Hazards of Tank Cleaning

The sources, nature and distribution of the lead hazards encountered in tank cleaning are discussed in the Tank Cleaning Report, which is available to all Safety Engineers. Each man should have knowledge of the data and be sufficiently familiar with the results of this study to be able to explain the character of the hazards to all persons actually concerned. It is the existence of these hazards that makes the supervision and precautions in Tank Cleaning necessary. However, the amount of information which should be given out will depend in each instance upon the situation.

The report has established the necessity for supervising the cleaning of all tanks that have ever contained leaded gasoline. No matter to what use a tank has been put after it has contained leaded gasoline, and no matter how often it has been cleaned in the mean time, it is not possible to predict how dangerous it may be when entered. It follows, therefore, that no one is justified in failing to supervise the cleaning of a tank merely because he does not anticipate any trouble. Furthermore, the hazard is likely to be as great in small tanks as in large ones. Regardless of size, whenever tanks are entered for purposes of cleaning, supervision is essential and precautions must be taken.

are followed. On the other hand, accidents have occurred when the specified precautions were not taken, particularly when air-line respirators were not worn. It is one of the major responsibilities of the Safety Engineer, therefore, to make sure that the instructions are followed by being present when tanks are entered and by supervising the entire tank cleaning operation.

Duties and authority of supervisor

The responsibility of the Safety Engineer in this connection is not limited, however, to supervision. He must see that his office receives proper notification and that warning signs are in place. Moreover, it is largely through his regular visits and discussions with the individuals responsible for cleaning the tanks that a sufficient spirit of coöperation and a satisfactory working arrangement are obtained. The Ethyl Gasoline Corporation does not accept responsibility for the safety of ~~employees of gasoline distributing~~ companies engaged in Tank Cleaning, but through the engineering assistance which it offers them, all hazards connected with Tank Cleaning may be eliminated.

It may happen that two tanks at widely separated points are to be cleaned at the same time. Under such circumstances it will be necessary for the Safety Engineer to decide which of the two operations he should supervise personally, and to make arrangements, if possible, to have another representative supervise the other cleaning.

Tank cleaning crews

There has been a tendency on the part of some of the oil companies to allow the supervisor of the tank cleaning crews to assume complete responsibility for the cleaning of tanks. This policy has been based upon the assumption that tank cleaning crews are well trained and equipped and that their own methods are adequate for the elimination of hazards. It is not advisable, however, to rely entirely on them. The practices of such crews have been known to vary and it is not safe to assume that they will have the same interest in the lead hazard as would one of our own safety engineers.

Note on Warning Signs

All tanks that have ever contained leaded gasoline should be marked with a warning sign suitable to the tank. The type of sign or stencil and its location will vary depending upon the use and location of the tank. In installing or inspecting these signs the safety engineer should keep in mind the function of the sign, namely to provide adequate warning and to direct the reader's attention to the detailed instructions available at the office. The sign functions as a warning and a reminder of the necessity of following instructions and is designed to supplement, not replace, discussions of the safety representative with responsible individuals concerned in tank cleaning.

In his function as supervisor of tank cleaning the safety engineer acts as a consultant only. As an adviser on the hazards of tank cleaning and means of preventing them he serves as a source of information ~~only~~ and does not directly assume the responsibility for the safety of any of the workmen except insofar as that is implied by the advice he gives. He is not, therefore, in the position of an executive and has no direct authority over the employees of any of the customer companies. If difficulties are encountered with the personnel immediately concerned in tank cleaning in regard to proper equipment or the following of instructions, the safety engineer should inform the safety man or executive in charge of the plant and secure his coöperation. If not successful in this, he may offer the local management the opportunity of discussing the situation with responsible members of the Ethyl Gasoline Corporation even though this necessitates a telephone call. In any event the safety engineer should inform someone in authority of the infraction which seems to threaten hazard. Such difficulties are seldom encountered and may be eliminated to a large extent if by proper discussion the requirements of the situation are understood.

Instructions

The regulations set up by the Ethyl Gasoline Corporation are to be followed in addition to the precautions usually practiced by the distributing companies. Our instructions are not designed to replace those of the refinery and should not cause any modification in their practices. No conflicts should arise, but if interpretation of our instructions should seem to interfere with the local rules, the matter should be brought to the attention of our Safety, or Medical Department. In case a company has no specific regulations, the rules given in the A.P.I. Manual on Cleaning Petroleum Storage Tanks should be followed, supplemented, of course, by our own instructions. These instructions follow:

(1) Anyone who enters a tank that has contained leaded gasoline must wear a blower-type or positive pressure air-line hose mask. This applies not only to tank cleaners but also to repairmen and others

who must enter ~~leaded gasoline storage~~ tanks that have not been thoroughly cleaned.

The use of air-line respirators is necessary, ~~not only~~ for protection against the hazard from volatile lead compounds ~~but also~~ to prevent the inhalation of gasoline vapors. A full face piece is preferable. Because of lower cost and convenience, there has been a tendency to substitute canister masks or dust respirators for the air-line mask, and to use the simple type hose mask without the blower when small horizontal tanks were being cleaned and 25 feet of hose appeared adequate. However the positive pressure air-line hose mask with the blower should ~~always~~ be used and in case such a mask is not available, the use of the Safety Engineer's equipment should be offered. All respirators used should have the approval of the U.S. Bureau of Mines.

(2) Hose lines for air-line masks have a limited life and should be kept clean. They should be cleaned before being put away, after each day's use, preferably by hosing thoroughly with water to remove adherent material. When any odor, as of gasoline, can be ~~detected~~ in the air stream, work must be stopped ~~promptly and not be resumed until the cause has been found~~ or until a new hoseline has been substituted. This will be discussed below, under Care of Equipment.

(3) All workmen must wear clean overalls, shirt, underwear, and socks. ~~They must~~ also ~~wear~~ acid-proof gloves ~~in perfect condition and hip boots of good quality,~~

in perfect condition.

(4) Clothing must be changed ~~and the face and hands washed before eating.~~ At the ~~end of work the clothing must be changed and a bath taken.~~ The ~~clothing must not~~ be worn longer than ~~one day~~, after which ~~it must be laundered.~~ ~~Boots and gloves must be washed daily~~. If clothing is accidentally soaked with sludge, the workmen must bathe at once and put on clean clothes. Where bathing facilities are not available at the plant, workmen should go to their hotel or home and bathe, when the job is finished, even though it is not the end of the working day.

(5) Sludge is dangerous material even after removal from the tank, ~~and~~ when there is any likelihood of exposure to its vapors, suitable precautions should be taken. Sludge should be buried where it will not contaminate streams or be uncovered accidentally. ~~It should be kept wet and buried as soon as possible after removal from the tank.~~ Provision should be made for its disposal as it is taken out and under no circumstances should it be allowed to lie about near the manhead ~~until it has all been removed from the tank.~~ When sludge has to be hauled for long distances in wheelbarrows or cans the workman ~~must~~ should wear a canister mask. Men burying sludge in pits are also exposed to its vapors and ~~must~~ should wear air-line respirators. ~~or canister.~~ There are numerous ways of disposing of sludge and it is not possible to anticipate the many situations in which exposure may occur. The Safety Engineer

should keep in mind the dangerous nature of the material and should not consider his supervision of the tank cleaning completed until all of the sludge has been disposed of.

(6) Repairs and other cold work should ~~preferably be carried out~~ after tanks have been cleaned. Welding and other hot work should ~~be done only after~~ tanks have been cleaned and the areas to be heated are down to ~~bright~~ clean metal.

~~Hydrate~~

The use of air-line masks for welding and other repair work is not always feasible, and if the tank has been thoroughly cleaned in advance, they need not be used. The surfaces to be worked on should have all the adherent material removed and ~~bright~~ clean metal exposed; this should be done during the regular cleaning operation with all precautionary measures taken including the use of air-line respirators. A sufficiently large area should be prepared so that no uncleaned surfaces will be heated ~~by the welding torch~~ or contaminate the clothes of the repairmen. After preliminary cleaning and the settling or removal of dust caused by it, repairmen may proceed with their work.

If tanks are thoroughly cleaned and aired they are safe for repair work. However there seems to be no general agreement as to what constitutes a clean tank. The decision as to whether or not a tank is safe for entering without masks must be made and since the Safety Engineer properly has more information on the hazards of tank cleaning than any other individual concerned, it may be up to him, as an advisor, to decide this question. From the point of view of subsequent contamination of the product, removal of gross amounts of scale and sludge is considered adequate by many operators. From the point of view of safety, however, a perfect cleaning would be one in which all metal was exposed. Such a result obviously can not be obtained in a routine cleaning operation, but in any event all non-adherent materials should be removed; in the case of the walls, by hosing or brushing, and from the floor of the tank, by flushing with large quantities of water followed by sweeping with a stiff broom or scraping with a shovel, as indicated. Even after these procedures, small quantities of sludge will remain about the girders and rivets and in the seams. The supervisor should be certain that the work has been done as thoroughly as practicable and that the tank is free from odors of the compound ~~or~~ dust before repairmen are permitted to enter it.

Dismantling of tanks

Dismantling and transportation of tanks is a special problem. The

following procedures designed to eliminate the hazards from Ethyl Fluid are recommended, and are to be used in addition to the precautions usually taken:

(1) Tanks should be thoroughly cleaned and sludge disposed of in accordance with instructions. (2) If the tank is to be dismantled, the roof should be removed and such other plates as are necessary to secure adequate ventilation. (3) All portions of the metal including those plates that have been removed should be covered with a coating of light oil, to elminate dust. (4) The side plates and then the bottom are dismantled. (If the tank has been thoroughly cleaned, special precautions are not necessary for these operations.) (5) Dismantled tank plates should be wire-brushed, sand-blasted, or burned out, depending upon which procedure can be carried out most easily. If burned off, air-line respirators should be used in the final cleansing of the plates. ~~Gas~~ masks are adequate in case scraping or brushing is done. After any of these types of cleaning, the material can be handled without special precautions.

Transporting tanks

A certain number of small tanks, after a more or less complete cleaning, are transported in toto for use in gasoline service elsewhere. Ordinarily these need no particular supervision other than that of the cleaning operation and disposal of the sludge. If, however, it is possible for the tank to be entered, any manheads or other openings which would permit entrance should be blanked off before the tank is released.

All tanks shall not be transported until cleaning is completed

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A certain number of small tanks are sold to second-hand dealers and may be resold into gasoline service, junked, or converted to other uses. At the present time we know very little about the fate of a large number of these tanks. In such cases the safety engineer should inform himself, if possible, of the circumstances and the use to which the tank will be put, and should inform the safety department fully concerning it. Tanks which have contained leaded gasoline must not be used subsequently for storage of drinking water, food, and the like. This applies equally to tank cars or tank trucks, as no satisfactory practical way has yet been found to insure complete removal of all traces of lead from such containers.

Equipment

The safety engineer should have the necessary equipment to take care of normal installations and tank cleaning operations as well as any emergencies that may arise in the transportation or handling of Ethyl Fluid. For his protection and for loan to others, where situations warrant it, the following equipment is provided:

2 Long-sleeved white coveralls fitting close to the neck;
2 White washable caps or hats that can be worn with the respirators;
2 Suits of long underwear of cotton or wool;
2 Pairs of white socks;
2 White sweaters (pullovers or sweat shirts) that can be worn over the underwear in cold weather;
1 Pair of white, acid-proof gloves, forearm length;
1 Pair of knee-length rubber boots;
2 Towels
1 Pair of goggles with shatterproof glass;
1 Dust respirator;

1 Canister mask;
1 Air-line hose mask consisting of blower, 3 lengths of air hose, safety rope, safety belt and trunk for the above;
1 Vapor-proof flashlight of approved type;
1 Spark-proof scraper;
1 Tool kit containing the following:

1 Screw driver, Lenox #6
1 Pair of pliers, Crescent Tool # 925-8
1 Brass hammer, AMPCO
1 8" Crescent wrench
2 7/8 x 1-1/16 open-end wrenches, Williams # 34
2 1-1/16 x 1-1/4 open-end wrenches, Billings #37-1140
1 Adjustable spanner wrench, 2" to 4-3/4", Williams
1 Eductor nozzle wrench
1 18" TRIMO wrench
1 Pair of shears, # T412 Cresent Tool
1 Package of emery cloth
1 Wire brush
1 3-1/2 x 1/4 Ashcroft Comp. gage, 30"-30#
Misc. packing and gasket material
1 Stencil for blending tanks
1 Stencil brush

Reports and record forms:

Quarterly inspection report blanks
Permanent record cards
Safety Activities report form
Supply of medical regulations for Tank equipment
Drum to weigh tank
Drum equipment
Complete set of blue prints
Supply of forms, INSPECTION REPORT ON ETHYL FLUID SHIPMENT
Poison placards for tank cars
Red tags reading DRUM TO BE REPAIRED

The tools are for use in demonstration and may be loaned to workmen under supervision. It is not intended that safety engineers engage in work for the customer companies. All clothing, protective devices and other equipment must be kept in good condition by proper care and replacement when necessary.

(5) Ellis ref. p. 6

Care of equipment

Face pieces of mask should be washed thoroughly with soap and water after

use. If contaminated by sludge they must be cleaned with kerosene and the kerosene removed with soap and water. If the mask has been used by some person other than the safety engineer the face piece can be sterilized effectively by the use of 2% Lysol in water, or a similar antiseptic solution. If this equipment is subject to frequent loan, an extra face piece will be provided for the exclusive use of the safety engineer. The canister mask should be kept in its box when not in use, and the canister sealed to delay deterioration. A time record of the use of each canister should be kept by the safety engineer, and replacements made at the same intervals as required of licensees. The face piece may be kept in a cloth or paper bag while in storage or when not in use. Safety hose must be cleaned before it is put away. If it has been contaminated heavily with sludge, all adherent material must be removed by washing with kerosene followed by large amounts of water and the hose should be dried thoroughly before it is replaced. Careful and frequent inspection of the air-line hose is necessary, and the user should at all times be on his guard for the appearance of odor of gasoline or lead compounds in the air stream. It is not safe to rely upon the external appearance of hose lines as evidence of their resistance to penetration by gasoline or tetraethyl lead. Odor in the air stream may be due to a leaking connection or a faulty gasket. If, after these have been checked, the odor persists, a new hose should be substituted and the old hose shipped to the Kettering Laboratory