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WEDNESDAY, MAY 3, 2000

CASE STUDY

Testing of PetroGuard for use as hazardous chemical spill control at Huntsman Tioxide, England.

OBJECTIVE

To prove the suitability of PetroGuard, a granular polymeric spill control product, for the use as an emergency spill control as well as for routine maintenance procedures.

DESCRIPTION OF CHEMICAL TESTED

Titanium tetrachloride [7550-45-0] A colour-less to light-yellow liquid; fumes in moist air. AIR SENSITIVE; LACHRYMATOR.

IUPAC-Name:	Titanium tetrachloride
CAS-No:	7550-45-0
UN No:	1838
UN Package Group	II
Molecular Formulae	Cl ₄ Ti
Molecular Weight	189.73
Density	1.72-1.73 gm/cc

189.679

Synonyms: Titanic chloride; Tetrachlorotitanium; titanium chloride; Titanium (IV) Tetrachloride; Titanium (IV) chloride; Titanium chloride (T-4)-; Titanium chloride (TiCl₄) (T-4)-; Titanium Tetrachloride;

Titanium tetrachloride is a highly corrosive liquid, which fumes when exposed to air when water vapour is present, to generate a dense, white, cloud of hydrochloric acid mist and solid particles of hydrolysed titanium compounds. This chemical reacts very vigorously with water. During World War 2, titanium tetrachloride was used to generate smoke screens, because of its intense reaction.

Spill control techniques in dealing with this dangerous chemical have remained virtually unchanged since the 1950's. Techniques vary depending on the extent of the spill, its location and prevailing weather conditions. Flushing with water, containment by use of chalk, lime or dolomite and use of foam systems to limit fume generation are all options. However new technologies which may offer the potential to improve on existing methods of spill control are always being sought.

TESTING

Based on work done with silicon tetrachloride and various substituted silanes it was believed that titanium tetrachloride and organo titanates would be effectively absorbed and immobilised by PetroGuard, as has been demonstrated with silanes.

Preliminary laboratory work done by Huntsman Tioxide at their Greatham plant in England demonstrated that the fuming which occurs when tetrachloride is exposed to the atmosphere was very rapidly suppressed when PetroGuard was applied to the liquid chemical. The proportions used were approximately two to three volumes of PetroGuard to one of liquid tetrachloride. PetroGuard rapidly immobilised the liquid $TiCl_4$ into a solid mass from which only slight fuming was visible. This reaction appeared to be from the surface of the solid $TiCl_4$ matrix, where some free liquid was exposed to the atmosphere, and not from the interior sections, indicating complete suppression of the gas or vapour production. It was also shown that the resulting PetroGuard / tetrachloride solid mass, once free of unabsorbed tetrachloride was not reactive when exposed to water. The solid mass could then be easily handled and manipulated, demonstrating the potential use of this product for emergency procedures.

A further larger scale plant trial was then carried out which again demonstrated the highly effective nature of PetroGuard in rapidly stopping fume evolution from a titanium tetrachloride spillage. This test illustrates that when applied in proper ratios, this immobilising absorbent quickly prevents the production of fume. When applied in this way, response teams would be allowed time to determine further action as appropriate.

The positive results attained indicate that PetroGuard has great potential as an industry-wide spill control technology. Further testing is being done by several manufacturers and users of $TiCl_4$ to confirm testing carried out by Huntsman Tioxide in the UK.

Note: June 2002 will mark the final test for application of PetroGuard for reactive chemical response. Results will be presented to the manufacturer's association in Europe with the plan to include PetroGuard a part of the emergency response standards for the industry.