

ALAN C. TULLY
REPRESENTING
ETHYL EXPORT CORPORATION
LONDON AND NEW YORK
368 COLLINS STREET, MELBOURNE C1

November 23rd, 1938.

Dr. R.A. Kehoe,
College of Medicine,
University of Cincinnati,
Cincinnati, OHIO, U.S.A.

Dear Dr. Kehoe,

I am enclosing herewith the tank cleaning study we have made with reference to the Vacuum Oil Company.

As you will note the report is very complete, and it has taken us some time to acquire full information. I trust the delay has not inconvenienced you, but I know that you would appreciate accuracy rather than speed. We are now working on a similar report for the other companies, and these will come forward as completed.

With kind regards and best wishes for a Merry Christmas and a most prosperous New Year.

Very truly yours,

Alan C. Tully

GB:MR

KE 0006084

N 7742

INSTRUCTIONS FOR CLEANING TANKS USED FOR MIXING
AND STORING LEADED GASOLINE AT REFINERIES
AND MIXING PLANTS.

(The usual refinery rules for cleaning gasoline tanks do not provide safety against sludge and scale from tanks used for leaded gasoline, and the following rules must be added.)

- A. Inside surfaces of the tank must be kept wet during the entire process of cleaning to prevent breathing dust.
- B. All workmen who enter the tanks must wear air-line hose masks.
- C. All workmen must wear special coveralls, shirts, underwear and socks; they must also wear heavy, acid-proof gloves in perfect condition, and knee-length rubber boots of good quality and in perfect condition.
- D. Clothing must be changed and the face and hands must be cleaned at lunch time. At the end of work the clothing must be changed and a shower bath must be taken. The clothing must not be worn longer than one day, after which it must be laundered. Boots and gloves must be cleaned daily. If clothing is accidentally soaked with sludge from the bottom of the tank, it must be changed at once.
- E. Sludge from the tank must not be left where anyone will come in contact with it. The sludge should be taken from the tank in a wet state and buried at some point where workmen will not uncover it in making excavations.

NOTE: Tank repairmen and welders must also follow these rules when working in uncleaned tanks. It is recommended that such procedure be carried out after thorough cleaning and elimination of dust.

ETHYL EXPORT CORPORATION

Oil Company _____ Country _____

1. Information on refineries with respect to tanks employed in handling leaded gasoline

Location	Number and Size of Blending Tanks	Number and Size of Storage Tanks
_____	_____	_____
_____	_____	_____

2. Information on Bulk or Terminal Storage Points with Respect to Such Tanks

Location	Number and Size of Blending Tanks	Number and Size of Storage Tanks
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

3. Length of life of tanks?
4. Frequency of changes of service, i.e. gasoline to oil, oil to gasoline, etc.?
5. Frequency of Repairs?
6. Frequency of Cleaning?
7. Methods of Cleaning - Type of workmen, type of supervision, safety rules and their enforcement.
 - A. Are men trained for this work?
 - B. Do men enter the tanks in cleaning?
 - C. Are men properly equipped for this work, i.e. mask, clothing etc.
 - D. Do they always wear air-line hose masks?
 - E. Are inside surfaces of tanks kept wet during cleaning?
8. Disposition of sludge from bottom of tanks.
9. What preliminary steps are taken before cleaning? Steaming, filling with water etc.?
10. What tests are carried out before men are permitted to enter a tank?

TANK CLEANING INVESTIGATION

Vacuum Oil Company Pty. Ltd. (Incorporated in Australia)

Question (1): Details of Gasoline storage (including Leaded and Unleaded Fuels) at our Australian ocean terminals:

Answer: Required particulars are included in enclosed Statement marked "Attachment 1".

Question (2): Number of inland towns in Australia where we have provided bulk Gasoline storage and the average tankage installed at each (including Leaded and Unleaded Fuels):

Answer: Enclosed Statement marked "Attachment 2" includes the required particulars.

Question (3): Approximate life of Gasoline Storage Tanks -

(a) at ocean terminals:

(b) at country installations:

Answer:

(a) Under normal service conditions (i.e. not allowing for accidents such as fire) we estimate that a storage tank at an ocean terminal would have a life of at least 50 years. The oldest tank we have in service is about 13 years old and the only major repair effected to date has been the replacement of the bottom plates.

(b) The life of a storage tank at a country installation is even more difficult to estimate than the life of a tank at an ocean terminal. In this country, it is only about 12 years since we commenced to instal storage tanks at country centres. Originally, many of these tanks were installed below ground, and it was found that owing to corrosive substances in the soil, tanks at a number of centres were becoming pitted. As a consequence, these tanks have been raised above ground, and after cleaning and painting, are in excellent repair. With frequent inspection and painting, which is our normal maintenance procedure, above-ground country storage tanks would have an almost indefinite life, but for the purpose of a rough estimate, we would suggest that you use a figure of approximately 100 years.

Question (4): Frequency of Repairs required to Storage Tanks containing Gasoline:

Answer: We regret that it is impossible for us to give a specific answer to this question. As with other Oil Companies, we repair storage tanks when and as necessary. As mentioned in the answer to the preceding question, major repairs so far effected to a tank at an ocean terminal have been replacement of the bottom plates.

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A common repair job required on Floating Roof Tanks every 7 to 10 years is the replacement of the Kearsage material which attaches the seal plates to the roof proper. Another repair which is frequently effected to Floating Roof Tanks of the original "Pan" type is the replacement of the water drain hose. The frequency of this replacement varies considerably. In our case, arrangements have been made to replace all such hose with a solid flexible type of drain when the tank becomes available for cleaning and inspection.

You will understand that the repairs above-mentioned have equal application to all storage tanks, irrespective as to whether they contain ordinary Gasoline, Leaded Gasoline or other Refined Products.

Unless a repair is urgent and needs immediate attention, it is our practice to defer normal repair work until such time as a tank has been emptied and is available for inspection and cleaning at intervals mentioned in answer to Question (5) hereunder.

Question (5): Frequency of Cleaning Gasoline Storage Tanks -

- (a) at ocean terminals:
- (b) at country installations:

Answer:

- (a) We endeavour to operate on a three-year schedule as applied to Floating Roof Tanks, and on a four-year schedule as applied to tanks fitted with gasometer or cone roofs.
- (b) There is no fixed period for the interior cleaning of storage tanks at country installations. As mentioned in answer to a preceding question, country storage tanks have been in use for the past 12 years. As yet, it has been unnecessary for any individual to enter the interior of one of these tanks for cleaning or any other purpose; nor do we believe that this will be necessary in the future. The tanks have been so designed and installed that foreign matter accumulates in a position where it can be simply removed per medium of a length of small diameter piping and a hand-operated semi rotary pump.

Question (6): Frequency of Change of Service:

Answer:

We can only reply to this question that tanks are changed over in service from one product to another when and as required. It will be appreciated that with an expanding market such as we have in Australia, and with the introduction of specialised products, tanks of small capacity particularly are somewhat frequently changed in service.

On the other hand, many of our tanks which were erected when we established our bulk distribution scheme approximately 12 years ago have remained in use for the same product. We regret that we cannot give you anything more specific as an answer to this question.

Question (7): Number, Capacity and Location of Blending Tanks:

Answer: We are enclosing Statement marked "Attachment 7" which includes the required particulars.

Question (8): Methods of Cleaning now in vogue in respect of -

- (a) Class of Workmen employed:
- (b) Type of Supervision:
- (c) Written Instructions relating to
Cleaning Operations:
- (d) Disposal of Sludge removed from tanks
which have contained Leaded Gasoline:

Answer:

- (a) Our regular employees are used for cleaning operations, and in general we employ men on this work who have had previous experience. It is not the practice to engage casual labor nor to employ outside contractors for any cleaning operations. If it happens that a repair job is to be effected to a tank which has contained Leaded Gasoline, cleansing operations are completed by our own staff before the contractor and his men have access to the tank.
- (b) Tank cleaning operations are under the direct supervision of a Leading Hand or Foreman, and under the general supervision of a qualified Engineer, such as a Branch or Plant Engineer.
- (c) We are enclosing copies of written instructions which have been issued to all branches and which are in the possession of all employees concerned.
Instruction marked "A" has general application to the cleaning of all tanks, whereas Instruction marked "B" is used as an Addendum to Instruction "A" and has particular reference to the cleaning of tanks which have contained Leaded Fuels. As you will observe, it is in line with instructions issued by your Corporation.
- (d) Sludge removed from storage tanks which have contained Leaded Fuels is buried in accordance with your standard instructions.

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TANK STORAGE FOR NAPHTHA AT MAIN PORTS

Installation	Tank No.	Type	Size		Capacity (Imp. Galls.)	
			Diameter	Height	S.P. Ethyl	P.M.S.
<u>BIRKENHEAD</u> (Adelaide)	6	FR	27'4"	29'0 $\frac{1}{2}$ "		95,200
	7	"	"	"	95,200	
	8	"	70'3"	46'3"		1,044,400
	9	FBR	"	"	1,044,400	
	11	GR	101'0"	41'0"		2,000,000
					1,139,600	3,139,600
<u>BULIMBA</u> (Brisbane)	1	FBR	70'3"	46'3"	1,044,400	
	2	FR	60'0"	29'0 $\frac{3}{4}$ "	459,200	
	3	"	"	"		459,200
	8	"	27'4"	29'0 $\frac{1}{2}$ "	95,200	
	9	"	"	"		95,200
	13	"	96'6"	46'6 $\frac{1}{2}$ "		2,000,000
					1,598,800	2,554,400
<u>CAIRNS</u>	1	CR	85'0"	29'2 $\frac{1}{2}$ "		1,000,000
	2	CR	38'0"	29'4 $\frac{1}{2}$ "	200,000	
	5	Horiz.	8'3"	30'0"	10,000	
	6	"	"	"		10,000
	7	"	"	"		10,000
					210,000	1,020,000
<u>FRUMLIN</u>	1	FR	27'4"	29'0 $\frac{1}{2}$ "		95,200
	2	"	"	"	95,200	
	4	FBR	87'8"	29'0 $\frac{1}{2}$ "	980,400	
	6	FR	60'0"	29'0 $\frac{1}{2}$ "		459,200
	9	GR	101'0"	40'10"		2,000,000
					1,075,600	2,554,400
<u>GLEBE ISLAND</u> (Sydney)	1	FR	34'6"	46'3"		251,300
	3	Horiz.	8'3"	30'0"	10,000	
	4	"	"	"	10,000	
	6	FR	96'6 $\frac{15}{16}$ "	46'9 $\frac{1}{2}$ "		2,000,000
	7	"	"	"	2,000,000	
					2,020,000	2,251,300
<u>HOLMART</u>	1	FBR	60'0"	46'3"		762,000
	2	"	30'0"	34'10"	140,000	
	5	GR	55'0"	35'0"	500,000	
					640,000	762,000
<u>NEWCASTLE</u>	1	FR	49'8 $\frac{1}{2}$ "	46'4"		524,000
	2	"	"	"	524,000	
	3	"	"	"	524,000	

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<u>BIRKENHEAD</u> (Adelaide)	6	FR	27'4"	29'0 $\frac{1}{2}$ "		95,200
	7	"	"	"	95,200	
	8	"	70'3"	46'3"		1,044,400
	9	FBR	"	"	1,044,400	
	11	GR	101'0"	41'0"		2,000,000
					1,139,600	3,139,600
<u>BULIMBA</u> (Brisbane)	1	FBR	70'3"	46'3"	1,044,400	
	2	FR	60'0"	29'0 $\frac{1}{2}$ "	459,200	
	3	"	"	"		459,200
	8	"	27'4"	29'0 $\frac{1}{2}$ "	95,200	
	9	"	"	"		95,200
	13	"	96'6"	46'6 $\frac{1}{2}$ "		2,000,000
					1,598,800	2,554,400
<u>CAIRNS</u>	1	CR	85'0"	29'2 $\frac{1}{2}$ "		1,000,000
	2	CR	38'0"	29'4 $\frac{1}{2}$ "	200,000	
	5	Horiz.	8'3"	30'0"	10,000	
	6	"	"	"		10,000
	7	"	"	"		10,000
					210,000	1,020,000
<u>PERMANLE</u>	1	FR	27'4"	29'0 $\frac{1}{2}$ "		95,200
	2	"	"	"	95,200	
	4	FBR	87'8"	29'0 $\frac{3}{4}$ "	980,400	
	6	FR	60'0"	29'0 $\frac{1}{2}$ "		459,200
	9	GR	101'0"	40'10"		2,000,000
					1,075,600	2,554,400
<u>GLEBE ISLAND</u> (Sydney)	1	FR	34'6"	46'3"		251,300
	3	Horiz.	8'3"	30'0"	10,000	
	4	"	"	"	10,000	
	6	FR	96'6 $\frac{15}{16}$ "	46'9 $\frac{1}{2}$ "		2,000,000
	7	"	"	"	2,000,000	
					2,020,000	2,251,300
<u>HOBART</u>	1	FBR	60'0"	46'3"		762,000
	2	"	30'0"	34'10"	140,000	
	5	GR	55'0"	35'0"	500,000	
					640,000	762,000
<u>NEWCASTLE</u>	1	FR	49'8 $\frac{1}{2}$ "	46'4"		524,000
	2	"	"	"	524,000	
	3	"	"	"	524,000	
	4	Horiz.	10'0"	30'0"	14,000	
	5	"	"	"		14,000
	8	GR	74'0"	29'4"		750,000
					1,062,000	764,000
<u>PULPIT POINT</u> (Sydney)	4	FR	77'0"	29'1"	756,900	
	10	FBR	96'5 $\frac{1}{4}$ "	42'6 $\frac{1}{8}$ "		1,798,900
					756,900	1,798,900

Installation	Tank No.	Type	Size		Capacity (Imp.Galls.)	
			Diameter	Height	S.P. Ethyl	P.M.S.
<u>PORTLAND</u>	1	FBR	60'0"	46'3"		762,000
	2	"	34'6"	46'3"	251,300	
	4	Horiz.	10'0"	30'0"	14,000	
	5	"	"	"		14,000
					265,300	776,000
<u>PORT PIRIE</u>	1	FBR	60'0"	46'3"		762,000
	2	"	40'0"	46'3"	338,400	
	4	Horiz.	8'3"	30'0"		10,000
	5	"	"	"		5,000
	6	"	2 Compt.			5,000
	7	"	8'3"	19'6"	6,000	
					344,400	782,000
<u>SUVA</u>	1	GR	34'0"	29'0"		161,800
	2	"	30'0"	29'0"		126,000
	3	Horiz. D.C.	9'11 $\frac{1}{2}$ "	30'0"		14,400
						302,200
<u>TOWNSVILLE</u>	1	GR	60'0"	46'3"		805,800
	3	"	34'6"	46'3"	266,500	
	4	Vertical	10'0"	30'0"	14,000	
	6	"	"	"		14,000
					280,500	819,800
<u>YARRAVILLE</u> (Melbourne)	1	FR	87'8"	29'0 $\frac{3}{4}$ "	980,400	
	9	"	96'6"	46'3"	1,971,800	
	10	FBR	"	"		1,971,800
	15	GR	124'0"	40'8 $\frac{1}{2}$ "		3,000,000
					2,952,200	4,971,800

MELBOURNE:
27th October, 1938.

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ATTACHMENT 2:

BULK PETROL STORAGE - 'A' DEPOTS

State	No. of 'A' Depots with Bulk Petrol Storage	Average Gallonage per Centre (Petrol Only)
Victoria	33	22,813
Tasmania	3	26,000
New South Wales	52	19,596
South Australia	15	19,066
Queensland	21	17,857
West. Australia	26	15,423
Total Australia	150	19,414

MELBOURNE:

27th October, 1938.

KE 0006993

ATTACHMENT 7:

ETHYL BLENDING TANKS

Centre	Blending Tanks Capacity
Yarraville (Melbourne)	2 x 6,000 Gallons 1 x 20,000 " 1 x 5,000 "
Pulpit Point (Sydney)	2 x 6,000 "

MELBOURNE:

27th October, 1938.

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Cleaning and Repairing.

General:

Mixtures of petrol vapor and air are explosive when the vapor is present within certain limits called the lower and upper explosive limits. These limits are generally from 1% to 6% by volume of vapor in air.

Mixtures of vapor and air outside the explosive limits may not explode, but a richer mixture can be ignited and burn as a torch when it issues into the air.

Remember - a mixture which tests may have shown is too rich to explode can eventually come within the stated explosive range as ventilation with air progresses.

The following instructions represent Safe Practice when attention in the way of cleaning and/or repairs is being given to tanks that previously held Inflammable Liquid. Their object is :-

- (a) To promote the safety of employees.
- (b) To prevent damage to plant and stocks.

: : : : : : : : : : : : : : : :

Cleaning - General Instructions:

The following precautions apply to the cleaning of all containers, irrespective of capacity:-

- (a) The container must not be opened to atmosphere unless separated from the nearest fire or open flame by a screen wall of brick, stone or concrete, or an intervening distance of at least fifty feet.
- (b) The container must be emptied and allowed to drain until as free as possible of inflammable liquid.
- (c) Skin contact with the contents of the container must be avoided as far as practicable.
- (d) The workman, or workmen, inside the container must be equipped with life lines, safety harness and fresh air gas masks operated by a blower. In addition to the man operating the blower, which must be capable of delivering ample air for two (2) masks, there must be at least one other man outside the container keeping those inside under continual observation, and at least one (1) spare blower gas mask in the event that it is necessary for a rescuer to enter a tank.

For tanks which have contained Ethyl products, the following additional precautions must be observed:-

- (e) Workmen employed in cleaning shall be clothed in overalls, shirts, underwear and socks, which must be used for cleaning service only. Gum-boots of good quality and in good condition, kept expressly for this service, must also be worn.
- (f) During cleaning, the interior walls of the container must be kept damp by sponging with a wet cloth, or by hosing, to prevent the formation of dust.
- (g) Before partaking of lunch and at the end of each day's work the workmen shall change their clothing and wash their hands and faces thoroughly.

Clothing shall not be worn longer than for one (1) day, after which it will be laundered at the Company's expense. Rubber boots must be cleaned daily.

- (h) For the interior inspection of containers, electric torches of approved vapor-proof type must only be used.

Special Instructions:

The following procedure is to be adopted for containers of varying size and construction:-

1. Containers 100-1500 Gallons Capacity: (E.G. Head Tanks at 'A' Depots and Tank Trucks - also Rail Tank Cars):

After the contents of the tank have been drained or pumped out, the tank shall be filled with water until it overflows and allowed to remain completely filled for a period of twenty-four hours.

After standing for the specified period, water shall then be added to the tank until it overflows, in order that any inflammable liquid which may have risen from sides, pockets, crevices or other such place may be displaced. The water shall then be drawn off and all cocks, valves, plugs, caps, manholes, etc. shall be opened to the fullest extent to permit as far as possible free circulation of air into, and through, the container. Care shall be taken to see that the top and bottom plugs to inter-compartment seals are also removed.

The workmen may then enter the container, as described under "General Instructions" and proceed with the cleaning operation, using a wet swab or mop, or where scale is to be removed, a flexible brass scraper.

2. Containers 1500-15000 Gallons Capacity: (E.G. 'A' Depots Tanks & Working Tanks at Main Warehouses but Excluding Rail Tank Cars):

After the inflammable liquid contents have been drawn off, the tank shall be filled with water, allowed to stand twenty-four hours then overflowed, and either allowed to drain or the water removed by pumping. All openings in the tank are then to be availed of to permit of the thorough ventilation of the container.

Where water for filling the tank is not available, ventilation by air alone will be carried out.

After this process the workmen may enter the tank wearing a blower gas mask, safety harness and life line, and in the case of tanks having access only from the top, at least two men in addition to the blower operator shall be stationed outside to assist the workman to safety in the event of his being overcome by fumes.

The cleaning operation is to be carried out by swabbing with a wet mop or by scraping with a flexible brass scraper.

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3. Containers above 15000 Gallons Capacity: (E.G. Main Storage Tanks):

- (a) Provided the stock position and other circumstances permit floating roof tanks shall be released for cleaning at intervals of approximately three(3) years and all other types of tanks at intervals of approximately four (4) years unless excessive corrosion or urgent repairs should make the release of a tank after a shorter period imperative. Stock position will, of course, be the governing factor, but the interval specified shall be used as the basis for planning a programme of tank cleaning.
- (b) If at any time, it is desired to inspect a tank which contains only 18" or less of petrol or kerosene, it is not necessary to first empty the tank completely. In the case of Pontoon (Day-Type) Roof, F.R. and B.F.R. tanks, a man wearing thigh-boots and gas mask can enter the tank through the roof manhole and inspect the interior with a powerful vapor-proof torch to ascertain whether it requires cleaning.
- (c) In the case of those floating roof tanks which are equipped with a fixed turned suction, as per Drawing A-22906, the entire spirit contents can be removed by introducing displacement water, but in the case of tanks not so equipped, as much of the tank contents shall be pumped out by the transfer pump through the swing pipe as its position permits into a tank containing a similar grade, and the balance of the spirit, also the water which cannot be discharged from the tank drain valves, removed in accordance with Clause (e).

Note: Where tankage conditions permit, some of the water can also be pumped out in order to ensure collecting all the spirit, and the remainder of the water can then be drained off. The spirit from another tank of the same grade can then be used for cleaning the other tank line, or lines, free of water.

- (d) With tanks having the Wiggins Pontoon (Day Type) Roof the roof will be supported on the link hangers to give ample head room for the workmen. As these hangers are designed to support the weight of the roof only and not any additional water load the following precautions must be observed when the hangers are put into place.
 - (i) Open the bleeder vents on the roof manholes to prevent the formation of vacuum under the deck.
 - (ii) As soon as the roof is suspended open the 3 in. drain plug at the centre to allow water to drain directly into the tank.

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When the roof is put back into service after a period of inactivity, the following steps should be taken.

- (i) Make sure that the shoes are not fast to the Shell.
- (ii) Open the bleeder vents long enough to permit the escape of air trapped under the centre deck and then close them.
- (iii) As soon as the roof floats remove the link hangers and prime the siphon drain.
- (e) For pan-type floating roof tanks, substitute longer roof supports, as per drawing A-21737, to give adequate head room for the workmen and permit a more thorough job of cleaning.
- (f) In the case of tanks not provided with recessed drain sump in the tank floor the bottom manhole cover shall then be removed and a suction disc, as per Drawing Y-3790, in conjunction with horizontal table, as per Drawing A-22077, coupled to flexible hose connected to the blanked-off tank elbow, and the pump started again to remove all remaining spirit. Alternatively, this hose should be connected to the special connection which at some installations is screwed into the elbow at the back of the tank gate valve.
- (g) The remaining shell and roof manholes shall then be removed to allow free circulation of air and, if desired, natural ventilation may be accelerated by the use of wind sails.
- (h) If not already done, all pipe lines connecting into the tank shall then be blanked off to prevent gas or spirit returning into the tank.
- (i) As soon as possible after the manholes are open and ventilation is under way, low pressure hose streams through long hose directors electrically bonded to the tank shall be used to break up the sludge and wash it towards the bottom manholes where it shall be pumped out with a hand pump and suction disc if light and liquid.

Note: These hose streams to be directed by workmen standing on the outside of the tank and preferably at the bottom manhole on the windward side of the tank. Where only one manhole is fitted, it will be necessary for workmen to enter the tank and use the hoses to direct the sludge towards the manhole. In such cases, gas masks must be worn.

- (j) Flushing and ventilation shall be continued and, if necessary, men wearing gas masks sent in to scrape and shovel into buckets the remaining heavy sludge but this shall only be done when the vapor concentration has been reduced below the lower explosive limit of 1% by volume of vapor in air as determined by the Laboratory Representative.

- (k) Except in special cases where the tank has contained an Ethyl petrol, if sufficient time is available the tank should be allowed to dry out and when certified gas-free men without gas masks may enter the tank and any dry, sediment present shall first be swept up with hard bass brooms and then removed on wooden shovels of three ply wood. The floor sides and underside of the roof shall then be brushed down with dandy brushes and where necessary scraped with flexible brass scrapers. On the other hand, if the tank has contained Ethyl petrol, the following special cleaning procedure must be followed in all particulars. Irrespective of whether the tank has been certified gas free, all workmen must wear blower gas masks and throughout cleaning operations the interior surfaces of the tank must be kept wet by hosing. The floor, sides and underside of the roof shall be brushed down with dandy brushes and scraped where necessary with brass scrapers, keeping the plates wet all the time. After the tank has been thoroughly cleaned, then it is permissible to allow the plates to dry to permit the application of interior paint but at all times the workmen must wear blower gas masks.

All sediment and rust shall be buried well away from the vicinity of pipe lines.

In the case of Gasometer Roof tanks the dip-ring and seal shall be brushed down with long handled brushes, any sediment and rust being brushed to the drain holes provided in the seal channel. Should it be deemed necessary to paint or carry out any repairs to the dip ring whilst the roof is not being supported by air or vapor pressure, Authority from Head Office must be obtained before proceeding with the work.

- (1) For the various types of tanks the opportunity should be taken to attend to the following work before the tank is sealed up:-

(1) For floating roof tanks fitted with other than the syphon type drainage, the Day swing pipe type of roof drainage system must be installed and for this purpose, standard reference drawings are available as follows:-

- A-23750 - Floating Roof Tanks - 29'-0 $\frac{1}{2}$ " high.
General Arrgt. of 2", 3" and 4" Swing Pipe
Drainage - Day Type.
A-24889 - Floating Roof Tanks - 46'3" high.
General Arrgt. of 2", 3" and 4" Swing Pipe
Drainage - Day Type.
A-23751 - Details of 2" Swing Pipe Drainage - Day Type.
A-23752 - " " 3" " " " " "
A-23753 - " " 4" " " " " "

When these alterations are made the wooden drain hose platform in the bottom of the tank will be of no further use and shall be removed. The Calibration of the tank will not be appreciably altered, even for the smallest tank, as the "deadwood" of this platform is negligible, but any alterations in the "deadwood" of a tank shall be the subject of advice to the Customs Department.

Should the stock position be such that the time the tanks available for cleaning is limited and not sufficient for these alterations the following procedure should be observed:

2. For pan-type floating roof tanks having the flexible hose system for roof drainage, careful inspection of this bronze hose and connections should be made and same subjected to a hydrostatic pressure test of 30 lbs. per sq. inch for ten (10) minutes to ensure that the system is in perfect condition.
3. For similar tanks having the Barco joint pipe drainage system, the complete assembly should be carefully inspected and, if considered necessary, the following modifications carried out as per drawing NSW B-21910.
 - (a) Provision of an additional support to the piping system which is attached to the roof deck.
 - (b) Welding of bracing plate to right angle bend in pipe system at the floor level to eliminate the present pipe clamps which tend to foul the angle iron supports to the drain pipe on the bottom of the tank.

After the above alterations have been carried out, the system must satisfactorily pass a hydrostatic pressure test of 30 lbs. per sq. inch for a period of ten (10) minutes.

4. For all tanks of the floating roof type, if not already done, and allowed for in the current Budget, the existing swing pipe draw-off should be altered to the up-turned draw-off principle as per Standard Drawing A-22906, thereby reducing evaporation losses when it becomes necessary to empty the tank.
 - (m) When cleaning is complete, the interior of the tank and the underside of the roof shall, if required, be painted as specified in the Painting Manual.
 - (n) After the painting work has been completed, the Plant Engineer shall carefully inspect the interior and pass the tank as fit for service before it is sealed up for further use.
 - (o) A report made out on the standard form, covering the condition of the tank and detailing the attention given it, shall be forwarded to Head Office by the Branch Engineer immediately following the cleaning of each tank.

KE 0007001

KEY TO QUESTIONNAIRE

- (1) The Ethyl licensee and plant location.
- (2) Number of blending tanks, and size of tanks.
- (3) Number and size of storage tanks for leaded fuels.
- (4) Length of life of tanks.
- (5) Frequency of changes of service, that is, from petrol to oil, from oil to petrol, etc.,
- (6) Frequency of repairs.
- (7) Frequency of cleaning.
- (8) Methods of cleaning, type of workmen, type of supervision, local safety rules and other details.
 - (a) Are men trained for this work?
 - (b) Do men enter the tanks during cleaning?
 - (c) Are men specially equipped for this work, that is, with gas masks, special boots and gloves.
 - (d) What type of gas mask are they wearing? Airline or canister?
 - (e) Are the inside surfaces of the tanks kept wet during cleaning?
- (9) Disposition of the sludge from the bottom of the tanks.
 - (a) What preliminary steps are taken before cleaning, - steaming, filling with water, etc.?
 - (b) What tests are carried out before men are permitted to enter a tank.
 - (c) Additional information.

TANK CLEANING INVESTIGATION

1. Vacuum Oil Company, Yarraville, Victoria.
 2. Two tanks:- 1 x 5,000 Gals. for 80 octane No. Aviation Ethyl
1 x 20,000 Gals. " 87 " " " "
 3. Two tanks:- 1 x 1,000,000 Galls. Super Plume Ethyl
1 x 2,000,000 " " " "
 4. Indefinite.
 5. Only one change in four years - from Ethyl to kerosene.
 6. None to date.
 7. Only when change over from Ethyl to Kerosene.
 8. Under supervision according to regulations set down by our company.
 - (a) Yes.
 - (b) Yes.
 - (c) Yes, fully equipped, as for mixing.
 - (d) Air-line to outside with air pump.
 - (e) Yes, during whole operation.
 9.
 - (a) Hosed down.
 - (b) Tests for fumes.
 - (c) Disposition of sludge - buried on premises.
-
1. Vacuum Oil Company Pty. Ltd. Pulpit Point, Hunters Hill, N.S.W., Australia.
 2. Two. One for 87 octane aviation and one for 80 octane aviation. Both have a capacity of 5,000 Imp. Gals.
 3. One tank of 750,000 gals. capacity at Pulpit Point, but there are three tanks at the Glebe Island terminal, one tank of 2,000,000 gals. and two of 10,000 gals. All of these tanks contain Ethyl Motor Spirit and there are no storage tanks for leaded aviation petrol.
 4. The 750,000 gal. tank is 12 years old. The 2,000,000 tank at Glebe is 3 months old and the two 10,000 tanks also at Glebe were built in 1928.
 5. Never changed.
 6. Not frequent.
 7. Two tanks only have been cleaned since introduction of Ethyl. Should be cleaned every three years.
 8. There is a set of rules issued by the Head Office of the Company for tank cleaning, embodying the rules and regulations as set out by the Ethyl Export Corporation for the cleaning of storage tanks containing leaded petrol. All tank cleaning is carried out under supervision of chemical department and no access to any tank can

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TANK CLEANING INVESTIGATION

- (a) Yes, there is a special team of cleaners.
 - (b) Yes, but only when gas free or wearing masks.
 - (c) Yes.
 - (d) Airline type.
 - (e) Yes.
9. The sludge is always removed first by draining off before actual cleaning begins.
- (a) The tank is first filled with water then drained off, then the vents and manifolds are opened and wind chutes are fitted to allow air to circulate, which is carried on for a week until the tank is air free.
 - (b) The air is tested by a chemist using a Miner's Safety Appliance Combustible Gas Indicator, before anyone is allowed to enter the tank.
 - (c) The safety of tank cleaning at this plant is helped by the fact that the chemical department supervize the entire operation.

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