



196405 Octel Bulletin No 12 The safe handling of Octel Antiknock compounds



BULLETIN

THE SAFE HANDLING OF OCTEL ANTIKNOCK COMPOUNDS

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THE ASSOCIATED OCTEL COMPANY LIMITED

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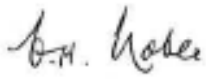
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Foreword

Octel Antiknock Compound containing tetraethyl lead (TEL) has been in use for many years and the procedures recommended for its safe handling have been well proved.

The introduction of tetraMethyl lead as a constituent of certain types of Compound necessitated a reappraisal of these procedures.

In general they proved to be adequate for all types of Compound. This bulletin restates the general principles involved, and emphasises some points of difference between the types of Compound.


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1. Composition of Compounds

Octel Antiknock Compounds are mixtures containing one or more lead alkyls together with ethylene dibromide, alone or with ethylene dichloride. Compounds containing TML also contain up to 12.5% toluene which is added to the TML during manufacture.

2. Properties of TEL, TML and Compounds

Lead alkyls are readily soluble in oils and spirits but virtually insoluble in water. TEL compounds have a sweet ethereal smell, similar to that of geraniums. TML compounds may be odourless but can often have a smell of rotten cabbage.

TML is more volatile than TEL. Its boiling point is 110°C whereas that of TEL is about 200°C, at which temperature it tends to decompose. The vapour pressure of pure TML is 100 times greater than that of pure TEL (17.5 and 0.17 mm Hg respectively at 15°C). The vapour pressure of TML Compound is similar to that of TEL Motor Compound over a wide range of temperatures.

This greater volatility results in very much higher concentrations of lead alkyl vapour in air in the vicinity of leaks or spills of Compounds containing TML.

3. Toxic hazard

All types of Compound are regarded as having the same toxicity. Absorption into the body can occur by inhalation of the vapour, ingestion of the liquid or penetration of the skin by the liquid. TML penetrates the skin less rapidly than does TEL.

The maximum acceptable concentration of the vapour of Compound in air, for unprotected personnel who may be regularly exposed during an eight-hour working day, is that which is equivalent to 0.75 mg. Pb/10m³ (2µg/ft³). The higher volatility of TML increases the difficulty of keeping below this figure when Compounds contain TML, especially in the event of accidental leaks or spills.



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4. Blending Plant design

The introduction of TML has made it necessary to redesign the layout of the vacuum pump unit which is usually incorporated in the larger Octel blending plants. In the original design two absorption towers were placed on the low pressure side of the vacuum pump to absorb any toxic vapours drawn from the Octel weigh or storage tanks. Because of the higher volatility of TML it was found necessary to place these towers on the high pressure side of the pump, and also to rearrange the seal-water system.

Full design details are available from The Associated Octel Company Limited.

5. Fire and Explosion hazards

Octel Compounds are capable of producing flammable vapour at ordinary temperatures, but the amounts which can be produced are strictly limited and for this reason Compounds are not regarded as "highly flammable". Extensive spills of Compound in a confined space give rise to a vapour explosion hazard.

Liquid Compounds can be made to burn, the difficulty of ignition is comparable with kerosine or heavier hydrocarbon fractions.

Compounds are stable at ordinary temperatures but if heated, decomposition takes place. If the Compound is enclosed in a drum or other container, heating may lead to explosion.

Considerable heat is generated when Compounds are mixed with solid or undiluted strong oxidising agents such as bleaching powder, bromine, chlorates, dichromates, nitrates, permanganates, peroxides, etc. Such materials should never be stored near to Compound.

Permanent storage areas for drums and all storage tanks for Octel Compounds should be provided with water sprinkler systems or suitably sited fire fighting monitor nozzles. Electrical equipment should be intrinsically safe or flame proof to the standards applicable to gasoline or paraffin hydrocarbons (e.g. B.S.229 Group II). Smoking and the introduction of any source of ignition should be prohibited in all storage areas and blending plants.

The detection of flammable concentrations of vapour from TML Compounds cannot be made reliably with some explosimeters incorporating platinum catalyst filaments, due to poisoning of the catalyst by lead. This problem of detection is discussed in Octel Bulletin No. 13—The use of explosimeters in atmospheres containing lead alkyl compounds.



6. Protective Equipment

For normal blending operations involving exposure to Compound (opening or closing drums, containers or tankers) and in the event of minor spills occurring in relatively open situations the standard equipment recommended comprises overalls, cap, PVC gloves and apron, rubber boots and an approved canister mask (e.g. Siebe Gorman CC or equivalent).

With larger spills, particularly in any confined space, the much greater volatility of TML calls for special precautions to be taken to achieve adequate respiratory protection. Significant leakage of contaminated air can take place through the edge of the facepiece of a canister mask. With high concentrations of lead in air this may produce a hazard to health for those involved. Under such circumstances the use of a positive pressure air supplied mask is strongly recommended. If this is not available a self-contained open circuit breathing apparatus affords a higher standard of protection than a canister mask. In an emergency a canister mask may be worn for a short period to enable the extent of a spill to be assessed and immediate first aid measures to be effected. Such use should be restricted to open situations or only in the presence of TEL. It should never be worn in confined spaces where there may be high concentrations of lead alkyls or a deficiency of oxygen. Great care should always be taken to ensure that the best possible fit of the facepiece has been achieved.

7. Emergency Action—Spills

Should Compound be spilled, speedy application of the recommended procedures should be effected. The area should be cleared of persons not directly involved in dealing with the accident. Adequate protective equipment (see section 6 above) should be worn by all persons who are so involved. Further spread of contamination should be prevented immediately by plugging any sources of leakage of Compound and containing and absorbing any spilled material. Smoking or other means of ignition in the vicinity of the spill should be strictly forbidden.

With TML Compound due to the high volatility of TML, relatively rapid decontamination of smooth, impervious surfaces in open situations may occur simply by evaporation of residual Compound after absorption of any gross accumulation of liquid by suitable absorbent.

Full decontamination procedures for spilled Compounds are given in Tables 1-3.

8. Emergency Action—Fire

Water sprays should be applied to all containers of Compound threatened by fire to keep the contents at a reasonable temperature.

Burning Compound should be attacked by foam, dry powder or water as fog or fine spray, taking care not to spread Compound by forceful application of water.

Since burning Compound results in the emission of copious toxic fumes, suitable respirators should be worn by all personnel involved.

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Table 1—Decontamination Methods

Material	Procedure ^{1 2 3}	Remarks
Skin	Swab thoroughly with kerosine, gasoline, or light mineral oil as soon as possible. Then wash thoroughly with soap and water.	Solvent swabs must be burned.
Hard PVC and rubber (lightly contaminated)	Swab thoroughly with cloth dampened with gasoline, kerosine, light mineral oil, carbon tetrachloride or trichloro-ethylene. Repeat and dry thoroughly.	For light contamination only. Heavily contaminated articles must be burned. Solvent swabs must be burned. Certain types of rubber are damaged by mineral oils and should be destroyed by burning.
Smooth impervious surfaces—tools, steel decks, etc.	Absorb excess fluid with Rags, "Dresser-Dri", Sand, Sawdust, etc. Swab thoroughly with kerosine or gasoline. Wipe dry.	Avoid spread of contamination. Absorbents, swabs and solvents to be burned.
Rough or rusty metal ^{4 5} and other rough but impervious surfaces.	Absorb excess fluid with "Dresser-Dri", Sand, Sawdust, etc. Soak in potassium permanganate solution for several hours. Scrape surface and repeat. Hose or wipe clean.	Avoid spread of contamination. Absorbents and swabs to be burned.
Concrete	Absorb excess fluid with "Dresser-Dri", Sand, Sawdust, etc. Scrub twice with permanganate solution. Leave covered with solution for several hours. Hose or swab clean. Repeat procedure if necessary.	Avoid spread of contamination. Where contamination is heavy and penetration is deep, the concrete may have to be dug up and buried elsewhere.
Absorbent materials, Bitumen, Asphalt, Wood, Canvas, Leather, Fabrics, Rope, Rubber and PVC (heavily contaminated), etc.	NO EFFECTIVE DECONTAMINATION POSSIBLE. Material must be removed and burned or buried.	

- NOTES: 1. Always wear adequate protective clothing during decontamination of spills. As much Compound as possible should be removed before applying decontaminants.
2. **NEVER USE A DECONTAMINANT DRY, UNDILUTED OR WITH ANOTHER DECONTAMINANT SINCE A FIRE MAY RESULT.**
3. Burning or heating (say to dull red heat) converts organic lead compounds to lead oxides, etc. Where this method may be safely applied it is the preferable means of decontamination. Such lead oxides, etc., although poisonous by ingestion do not give rise to lead-in-air hazard.
4. Any burning should be carried out well away from the area of the spill and at least 50 yards from any habitation and preferably after the area has been decontaminated. Toxic fumes are emitted during burning of Compound.
5. TML vaporises quite readily. Small spills of Compound in OPEN SITUATIONS on surfaces where little or no penetration has occurred may often be adequately neutralised by allowing evaporation to take place. This procedure **MUST NOT** be applied in enclosed spaces nor with any compound containing TEL.
6. "Dresser-Dri" is available from the Magnus Chemical Co. Ltd., Uxbridge, Middlesex, England.



Table 2—Information on Decontaminant, Solvent and Absorbent Agents for Use on Lead Alkyl Spills

Decon- taminants	Description	Precautions in Handling and Storing	Solutions, quantities required, etc.		Application (Never use decon- taminations dry or with another decontaminant)
			Decontaminant in Diluent	Remarks	
Potassium Permanganate KMnO_4	Dark purple salt. Strong oxidising agent.	Store in air-tight container. Con- tact with skin will cause brown stains.	2 lb (1 kg) dis- solved in 4 gal (20 litres) 1:1 water-acetone mixture.	If acetone (flam- mable) not avail- able, use water only and add 50 ml detergent be- fore use	Suitable for decon- tamination of all materials especially concrete, wood, soil —provided penetra- tion has not been too deep. Stains may be later re- moved with dilute hydrochloric acid (HCl.)

Solvents or absorbents

Kerosine	Flammable	Avoid naked lights	Apply direct		Solvents dilute but do not destroy.
Gasoline	Flammable	Avoid naked lights	Apply direct		
Light mineral oils	Flammable	Store in metal container	Apply direct		
Carbon tetra- chloride CCl_4	Non-flammable Poisonous	Store in metal container	Apply direct		
Trichloro- ethylene $\text{CHCl}_2\text{CCl}_2$	Flammable Poisonous	Store in metal container	Apply direct		
"Dresser-Dri", or other absorbent clay.	Absorbent Clay	—	Apply direct		Absorbents are suitable for dam- ming or mopping- up spilled Com- pound.
Sand, dry earth, sawdust, rags.	—	—	Apply direct	Avoid using dry sawdust with potassium per- manganate or fire may result.	No destruction of Compound is achieved, and used absorbents must therefore be re- moved and treated with decontaminant or fire; the area of the spill should then be finally decon- taminated.



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Table — Materials and Methods for Sealing Leaks in Containers

Name and Description	Source	Remarks	Approx. Setting Time	Approximate Quantity for about 10 leaks	Other Items required	Method
1. S.77 Isophthalic resin (liquid) S.11 Catalyst (liquid) Fibreglass tape, open weave cloth as reinforcement.	The Fibro-Resin Corporation, 1914 West Burbank Blvd., Burbank, California, U.S.A.	This material is the best for making a strong permanent seal, and can be improved by adding powdered aluminium to the mixture.	30 min.	Resin: 1 pint (500 cc.) Catalyst (amount for 1 pint of resin: approx. 5 cc.) Fibreglass tape, 3 in. wide, 1 yard (1 metre).	Coarse emery cloth, sheets 2 Shallow tin, suitable for mixing 1 Putty knife 2 Scissors 1 Soft 1-inch paint brush 1	1. Clean round hole to bright metal and roughen with emery cloth. 2. Cut fibreglass cloth to cover hole and give good overlap (say 1 in. or 2 cm. round the hole). 3. Add requisite amount of catalyst to resin and stir well. 4. Soak fibreglass cloth in the mixed resin, and apply over hole. 5. Brush more resin over the cloth, especially at edges.
2. Hermetal Double Bond Putty; A and B putties supplied separately, to be mixed immediately, before use.	The Kenilworth Mfg. Co. Ltd., West Drayton Middlesex England.	This material requires no reinforcement, and is as effective as the S.77 resin, but takes longer to set (about 2 hours, setting time being shortened at higher temperatures).	2 hrs.	Hermetal Double Bond: Putty A—1 lb (500 g.) Putty B—1 lb (500 g.)	Coarse emery cloth, sheets 2 Putty knife 2	1. Clean round hole to bright metal and roughen with emery cloth. 2. Mix equal quantities of A and B components by hand to give putty-like texture. 3. Use the mixed material to plug the hole with excess material overlapping edges of hole.
3. Glycerine and litharge. Open weave cloth or fibreglass tape as reinforcement.	Most chemical suppliers.	This material is suitable for quick, temporary repairs, but the seal is less permanent and more brittle than the S.77 resin. The glycerine should be 30% (i.e. 30% glycerine, 70% water). The litharge should be finely powdered (preferably passing 200 mesh B.S. sieve).	20 min.	30% glycerine; $\frac{1}{2}$ pint (250 cc.) litharge: 1 lb. (500 gm.) Open weave cloth: $\frac{1}{2}$ sq. yd. ($\frac{1}{2}$ sq. metre).	Coarse emery cloth, sheets 2 Shallow tin, suitable for mixing 1 Putty knife 2 Scissors 1	1. Clean round hole to bright metal and roughen with emery cloth. 2. Cut cotton mutton cloth or fibreglass cloth to cover hole and give a good overlap. 3. Add the litharge to the glycerine until a thick paste is obtained. 4. Soak the cloth in the litharge paste, and apply over hole. 5. Add further paste over cloth, especially at edges.
4. Salt (sodium chloride) and zinc dust. Open weave cloth or fibreglass tape as reinforcement.	Salt: Any grocer or chemist. Zinc dust: Most chemical suppliers.	This material, made up as a paste using a saturated solution of salt in water with zinc dust, is adequate as a sealing material, but has a longer setting time (about 2 hours) than the glycerine/litharge cement; it is, however, less brittle.	2 hrs.	Salt: (sodium chloride) $\frac{1}{2}$ lb. (500 gm.) Zinc dust—1 lb (500 gm.) Open weave cloth: $\frac{1}{2}$ sq. yard ($\frac{1}{2}$ sq. metre).	Coarse emery cloth, sheets 2 Shallow tin, suitable for mixing 1 Putty knife 2 Scissors 1	1. Clean round hole to bright metal and roughen with emery cloth. 2. Cut cotton mutton cloth or fibreglass cloth to cover hole and give good overlap. 3. Add zinc dust to a saturated salt solution. 4. Soak cloth in paste and apply over hole. 5. Add further paste over cloth, especially at edges.

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