

AMERICAN METHOD FOR THE TESTING OF TALLOW FOR RAILROAD USE.

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TALLOW is used in the service of this Company chiefly for one purpose, *i.e.*, mixed with a high grade mineral oil to form a cylinder lubricant.

All of the tallow is purchased subject to specifications, a copy of which is herewith given:—

SPECIFICATIONS FOR TALLOW.

Tallow for use in locomotive cylinders should contain the least possible amount of free acid, and should, at the same time, be as free as possible from dirt, cracklings and fibre. In order to secure such tallow the following specifications have been adopted:—

1st. Tallow which, on inspection, is found to contain dirt or cracklings disseminated through it, or in streaks, or which has a layer of dirt or cracklings in the bottom of the barrel, more than an eighth of one inch thick, will be rejected.

2nd. Tallow containing more than one and one-half per cent. of free acid will be rejected.

3rd. Tallow containing soap, or other substances not properly belonging to tallow, will be rejected.

To persons furnishing tallow who may not have appliances for determining the amount of free acid in tallow, it may be said, that if the fat is rendered within twelve hours from the time the animal is killed, using a temperature not more than 225° to 250° Fahrenheit during the rendering, it is believed that the free acid in the tallow will be less than amount specified. In very warm weather it may be necessary to render the fat in less than twelve hours after the animal is killed.

Concerning the sample our "directions for sampling oils and tallow" require "one sample from each barrel, sample cans to be wiped perfectly clean before filling with new tallow. In sampling from a barrel, care should be taken to see, first, that the 'thief' or 'tallow-tester' is clean; second, that the sample contains no dirt or chips, resulting from boring into the barrel."

Our method for determining the free fatty acids, soap and water in the tallow, while possessing no claim to startling originality, is yet so satisfactory, being simple, easily managed and rapid, that I give it in full detail.

FREE FATTY ACIDS.

The process is the usual one of titration with standard alkali.

Potash Solution.—16 to 18 grammes pure KHO is dissolved in distilled water in a litre flask (if many analyses are to be made, dissolve 90 grms. in 5 litres water). Add 10 c.c. of a saturated solution of baric hydrate, fill up to mark with water, shake, mix and let stand over night, finally syphon off into a dry bottle, and pour on top a little kerosene.

Phenol-phthalein Solution.—1.5 grammes in 100 c.c. of ordinary alcohol.

Neutral Alcohol.—Can be prepared in two ways:—1st method. Fill a gallon bottle with ordinary alcohol (95 per cent.), drop in $\frac{1}{4}$ oz. dry carbonate of soda, shake and let settle. Filter through dry filter paper. This is to neutralise any acid reaction of the alcohol.—2nd and better method. Add to contents of alcohol bottle, solution of phenolphthalein, say 10 drops to one quart alcohol, and run in caustic potash solution till the alcohol is of a faint but permanent pink colour.

Standardizing the Potash Solution.—Dissolve about 2.5 grms. (very carefully weighed) free fatty acids prepared from tallow (or pure stearic acid will do) in warm neutral alcohol, in flask of about 150 c.c. capacity, cool to ordinary temperature, add 5 drops of the indicator solution, and run in the KHO solution slowly, till by the addition of a single drop, the colour, rose, remains unchanged.

Then $\frac{\text{weight of acid taken}}{\text{no. c.c. KHO sol.}} = \text{weight free acid per each c.c. KHO solution, thus } 2.55$
 grms. fatty acids required 30 c.c. KHO solution, hence $\frac{2.55}{30} = 8.50 = \text{grms. free acid}$
 that each c.c. of KHO will neutralise.

No attempt is made to have the KHO solution normal. Instead, we take for the actual test, such an amount of the tallow as corresponds to the strength of the KHO solution; thus, if the latter was of the strength just indicated, 8.5 grms. of the tallow would be taken, and the No. of c.c. of KHO solution used would give the percentage of free fatty acids at once. Between 5 and 10 grms. tallow is a convenient quantity to work with.

The Analysis.—Balance a watch-glass in scale-pan of balance capable of weighing to within 10 mgrs. Weigh the proper amount of tallow, and wash it with hot neutral alcohol into a casserole; pour on this from 1 to $1\frac{1}{4}$ oz. warm neutral alcohol, add about 5 drops phenolphthalein solution, and, keeping warm, run in, with stirring, the KHO solution till the rose colour is permanent. No. of c.c. of KHO sol. used = percentage of free fatty acids. By this method, twenty samples can be tested in an hour, by one person. If this is not rapid enough, the tallow can be measured by weight, by marking a pipette so that it will deliver as many grammes (not c.c.) of the barely melted tallow, as the factor calls for. Fifty to seventy-five samples can thus be examined in an hour, and accurately enough.

SOAP.

Our specifications limiting the free fatty acids to $1\frac{1}{2}$ per cent., it would be practicable on the part of the manufacturer to neutralize the free acid in excess of the figures quoted, by addition of the non-volatile alkalies, potash or soda. If this were done, and the resulting compounds removed, no objections would be raised, as this would really be a purification (refined tallow being prepared in a similar manner), but we do not wish to have any soap left in the tallow.

Process.—Of every lot of from 4 to 16 samples, 5 grms. of each are weighed approximately, transferred to a casserole, and melted, observing at the same time the character of the mixed samples as to dirt, &c. It is then filtered through filter-paper, using a hot water jacketed filter. This is to avoid the obtaining an abnormally high ash due to any wood or other impurity. When the filtrate is cold, 5 grms. are carefully weighed into a medium-size porcelain capsule, and a filter-paper folded into a narrow strip and bent in the form of a square-bottomed U, is placed therein, the ends emerging. The latter are then lighted, when the sample burns quietly, like any double-wicked lamp, till dry, after which a few minutes' ignition with a Bunsen burner brings all to an ash, which is weighed as usual. We use the Schleicher and Schüll prepared paper, No. 589, 9 c.m., with an ash of 0.00011 grms., which weight is always deducted.

The ash of tallow, thus tested, ranges from 0.002 % to 0.012 %, and will average 0.004 %—refined tallow is lower than common butchers' stock. The method is so delicate that it will detect a very slight neutralization with alkali. To illustrate:—

Average ash = 0.004 % or for 1 gm. = 0.0004 grms.

16 samples with a total of 5 grms. weight = 0.3125 grms. per sample.

15 „ would then weigh 4.6875 grms., or have an ash in

actual weight of $0.0004 \times 4.6875 = .001875$ gm.

Add for 1 bad sample having originally } .0066 „

2 % free acid, reduced to $1\frac{1}{2}$ % by KHO } .0067875 „

Or, dividing by 16, and pointing off, gives an ash of 0.042 %, or over *ten times* the average ash, showing that even one sample out of 16 could not have its free acid lowered .5 % without detection. The .0066 gm. is the result of experiment on a tallow containing originally 11.925 % free acid. It was reduced to 2.50 % by the addition of 0.125 gm. KHO, or at the rate of .0066 gm. for each .5 % free acid

WATER.

From the same filtered sample that the ash is determined in, 5 grms. is weighed out in a flat copper dish, and heated in an air-bath at 250° F. for $1\frac{1}{2}$ hours. The operation can be hastened without material error by heating over an open flame for a time, or till all the water is sure to be driven off—heat till the sample smokes. In good tallows the loss rarely exceeds 0.3 %, and running as low as 0.03 %.

MONTHLY RECORD OF ANALYTICAL RESEARCHES INTO FOOD.

ON THE DRYING OF FATS.—A. Sonnenschein.—Zeitschr. f. Anal. Chem. vol. 25, p. 372.—It is usually stated that fats should be dried at 100–110° C., and be allowed to stand over sulphuric acid for some time before being weighed. Now, on one hand,

when the fat melts the water collects at the bottom, and its vapours can only escape with difficulty. A higher temperature is liable to decompose the fats. The latter also enclose the water, and it is, therefore, of no use to place them over sulphuric acid. The author, therefore, recommends the following simple device:—A small flask is fitted with a doubly-perforated stopper, through which passes a short bent tube (*a*) and a long straight one (*b*) which reaches to the bottom of the flask. The weight of the whole is taken, the fat put in, and its weight determined. Tube (*a*) is connected with a suction-pump, and tube (*b*) with a drying-tube. The flask is then heated on the water bath, whilst air is passed through. When the water has been thus completely removed, its amount is determined by the loss of weight sustained.

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MONTHLY RECORD OF ANALYTICAL RESEARCHES INTO DRUGS.

TEST FOR QUININE.—G. Vulpius.—Pharm. Centrall. XXVII., p. 280.—Instead of using chlorine water in the well-known test for quinine, the author recommends the employment of a mixture of potassium chlorate and hydrochloric acid for evolving the chlorine. Unless carried out as described below, the test is uncertain, but is very trustworthy if the directions are followed. It appears that a certain excess of hydrogen chloride is necessary, and that no undecomposed potassium chlorate should be present. .02 gr. of potassium chlorate is put into a dry test tube, capable of holding about 25 c.c.; 4 drops of hydrochloric acid and 2 drops of water are added, and the mixture heated in the water bath or over a flame, till no further increase in the yellow colouration of the liquid occurs, and the visible evolution of gas has ceased. Five c.c. of cold water are now added, and the whole well shaken up. The chlorine which fills the test-tube is thus also absorbed. .01 gr. of the quinine salt is now added, the mixture well shaken up, diluted with 5 c.c. of water, and 1 c.c. of ammonia poured on the surface. An immediate deep-green colour invariably makes its appearance at the point of contact, and this gradually spreads downwards throughout the liquid.

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