Winterizing Oils

Progress in Handling Methods Attains Reduction of Refrigeration Needed

By FRANCIS M. TURNER

SO far as we know today no actual oil is formed of one and only one Glyceride. Stearin is a glyceride, being formed by the union of Stearic Acid with Glycerol. Palmitine, of Palmitic Acid and Glycerol, is another. There are many others such as Olein, Linolin, Linolein, and so forth. All these Glycerides solidify at different temperatures; for example Stearin and Palmitin solidify at relatively high points, Olein, Linolin and Linolein at relatively low points.

Taking the specific instance of Cottonseed Oil, when this oil, consisting principally of a mixture of Palmitin, Olein and Linolin is chilled, the Palmitin falls out, the Olein and Linolin remaining fluid. The Palmitin is separated out and the liquid oil is then known as 'Destearinized' or 'Winter' Oil.

Many of the Vegetable, Animal and Marine Oils when chilled deposit a mass usually crystalline, although in many instances the precipitation is in gelatinous form. The class name 'Stearin' has been given to these deposits.

It is desirable that oils intended for edible use should be clear at temperatures near the freezing point. In the manufacture of Animal Lubricating Oils, for example, Lard Oil intended for Railroad use, it is important that the oil remain liquid at low temperatures, minus 15° C often being specified for Winter Lard Oil.

Fish Oils such as Menhaden, Sardine, Herring and Cod must undergo destearinization before their Employment in the Arts. Partial purification of oils is effected somewhat during destearinization as albuminous substances are less soluble in cold than in hot oils,

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consequently, improvement can be accomplished in that manner—especially of Menhaden, Herring, Sardine, Cod and other Fish Oils (See English Patent, Buchanan 1905, German Patent, Megemann.)

The flavor of Medicinal Cod Liver Oil is undoubtedly improved by chilling and removal of the 'Stearin' which oil by the way is one of the most difficult of all oils to destearinize commercially.

Various Processes Employed

The origin of the term 'Winterizing' is obvious. This operation was for a long time effected by storing oils in tanks in cellars and other cool places during the Winter, and 'racking off' the supernatant layer of liquid oil. The old name 'Racked Oil' is still often employed to designate 'Winter Oil.'

This slow and cumbrous process soon gave way to quicker and more efficient methods, as it was too costly to hold large quantities of oil for long periods. Artificial refrigeration was introduced and various methods of applying the chilling medium came with this improvement.

In America the general practice was the gradual chilling of oils until they are, as it is called, 'seeded,' preceding separation by means of filtration usually performed by means of filter-presses; although, in the Fish Oil trade separation of the clear oil from the magma was done with conical filter bags suspended from poles in cool rooms, the clear oil dripping through by gravity. Many plants have chilling tanks, in which the oil is cooled, placed in insulated rooms. Others put the oil in large steel tanks submerged in water, the chilled water circulating around. When the chilling is complete the chilled oil passed through filter-presses, separating the clear 'Winter Oil' from the 'Stearine.'

These are the general methods in vogue, although there are many variations. In England many plants are equipped with chilling tanks which are installed in insulated rooms, the tanks being provided with agitators consisting of piping through which the cooling brine is circulated. After the oil is cooled to the correct point it is filter-pressed in the ordinary manner. Another even more expensive and impractical method—the description of which appears in a recent text book—is conducted in a tank provided with a stationary cooling coil. Below this tank is another into which the cooled oil is supposed to drop and from which it is pumped to a filter press, for separation of liquid and solid parts.

Why, you may ask, are these three methods described above incorrect? The great waste of refrigeration is the greatest drawback, no provision being made for removal of the frozen oil from the chilling surface. That congealed oil is almost a non-conductor is a well known fact. Chilling oil in tanks is exceedingly slow, for which reason a very large amount of refrigeration is wasted. In the case of the last two methods the surface of the cooling coils soon becomes so coated with solidified oil that the transmission of the refrigeration is a slow and very costly process.

A few years ago experiments were instituted in an endeavor to find better methods with lower cost of refrigeration and labor. The latter item is quite high, especially in the winterizing of fish oil. A very complete study of the subject resulted in finding that many of the hypotheses which had prevailed were fallacious. One point tenaciously held was that in the process of chilling the oil the deposited 'crystals' should be kept as large as possible in order to obtain the greatest yield. Repeated experiments proved the contrary to be true; i. e., best practice is to have the crystals as small as possible in order to obtain the greatest yield. Again, what becomes of the crystals after they have passed through the pump enroute to the filter-press? Actually they are very well churned up, as has been determined by actual observation. The chief objection, however, to all these methods, is the tremendous amount of refrigeration wasted. In all processes today everything is 'figured back to the coal pile,' hence the cost of refrigeration is an important factor in the total cost of winterizing.

1.043 tons are the theoretical tons of refrigeration required to chill 1000 gallons Cottonseed Oil from 90° F. to 38° F. Reduced to gallonage, 1 gallon would require 2.086 lbs. of refrigeration.

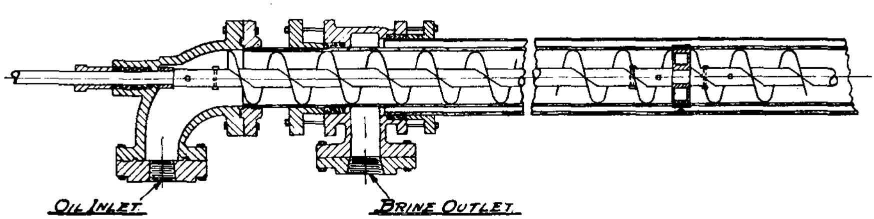
What does refrigeration cost? Consensus of opinion among refrigeration engineers is that it requires about 50 pounds of steam or roughly 7 pounds of coal @ $5.25 per ton to produce 1 ton of refrigeration, therefore the cost is 1.5c per ton refrigeration, approximately.

A New and Improved Method

Permit me to apply these facts to another method of Winterizing or Destearinizing Oil which is now in successful operation in several plants, a method which is superior in efficiency and economy when compared with the methods formerly used. This is the result of a series of experiments conducted with the object of economy of refrigeration and other costs in mind.

The construction of insulated rooms is very costly. Were it possible to apply the refrigeration directly or nearly so to the oil to be treated instead of chilling a room containing a tank of oil an economy could be effected. After many trials an apparatus which would save much refrigeration was devised, in which the oil to be chilled is passed through a pipe surrounded by another through which the chilling brine travels. It was soon found that the congealed oil which formed on the surface of the oil pipe was an active insulator, after which a scraper-like helical conveyor was placed inside to remove the congealed oil from the surface, making a distinct improvement.

The outer or brine pipe is 8″ in diameter. The inner or oil pipe is 6″ in diameter. The helical scraper revolves in the direction of the flow of oil and clears the surface very slightly. The length of the pipes is about 41 feet. Each pipe takes up a space of about 1 square foot; the amount of power required being about ¼ H. P. for each tube. The minimum capacity of each tube is about 44 gallons per hour which is the operating unit. Larger capacities are obtained by multiplication of these units, usually in pairs.



Continuous Destearinizer

Standard results can be obtained by maintaining the temperature of the chilling brine at the proper differential, for instance, the oil entering the apparatus at 90° F. will pass out at 38° F.