

Quality Control in Export Shipments of Commercial Oil and Oilseed Products

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ABSTRACT

In Canada, as in the USA, the quality of commercial oil exports is determined by independent laboratories, whereas the quality of oilseed exports is controlled by government agencies. An independent laboratory has no direct control of oil exported. The oil is sampled and analyzed at the time of shipment to determine whether certain contract specifications are met. Since a particular oil may be shipped to any of a number of countries with different end uses, analysis requirements are not necessarily the same. Besides analysis, other precautions are taken to ensure that quality is maintained. These include inspections of ships' tanks for cleanliness and suitability. In respect to oilseeds in Canada, quality is controlled at various stages by strict adherence to grading standards regarding such items as dockage, seed maturity and moisture. All of this sampling and control work is done by the Canadian Grain Commission, a government agency. Government grading standards make no reference to oil content, but since most exports of oilseed are sold on a certain minimum oil content, an analysis for this is performed by an independent laboratory on samples taken by the Canadian Grain Commission at the time of shipment.

Quality control implies a degree of monitoring and intervention which an independent testing laboratory does not have the authority to exercise. However, if you accept a wider definition of quality control, to include any action which is taken to maintain quality, then indeed there are precautions taken with bulk export shipments of oils or fats which fall under this definition.

The methods for handling oils and fats outlined in this paper refer specifically to exports from Western Canada through the Port of Vancouver. However, the procedures for the inspection, sampling and survey of these cargoes have been used by our organization for a number of years. They are widely accepted internationally and are practically the same as those proposed, but not yet adopted, by the National Surveyors Council, an organization affiliated to the National Institute of Oilseed Products.

Surveyors are hired by interested parties such as shippers, consignees, ship owners, ships' agents and government agencies where foreign aid shipments are involved (we usually work on behalf of the shippers). Surveyors' main duties are to determine quantity, to see that precautions are taken to maintain quality and to take samples from which actual quality at the time of shipment can be ascertained. Cleanliness is of prime concern since ships' tanks which are used to transport oils or fats may also be used to carry a great variety of other cargoes. Tanks are closely inspected for cleanliness, dryness, residues of previous cargoes, odor, condition of tank coating, etc. Clean-up of the tanks is the responsibility of the ship, should the tanks be rejected.

The degree of cleanliness required is naturally dependent upon the type of oil to be loaded. It seems ironic that requirements for cleanliness are more stringent when certain industrial chemicals are to be loaded than for vegetable oils. For example, before a shipment of methanol is made, wall-wash tests are performed, whereas these are not required even when cargo to be loaded is a fully refined, deodorized salad oil.

Ships' records are checked, and three previous cargoes in each tank are noted to determine whether any health hazard might be involved. For example, no edible product will be allowed to be loaded into a ship's tank which has carried leaded gasoline in any of the three previous cargoes.

All pipelines and pumps which are used to load the cargo are inspected closely for cleanliness. Most vessels' tanks carrying this type of cargo have steam coils. These are pressure tested, or a certificate is accepted from the ship attesting to a satisfactory pressure test when a high melting point cargo such as tallow is to be loaded. Steam valves are closed and sealed if a completely liquid oil is scheduled to be loaded.

Before loading, a list of metals detrimental to the oil due to load should be supplied by the shipper and a certificate provided by the master or owner to show that the vessel's tanks do not have any parts or fittings detrimental to the intended cargo. It is not the responsibility of the surveyor to inspect the ship to ensure that these metals are not present.

Oil arriving at an export terminal tank farm is not usually sampled unless it is going straight to a ship, as is the case with special cargoes such as fully refined oils where oxidation may occur in storage or where volume of a particular oil shipped does not warrant storage. Oil may also be sampled in the tank car before pumping to storage if ownership of that oil is changing hands and, of course, storage tanks can be sampled and analyzed at any time at the owner's request if problems are suspected or to make sure that oil of a future shipment is within specification.

At the time of shipment, oil is pumped through shore lines to a flexible pipe and thence directly into the ship's tank or to a manifold on deck. The latter is more hazardous but far more efficient. Samples are taken from shore tanks and tank cars before the oil is pumped to the vessel, after it is ascertained that tank contents are entirely liquid. A composite of these samples usually is analyzed. Samples are taken with a bomb sampler at approximately one foot intervals throughout the depth of tank. Ship's tanks are sampled after loading but these samples are not analyzed unless the contract specifically calls for analysis on ship's tank samples or if problems arise with the analysis of the shore samples. Two sealed samples from each ship's tank are left on board—one for the use of the consignee and one for the ship.

Shore tank analysis is favored for the following reasons. Firstly, since the quantity to be loaded from each tank is known (approximately) before pumping commences, analysis may be performed while the ship is loading. Secondly, shore tank analysis is preferred because individual shippers' oil can then be analyzed separately due to the fact that in large shipments, involving several separate shippers but one consignee, oil may be mingled in the ship's tank. Thirdly, since samples from ships' tanks are usually taken from above the point where the oil enters the tank and are taken immediately after loading the ship's tanks, the samples contain a disproportionate amount of the last material pumped into that tank. The disadvantage of the shore tank sample is that it may contain a residue from the bottom of the tank which may remain in the tank after pumping.

If any of these drawbacks should become critical, we would no doubt use a continuous flow method of sampling, but to date this has not been necessary.

During pumping of oil to a vessel, a surveyor is present at all times to supervise loading operations and to keep a loading log by recording all pumping times and any onto-

QUALITY CONTROL IN EXPORT SHIPMENTS

ward incidents which might affect quality or quantity. When pumping is complete, all lines are blown, samples are taken and ullages and temperature of the cargo are measured and recorded.

An Ullage Report is issued based on these figures. This report is used by surveyors at the port of discharge, primarily to alert them to possible shortage if ullages are greater, but also to warn of possible contamination from other cargo, or water if ullages are less. Heating instructions, giving maximum and minimum temperatures for the cargo, are provided for the ship.

Analysis is performed to determine whether contract specifications are met; as a rule penalties are imposed on the shipper of product not meeting specifications, but no bonus is paid when oil specifications are exceeded. These specifications vary not only from product to product but also for the same product depending on where it is shipped and its intended end use. For example, the National Standard of Canada has published specifications (1) for crude rapeseed oil which list requirements for free fatty acid, moisture and impurities, flash point, refined, bleached color, green color, neutral oil and erucic acid. Many crude rapeseed oil or canola oil sales are based on these specifications. However, in the case of crude rapeseed oil sold to India, where the oil is used and favored as a cooking oil without refining, color is not a requirement, but specifications are included for peroxide value, unsaponifiable matter, refractive index, iodine value and saponification value. These last three items would not usually be considered as quality specifications but rather as characteristic standards. However, where the buyer and seller are many thousands of miles apart, and the chances of contamination or adulteration are many, it is natural that these requirements be included.

With regard to these shipments, saponification value was a problem a few years ago. References published before 1970, and even some more recent ones, list a saponification value for rapeseed oil in the range of 168-180 (2), and specifications were based on this value. Low erucic acid varieties developed in Canada have saponification values of 184-190. After several months the Indian Government agreed to change their specification.

No mention has been made as yet regarding oilseed exports. This is an area in Canada where a far greater degree of quality control is exercised by strict adherence to grading standards by the Canadian Grain Commission. Every car of grain or oilseed discharged at a terminal elevator is sampled and graded. A visual grade is assigned by

the terminal's own inspector. The seed is consigned to a bin determined by this visual grade or it may be held in a separate bin until an official grade is given by Canadian Grain Commission inspectors usually within 12 minutes.

Each bin of grain and oilseed in storage at the terminal is sampled periodically (ca. every 10-12 weeks) and checked for insect infestation. Grain Commission entomologists also inspect terminal facilities for insect infestation and cleanliness and have authority to order clean-up or fumigation where necessary.

Before a ship loads, its holds are inspected for cleanliness and freedom from insect infestation. If holds are passed, a "Ship Release Certificate" is issued to the ship by Agriculture Canada. A "Phyto-Sanitary Certificate" is also issued based on inspections of the ship, loading facilities and terminal. This is for the use of the consignee at the port of discharge.

During loading, samples are taken by automatic sampler, supervised by the Canadian Grain Commission. This sample may be composited with samples taken in likewise manner at other terminals loading to the same ship. Final grade, moisture and dockage are determined on this composite sample. Sales contracts for rapeseed, besides specifying grade, also call for a guaranteed percentage minimum oil content. Therefore, the shippers (i.e. the grain companies) require an analysis for oil content. This analysis is performed on a sample supplied by the Grain Commission to an independent laboratory and the oil content is determined using an extraction procedure (3). Occasionally, the contract will specify that the oil content be determined by the Canadian Grain Commission's Grain Research Laboratory.

With the use of modern processing equipment and effective quality control procedures, problems regarding quality of exported oil are remarkably few.

REFERENCES

1. National Standard of Canada, Standard for Rapeseed Oil, Crude and Degummed CAN 2-32, 300M-76.
2. Official and Tentative Methods of the American Oil Chemists' Society, Table I, 1-46, revised 1962 (now deleted from official Standards).
3. International Union of Pure and Applied Chemistry: Standard Methods for the Analysis of Oils, Fats and Derivatives, 6th edn., 1979, Pergamon Press, Oxford.

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