6.3	5.3	5.9	6.6	5.5	6.0	6.5	5.8	6.2	6.7
Condition of foots		sloppy	sloppy	sloppy	sloppy	sloppy	sloppy	sloppy	sloppy	hard	sloppy	sloppy
Condition of foots	Stoppy	210pp3	ыорру	BIOPP3	STOP PJ	eropp.		~			very	
Break at end of fast agitation	none	none	none	none	none	none	none	none	none	slight	slight	none
Break at end of last agreation	110110	very	very		very	very		very	very			very
Break at end of slow agitation	slight	slight	slight	slight	slight	slight	slight	slight	slight	good	slight	slight
Color taken on by oil upon addition		~	~0		J		gr'nish	gr'nish	gr'nish	gr'nish	gr'nish	gr'nish
of lye	creamy	creamy	creamy	creamy	creamy	creamy	yellow	yellow	yellow	brown	brown	brown
Of the	Or Curry	or ourning	Cr Cwiii,	0			•	•	•			

#### SOYA BEAN OIL REFINING-EXPELLER OIL

# Method used for Slow Breaking Crude Cottonseed Oil 45 Minutes fast agitation—Temp. 20-24° C.

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	tes last a	gitation—1	Camp. 65°	r.				
Test Series No. 2 20 Minu	tes slow a			C.				
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	Max.	4/5 Max.		1/2 Max.	Max.	4/5 Max.	2/3 Max.	1/2 Max.
	Amt.	Amt.	Amt.	Amt.	Amt.	Amt.	Amt.	Amt.
	Lye	Lye	Lye	$_{\mathbf{Lye}}$	$_{ m Lye}$	Lye	$_{ m Lye}$	$_{ m Lye}$
	used	used	used	used	used	used	used	used
	for	for	for	for	for	for	for	for
	CS Oil	CS Oil	CS Oil	CS Oil	CS Oil	CS Oil	CS Oil	CS Oil
Per cent of lye used	8.0	6.4	5.9	4.0	6.7	5.3	4.4	3.3
Grams of lye used for 500 grams of oil	40.0	32.0	29.5	20.0	33.5	26.5	22.0	16.5
Grams of dry NaOH used for 500 grams oil	3.2	2.5	2.360	1.600	3.183	2.517	2.090	1.568
Grams of H <sub>2</sub> O used for 500 grams of oil	36.800	29.400	27.140	18.400	30.317	23.983	19.910	14.932
Grams of oil first pour off		475.5	473.0	461.0	473.5	471.5	473.0	411.0
Grams of oil recovered by remelting foots		0.9	3.0	22.6	0.5	1.8	1.0	66.3
		476.4	476.0	483.6	474.5	473.3	474.0	477.3
Total grams of oil	none	one	two	three	one	one	one	four
Loss (per cent)		4.7	4.8	3.3	5.2	5.3	5.2	4.5
Color of oil (red)		5.4	5.7	6.2	5.4	5.5	5.7	6.7
Condition of foots	hard	hard	soft	sloppy	hard	hard	soft	sloppy
Break at end of fast agitation	slight	slight	slight	slight	slight	slight	slight	slight
Break at end of slow agitation	good	good	good	fair	good	good	good	fair
Color taken on by oil upon addition of lye		creamy	creamy	creamy	creamy	creamy	creamy	creamy
Color territor or by our april				-				
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			eaumé				eaumé	4 10 3 5
	Max.	4/5 Max.	2/3 Max.	1/2 Max.	Max.	4/5 Max.	2/3 Max.	1/2 Max.
	Amt.	4/5 Max. Amt.	2/3 Max. Amt.	Amt.	Amt.	4/5 Max. Amt.	2/3 Max. Amt.	Amt.
	Amt. Lye	4/5 Max. Amt. Lye	2/3 Max. Amt. Lye	Amt. Lye	Amt. Lye	4/5 Max. Amt. Lye	2/3 Max. Amt. Lye	Amt. Lye
	Amt. Lye used	4/5 Max. Amt. Lye used	2/3 Max. Amt. Lye used	Amt. Lye used	Amt. Lye used	4/5 Max. Amt. Lye used	2/3 Max. Amt. Lye used	Amt. Lye used
	Amt. Lye used for	4/5 Max. Amt. Lye used for	2/3 Max. Amt. Lye used for	Amt. Lye used for	Amt. Lye used for	4/5 Max. Amt. Lye used for	2/3 Max. Amt. Lye used for	Amt. Lye used for
	Amt. Lye used	4/5 Max. Amt. Lye used	2/3 Max. Amt. Lye used	Amt. Lye used	Amt. Lye used for CS Oil	4/5 Max. Amt. Lye used for CS Oil	2/3 Max. Amt. Lye used for CS Oil	Amt. Lye used for CS Oil
Per cent of Ive used	Amt. Lye used for	4/5 Max. Amt. Lye used for	2/3 Max. Amt. Lye used for	Amt. Lye used for	Amt. Lye used for	4/5 Max. Amt. Lye used for CS Oil 3.5	2/3 Max. Amt. Lye used for CS Oil 2.9	Amt. Lye used for CS Oil 2.2
Per cent of lye used	Amt. Lye used for CS Oil	4/5 Max. Amt. Lye used for CS Oil	2/3 Max. Amt. Lye used for CS Oil	Amt. Lye used for CS Oil 2.9 14.5	Amt. Lye used for CS Oil 4.4 22.0	4/5 Max. Amt. Lye used for CS Oil 3.5 17.5	2/3 Max. Amt. Lye used for CS Oil 2.9 14.5	Amt. Lye used for CS Oil 2.2 11.0
Grams of lye used for 500 grams of oil	Amt. Lye used for CS Oil 5.75 28.8	4/5 Max. Amt. Lye used for CS Oil 4.6	2/3 Max. Amt. Lye used for CS Oil 3.83	Amt. Lye used for CS Oil 2.9	Amt. Lye used for CS Oil 4.4 22.0 3.159	4/5 Max. Amt. Lye used for CS Oil 3.5 17.5 2.513	2/3 Max. Amt. Lye used for CS Oil 2.9 14.5 2.082	Amt. Lye used for CS Oil 2.2 11.0 1.580
Grams of lye used for 500 grams of oil	Amt. Lye used for CS Oil 5.75	4/5 Max. Amt. Lye used for CS Oil 4.6 23.0	2/3 Max. Amt. Lye used for CS Oil 3.83 19.2	Amt. Lye used for CS Oil 2.9 14.5	Amt. Lye used for CS Oil 4.4 22.0 3.159 18.841	4/5 Max. Amt. Lye used for CS Oil 3.5 17.5 2.513 14.987	2/3 Max. Amt. Lye used for CS Oil 2.9 14.5 2.082 12.418	Amt. Lye used for CS Oil 2.2 11.0 1.580 9.420
Grams of lye used for 500 grams of oil	Amt. Lye used for CS Oil 5.75 28.8 3.185	4/5 Max. Amt. Lye used for CS Oil 4.6 23.0 2.544	2/3 Max. Amt. Lye used for CS Oil 3.83 19.2 2.124 17.076 473.0	Amt. Lye used for CS Oil 2.9 14.5 1.604 13.896 389.5	Amt. Lye used for CS Oil 4.4 22.0 3.159 18.841 464.5	4/5 Max. Amt. Lye used for CS Oil 3.5 17.5 2.513 14.987 470.2	2/3 Max. Amt. Lye used for CS Oil 2.9 14.5 2.082 12.418 431.0	Amt. Lye used for CS Oil 2.2 11.0 1.580 9.420 393.5
Grams of lye used for 500 grams of oil	Amt. Lye used for CS Oil 5.75 28.8 3.185 25.615	4/5 Max. Amt. Lye used for CS Oil 4.6 23.0 2.544 20.456	2/3 Max. Amt. Lye used for CS Oil 3.83 19.2 2.124 17.076	Amt. Lye used for CS Oil 2.9 14.5 1.604 13.896	Amt. Lye used for CS Oil 4.4 22.0 3.159 18.841 464.5 .7	4/5 Max. Amt. Lye used for CS Oil 3.5 17.5 2.513 14.987 470.2 3.4	2/3 Max. Amt. Lye used for CS Oil 2.9 14.5 2.082 12.418 431.0 41.6	Amt. Lye used for CS Oil 2.2 11.0 1.580 9.420 393.5 56.2
Grams of lye used for 500 grams of oil.  Grams of dry NaOH used for 500 grams oil.  Grams of H <sub>2</sub> O used for 500 grams of oil.  Grams of oil first pour off.  Grams of oil recovered by remelting foots.  Total grams of oil.	Amt. Lye used for CS Oil 5.75 28.8 3.185 25.615 475.7	4/5 Max. Amt. Lye used for CS Oil 4.6 23.0 2.544 20.456 475.0	2/3 Max. Amt. Lye used for CS Oil 3.83 19.2 2.124 17.076 473.0	Amt. Lye used for CS Oil 2.9 14.5 1.604 13.896 389.5 89.6 479.1	Amt. Lye used for CS Oil 4.4 22.0 3.159 18.841 464.5	4/5 Max. Amt. Lye used for CS Oil 3.5 17.5 2.513 14.987 470.2 3.4 473.6	2/3 Max. Amt. Lye used for CS Oil 2.9 14.5 2.082 12.418 431.0 41.6 472.6	Amt. Lye used for CS Oil 2.2 11.0 1.580 9.420 393.5 56.2 449.7
Grams of lye used for 500 grams of oil.  Grams of dry NaOH used for 500 grams oil.  Grams of H <sub>2</sub> O used for 500 grams of oil.  Grams of oil first pour off.  Grams of oil recovered by remelting foots.  Total grams of oil.	Amt. Lye used for CS Oil 5.75 28.8 3.185 25.615 475.7 0.7	4/5 Max. Amt. Lye used for CS Oil 4.6 23.0 2.544 20.456 475.0 1.1 476.1 one	2/3 Max. Amt. Lye used for CS Oil 3.83 19.2 2.124 17.076 473.0 2.7 475.7 two	Amt. Lye used for CS Oil 2.9 14.5 1.604 13.896 389.5 89.6 479.1 eight	Amt. Lye used for CS Oil 4.4 22.0 3.159 18.841 464.5 .7 465.2 one	4/5 Max. Amt. Lye used for CS Oil 3.5 17.5 2.513 14.987 470.2 3.4 473.6 three	2/3 Max. Amt. Lye used for CS Oil 2.9 14.5 2.082 12.418 431.0 41.6 472.6 four	Amt. Lye used for CS Oil 2.2 11.0 1.580 9.420 393.5 56.2 449.7 six
Grams of lye used for 500 grams of oil. Grams of dry NaOH used for 500 grams oil. Grams of H <sub>2</sub> O used for 500 grams of oil. Grams of oil first pour off. Grams of oil recovered by remelting foots. Total grams of oil. Number of times foots were remelted. Loss (per cent).	Amt. Lye used for CS Oil 5.75 28.8 3.185 25.615 475.7 0.7 476.4 one 4.9	4/5 Max. Amt. Lye used for CS Oil 4.6 23.0 2.544 20.456 475.0 1.1 476.1 one 4.8	2/3 Max. Amt. Lye used for CS Oil 3.83 19.2 2.124 17.076 473.0 2.7 475.7 two 4.8	Amt. Lye used for CS Oil 2.9 14.5 1.604 13.896 389.5 479.1 eight 4.2	Amt. Lye used for CS Oil 4.4 22.0 3.159 18.841 464.5 7 465.2 one 7.0	4/5 Max. Amt. Lye used for CS Oil 3.5 17.5 2.513 14.987 470.2 3.4 473.6 three 5.3	2/3 Max. Amt. Lye used for CS Oil 2.9 14.5 2.082 12.418 431.0 41.6 472.6 four 5.5	Amt. Lye used for CS Oil 2.2 11.0 1.580 9.420 393.5 56.2 449.7 six 10.0
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Grams of lye used for 500 grams of oil. Grams of dry NaOH used for 500 grams oil. Grams of HaO used for 500 grams of oil. Grams of oil first pour off. Grams of oil recovered by remelting foots. Total grams of oil. Number of times foots were remelted. Loss (per cent). Color of oil (red). Condition of foots.	Amt. Lye used for CS Oil 5.75 28.8 3.185 25.615 475.7 0.7 476.4 one 4.9 5.4 hard	4/5 Max. Amt. Lye used for CS Oil 4.6 23.0 2.544 20.456 475.0 1.1 476.1 one 4.8 5.6 hard	2/3 Max. Amt. Lye used for CS Oil 3.83 19.2 2.124 17.076 473.0 2.7 475.7 two 4.8 5.9 soft	Amt. Lye used for CS Oil 2.9 14.5 1.604 13.896 389.5 89.6 479.1 eight 4.2 6.7 sloppy	Amt. Lye used for CS Oil 4.4 22.0 3.159 18.841 464.5 .7 465.2 one 7.0 5.7 hard	4/5 Max. Amt. Lye used for CS Oil 3.5 17.5 2.513 14.987 470.2 3.4 473.6 three 5.3 5.8 soft	2/3 Max. Amt. Lye used for CS Oil 2.9 14.5 2.082 12.418 431.0 41.6 472.6 four 5.5 6.2 soft	Amt. Lye used for CS Oil 2.2 11.0 1.580 9.420 393.5 56.2 449.7 six 10.0 6.5 sloppy
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Test Series No. 3

45 Minutes fast agitation—Temp. 28° C. 20 Minutes slow agitation—Temp. 65° C.

	12 Beaumé			14 Beaumé					20 Beaumé			
	<del>1</del>			1		ne		6 Beaum		z		
	Max.	4/5 Max.	Max.	Max.	4/5 Max.	2/3 Max. Amt.	Max. Amt.	4/5 Max. Amt.	2/3 Max. Amt.	Max. Amt.	4/5 Max. Amt.	2/3 Max. Amt.
	Amt. Lye	Amt. Lye	Amt. Lye	Amt. Lye	Amt. Lye	Lye used						
	used for	for	for	used for	for	for	for CS Oil					
	CS Oil	CS Oil	CS Oil	CS Oil	CS Oil	CS Oil	CS OII	CS On	CS OII	CS OII	CSOII	CSOI
Per cent of lye used	8.0	6.4	5.9	6.7	5.3	4.4	5.75	4.6	3.83	4.4	3.5	2.9
Grams of lye used for 500 grams of oil	40.0	32.0	29.5	33.5	26.5	22.0	28.8	23.0	19.20	22.0	17.5	14.5
Grams of dry NaOH used for 500 grams of oil	3.2	2.500	2.360	3.182	2.517	2.090	3.185	2.544	2.124	3.159	2.513	2.082
Grams of H <sub>2</sub> O used for 500 grams of oil	36.800	29.440	27.140	30.318	23.983	19.910	25.615	20.456	17.076	18.841 466.0	14.987 469.0	12.418 $415.5$
Grams of oil first pour off Grams of oil recovered by remelt-	474.0	469.5	470.0	468.0	470.0	470.0	465.0	470.0	469.5			
ing foots	$0.0 \\ 474.0$	$\substack{2.1\\471.6}$	$\frac{2.0}{472.0}$	$0.0 \\ 468.0$	$\begin{array}{c} 2.2 \\ 272.2 \end{array}$	$\frac{2.7}{472.7}$	$\frac{3.9}{468.9}$	$\frac{3.8}{473.8}$	$\frac{2.8}{472.3}$	$\frac{1.5}{467.5}$	$\frac{2.6}{471.6}$	57.6 $473.1$
Number of times foots were re-		21210	27210			2-2	20070					
melted	one	two	two	one	two	two	two	two	two	one	two	five
Loss (per cent)	5.2	5.7	5.6	6.4	5.6	5.5	6.2	5.2	5.5	6.5	5.7	5.4 6.7
Color of oil (red)	5.4	5.8	6.1	5.5	5.8	6.2	5.5	5.9 soft	6.4	5.6 soft	6.3 soft	sloppy
Condition of foots	hard	soft slight	soft slight	hard slight	soft slight	soft slight	soft slight	slight	soft slight	slight	slight	slight
Break at end of slow agitation		good	good	good	good	good	good	good	good	good	good	good
Color taken on by oil upon addition	5000		, u	0.00M	9004	8	gr'nish	gr'nish	gr'nish	gr'nish	gr'nish	
of lye	creamy	creamy	creamy	creamy	creamy	creamy	yellow	yellow	yellow	brown	brown	brown

#### SOYA BEAN OIL REFINING-EXPELLER OIL

Test Series No. 4

45 Minutes fast agitation—Temp. 32° C. 20 Minutes slow agitation—Temp. 65° C.

			12 Beaumé		- 14 Beaumé 5/9			16 Beaumé				
	Max. Amt. Lye used for CS Oil	2/3 Max. Amt. Lye used for CS Oil	5/9 Max, Amt. Lye used for CS Oil	Max. Amt. Lye used for CS Oil	2/3 Max. Amt. Lye used for CS Oil	5/9 Max. Amt. Lye used for CS Oil	Max. Amt. Lye used for CS Oil	2/3 Max. Amt. Lye used for CS Oil	5/9 Max. Amt. Lye used for CS Oil	Max. Amt. Lye used for CS Oil	Max. Amt. Lye used for CS Oil	Max. Amt. Lye used for CS Oil
Per cent of lye used	9.7	6.5	5.4	8.0	5.9	4.44	6.7	4.4	3.7	(*)	3.83	3.2
Grams of lye used for 500 grams of oil	48.5	32.5	27.0	40.0	29.5	22.00	23.5	22.0	18.6	(*)	19.2	16.0
grams of oil	3.274	2.194	1.823	3.2	2.360	1.760	3.183	2.090	1.767	(*)	2.123	1.769
Grams of H <sub>2</sub> O used for 500 grams of oil	$45.226 \\ 474.0$	$30.306 \\ 466.5$	$\substack{25.177\\468.0}$	$\frac{36.8}{473.5}$	27.140 464.5	20.240 469.0	$30.317 \\ 468.0$	$^{19.910}_{463.0}$	$^{16.833}_{422.0}$	(*) (*)	$^{17.07}_{456.000}$	14.23 394.10
Grams of oil recovered by remelting foots	$\begin{smallmatrix}0.0\\474.0\end{smallmatrix}$	$\begin{array}{c} 3.7 \\ 470.2 \end{array}$	6.8 474.8	$\begin{array}{c} \textbf{0.0} \\ \textbf{473.5} \end{array}$	$\begin{smallmatrix} 5.4\\469.9\end{smallmatrix}$	$\frac{4.9}{473.9}$	$\begin{smallmatrix}0.0\\468.0\end{smallmatrix}$	$\begin{array}{c} 8.8 \\ 471.8 \end{array}$	$52.50 \\ 474.50$	(*) (*)	15.40 471.4	$\begin{array}{c} 75.9 \\ 470.0 \end{array}$
melted		two 6.0 6.0 soft slight good	two 5.0 5.0 soft slight good	one 5.3 5.5 hard slight good	two 6.0 6.1 soft slight good	two 5.2 6.5 soft slight good	one 6.4 5.5 hard slight good	two 5.6 6.0 soft slight good	four 5.1 6.7 soft slight good	(*) (*) (*) (*) (*) (*)	two 5.7 6.1 soft slight good	five 6.0 6.1 sloppy slight good
of lye	creamy	creamy	creamy	creamy	creamy	creamy	creamy	creamy	creamy	(*)	creamy	creamy

<sup>(\*)</sup> Determination spoiled.

#### SOYA BEAN OIL REFINING-EXPELLER OIL

45 Minutes fast agitation—Temp. 20-24° C.

Test Series No. 5		12 Mi	nutes slo	w agita	tion—Te	mp. 65° (	d.					
	10			1	2 Beaun		1	4 Beaun		1		
	Max. Amt. Lye used for CS Oil	2/3 Max. Amt. Lye used for CS Oil	5/9 Max. Amt. Lye used for CS Oil	Max. Amt. Lye used for CS Oil	2/3 Max. Amt. Lye used for CS Oil	5/9 Max. Amt. Lye used for CS Oil	Max. Amt. Lye used for CS Oil	2/3 Max. Amt. Lye used for CS Oil	5/9 Max. Amt. Lye used for CS Oil	Max. Amt. Lye used for CS Oil	2/3 Max. Amt. Lye used for CS Oil	5/9 Max. Amt. Lye used for CS Oil
Per cent of lye used	9.7	6.5 .	5.4	8.0	5.9	4.44	6.7	4.4	3.7	5.75	3.83	3.2
Grams of lye used for 500 grams	48.5	32.5	27.0	40.0	29.5	22.00	33.5	22.5	18.6	28.8	19.2	16.0
Grams of dry NaOH used for 500 grams of oil	3.274	2.194	1.823	3.200	2.360	1.760	3.183	2.090	1.767	3.185	2.124	1.769
Grams of H <sub>2</sub> O used for 500 grams of oil	45.226 476.5	30.306 468.5	25.177 461.5	$\substack{36.800 \\ 476.0}$	$\substack{27.140 \\ 464.0}$	20.240 444.0	30.317 473.5	$^{19.910}_{466.5}$	$\substack{16.833 \\ 434.5}$	$25.615 \\ 473.0$	17.076 467.5	$14.231 \\ 403.5$
ing foots	$\begin{smallmatrix}0.0\\476.5\end{smallmatrix}$	$\substack{5.0\\473.5}$	9.3 470.8	$\begin{array}{c} 0.3 \\ 476.3 \end{array}$	$\substack{8.9 \\ 472.9}$	$29.2 \\ 474.2$	$\begin{array}{c} 0.4 \\ 473.9 \end{array}$	8.0 474.5	39.8 474.3	1.4 474.4	$\begin{array}{c} 6.3 \\ 473.8 \end{array}$	74.9 476.4
melted Loss (per cent). Color of oil (red). Condition of foots. Break at end of fast agitation. Break at end of slow agitation. Color taken on by oil upon addition	good	two 5.3 6.5 soft slight good	three 5.8 6.7 soft slight good	one 4.7 5.7 hard slight good	two 5.4 6.0 soft slight good	three 5.2 6.5 soft slight good	one 5.2 5.4 hard slight good	three 5.1 5.9 soft slight good	three 5.1 6.5 soft slight good	one 5.1 5.4 hard slight good gr'nish yellow	two 5.2 5.9 soft slight good gr'nish vellow	four 4.7 6.5 sloppy slight good gr'nish yellow
of lye	or earring	creatily	Creamy	cicamy	Creamy	CLCAIN	cically	cicamy	Creamy	J CIIO W	3 0110 11	3 0000 11

Test Series No. 6

45 Minutes fast agitation—Temp. 20-24° C. 12 Minutes slow agitation—Temp. 65° C.

			LUCON DIC	, agrea		mp, oo	٠.					
	8	Beaum 2/3	6	1	0 Beaun 2/3	n <del>é</del>	1	Beaum	né	1	.4 Beaun 2/3	né
	Max.	Max.	Max.	Max.	Max.	Max.	Max.	Max.	Max.	Max.	Max.	Max.
	Amt. Lye	Amt. Lye	Amt.	Amt.	Amt.	Amt.	Amt.	Amt.	Amt.	Amt.	Amt.	Amt.
	used	used	$_{f used}$	Lye used	$_{ m used}$	Lye used	Lye used	Lye used	Lye used	Lye used	Lye used	Lye used
	for	for	$\mathbf{for}$	for	for	for	for	for	for	for	for	for
	CS Oil	CS Oil	CS Oil	CS Oil	CS Oil	CS Oii	CS Oil	CS Oil				
Per cent of lye used	11.4	7.6	6.3	9.7	6.5	5.4	8.0	5.9	4.44	6.7	4.4	3.7
of oil	57.0	38.0	31.5	48.5	32.5	27.0	40.0	29.5	22.0	33.5	22.0	18.5
grams of oil	3.192	2.128	1.764	3.274	2.194	1.823	3.200	2.360	1.760	3.183	2.090	1.767
of oil	53.808	35.872	29.736	45.226	30.306	25.177	36.800	27.140	20,240	30.317	19.910	16.833
Grams of oil first pour off Grams of oil recovered by remelt-	466.5	456.5	440.0	474.5	465.5	446.0	474.5	472.7	434.7	474.5	467.0	441.7
ing foots	1.8	8.4	29.1	0.0	2.6	25.7	0.4	1.1	40.7	0.5	7.5	33.2
Total grams of oil	468.3	464.9	469.1	474.5	468.1	471.7	474.9	473.8	475.4	475.0	474.5	474.9
melted	one	two	three	one	two	three	one	one	four	one	two	three
Loss (per cent)	6.3	7.0	6.2	5.1	6.4	5.7	5.0	5.2	4.9	5.1	5.1	5.2
Color of oil (red)	5.5 soft	6.1 soft	6.4 soft	5.5 hard	6.0 soft	6.3 soft	5.5 hard	5.9 soft	6.1 soft	5.4 hard	5.8 soft	6.3 soft
Break at end of fast agitation	slight	slight	slight	slight	slight	slight	slight	slight	slight	slight	slight	slight
Break at end of slow agitation	medium	medium	medium	good	good	good	good	good	good	good	good	good
	creamy	creamy	creamy	creamy	creamy	creamy	creamy	creamy	creamy	creamy	erea mar	creamy
Color taken on by oil upon addition of lye				_	_	-	_	_		_	_	_

of lye ...... creamy cr

#### SOYA BEAN OIL REFINING-EXPELLER OIL

Test Series No. 7

45 Minutes fast agitation—Temp. 20-24° C. 12 Minutes slow agitation—Temp. 75° C.

	8	Beaum		10			12		1 <del>6</del>	1	4 Beaun	né
		$\frac{2}{3}$	5/9		$\frac{2}{3}$	5/9		$\frac{2}{3}$	_5/9		$\frac{2}{3}$	5/9
	Max.	Max.	Max.	Max.	Max.	Max.	Max.	Max.	Max.	Max.	Max.	Max.
	Amt. Lye	Amt. Lye	Amt. Lye	Amt. Lye	Amt. Lye	Amt. Lye	Amt. Lye	Amt. Lye	Amt. Lye	Amt. Lye	Amt. Lve	Amt.
	used	used	used	used	used	used	used	used	used	used	used	Lye used
	for	for	for	for	for	for	for	for	for	for	for	for
	CS Oil	CS Oil	CS Oil	CS Oil	CS Oil	CS Oil	CS Oil	CS Oil	CS Oil	CS Oil	CS Oil	CS Oil
Per cent of lye used	11.4	7.4	6.3	9.7	6.5	5.4	8.0	5.9	4.44	6.7	4.4	3.7
Grams of lye used for 500 grams												
of oil	57.0	37.0	31.5	48.5	32.5	27.0	40.0	29.5	22.0	33.5	22.0	18.5
Grams of dry NaOH used for 500 grams of oil	3.192	2,128	1.764	3.274	2.194	1.823	3.200	2.360	1.760	3.183	2.090	1.767
Grams of H2O used for 500 grams	5.102	2.120	101	0.211	2.104	1.020	3.200	2.000	1.100	0.105	4.050	1.707
of oil	53.808	35.872	29.736	45.226	30.306	25.177	36.800	27.140	20.240	30.317	19.910	16.833
Grams of oil first pour off	469.500	461.7	459.0	476.5	470.0	469.8	477.2	473.8	470.9	477.0	472.0	468.7
Grams of oil recovered by remelt-												_
ing foots	0.0	6.7	9.1	0.0	3.4	2.9	0.2	1.1	3.9	0.2	2.0	6.6
Total grams of oil	469.5	468.4	468.1	476.5	473.4	472.7	477.4	474.9	474.8	477.2	474.0	475.3
melted	one	two	two	one	two	two	one	one	two	one	two	two
Loss (per cent)	6.1	6.3	6.4	4.7	5.3	5.5	4.5	5.0	5.0	4.6	5.2	4.9
Color of oil (red)	5.6	5.9	6.6	5.2	5.8	6.7	5.3	5.5	6.3	4.6	6,2	6.7
Condition of foots		soft	soft	hard	soft	soft	hard	soft	soft	hard	soft	soft
Break at end of fast agitation		slight	slight	slight	slight	slight	slight	slight	slight	slight	slight	slight
Break at end of slow agitation	medium	medium	medium	good	good	good	good	good	good	good	good	good
Color taken on by oil upon addition.												

of lye ....................... creamy creamy

#### SOYA BEAN OIL REFINING-EXPELLER OIL

Test Series No. 8

45 Minutes fast agitation—Temp. 20-24° C. 12 Minutes slow agitation—Temp. 85° C.

	12 1911	iuces oic	W agra	CIOHTE	mp. oo	C.					
	2/3	5/9		2/3	5/9		2/3	5/9		2/3	5/9
Amt.	Amt,	Amt.	Amt.	Amt.	Amt.	Amt.	Max. Amt. Lve	Amt.	Amt.	Amt.	Max. Amt. Lye
used for CS Oil	used for CS Oil	used for CS Oil	used for CS Oil	used for CS Oil	used for CS Oil	used for CS Oil	used for CS Oil	used for CS Oil	used for CS Oil	used for CS Oil	used for CS Oil
11.4	7.4	6.3	9.7	6.5	5.4	8.0	5.9	4.44	6.7	4.4	3.7
57.0	37.0	31.5	48.5	32.5	27.0	40.0	29.5	22.0	33.5	22.0	18.5
3.192	2.128	1.764	3.187	2.194	1.823	3.200	2.360	1.760	3.183	2.090	1.767
53.808 469.8	35.872 449.8	29.736 $442.4$	45.313 474.2	30.306 463.5	25.177 467.5	36.800 476.0	27.140 47 <b>2</b> .5	20.240 471.0	30.317 474.5	19.910 471.5	16.833 <b>43</b> 8.5
$\begin{smallmatrix}0.8\\470.6\end{smallmatrix}$	17.0 466.8	25.5 467.9	$\begin{matrix} 0.2 \\ 474.4 \end{matrix}$	5.0 468.5	$\begin{smallmatrix} 5.1\\472.6\end{smallmatrix}$	$\substack{0.2\\476.2}$	$\begin{array}{c} 0.9 \\ 473.4 \end{array}$	$\begin{smallmatrix} 0.6\\471.6\end{smallmatrix}$	$\begin{array}{c} \textbf{0.6} \\ \textbf{475.1} \end{array}$	$\begin{array}{c} 3.3 \\ 474.8 \end{array}$	$\frac{38.5}{477.0}$
one 5.9 6.3	four 6.6 6.6	three 6.4 6.7	one 5.1 5.4	three 6.3 6.4	two 5.7 6.5	one 4.8 5.4	one 5,3 5.6	one 5.7 5.8	one 5.0 5.4	two 5.0 5.6	four 4.6 6.0
hard slight good	soft slight good	soft slight good	hard slight good	soft slight good	soft slight good	hard slight good	soft slight good	soft slight good	hard slight good	soft slight good	soft slight good
creamy	creamy	creamy	creamy	creamy	creamy	creamy	creamy	creamy	creamy	creamy	creamy
						were f	loating	foots w	ere floa	t- were	
	Max. Amt. Lye used for CS Oil 11.4 57.0 3.192 53.898 469.8 470.6 one 5.9 6.3 hard slight good creamy 0.2 Part o	Max. Amt. Lye used for CS Oil 11.4 7.4 67.0 37.0 3.192 2.128 53.808 35.872 449.8 0.8 470.6 466.8 one four 5.9 6.6 6.3 hard slight good creamy creamy 0.2 Part of the foo	Max. Amt. Lye used for CS Oil CS Oil 11.4 7.4 6.3 6.6 6.7 6.4 6.7 9 6.8 6.6 6.7 soft slight good creamy creamy 0.2 5.7 Max. Amt. Lye used for CS Oil CS Oil 11.4 7.4 6.3 57.0 37.0 31.5 3.192 2.128 1.764 53.808 35.872 29.736 449.8 449.8 442.4 6.8 6.6 6.7 9 6.6 6.4 6.3 soft slight good creamy creamy creamy 0.2	Max.   Max.   Max.   Max.   Max.   Max.   Max.   Max.   Amt.   Lye   Lye   Used   for   for	Max   Max   Max   Max   Max   Max   Amt   Lye   Lye	Name	Max   Max	Max. Amt. Amt. Lye used for CS Oil	Max   Max	Max   Max	Max   Max

Started with 20 Beaumé Lye-agitated 30 min. then added H<sub>2</sub>O in quantities to make to the following Beaumés.
45 Minutes fast agitation—Temp. 20-24° C.
12 Minutes slow agitation—Temp. 75° C.

Test	Seri	ee	No.	c

		10 1/11	itutes sit	ow agita	CIOHI 6	mp. (9	C.					
	Max. Amt. Lye used for CS Oil	2/3 Max. Amt, Lye used for CS Oil	5/9 Max. Amt. Lye used for CS Oil	Max. Amt. Lye used for CS Oil	2/3 Max. Amt. Lye used for CS Oil	5/9 Max. Amt. Lye used for CS Oil	Max. Amt. Lye used for CS Oil	2/3 Max. Amt. Lye used for CS Oil	5/9 Max. Amt. Lye used for CS Oil	Max. Amt. Lye used for CS Oil	2/3 Max. Amt. Lye used for CS Oil	5/9 Max. Amt. Lye used for CS Oil
Per cent of lye used	11.4	7.4	6.3	9.7	6.5	5.4	8.0	5.9	4.44	6.7	4.4	3.7
of oilGrams of dry NaOH used for 500	57.0	37.0	31,5	48.5	32.5	27.0	40.0	29.5	22.00	33.5	22.0	18.5
grams of oil	3.192	2.128	1.764	3.187	2.194	1.823	3.200	2.360	1.760	3.183	2.090	1.767
of oil	53.808 457.2	$35.872 \\ 465.2$	29.736 456.0	45.313 $455.2$	$30.306 \\ 461.0$	$25.177 \\ 458.0$	36.800 469.0	27.140 470.5	$20.240 \\ 433.0$	30.317 $471.0$	$^{19.910}_{467.0}$	$^{16.833}_{406.8}$
Ing foots	$\frac{2.1}{459.3}$	3.9 469.1	$16.5 \\ 472.5$	$\frac{4.2}{459.4}$	$\frac{11.0}{472.0}$	$\substack{15.6 \\ 473.6}$	$\substack{0.2\\469.2}$	$\substack{3.6\\474.1}$	$\substack{41.6\\474.6}$	$\substack{0.2\\471.2}$	$\substack{6.3\\473.3}$	$\substack{66.8\\473.6}$
melted Loss (per cent). Color of oil (red) Condition of foots. Break at end of fast agitation. Break at end of slow agitation. Color taken on by oil upon addition	slight	two 6.2 6.2 soft slight good	three 5.5 6.6 soft slight good	two 8.1 5.7 soft slight good	two 5.6 6.4 soft slight good	three 5.3 6.8 soft slight good	one 6.2 6.2 hard slight good	two 5.2 6.4 soft slight good	four 5.1 6.4 sloppy slight good	one 5.8 5.9 hard slight good	two 5.3 6.2 soft slight good	six 5.3 6.6 sloppy slight good
of lye	br'nish	br'nish	br'nish									
F.F.A. of refined oil	$0.025 \\ 4.4$	2.9	2.2	$0.020 \\ 4.4$	2.9	2,2	$0.020 \\ 4.4$	2.9	2.2	4.4	2.9	$\begin{array}{c} \textbf{0.020} \\ \textbf{2.2} \end{array}$
500 grams of oil	22.0	14.5	11.0	22.0	14.5	11.0	22.0	14.5	11.0	22.0	14.5	11.0
utes of agitation	35.000	22.500	20.500	26.500	18.0	16.0	18.000	15.000	11.000	11.500	7.500	7.500

#### SOYA BEAN OIL REFINING-EXPELLER OIL

Test Series No. 10

45 Minutes fast agitation—Temp. 20-24° C. 12 Minutes slow agitation—Temp. 70° C.

	10 Beaumé				12 Beaumé				— ————————————————————————————————————			
	Max. Amt. Lye used for CS Oil plus slight excess	Max. Amt. Lye used for CS Oil	2/3 Max. Amt. Lye used for CS Oil	5/9 Max. Amt. Lye used for CS Oil	Max. Amt. Lye used for CS Oil plus slight excess	Max.	2/3 Max. Amt. Lye used for CS Oil	5/9 Max. Amt. Lye used for CS Oil	Max. Amt, Lye used for CS Oil plus slight excess	Max.	2/3 Max. Amt. Lye used for CS Oil	5/9 Max. Amt. Lye used for CS Oil
Per cent of lye used	9.9	9.7	6.5	5.4	8.2	8.0	5.9	4.44	6.9	6.7	4.4	3.7
Grams of lye used for 500 grams of oil	49.5	48.5	32.5	27.0	41.0	40.0	29.5	22.0	34.5	33.5	22.0	18.5
grams of oil	3.252	3.186	2.194	1.822	3.280	3.200	2.360	1.760	3.278	3.183	2.090	1.767
of oil	$46.248 \\ 470.4$	$\substack{45.314 \\ 470.7}$	$\frac{30.306}{461.2}$	$\substack{25.178 \\ 451.5}$	37.720 474.7	$^{36.800}_{472.2}$	$\substack{27.140 \\ 467.9}$	$20.240 \\ 438.6$	$31.222 \\ 470.5$	$30.317 \\ 471.2$	$^{19.910}_{464.2}$	$\substack{16.833 \\ 429.5}$
ing foots	0.2	$\begin{array}{c} 0.2 \\ 470.9 \end{array}$	$\substack{6.6\\467.8}$	$\substack{22.6\\474.1}$	$\substack{0.4\\475.1}$	$\substack{0.3\\472.5}$	$\frac{4.0}{471.9}$	$\frac{34.8}{473.9}$	$\begin{smallmatrix}0.2\\470.7\end{smallmatrix}$	$\substack{0.3\\471.5}$	$\substack{7.2\\471.4}$	$\substack{43.1\\472.6}$
melted Loss (per cent) Color of oil (red) Condition of foots Break at end of fast agitation Break at end of slow agitation Color taken on by oil upon addition	6.2 hard slight good	one 5.8 5.8 hard slight good	two 6.4 7.0 soft slight good	three 5.2 7.4 soft slight good	one 5.0 6.6 hard slight good	one 5.5 6.7 hard slight good	two 5.6 7.1 soft slight good	three 5.3 7.4 soft slight good	one 5.9 6.2 hard slight good	one 5.7 6.5 hard slight good	two 5.7 7.0 soft slight good	four 5.5 7.3 soft slight good
of lyeOil set over night before pouring off	creamy	creamy	creamy	creamy	creamy	creamy	creamy	creamy	creamy	creamy	creamy	creamy

#### SOYA BEAN OIL REFINING-EXPELLER OIL

Test Series No. 11

45 Minutes fast agitation—Temp. 20-24° C. 12 Minutes slow agitation—Temp. 75° C.

		14 1111	intes sig	w agitai	1011-161	np. 10 C	•					
	Max. Amt. Lye used for CS Oil plus slight excess	Max. Amt. Lye used for CS Oil	2/3 Max. Amt. Lye used for CS Oil	5/9 Max. Amt. Lye used for CS Oil	Max. Amt. Lye used for CS Oil plus slight excess	Max. Amt. Lye used for CS Oil	2/3 Max. Amt. Lye used for CS Oil	5/9 Max. Amt. Lye used for CS Oil	Max. Amt. Lye used for CS Oil plus slight excess	Max. Amt. Lye used for CS Oil	2/3 Max. Amt. Lye used for CS Oil	5/9 Max. Amt. Lye used for CS Oil
Per cent of lye used	9.9	9.7	6.5	5.4	8.2	8.0	5.9	4.44	6.9	6.7	4.4	3.7
of oil	49.5	48.5	32.5	27.0	41.0	40.0	29.5	22.0	34.5	33.5	22.5	18.5
grams of oil		45.314 474.7	30.365 465.5	$25.177 \\ 458.2$	37.720 474.7	$\frac{36.800}{474.7}$	$27.140 \\ 467.0$	20.240 464.8	$31.222 \\ 472.5$	$30.317 \\ 473.5$	19.910 458.8	16.833 471.5
ing foots	$\begin{array}{c} 0.6 \\ 475.8 \end{array}$	$\substack{0.7\\475.4}$	$\begin{array}{c} 5.0 \\ 470.5 \end{array}$	$11.5 \\ 469.7$	$\begin{array}{c} 0.7 \\ 475.4 \end{array}$	$0.8 \\ 475.5$	5.7 472,7	$\begin{array}{c} 10.3 \\ 475.1 \end{array}$	$\substack{3.1\\475.6}$	$\begin{array}{c} 1.4 \\ 474.9 \end{array}$	$11.3 \\ 470.1$	3.4 474.9
melted Loss (per cent) Color of oil (red). Condition of foots. Break at end of fast agitation. Break at end of slow agitation. Color taken on by oil upon addition	one 4.8 6.2 hard slight good	one 4.9 6.8 hard slight good	5.9 7.4 soft slight good	three 6.1 7.6 soft slight good	one 4.9 6.2 hard slight good	one 4.9 6.5 hard slight good	two 5.5 7.1 soft slight good	three 5.0 7.4 soft slight good	two 4.9 6.1 hard slight good	one 5.0 6.5 hard slight good	three 6.0 7.4 soft slight good	two 5.0 7.5 soft slight good
of lye Oil set over night before pouring off	creamy	creamy	creamy	creamy	creamy	creamy	creamy	creamy	creamy	creamy	creamy	creamy

Test Series No. 12

60 Minutes fast agitation—Temp. 20-24° C. 12 Minutes slow agitation—Temp. 75° C.

rest Series INO. 12		12 14111	utes sio	w agitai	rion-rei	mb. to d	J.					
	Max. Amt. Lye used for CS Oil plus slight excess	Max. Amt. Lye used for CS Oil	2/3 Max. Amt. Lye used for CS Oil	5/9 Max. Amt. Lye used for CS Oil	Max. Amt. Lye used for CS Oil plus slight excess	Max. Amt. Lye used for CS Oil	2/3 Max. Amt. Lye used for CS Oil	5/9 Max. Amt. Lye used for CS Oil	Max. Amt. Lye used for CS Oil plus slight excess	Max. Amt. Lye used for CS Oil	2/3 Max. Amt. Lye used for CS Oil	5/9 Max. Amt. Lye used for CS Oil
Per cent of lye used	9.9	9.7	6.5	5.4	8.2	8.0	5.9	4.44	6.9	6.7	4.4	3.7
Grams of lye used for 500 grams of oil	49.5	48.5	32.5	27.0	41.0	40.0	29.5	22.0	34.5	33.5	22.5	18.5
grams of oil	3.252	3.186	2.194	1.823	3.280	3.200	2.360	1.760	3.278	3.183	2.090	1.767
Grams of H <sub>2</sub> O used for 500 grams of oil		45.314 476.5	$\substack{30.306 \\ 472.5}$	$^{25.177}_{469.0}$	37.720 478.5	36.800 478.0	$27.140 \\ 475.5$	$20.240 \\ 469.5$	$\frac{31.222}{475.0}$	$\frac{30.317}{475.5}$	19.910 473.5	16.833 470.0
ing foots	$\begin{array}{c} 0.0 \\ 478.0 \end{array}$	$\substack{0.0\\476.5}$	$\substack{\textbf{4.0}\\\textbf{476.5}}$	$\frac{3.3}{472.3}$	$\substack{\textbf{0.0}\\\textbf{478.5}}$	$\begin{smallmatrix} 0.0\\478.0\end{smallmatrix}$	$\substack{1.2\\476.7}$	$\substack{5.2\\474.7}$	$\begin{array}{c} 0.0 \\ 475.0 \end{array}$	$\begin{array}{c} 0.2 \\ 475.7 \end{array}$	$\begin{array}{c} 2.4 \\ 475.9 \end{array}$	4.5 474.5
melted Loss (per cent)	6.4 hard slight	one 4.7 6.4 hard slight good	two 4.7 7.1 soft slight good	two 5.5 7.3 soft slight good	one 4.3 6.5 hard* slight good	one 4.4 6.5 hard slight good	one 4.7 6.9 soft slight good	two 5.1 7.2 soft slight good	one 5.0 6.4 hard slight good	one 4.9 6.4 hard slight good	two 4.8 7.1 soft slight good	two 5.1 7.4 soft slight good
of lye		creamy	Part of were fl	creamy the foot oating c wo test	ts on		creamy Part of on these were floa	the foot two tes	ts	1	Part of a	the foots ating on

#### SOYA BEAN OIL REFINING-EXPELLER OIL

75 Minutes fast agitation—Temp. 20-24° C. 12 Minutes slow agitation—Temp. 75° C.

Test Series No. 13

	10 Beaumé					—12 Be	aumé			14 Be	aum <del>é</del> —	
	Max. Amt. Lye used for CS Oil plus slight excess	Max. Amt. Lye used for CS Oil	2/3 Max. Amt. Lye used for CS Oil	5/9 Max. Amt. Lye used for CS Oil	Max. Amt. Lye used for CS Oil plus slight excess	Max. Amt. Lye used for CS Oil	2/3 Max. Amt. Lye used for CS Oil	5/9 Max. Amt. Lye used for CS Oil	Max. Amt. Lye used for CS Oil plus slight excess	Max. Amt. Lye used for CS Oil	2/3 Max. Amt. Lye used for CS Oil	5/9 Max. Amt. Lye used for CS Oil
Per cent of lye used	9.9	9.7	6.5	5.4	8.2	8.0	(*)	4.4	6.9	6.7	4.4	3.7
Grams of lye used for 500 grams of oil	49.5	48.5	32.5	27.0	41.0	40.0	(*)	22.0	34.5	33.5	22.0	18.5
grams of oil	3.252	3.186	2.194	1.823	3.280	3.200	(*)	1.760	3.278	3.183	2.090	1.767
Grams of H <sub>2</sub> O used for 500 grams of oil	46.248 479.0	45.314 478.5	30.306 474.5	$25.177 \\ 467.5$	37.720 478.5	36.800 478.5	(*) (*)	$20.240 \\ 474.0$	$\begin{array}{c} 31,222 \\ 476.0 \end{array}$	30.317 477.0	$^{19.910}_{476.0}$	16.833 473.0
Grams of oil recovered by remelting foots	$\begin{smallmatrix} 0.1\\479.1\end{smallmatrix}$	$\substack{0.0\\478.5}$	$\substack{1.0\\475.5}$	$\substack{8.6\\476.1}$	$\begin{array}{c} 0.2 \\ 478.7 \end{array}$	$\substack{\textbf{0.3}\\\textbf{478.8}}$	(*) (*)	3.7 477.7	$\substack{1.2\\477.2}$	$\begin{array}{c} \textbf{0.7} \\ \textbf{477.7} \end{array}$	0.8 476.8	4.7 477.7
melted	4.2 6.0 hard slight	one 4.3 6.2 hard slight good	one 4.9 6.6 soft slight good	two 4.8 7.0 soft slight good	one 4.3 6.2 hard slight good	one 4.2 6.4 hard slight good	(*) (*) (*) (*) (*) (*)	two 4.5 7.1 soft slight good	one 4.6 6.3 hard slight good	one 4.5 6.7 hard slight good	one 4.6 6.8 soft slight good	two 4.5 7.2 soft slight good
Color taken on by oil upon addition of lyeOil set two hours before pouring off	creamy	creamy	I f	creamy Part of toots we loating	he	creamy	fc	creamy art of the oots wer		creamy	Pa foo	creamy rt of the ots were ating

# SOYA BEAN OIL REFINING-EXPELLER OIL 90 Minutes fast agitation—Temp. 20-24° C. 12 Minutes slow agitation—Temp. 75° C.

Test Series No. 14

						٥,					
——-8	Beaum			Beaun	né	——————————————————————————————————————	Beaun	16— <u>—</u> —		1 Beaun	2/3
	3.50			3.6			3.5			7.6	
											Max.
											Amt.
											Lye
											used
											for
max.	CS OII	CS On	max.	CS OII	CS On	max.	CS Oil	CS On	max.	CS Oil	CS Oil
15.2	11.4	7.6	12.9	9.7	6.5	10.7	8.0	5.9	8.9	6.7	4.4
		80.4					40.0	00 =			00.0
	57.0	38.0	64.5	48.5	32.5	53.5	40.0	29.5	44.5	33.5	22.0
								0.000			
	3.192	2.128	4.238	3.186	2.135	4.280	3.200	2.360	4.228	3.183	2.090
	<b>**</b> 000	05 050	00.000			40.000		0= 440	40.000	00.04=	
											19.910
	476.5	475.5	477.5	477.5	472.0	477.5	478.5	479.0	478.5	478.0	477.5
0.0											1.1
477.5											478.6
											one
											4.3
6.3											6.2
											hard
slight					slight				slight		slight
					very				very		very
good	good	good	good	good	good	good	good	good	good	good	good
	Max. Amt. Lye used for CS Oil plus 1/3 Max. 15.2 75.0 4.200 70.800 477.5 0.0 477.5 one 4.5 6.3	Max	Max. Amt. Lye	Max. Amt. Lye   Lye   Used for   Lye   Used for   Lye   Used for   CS Oil   plus 1/3   for   for   for   for   for   for   plus 1/3   for   for   for   for   plus 1/3   Max.   Lye   Used for   CS Oil   plus 1/3   Max.   Lye   Lye   Lye   Used for   CS Oil   plus 1/3   Max.   Lye   Lye   Lye   Used for   CS Oil   plus 1/3   Max.   Lye   Lye	Max. Amt. Lye	Name	Max	Name	Max	Max	Max.

Oil set over night before pouring off Some of foots were floating, probably due to too long agitation slow, at 75° C.

<sup>\*</sup>No test.

After the refined oil had set over night there was a thin deposit of foots on the bottom of the cup.

Test Series No. 15

#### 75 Minutes fast agitation—Temp. 20-24° C. 8 Minutes slow agitation—Temp. 75° C.

	The state of the s											
		10 Be	aumé-			12 Be	aumé			—-14 Be	aum <del>é</del>	
	Max.	Max.	3.5	2/3	Max.	Max.	7.5	2/3	Max.	Max.		2/3
	Amt. Lye	Amt. Lve	Max. Amt.	Max. Amt.	Amt. Lye	Amt. Lye	Max. Amt.	Max. Amt.	Amt. Lye	Amt. Lye	Max. Amt.	Max.
	used for	used for		Laye	used for			Lye				Amt. Lye
	CS Oil	CS Oil	used	used	CS Oil	CS Oil	used	used	CS Oil	CS Oil	used	used
	plus	plus	for	for	plus	plus	for	for	plus	plus	for	for
	1/3 Max.	. 1/5 Max	. CS Oil	CS Oil	1/3 Max	. 1/5 Max	CS Oil	CS Oil	1/3 Max.	. 1/5 Max	c. CS Oil	CS Oil
Per cent lye used	12.9	11.6	9.7	6.5	10.7	9.6	8.0	5.9	8.9	8.0	6.7	4.4
Grams lye used for 500 grams of oil	64.5	58.0	48.5	32.5	53.5	48.0	40.0	29.5	44.5	40.0	33.5	22.0
Grams of dry NaOH used for 500	4 000	0.011	0.100	0 105	4.000	0.040		0.000	4.000		0.100	
grams of oil	4.238	3.811	3.186	2.135	4.280	3.840	3.200	2.360	4.228	3.800	3.183	2.090
oil	60.262	54.189	45.313	30.365	49.220	44.160	36.800	27.140	40.272	36.200	30.317	19.910
Grams of oil first pour off	476.5	476.5	477.0	469.5	475.5	475.5	477.0	477.0	474.5	475.5	474.5	475.5
Grams oil recovered by remelting												
foots	0.1	0.1	0.1	5.9	0.2	0.8	0.3	0.2	0.1	0.6	1.0	1.0
Total grams of oil	477.6 one	476.6 one	477.1 one	475.4 two	475.7 one	476.3 one	477.3 one	477.2 one	474.6 one	476.1 one	475.5 one	476.5 one
Loss (per cent)	4.7	4.7	4.6	4.9	4.9	4.5	4.5	4.6	5.1	4.8	4.9	4.7
Color of oil (red)	5.5	5.9	6.0	6.2	5.5	6.0	6.2	6.3	5.7	6.0	6.2	6.4
Condition of foots	hard	hard	hard	soft	hard	hard	hard	hard	hard	hard	hard	hard
Break at end of fast agitation						medium i				medium		medium
Break at end of slow agitation	very	very good	very	very	very							
Color taken on by oil upon addition		5004	good	Soou	5000	Soou	goou	8000	5∪ <del>v</del> u	good	good	good
of lye	creamy	creamy	creamy	creamy	creamy	creamy	creamy	creamy	creamy	creamy	creamy	creamy
Oil set overnight before pourin	g off.								-			

#### SOYA BEAN OIL REFINING-EXPELLER OIL

Test Series No. 16

90 Minutes fast agitation—Temp. 20-24° C. 8 Minutes slow agitation—Temp. 75° C.

	o minutes slow agreetion Temp. 15 C.											
		—-10 Be	aumé			12 Be	aumé				aumé-	
	Max,	Max.	7.7	$\frac{2}{3}$	Max.	Max.	76	$\frac{2}{3}$	Max.	Max.	35	2/3
	Amt. Lye	Amt. Lye	Max. Amt.	Max. Amt.	Amt. Lve	Amt. Lye	Max. Amt.	Max. Amt.	Amt. Lve	Amt. Lye	Max. Amt.	Max. Amt.
		used for	Lye	Lye		used for	Lye	Lye	used for			Lye
	CS Oil	CS Oil	used	used	CS Oil	CS Oil	used	used	CS Oil	CS Oil	used	used
	plus	plus	for	for	plus	plus	for	for	plus	plus	for	for
	1/3 Max.	1/5 Max	. CS Oil	CS Oil	1/3 Max.	. 1/5 Max	. CS Oil	CS Oil	1/3 Max.	1/5 Max	. CS Oil	CS Oil
Per cent of lye used	12.9	11.6	9.7	6.5	10.7	9.6	8.0	5.9	8.9	8.0	6.7	4.4
Grams lye used for 500 grams of oi	1 64.5	58.0	48.5	32.5	53.5	48.0	40.0	29.5	44.5	40.0	33.5	22.0
Grams dry NaOH used for 500 grams of oil	} 4 000	0.011	0.100	0.405	4.000	0.040		• • • • •			0.400	0.000
Grams H <sub>2</sub> O used for 500 grams	4.238	3.811	3.186	2.135	4.280	3.840	3.200	2.360	4.228	3.800	3.183	2.090
of oil	60.262	54.189	45.314	30.365	49.220	44.160	36.800	27.140	40.272	36.200	30.317	19.910
Grams oil first pour off	478.0	478.3	478.2	470.5	478.0	478.0	477.0	479.0	476.0	476.0	473.0	477.0
Grams oil recovered by remelting	;											
foots	0.0	0.3	0.2	5.2	0.3	0.5	0.5	0.6	0.3	0.8	1.4	2.6
Total grams of oil Number times foots were remelted	. 478.0 . one	478.3 one	478.2	475.7 two	478.3	478.5	477.5	479.6	476.3	476.8	474.4	479.6
Loss (per cent)	4.4	4.4	one 4.4	4.9	$^{\rm one}_{4.3}$	one 4.3	one 4.5	$_{4.1}^{\mathrm{one}}$	one 4.7	one 4.6	one 5.1	two 4.1
Color of oil (red)	5.4	5.4	5.7	6.0	5.4	5.5	5.7	6.1	5.5	5.8	5.9	6.1
Condition of foots	. hard	hard	hard	soft	hard	hard	hard	hard	hard	hard	hard	soft
Break at end of fast agitation				medium		medium i		medium			medium	
Break at end of slow agitation	very good	very	very	very	very	very	very	very	very	very	very	very
Color taken on by oil upon addition	, вооч	good	good	good	good	good	good	good	good	good	good	good
of lye	creamy	creamy	creamy	creamy	creamy	creamy	creamy	creamy	creamy	creamy	creamy	creamy
Oil set overnight before pouring	ng off.		•									

#### SOYA BEAN OIL REFINING-EXPELLER OIL

Test Series No. 17

75 Minutes fast agitation—Temp. 20-24° C. 8 Minutes slow agitation—Temp. 75° C.

		8 Be	aumé —			10 Be	aumé			12 Be	eaum <del>é</del> —-	
	Max.	Max.		2/3	Max.	Max.		2/3	Max.	Max.		2/3
	Amt.	Amt.	Max.	Max.	Amt.	Amt.	Max.	Max.	Amt.	Amt.	Max.	Max.
	$_{ m Lye}$	Lye	Amt.	Amt.	Lye	$_{\mathbf{Lye}}$	Amt.	Amt.	Lye	Lye	Amt.	Amt.
	used for	used for	Lye	Lye	used for			Lye		used for		Lye
	CS Oil	CS Oil	used	used	CS Oil	CS Oil	used	used	CS Oil	CS Oil	used	used
	plus	plus	for	for	olus	plus	for	for	plus	plus	for	for
	1/3 Max.	1/5 Max	c CS Oil	CS Oil	1/3 Max	. 1/5 Max	. CS Oil	CS Oil	1/3 Max		k. CS Oil	CS Oil
Per cent lye used	15.2	13.7	11.4	7.6	12.9	11.6	(*)	6.5	10.7	9.6	8.0	5.9
Grams lye used for 500 grams of oil	75.0	68.5	57.0	38.0	64.5	58.0	<b>(*</b> )	32.5	53.5	48.0	40.0	29.5
Grams dry NaOH used for 500							` '			20.0		
grams of oil	4.200	3.836	3.192	2.128	4.238	3.811	(*)	2.135	4.280	3.840	3.200	2.360
Grams H2O used for 500 grams							` '					
_ of oil	70.800	64.664	53.808	35.872	60.262	54.189	(*)	30.365	49.220	44.160	36.800	27.140
Grams oil first pour off	476.0	476.0	476.5	475.5	476.0	477.0	(*)	469.0	477.2	477.5	477.5	477.5
Grams oil recovered by remelting												
foots	0.4	0.0	0.5	0.7	0.2	0.2	(*)	5.6	0.2	0.4	0.3	0.6
Total grams oil	476.4	476.0	477.0	476.2	476.2	477.2	(*)	474.6	477.4	477.9	477.8	478.1
Number times foots remelted	one	one	one	one	one	one	(*)	three	one	one	one	one
Loss (per cent)	4.7	4.8	4.6	4.8	4.8	4.6	(*)	5.1	4.5	4.4	4.4	4.4
Color oil (red)	5.7	5.8	6.0	6.2	5.2	5.3	(*)	5.7	5.3	5.3	5.6	5.8
Condition of foots	hard	hard	hard	hard	hard	hard	(*)	soft	hard	hard	hard	hard
Break at end of fast agitation		slight	slight	slight	slight	slight	(*)	slight	slight	slight	slight	slight
Description of the state of the state of	very	very	very	very	very	very	(*)	very	very	very	very	very
Break at end of slow agitation	good	good	good	good	good	good	(*)	good	good	good	good	good
Color taken on by oil upon addition												
of lye *No test	creamy	creamy	creamy	creamy	creamy	creamy	creamy	creamy	creamy	creamy	creamy	creamy

Oil set overnight before pouring off.

Test Series No. 18					ation—Te ation—Te							
		8 Bea	umé							12 Ве	aumé	
	Max.	Max.		2/3	Max.	Max.		2/3	Max.	Max.		2/3
	Amt.	Amt.	Max.	Max.	Amt.	Amt.	Max.	Max.	Amt.	Amt.	Max.	Max.
	Lye	$_{ m Lye}$	Amt.	Amt.	Lye	$_{\mathbf{Lye}}$	Amt.	Amt.	Lye	$\mathbf{L}\mathbf{y}\mathbf{e}$	Amt.	Amt.
		used for		Lye		used for	Lye	Lye		used for		Lye
	CS Oil	CS Oil	used	used	CS Oil	CS Oil	used	used	CS Oil	CS OII	used	used
	plus	plus	for	for	plus	plus	for	for	plus	plus	for	for
	1/3 Max.	_,							1/3 Max.			CS Oil
Per cent lye used	15.2	13.7	11.4	7.6	12.9	11.6	9 7	6.5	10.7	9.6	8.0	5.9
Grams lye used for 500 grams of oil		68.5	57.0	38.0	64.5	58.0	48.5	32.5	53.5	48.0	40.0	29.5
Grams dry NaOH used for 500		0.000	0.400	0.400	4.000	0.014	0.404	0 105	4.000	0.040		0.000
grams of oil	4.200	3.836	3.192	2.128	4.238	3.811	3.186	2.135	4.280	3.840	3.200	2.360
Grams H <sub>2</sub> O used for 500 grams		CA CCA	E9 000	95 979	en 9e9	E4 100	45 914	20 205	40 990	44 160	90 000	97 140
of oil	70.800 $473.7$	64.664 $474.0$	53.808 $471.5$	35.872 $472.0$	60.262 $475.0$	54.189	45.314 474.3	30.365 $461.5$	$\frac{49.220}{474.9}$	44.160 475.6	36.800	27.140
Grams oil recovered by remelting		414.0	4/1.5	412.0	410.0	477.0	4/4.5	401.5	474.9	475.6	475.2	475.4
foots		0.2	0.3	2.6	0.3	0.6	0.2	10.8	0.9	1.4	1.2	1.4
Total grams oil		474.2	471.8	474.6	475.3	477.6	474.5	472.3	474.9	475.6	475.2	475.4
Number times foots were remelted	one	one	one	two	one	one	one	two	one	one	one	one
Loss (per cent)		5.2	5.6	5.1	4.9	4.6	5.1	5.5	5.0	4.9	5.0	4.9
Color oil (red)	5.6	6.1	6.3	6.6	5.6	5.6	6 1	6.3	5.2	5.4	5.7	5.9
Condition of foots		hard	hard	soft	hard	hard	hard	soft	hard	hard	hard	hard
Break at end of fast agitation	medium:	medium	medium	medium	medium	medium	medium	medium	medium	medium	medium	medium
	very	very	very	very	very	very	very	very	very	very	very	very
Break at end of slow agitation		good	good	good	good	good	good	good	good	good	good	good
Color taken on by oil upon addition												
of lya	creams	CPAGMM	Creamy	ereq mi	craamy	area mar	Orcomit	ores ma	area mar	OTOO WATE	OPOO MIT	OTTO TOTAL

of lye .............. creamy c

#### SOYA BEAN OIL REFINING-EXPELLER OIL

Test Series No. 19		8 Min	utes slo	w agita	tion—Te	mn 75° (	•			12 Be	aumé	
	Max.	Max.		2/3	Max.	Max.		2/3	Max.	Max.		2/3
	Amt.	Amt.	Max.	Max.	Amt.	Amt.	Max.	Max.	Amt.	Amt.	Max.	Max.
	Lye	Lye	Amt.	Amt.	Lye	Lye	Amt.	Amt.	Lye	Lye	Amt.	Amt.
		used for	Lye	Lye		used for	Lye		used for	used for	Lve	Lye
	CS Oil	CS Oil	used	used	CS Oil	CS Oil	used	used	CS Oil	CS Oil	used	used
	plus	plus	for	for	plus	plus	for	for	plus	plus	for	for
	1/3 Max.			CS Oil	1/3 Max.			CS Oil	1/3 Max.			CS Oil
75.												
Per cent lye used		13.7	11.4	7.6	12.9	11.6	9.7	6.5	10.7	9.6	8.0	5.9
Grams lye used for 500 grams of oi		68.3	57.0	38.0	64.5	58.0	48.5	32.5	53.5	48.0	40.0	29.5
Grams of dry NaOH used for 500	)											
grams of oil	4.200	3.836	3.192	2.128	4.238	3.810	3.186	2.135	4.280	3.840	3.200	2.300
Grams H2O used for 500 grams of										4		
oil		64.664	53.808	35.872	60.262	54.190	45.314	30.365	49.220	44.160	36.800	27.140
Grams oil first pour off		478.2	477.0	473.0	476.0	478.0	477.0	477.5	473.5	476.0	476.0	474.5
Grams oil recovered by remelting	3											
foots	0.0	0.0	0.2	3.6	0.2	0.2	0.3	0.5	1.2	1.0	0.2	1.1
Total grams oil	477.0	478.2	477.2	476.6	476.2	478.2	477.3	478.0	474.7	477.0	476.2	475.6
Number of times foots were re-	-											
melted	one	one	one	two	one	one	one	one	one	one	one	one
Loss (per cent)		4.4	4.7	4.6	4.7	4.4	4.5	4.4	5.1	4.6	4.8	4.9
Color oil (red)		5.6	5.9	6.1	5.3	5.4	5.5	5.6	5.2	5.3	5.8	6.0
Condition of foots		hard	hard	soft	hard	hard	hard	hard	hard	hard	hard	hard
Break at end of fast agitation				medium			medium	medium			medium	
	verv	very	very	very	very	very	very	very	very	very	very	very
Break at end of slow agitation		good	good	good	good	good	good	good	good	good	good	good
Color taken on by oil upon addition		gu	3-04	,	2004	8000	2u	0	2004	, u	2004	B004
of lye		creamy	creamy	creams	creamy	creamy	creamy	creamy	creamy	creamy	creamy	creamy
Oil set overnight before maki			or carry	C. Cumy	or outily	.,,	52 5201119	or coming	or camy	01 024113	or cetting	or carry
On but of congue before make		pour our.										

#### SOYA BEAN OIL REFINING-EXPELLER OIL

		90 Mii	iutes fa:	st agitat	ion—Ten	ap. 20-24	°C.					
Test Series No. 20		8 Mir	iutes slo	w agita	tionTe	mp. 75°	C.					
	<del></del>		aumé				aumé			—-12 Be	aumé	
	Max.	Max.		2/3	Max.	Max.		2/3	Max.	Max.		2/3
	Amt.	Amt.	Max.	Max.	Amt.	Amt.	Max.	Max.	Amt.	Amt.	Max.	Max.
	$_{ m Lye}$	Lye	Amt.	Amt.	Lye	$_{\mathbf{Lye}}$	Amt.	Amt.	$_{ m Lye}$	Lye	Amt.	Amt.
		used for	$_{ m Lye}$	$_{\mathbf{Lye}}$	used for		Lye	$_{\mathbf{Lye}}$		used for	$_{ m Lye}$	$_{ m Lye}$
	CS Oil	CS Oil	used	used	CS Oil	CS Oil	used	used	CS Oil	CS Oil	used	used
	plus	plus	for	for	plus	plus	for	for	plus	plus	for	for
	1/3 Max.	1/5 Max	. CS Oil .	CS Oil	1/3 Max.	1/5 Max	. CS Oil	CS Oil	1/3 Max.	1/5 Max	. CS OII	CS Oil
Per cent lye used	15,2	13.7	11.4	7.6	12.9	11.6	9.7	6.5	10.7	9.6	8.0	5.9
Grams lye used for 500 grams of oi		68.5	57.0	38.0	64.5	58.0	48.5	32.5	53.5	48.0	40.0	29.5
Grams dry NaOH used for 500												
grams of oil		3.836	3.192	2.128	4.238	3.810	3.186	2.135	4.280	3.840	3.200	2.360
Grams H <sub>2</sub> O used for 500 grams												
of oil	70.800	64.664	53.808	35.872	60.262	54.190	45.314	30.365	49.220	44.160	36.800	27.140
Grams of oil first pour off		478.0	477.0	475.0	477.0	478.5	478.5	473.5	478.5	478.5	478.0	479.5
Grams oil recovered by remelting												
foots		0.0	0.0	2.4	0.1	0.1	0.0	2.6	0.0	0.3	0.3	0.0
Total grams oil		478.0	477.0	477.4	477.1	478.6	478.5	476.1	478.5	478.8	478.3	479.5
Number times foots remelted		one	one	two	one	one	one	two	one	one	one	one
Loss (per cent)	. 4.4	4.4	4.6	4.5	4.6	4.3	$\frac{4.3}{5.7}$	4.8	4.3	4.2	4.3	4.1
Color oil (red)	5.7	5.8	6.1	6.8 soft	5.4	5.7	5.7 hard	6.0 soft	5.1 hard	5.4	5.5	5.7
Condition of foots		hard medium	hard medium	medium	hard medium	hard medium		medium		hard medium	hard medium	hard
Break at end of fast agitation								very	very	very		
Break at end of slow agitation	very	very good	very good	very good	very good	very good	very good	good	good	good	very	very
Color taken on by oil upon addition		goou	good	good	good	goou	good	good	good	good	good	good
of lye		gragnay	orgamy	creamy	craamy	creamy	creamy	creamy	creamy	cres may	oreomy	O** 0 PO T
Oil set overnight before nouri	o off	Creamy	C. Camy	Creamy	Cicamy	Creamy	Creamy	Cicality	Creamy	cicality	creamy	creamy
on set overnight before pourn	. B 0.1.											

#### SOYA BEAN OIL REFINING

#### Tank Car of Soya Bean Oil received at Swift & Company Refinery

Test Series No. 21

90 Minutes fast agitation—Temp. 20-24° C. 8 Minutes slow agitation—Temp. 75° C.

						10 Be	aumé			12 Ве	aumé	
	Max.	Max.		2/3	Max.	Max.		2/3	Max.	Max.		2/3
	Amt.	Amt.	Max.	Max.	$\mathbf{\underline{A}mt}.$	Amt.	Max.	Max.	Amt.	Amt.	Max.	Max.
	Lye	Lye	Amt.	Amt.	Lye	Lye	Amt.	Amt.	Lye	Lye	Amt.	Amt.
			Lye	Lye			Lye		used for		Lye	Lye
	CS Oil plus	CS Oil plus	used for	used for	CS Oil plus	CS Oil plus	used for	used for	CS Oil plus	CS Oil	used	used
					1/3 Max.					plus 1/5 Max	for CS Oil	for CS Oil
	-				•	•				•		
Per cent lye used		14.5	12.1	8.0	13.7	12.4	10.3	6.8	11.2	10.1	8.4	6.3
Grams of lye used for 500 grams		70 5	00.5	40.0	có r	0.00	F1 F	04.0	rc 0	50.5	49.0	04 -
of oil	80.5	72.5	60.5	40.0	68.5	62.0	51.5	34.0	56.0	50.5	42.0	31.5
grams of oil		4.060	3.388	2.240	4.501	4.070	3.384	2.234	4.480	4.040	3.360	2.520
Grams H2O used for 500 grams		1.000	0.000	2.210	1.001	1.010	0.001	2.201	1.100	1.010	5.000	2.020
of oil	75.992	68.440	57.112	37.760	63.999	57.930	48.116	31.766	51.520	46.460	38.640	28.980
Grams oil first pour off	469.5	464.0	461.5	469.5	475.2	475.0	470.5	472.7	475.0	476.3	478.0	470.5
Grams oil recovered by remelting												
_ foots	0.7	1.8	1.6	1.1	0.2	0.0	1.5	2.7	0.2	0.0	0.2	1.3
Total grams oil		465.8	463.1	470.6	475.4	475.0	472.0	472.7	475.2	476.3	478.2	471.8
Number of times foots were re-		*	4					4				
melted	one 6.0	two 6.8	two 7.4	$\begin{array}{c} \textbf{one} \\ \textbf{5.9} \end{array}$	$\begin{array}{c} \textbf{one} \\ \textbf{5.0} \end{array}$	one 5.0	one 5.9	two 5.5	one 5.0	one 4.7	one 4.4	one 5.6
Loss (per cent)	6.7	6.7	7.0	7.3	6.5	6.7	6.9	7.2	6.4	6.6	6.7	7.2
Condition of foots		soft	soft	soft	hard	hard	soft	soft	hard	hard	hard	soft
Break at end of fast agitation	slight	slight	slight	slight	slight	slight	slight	slight	slight	slight	slight	slight
	3	6***	~		very	very	very	very	very	very	very	very
Break at end of slow agitation	good	good	good	good	good	good	good	good	good	good	good	good
Color taken on by oil upon addition						_						
of lye	creamy	creamy	creamy	creamy	creamy	creamy	creamy	creamy	creamy	creamy	creamy	creamy

Oil set overnight before pouring off. F. A. .7%.

#### SOYA BEAN OIL REFINING-EXPELLER OIL-Using Sodium Silicate.

Test Series No. 22

45 Minutes fast agitation—Temp. 20-24° C. 30 Minutes slow agitation—Temp. 50-53° C.

3	——8 Beaumé—— Max. Amt. Lye used		—10 Bea Max. Amt.		——12 Bea Max. Amt.	umé—	—14 Bea Max. Amt.	ıum <b>é——</b>
	for CS Oil	80% Max.	Lye used for CS Oil	80% Max.	Lye used for CS Oil	80% Max.	Lye used for CS Oil	80% Max.
Per cent lye used	11.4 57.0 3.192 53.808 0.5 2.5 479.0 0.2 479.2 one 4.2 6.3 hard medium very good greenisw	9.12 45.6 2.554 43.046 0.5 2.5 477.0 0.5 477.5 one 4.5 6.4 hard medium very good greenish yellow	9.7 48.5 3.186 45.314 0.5 2.5 478.0 1.8 479.8 two 4.0 5.7 hard medium very good greenish yellow	7.8 39.0 2.562 36.438 0.5 2.5 478.0 0.9 478.9 one 4.2 6.0 hard medium very good greenish yellow	8.0 40.0 3.200 36.800 0.5 2.5 475.5 3.5 479.0 two 4.2 5.7 hard medium very good greenish yellow	6.4 32.0 2.560 29.440 0.5 2.5 477.0 2.5 479.5 two 4.1 5.9 hard medium very good greenish yellow	6.7 33.5 3.183 30.317 0.5 2.5 472.5 3.1 475.6 two 4.9 5.4 hard medium very good greenish yellow	5.4 27.0 2.546 24.454 0.5 2.5 477.0 2.3 479.3 two 4.1 5.6 hard medium very good greenish yellow

#### SOYA BEAN OIL REFINING-HYDRAULIC OIL

90 Minutes fast agitation—Temp. 20-24° C. 8 Minutes slow agitation—Temp. 75° C.

Test Series No. 23

	8 Beaumé-					10 Bea	umé			—-12 Bea	umé	
	Max.	Max.		2/3	Max.	Max.		2/3	Max.	Max.		2/3
	Amt.	Amt.	Max.	Max.	Amt.	Amt.	Max.	Max.	Amt.	Amt.	Max.	Max.
	Lye	Lye	Amt.	Amt.	$_{\mathbf{Lye}}$	Lye	Amt.	Amt.	Lye	Lye	Ąmt.	Amt.
			Lye	$_{ m Lye}$		used for	Lye	Lye			Lye	Lye
	CS Oil	CS Oil	used	used	CS Oil	CS Oil	used	used	CS Oil plus	CS Oil plus	used for	used for
	plus	plus 1/5 Max.	for	for	plus	plus 1/5 Max.	for CS Oil	for CS Oil		1/5 Max		CS Oil
	•	1/5 MILLA	CSOn	CS OII	I/O MICA.	I/O Max.	CS OII	CBOIL	·			
Per cent lye used		14.7	12.2	8.16	14.1	12.7	10.6	7.0	11.6	10.4	8.7	5.8
Grams lye used for 500 grams of oi		73.5	61.0	41.0	70.5	63.5	53.0	35.0	58.0	52.0	43.50	29.00
Grams dry NaOH used for 50		4 110	0 410	0.000	4 600	4 1 17 7	8 400	0.000	4 640	4.160	3.480	2.320
grams of oil		4,116	3.416	2.296	4.630	4.171	3.482	2.299	4.640	4.160	3.480	2.320
oil		69.384	57.584	38.704	65.870	59,329	49.518	32.701	53.360	47.840	40.020	26.680
Grams oil first pour off		475.5	476.5	470.0	477.0	476.5	473.5	475.5	474.5	474.0	474.0	472.5
Grams oil recovered by remelting		21010	210.0	1.0.0		1,0.0	110.0	1.0.0		21-10		2
foots		0.1	0.1	0.6	0.0	0.0	0.1	0.2	0.7	0.3	0.2	0.3
Total grams oil	476.0	475.6	476.6	470.6	477.0	476.5	473.3	475.7	475.2	474.3	474.2	472.8
Number times foots were remelted	i one	one	one	one	one	one	one	one	one	one	one	one
Loss (per cent)		4.9	4.7	5.9	4.6	4.7	5,3	4.9	5.0	5.1	5.2	5.4
Color oil (red)	. 5.5	5.6	5.7	5.7	4.9	5.1	5.3	5.7	5.0	5.1	5.3	5.7
Condition of foots		hard	hard	soft	hard	hard	hard	hard	hard	hard	hard	hard
Durals of and of foot outsides	very	very	very	very	very	very	very	very	very	very	very	very
Break at end of fast agitation Break at end of slow agitation			slight good	slight	slight	slight	slight	slight	slight good	slight good	slight good	slight good
Color taken on by oil upon addition		good	good	good	good	good	good	good	5004	500u	Boou	good

#### SOYA BEAN OIL REFINING-HYDRAULIC OIL

							12 Веа	umé	
ax.	2/3	Max.	Max.		2/3	Max.	Max.		2/3
mt. Max	Max.	Amt.	Amt.	Max.	Max.	Amt.	Amt.		Max.
		$_{ m Lye}$		Amt.	Amt.				Amt.
									Lye
									used
									for
Max. CS	on es on	1/3 Max.	1/5 Max.	CS Oil	CS Oil	1/3 Max.	1/5 Max		
.7 12.2	8.16	14.1	12.7	10.6	7.0	11.6	10.4		5.8
.5 61.0	41.0	70.5	63.5	53.0	35.0	58.0	52.0	43.50	29.0
.116 3.4	6 2.296	4.631	4.171	3.482	2.299	4.640	4.160	3.480	2.320
						** ***	45.040	40.000	00.000
									26.680
.5 475.0	470.0	476.0	474.0	474.0	475.5	475.0	474.0	472.9	474.5
					0.1		Α 1	0.0	20.0
									0.2
									474.7
									one 5.1
									5.3
									hard
									very slight
	8 Minutes   8 Beaumé—   2	8 Minutes slow agita 8 Beaumé- 2/3 mt. Max. wye Amt. Amt. d for Lye Lye 6 Oil used used 10s for for 6 Max. CS Oil CS Oil 7 12.2 8.16 5 61.0 41.0 .116 3.416 2.296 .384 57.584 38.704 .5 475.0 470.0 .5 475.1 472.1 ne one two 1.7 4.75.1 472.1 ne one two 1.7 5.0 5.6 1.4 5.5 5.6 nd hard soft yv yvery very	8 Minutes slow agitation—Te 8 Beaume— 2/3 Max. mt. Max. Max. Max. ye Amt. Amt. Lye d for Lye Lye used for lus for for plus 6 Max. CS Oil CS Oil 1/3 Max. 7 12.2 8.16 14.1 5 61.0 41.0 70.5 .116 3.416 2.296 4.631 3.384 57.584 38.704 65.869 5 475.0 470.0 476.0 .1 475.1 472.1 476.0 ne one two one 1.7 5.0 5.6 4.8 1.4 5.5 5.6 4.9 nd hard soft hard yery yery very	8 Minutes slow agitation—Temp. 75° C 8 8 Beaume———————————————————————————————————	8 Minutes slow agitation—Temp. 75° C. 8 Beaumé————————————————————————————————————	8 Beaumé  ax.  Max.  Max.  Max.  Max.  Max.  Max.  Max.  Max.  Lye  Lye  Amt.  Lye  Lye  Amt.  Amt.  Max.  Amt.  Max.  Amt.  Max.  Amt.  Lye  Lye  Amt.  Amt.  Amt.  Max.  Amt.  Amt.  Amt.  Lye  Lye  Amt.  Amt.  Amt.  Amt.  Amt.  Amt.  Amt.  Amt.  Amt.  April  April  CS Oil  CS	8 Minutes slow agitation—Temp. 75° C. 8 Beaumé 2.	8 Minutes slow agitation—Temp. 75° C. 8 Beaumé 2.	8 Minutes slow agitation—Temp. 75° C. 8 8 Beaumé— 3.

Break at end of fast agitation.... slight sl

#### SOYA BEAN OIL REFINING-HYDRAULIC OIL

	v	U.A D-										
Test Series No. 25					tion—Ten ttion—Te							
		14 Bea	aum <del>é</del> —			——16 Bea	aumé			20 Bea	aumé	
	Max.	Max.		2/3	Max.	Max.		2/3	Max.	Max.		2/3
	Amt.	Amt.	Max.	Max.	Amt.	Amt.	Max.	Max.	Amt.	Amt.	Max.	Max.
	Lye	Lye	Amt.	Amt.	Lye	Lye	Amt.	Amt.	Lye	Lye	Amt.	Amt.
	used for			Lye					used for	used for	Lye	Lye
	CS Oil	CS Oil	used	used	CS Oil	CS Oil	used	used	CS OII	CS Oil	used	used
	plus	plus	for	for	plus	plus	for	for	plus	plus	for	for
		1/5 Max			1/3 Max.				1/3 Max.			CS Oil
Per cent lye used	9.7	8.8	7.3	4.8	8.4	7.6	6.3	4.2	6.4	5.8	4.8	3.2
Grams lye used for 500 grams of oil		44.0	36.5	24.0	42.0	38.0	31.5	21.0	32.0	29.0	24.0	16.0
Grams dry NaOH used for 500		- 210					02.0		<b>5</b>			
grams of oil		4.180	3.467	2.280	4.645	4.203	3.484	2.323	4.595	4.164	3.446	2.298
Grams H2O used for 500 grams of		•1					0.101				-	
oil	43.893	39.820	33.033	21.720	37.355	33.797	38.016	18.677	27.405	24.836	20.554	13.702
Grams oil first pour off		473.0	473.0	472.0	471.8	471.0	473.5	472.0	476.0	476.0	475.5	471.0
Grams of oil recovered by remelt-		21313					2.0.0	21-10				
ing foots		0.4	0.5	0.8	1.2	2.7	0.6	1.5	0.2	0.2	9.5	5.1
Total grams oil		473.4	473.5	472.8	473.0	473.7	474.1	473.5	476.2	476.2	476.0	476.1
Number times foots were remelted		one	one	one	one	two	one	one	one	one	one	two
Loss (per cent)		5.4	5.3	5.4	5.4	5.3	5.2	5.3	4.8	4.8	4.8	4.8
Color of oil (red)	5.7	5.8	5.9	6.4	5.4	5.3	5.2	5.3	5.7	5.8	5.8	6.0
Condition of foots	hard	hard	hard	hard	hard	hard	hard	hard	hard		hard	hard
	very	very	very	very	very	very	verv	very				
Break at end of fast agitation		slight	slight	slight	slight	slight	slight	slight	good	good	good	good
	Eligine	2118110	.3118110	Dilgin	BIIDIIC	D B.I.	2*15110	DALGALO	very	very	very	very
Break at end of slow agitation	medium	medium	medium	medium	medium	medium	medium	medium		good	good	good
Color taken on by oil upon addition					·······	1110010111	incaran			u	2	2004

Color taken on by oil upon addition.... creamy crea

# SOYA BEAN OIL REFINING-HYDRAULIC OIL

	-											
Test Series No. 26					tion—Ter ation—Te							
			aumé			—-16 Be				—20 Ве	ลมพ6	
	Max.	Max.	aume	2/3	Max.	Max.	Li dilli C	2/3	Max.	Max.		2/3
	Amt.	Amt.	Max.	Max.	Amt.	Amt.	Max.	Max.	Amt.	Amt.	Max.	Max.
	Lye	Lye	Amt.	Amt.	Lve	Lye	Amt.	Amt.	Lye	Lye	Amt.	Amt.
	used for			Lye	used for		Lye	Lye	used for		Lye	Lye
	CS Oil	CS Oil	used	used	CS Oil	CS Oil	used	used	CS Oil	CS Oil	used	used
	plus	plus	for	for	plus	plus	for	for	plus	plus	for	for
	1/3 Max.				1/3 Max.				1/3 Max.	1/5 Max		CS Oil
Per cent lye used	. 9.7	8.8	7.3	4.8	8.4	7.6	6.3	4.2	6.4	5.8	4.8	3.2
Grams lye used for 500 grams of oi	1 48.5	44.0	36.5	24.0	42.0	38.Ŏ	31.5	21.0	32.0	29.0	24.0	16.0
Grams dry NaOH used for 50			00.0			00.0	02.0					
grams of oil		4.180	3,467	2.280	4.645	4.203	3.484	2.323	4.595	4.163	3.446	2.298
Grams H2O used for 500 grams o	f 2.001	1.100	0.10.	2.200	2.020	1.500	0.101	2.020	2,000	11200	01110	
oil		39.820	33.033	21,720	37.355	33.797	38.016	18.677	27,405	24.836	20.554	13.702
Grams oil first pour off	470.0	472.0	472.0	473.3	463.8	467.0	472.0	472.7	475.5	475.0	475.0	471.0
Grams oil recovered by remelting		-1-10					2.2.0			-1010		
foots		0.2	0.2	0.4	4.2	1.0	0.2	4.3	0.2	0.4	0.5	5.2
Total grams oil	471.8	472.2	472.2	473.7	468.0	468.0	472.2	477.0	475.7	475.4	475.5	476.2
Number times foots were remelted	l two	one	one	one	two	one	one	two	one	one	one	two
Loss (per cent)	5.6	5.6	5.6	5.3	6.4	6.4	5.6	4.6	4.9	4.9	4.9	4.8
Color of oil (red)	5.8	6.0	6.1	6.5	5.5	6.0	6.1	6.3	5.4	5.5	6.0	6.2
Condition of foots	hard	hard	hard	soft	hard	hard	hard	hard	hard	hard	hard	hard
02 200001111111111111111111111111111111	very	verv	very	verv	very	very	very	very	22002 02	<b>1101</b> G		******
Break at end of fast agitation		slight	slight	slight	slight	slight	slight	slight	good	good	good	good
Break at end of slow agitation	medium		medium		medium		~g	very	very	very	very	very
Color taken on by oil upon addition							medium		good	good	good	good
of lye	creamy	creamy	creamy	creamy	creamy	creamy	creamy	creamy	creamy		creamy	creamy
Oil set overnight before pouris	ng off.		0- 0001113		or coming	or camy	01,041113	or coming	or sumy	01 001113		or carry
- · · · · · · · · · · · · · · · · · · ·	_											

# SOYA BEAN OIL REFINING-EXTRACTED OIL

Test Series No. 27

90 Minutes fast agitation—Temp. 20-24° C. 8 Minutes slow agitation—Temp. 75° C.

	Max May 9/2					10 Be	aumé		12 Beaumé			
	Max.	Max.		2/3	Max.	Max.		2/3	Max.	Max.		2/3
	Amt.	$\mathbf{Amt}.$	Max.	Max.	Amt.	Amt.	Max.	Max.	Amt.	Amt.	Max.	Max.
	Lye	Lye	Amt.	Amt.	$_{\mathbf{Lye}}$	$_{ m Lye}$	Amt.	Amt.	Lye	Lye	Amt.	Amt.
		used for	$_{ m Lye}$	$_{ m Lye}$		used for		$_{ m Lye}$	used for		Lye	Lye
	CS Oil	CS Oil	used	used	CS Oil	CS Oil	used	used	CS Oil	CS Oil	used	used
	plus	plus	for	for	plus	plus	for	for	plus	plus	for	for
	1/3 Max.	1/5 Max.			1/3 Max.	1/5 Max	. CS Oil	CS Oil	1/3 Max.	1/5 Max.	CS Oil	CS Oil
Per cent lye used		13.7	11.4	7.6	12.9	11.6	9.7	6.5	10.7	9.6	8.0	5.9
Grams lye used for 500 grams of oil		68.5	57.0	38.0	64.5	58.0	48.5	32.5	53.5	48.0	40.0	29.5
Grams dry NaOH used for 500												
grams of oil		3.836	3.192	2.128	4.237	3.811	3.186	2.193	4.280	3.840	3.200	2.360
Grams H <sub>2</sub> O used for 500 grams of	WA 040	21.221										
Oil	70.800	64.664	53.808	35.872	60.263	54,189	45.314	30.307	49.220	44.160	36.800	27.140
Grams oil first pour off		438.0	436.3	425.0	404.3	417.0	420.0	334.2	447.6	453.0	454.5	440.0
Grams of oil recovered by remelt-		17.1	18.9	32.6	40 =	00.0	00.0	***	4.0			
ing foots		455.1	455.2	32.6 458.6	49.5	32.6	30.3	112.4	1.0	0.6	1.4	13.2
Number of times foots were re-		499.1	430.2	400.0	453.8	449.6	450.3	446.6	448.6	453.6	455.9	453.2
melted		three	five	five	three	three	four	form				£
Loss (per cent)	9.2	9.0	9.0	8.3	11.2	10.2	9.8	four 10.7	one 10.3	one 9.3	one 8.8	four 9.4
Color oil (red)		10.1	10.3	10.3	9.3	9.6	9.8	10.0	9.3	9.4	9.7	10.0
Condition of foots		sloppy	sloppy	sloppy	sloppy	sloppy	sloppy	sloppy	soft	soft	soft	
Condition of 2000011111111111111111	very	very	very	very	very	very	very	very	very		very	sloppy very
Break at end of fast agitation		slight	slight	slight	slight	slight	slight	slight	slight		slight	slight
Break at end of slow agitation			poor	poor	poor	poor	poor	poor	good	good	good	good
Color taken on by oil upon addition		poor.	P00.	Poor	poor	poor	poor	poor	good	good	2000	good
of lye		creamy	creamy	creamy	creamy	creamy	creamy	creamy	creamy	creamy	creamy	creamy
Oil set overnight before pourin	g off.							J	01 001113		or camy	0. 00.11.3
F. F. A5%.	_											

# SOYA BEAN OIL REFINING-EXTRACTED OIL

Test Series No. 28

90 Minutes fast agitation—Temp. 20-24° C. 8 Minutes slow agitation—Temp. 75° C.

	14 Beaumé				16 Bea	11m6		18 Beaumé				
	Max.	Max.		2/3	Max.	Max.	unc	2/3	Max.	Max.	aume —	2/3
	Amt.	Amt.	Max.	Max.	Amt.	Amt.	Max.	Max.	Amt.	Amt.	Max.	Max.
	$_{\mathbf{Lye}}$	Lye	Amt.	Amt.	Lye	Lye	Amt.	Amt.	Lve	Lve	Amt.	Amt.
	used for		$\mathbf{L}\mathbf{y}\mathbf{e}$	$_{\mathbf{Lye}}$	used for			Lye	used for			Lye
	CS Oil	CS Oil	used	used	CS Oil	CS Oil	used	used	CS Oil	CS Oil	used	used
	plus	plus	for	for	plus	plus	for	for	plus	plus	for	for
	1/3 Max.	1/5 Max.	CS Oil	CS Oil	1/3 Max.	1/5 Max	. CS Oil	CS Oil	1/3 Max.	1/5 Max	CS Oil	CS Oil
Per cent lye used	8.9	8.0	6.7	4.4	7.7	7.0	5.8	3.8	5.8	5.3	4.4	2.8
Grams lye used for 500 grams of oil		40.0	33.5	22.0	38.5	35.0	29.0	19.0	29.0	26.5	22.0	14.0
Grams dry NaOH used for 500												22.0
grams of oil	4.230	3.800	3.180	2.090	4.260	3.870	3.210	2.100	4.160	3.810	3.160	2.010
Grams H <sub>2</sub> O used for 500 grams												
of oil	40.270	36.200	30.320	19.910	34.240	31.130	25.790	16.900	24.840	22.690	18.840	11.990
Grams oil first pour off		453.5	454.2	394.0	448.8	451.8	458.0	386.8	417.4	372.2	340.0	374.8
Grams oil recovered by remelting		4.0										
foots	0.5	1.8	4.2	57.9	2.4	2.7	2.6	75.2	32.2	79.2	120.1	85.7
Total grams of oil	453.2	455.3	458.4	451.9	451.2	454.5	460.6	462.0	449.6	451.4	460.1	460.5
Number times foots were remelted		two	two	four	two	two	two	four	four		seven	ten
Loss (per cent)	9.4	8.9	8.3	9.6	9.8	9.1	7.7	7.6	10.1	9.7	8.0	7.9
Color oil (red)		9.7	9.8	10.4	9.0	9.6	9.9	10.0	9.3	9.6	10.0	10.3
Condition of foots	soft	soft	soft	sloppy	soft	soft	soft	sloppy	sloppy	sloppy	sloppy	sloppy
Break at end of fast agitation	very slight	very slight	very slight	very slight	very	very	very	very	very	very	very	very
Break at end of slow agitation		good	good	good	slight	slight	slight	slight	slight	slight	slight	slight
Color taken on by oil upon addition		good	good	good	good	good	good	good	good	good	good	good
of lye		creamy	creamy	creamy	creamy	eres my	creamy	eren ma	orognu	area mar	aree mar	oncom37
Oil set overnight before makin	g first r	our off.	creamy	creamy	creamy	creamy	creamy	creamy	creamy	creamy	creamy	Creamy

#### SOYA BEAN OIL REFINING-EXTRACTED OIL

90 Minutes fast agitation—Temp. 20-24° C.

Test Series No. 29

Test Series No. 29 8 Minut	es slow agita	ttion—Temp.	75° C,			
	——— 12 Be	aumé	14 Be	eaumé	16 Be	aumé
	Max.	Max.	Max.	Max.	Max.	Max.
	Amt. Lye	Amt. Lye	Amt. Lye	Amt. Lye	Amt. Lye	Amt. Lye
	used for	used for	used for	used for	used for	used for
		CS Oil plus		CS Oil plus	CS Oil plus	CS Oil plus
	1/2 Max.	3/4 Max	1/2 Max.	3/4 Max	1/2  Max.	3/4 Max
Per cent lye used	12.0	14.0	10.0	11.5	8.7	10.0
Grams lye used	60.0	70.0	50.0	57.5	43.4	50.0
Grams dry NaOH used for 500 grams oil	4.800	5.600	4.750	5.500	4.810	5.530
Grams H <sub>2</sub> O used for 500 grams of oil	<b>55.200</b>	64.400	45.250	52.000	38,690	44.470
Grams oil first pour off	452.2	452.0	446.2	446.0	442.5	436.4
Grams oil recovered by remelting foots	1.4	0.0	0.2	0.2	0.3	0.3
Total grams oil	453.6	452.0	446.4	446.2	442,8	436.7
Number of times foots were remelted	one	one	one	one	one	one
Loss (per cent)	9.3	9.6	10.7	10.8	11.4	12.7
Color of oil (red)	9.1	8.5	8.5	8.4	8.4	8.5
Condition of foots	hard	hard	hard	hard	hard	hard
Break at end of fast agitation	slight	slight	slight	slight	slight	slight
Break at end of slow agitation	good	good	good	good	good	good
Color taken on by oil upon addition of lye	creamy	creamy	creamy	creamy	creamy	creamy
Oil set overnight before pouring off.						-

# SOYA BEAN OIL REFINING-EXTRACTED OIL

90 Minutes fast agitation—Temp. 20-24° C. 12 Minutes slow agitation—Temp. 75° C.

Test Series No. 30

		14 Be	011má		-	16 Bea	311má			18 Bea	11m4	
	Max.	Max.	aume	2/3	Max.	Max.	aumic —	2/3	Max.	Max.	aume-	2/3
	Amt.	Amt.	Max.	Max.	Amt.	Amt.	Max.	Max.	Amt.	Amt.	Max.	Max
	Lye	Lye	Amt.	Amt.	Lye	Lye	Amt.	Amt.	Lye	Lye	Amt.	Amt.
	used for	used for	Lye	Lye	used for	used for	Lye	Lye		used for	$_{\mathbf{Lye}}$	$_{ m Lye}$
	CS Oil	CS Oil	used	used	CS Oil	CS Oil	used	used	CS Oil	CS Oil	used	used
	plus	plus	for	for	plus	plus	for	for	plus	plus	for	for
	1/3 Max.	1/5  Max	CS Oil	CS Oil	1/3 Max.	1/5 Max.	CS Oil	CS Oil	1/3 Max.	1/5 Max.	CS Oil	CS Oil
Per cent lye used	8.9	8.0	6.7	4.4	7.7	7.0	5.8	3.8	6.7	6.0	5.0	3.4
Grams lye used for 500 grams of oil	44.5	40.0	33.5	22.0	38.5	35.0	29.0	19.0	33.5	30.0	25.0	17.0
Grams dry NaOH used for 500		0.000	0.400	9.000	4.000	0.050	0.010	0 100	4.050	9.000	0.450	0.100
grams oil		3.800	3.180	2.090	4.260	3.870	3.210	2.100	4.250	3.800	3.170	2.160
Grams H <sub>2</sub> O used for 500 grams of		36,200	30.320	19.910	34.240	31.130	25.790	16.900	29.250	26,200	21.830	14.840
Grams oil first pour off		455.7	458.8	384.2	446.0	453.0	452.0	378.0	452.8	456.3	453.3	372.7
Grams oil recovered by remelting		100.1	100.0	001.2	110.0	100.0	402.0	0.0.0	102.0	100.0	100.0	01.2
foots		1.0	2.4	84.7	1.1	0.5	9.3	93.1	1.0	4.2	14.9	98.3
Total grams oil		456.7	461.2	468.9	447.1	453.5	461.3	471.1	453.8	460.5	468.2	471.0
Number times foots were remelted	one	one	two	four	one	one	three	five	one	two	four	five
Loss (per cent)	10.9	8.7	7.8	6.2	10.6	9.3	7.7	5.8	9.2	7.9	6.4	5.8
Color of oil (red)	9.3	9.4	9.4	9.5	8.5	8.5	8.5	9.1	8.6	8.6	8.7	8.7
Condition of foots	soft	soft	soft	sloppy	soft	soft	soft	sloppy	soft	soft	soft	sloppy
	very	very	very	very	very	very	very	very				very
Break at end of fast agitation	slight	slight	slight	slight	slight	slight	slight	slight	slight		slight	slight
December of the Assessment of			a	41	very	very			very	very	very	
Break at end of slow agitation		good	good	medium	good	good	good	medium	good	good	good	good
Color taken on by oil upon addition		creamy	craamy	creamy	creamy	creamy	areams	oreams	oreamy	Ores my	ores ma	creamy
of lye		Cicamy	cicamy	creamy	creamy	creamy	creamy	creamy	Cicamy	creamy	creamy	creamy
on set overnight before pourn	is oir.											

#### SOYA BEAN OIL REFINING-EXTRACTED CLARIFIED

Test Series No. 31

90 Minutes fast agitation—Temp. 20-24° C. 12 Minutes slow agitation—Temp. 75° C.

1621 36162 140. 31		12 1111	iutes sio	w agraa	1011	111 <u>1</u> 111	•					
		14 Bea	aumé			—-16 Bea	aumé—			18 Be	aumé—	
	Max.	Max.		2/3	Max.	Max.		2/3	Max.	Max.		2/3
	$\mathbf{\underline{A}mt}.$	Amt.	Max.	Max.	Aint.	Amt.	Max.	Max.	Amt.	Amt.	Max.	Max.
	Lye	Lye	Amt.	Amt.	Lye	Lye	Amt.	Amt.	Lye	Lye	$\mathbf{\underline{A}mt}.$	Amt.
		used for	Lye				Lye		used for			Lye
	CS Oil	CS Oil	used for	used for	CS Oil plus	CS Oil plus	used for	used for	CS Oil plus	CS Oil plus	used for	used for
	plus	plus 1/5 Max.				1/5 Max.			1/3 Max.			CS Oil
Per cent lye used		8.0	6.7	4.4	7.7	7.0	5.8	3.8	6.7	6.0	5.0	3.4
Grams lye used for 500 grams of oi		40.0	33.5	22.0	38.5	35.0	29.0	19.0	33.5	30.0	25.0	17.0
Grams dry NaOH used for 50		0.000	0.100	0.000	4.000	9.050	9 940	2.100	4.250	2 000	9 170	2.160
grams oil	4.230	3.800	3.180	2.090	4.260	3.870	3.210	2,100	4.250	3.800	3.170	2.160
oil		36.200	30.320	19.910	34,240	31.130	25,790	16,900	29.250	26.200	21.830	14.840
Grams oil first pour off		447.5	456.3	463.0	441.8	447.5	454.2	375.3	440.0	445.2	450.3	364.0
Grams oil recovered by remelting		111.0	100.0	100.0	111.0	111.0	101.2	010.0	110.0	110.5	100.0	004.0
foots		0.7	0.6	5.8	3.2	2.6	1.5	90.0	4.0	3.5	6.2	96.7
Total grams oil		448.2	456.9	468.8	445.0	450.1	455.7	465.3	444.0	449.7	456.5	460.7
Number times foots were remelted		one	one	two	two	two	one	five	two	two		seven
Loss (per cent)	. 11.2	10.4	8.6	6.2	11.0	10.0	8.9	6.9	11.2	10.0	8.7	7.9
Color of oil (red)		9.8	9.8	10.3	9.6	9.6	9.7	10.0	9.6	9.6	9.7	10.1
Condition of foots		soft	soft	soft	soft	soft	soft	sloppy	soft	soft	soft	sloppy
	very	very	very	very	very	very	very	very	very	very	very	very
Break at end of fast agitation	. slight	slight	slight	slight	slight	slight	slight	slight	slight	slight	slight	slight
Ducols at and of class agitation	anod.	good	good	medium	- mood	good	hoor	medium	very good	very	hoon	medium
Break at end of slow agitation Color taken on by oil upon addition		g.oou	goou	medium	i good	good	good	medium	good	good	good	medium
of lye	creamy	creamy	creamy	creamy	creamy	creamy	creamy	creamy	creamy	creamy	creamy	creamy
Oil set overnight before pouri	ng off.	or carry	creamy	or ourns	oroung	01 00111,	C. C	01 0021113	01 011111	cream,	or curry	CI COLLIN
F. F. A5%.												
•••												

#### SOYA BEAN OIL REFINING-EXTRACTED CLARIFIED

Test Series No. 32

90 Minutes fast agitation—Temp. 20-24° C.
15 Minutes slow agitation—Temp. 75° C.
——12 Beaumé———14 Beaumé——

	12 B		14 Be		16 B		18 Beaume		
		7/8		7/8		7/8		7/8	
	Max. Amt.	Max. Amt.	Max. Amt.	Max. Amt.	Max. Amt.	Max. Amt.	Max. Amt.	Max. Amt.	
	Lve used	Lve used	Lve used	Lve used			Lye used		
				for CS Oil			for CS Oil		
D					70	F 1	F 0	4.9	
Per cent lye used	8.0	7.0	6.7	5.9	5.8	5.1	5.0	4.3	
Grams lye used for 500 grams of oil	46.0	35.0	33.5	29.5	29.0	25.5	25.0	21.5	
Grams dry NaOH used for 500 grams oil	3.200	2.800	3.180	2.800	3.210	2.800	3.170	2.730	
Grams H <sub>2</sub> O used for 500 grams of oil	36.800	32.200	30.320	26.700	25.790	22.700	21.830	18.770	
Grams oil first pour off	457.5	462.5	462.5	460.0	454.5	459.3	425.0	415.2	
Grams oil recovered by remelting foots	1.4	1.0	0.5	3.4	1.1	3.6	32.7	47.6	
Total grams oil	458.9	463.5	463.0	463.4	455.6	462.9	457.7	462.8	
Number times foots were remelted	one	one	one	two	one	two	three	four	
Loss (per cent)	8.2	7.3	7.4	7.3	8.9	7.4	8.5	7.4	
Color of oil (red)	10.0	10.3	9.6	10.1	9.6	10.2	9.6	9.9	
Condition of foots	soft	soft	hard	hard	hard	hard	soft	soft	
Break at end of fast agitation	slight	slight	slight	slight	slight	slight	slight	slight	
Break at end of slow agitation		very good	very good	very good	very good	very good	very good	very good	
Color taken on by oil upon addition of lye	creamy	creamy	creamy	creamy	creamy	creamy	creamy	creamy	
Oil set overnight before pouring off.	Citamy	Creamy	Creamy	Creamy	Creamy	Creamy	Creamy	Creamy	
on set overlight before pouring off.									

Test Series No. 33			SOYA B	EAN OI	L REFI	NING						
	Expe	ller Oil	Hydra	ulic Oil		—Extra	cted Oil-		—-Ех	tracted	Clarified	Oil——
	-12 Be		-20 Be	aumé—	-12 B	eaume-	14 Be	aumé	12 E	Beaum <del>é</del> —		eaumé—
		2/3		2/3		7/8		7/8		7/8		7/8
	Max.	Max.	Max.	Max.	Max.	Max.	Max.	Max.	Max.	Max.	Max.	Max.
	Amt.	Amt.	Amt.	Amt.	Amt.	Amt.	Amt.	Amt	Amt.	Amt.	Amt.	Amt.
	Lye used	Lye used	Lye used	Lye used	Lye used	Lye used	Lye used	Lye used	Lye used	Lye used	Lye used	Lye used
	for	for	for	for	for	for	for	for	for	for	for	for
	CS Oil	CS Oil	CS Oil	CS Oil	CS Oil	CS Oil	CS Oil	CS Oil	CS Oil	CS Oil	CS Oil	CS Oil
Per cent lye used	8.0	5.9	4.8	3.2	8.0	7.0	6.7	5.9	8.0	7.0	6.7	5.9
Grams lye used for 500 grams of oil Grams dry NaOH used for 500	40.0	29.5	24.0	16.0	40.0	35.0	33.5	29.5	40.0	35.0	33.5	29.5
grams of oil	3.200	2.300	3.446	2.298	3.200	2.800	3.180	2.800	3.200	2.800	3.180	2.800
oil	36.800	27,140	20.554	13.702	36.800	32.200	30.320	26.700	36.800	32.200	30.320	26.700
Grams oil first pour off	479.2	477.9	472.8	471.5	453.8	450.1	463.7	463.1	462.9	459.1	460.0	465.8
Grams oil recovered by remelting foots	0.1	0.2	0.4	4.4	0.5	5.1	0.3	1.4	0.8	0.5	0.4	0.4
Total grams oil		478.1	473.2	475.9	454.3	455.2	464.0	464.5	463.7	459.6	460.4	466.2
Number times foots were remelted	one	one	one	two	one	two	one	one	one	one	one	one
Loss (per cent)		4.4	5.6	4.8	9.1	9.0	7.2	7.1	7.3	8.1	7.9	6.8
Color of oil (red)	5.3	5.4	5.3	5.4	9.8	9.9	9.8	10.1	9.9	10.1	10.0	10.3
Condition of foots		hard	hard	hard	hard	soft	hard	hard	hard	hard	hard	hard
Break at end of fast agitation		slight	good	good	slight	slight	slight	slight	slight	slight	slight	slight
Durals of and of alass and other	very	very	very	very	very	an od	very	very good	very good	medium	very	very
Break at end of slow agitation Color taken on by oil upon addition	_	good	good	good	good	good	good	_	_		good	good
of lye		creamy	_	-						v creamy	-	-
	90 min. fast 45 min. fast 90 min. fast agitation— 90 min. fast agitation— Temp. 20-24° C. Temp. 20-24								24° C.			
Oil set overnight before pouring off.	Temp. 2 12 min agitat	. slow	12 mii	20-24° C. n. slow tion—		min, slov Pemp, 65°		on—		min. slov Femp. 65°		ion—
	Temp.			65° C.								

# **ABSTRACTS**

# **Oils and Fats**

Edited by M. M. PISKUR and Ruth LINDAHL

Fat chemistry in the battle against food spoilage. K. Taufel. Fette u. Seifen 44, 179-87 (1937). A review on spoilage of fats.

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Antioxidants and the autoxidation of fats. IX. The antioxidant properties of the tocopherols. H. S. Olcott and O. H. Emerson. J. Amer. Chem. Soc. 59, 1008-9 (1937).  $\alpha$ ,  $\beta$  and  $\gamma$  tocopherols and their allophanates are effective antioxidants in lard. The degree of protection afforded by the tocopherols is not proportional to their vitamin E activity.

Action of microorganisms on fats. L. B. Jensen and D. P. Grettie. Food Res. 2, 97-116 (1937). Methods are indicated for study of hydrolyzing bacteria on emulsified and continuous fat substrates. Certain strains of bacteria producing two kinds of enzymes—lipases and oxidases—appear to be responsible for rapid development both of free fatty acid and of oxidation products. The phenomenon parallels oxidative rancidity of so-called chemical or oxygen-light origin. Numerous determinations of bacteria and stability tests on bacon fats indicate a connection with numbers of bacteria on the original fat and tendency towards rancidity when held at —17.8° C. Moisture-

free fats do not support growth of the microorganisms tested, whereas 3 per cent moisture or more in an animal fat aids in promoting growth of the same microbes. Fat-soluble pigments of various microorganisms cause "pink" fats and purple "stamping ink" discolorations by oxidation-reduction mechanisms.

Color reactions of vegetable oils. Fosco Provvedi. Olii minerali, olii e grassi, colori vernici 16, 103-4 (1936).—Carr and Price's reagent (1-2 cc. oil and 4-5 cc. reagent) gave in 5 min. with cottonseed oil dark red-brown, olive oil light green, sesame oil very light pink-yellow, peanut oil very light pink, colza oil bluegreen, rape-seed oil very light green, poppy-seed oil yellow, apricot oil very light sky blue with slight opalescence, sunflower oil brown-yellow (turbid), grape-seed oil green-brown (turbid), corn oil yellow, soybean oil violet-gray with slight opalescence, raw linseed oil green (turbid), boiled linseed oil black-green (turbid), sweet-almond oil violet-blue with slight opalescence. Rancid colza oil reacts similarly to cottonseed oil. Rancid olive oil behaves differently from the neutral, and the chloroform soln. of SbCl<sub>3</sub> can be used to detect rancidity by development of a visible opalescence. In nonrancid oils the reagent identifies cottonseed oil, (Chem. Abs.)

The catalytic interchange of esters of fatty oils by alcoholic-potassium hydroxide. H. Kurz. Fette u. Seifen 44, 144-5 (1937). In test on treatment of oils with various amts. of alc.-KOH soln. it was found that considerable splitting of the glycerides takes place before any free glycerin is apparent. The splitting was evaluated by detg. the sapon. and Ac values of the reaction products. The data are presented in 12 tables.

The fatty acids associated with banana starch. L. Lehrman and E. A. Kabat. J. Amer. Chem. Soc. 59, 1050-1 (1937). The amt. of fatty acids liberated