

IMPERIAL CHEMICAL INDUSTRIES LIMITED

PETROCHEMICALS DIVISION

SAFETY NEWSLETTER No.77

77/1 A FATAL ACCIDENT DURING VESSEL ENTRY

Many fatal or serious accidents and near misses have occurred because insufficient precautions were taken during entry to a vessel or other confined space. For example, see the following Newsletter items. Nine of the incidents occurred in ICI; the rest in other companies. All but one occurred during the last seven years.

- 4/2 The atmosphere was tested too near a man-hole.
- 4/2 There was a choke in the oxygen analyser.
- 13/6 A flammable deposit on the walls of the vessel caught fire.
- 18/6 Instead of connecting a compressed air hose to a vessel, a nitrogen hose was connected.
- 22/1 A man was willing to enter a vessel full of nitrogen to recover a rope.
- 28/5 A compressed air-driven light inside a vessel was driven by nitrogen.
- 34/1 A stand-by man did not know how to change over from an empty to a full compressed air cylinder.
- 35/4 & 37/5a Formation of rust used up some of the oxygen in a tank. The usual entry procedure was omitted because the tank contained only water and was not connected to any other equipment.
- 51/9 Three men entered a well (in 1812) to recover stolen beef which they had hidden in it.
- 55/1 A man stood on a ladder above a drain man-hole before putting on his life-line and breathing apparatus. He was overcome by fumes rising out of the drain, and fell into it.
- 59/4 A man entered a ship's pump-room without breathing apparatus to rescue another man who was overcome by fumes.
- 63/3 A visiting tanker driver entered a pit, without permission, to position a hose.
- 65/1 In an old factory, acid entered an excavation and reacted with limestone in the soil to produce carbon dioxide.
- 66/5 A supervisor went into a reactor to remove a piece of rubbish, fell and was knocked unconscious.
- 69/3 Some toxic liquid was trapped inside the bearing of a stirrer.

Now another incident has occurred in one of our overseas companies. It took place in a factory where chlorine and caustic soda are made from common salt. The chlorine and the caustic soda are treated with great care, but the salt is normally considered a harmless material.

The salt is stored in round hoppers which have a conical base. They are 16 feet in diameter and 22 feet high. The salt flows out by gravity, but sometimes it sticks to the side. Three men were instructed to loosen large quantities of salt which were stuck to the walls.

One man was lowered on a lifeline to the bottom of the hopper well below the level of the salt which was sticking to the walls. He tried to loosen the salt with a shovel and a water hose.

Suddenly a large quantity of salt slid down and buried him to a depth of 5 feet. By the time he was dug out he was dead.

The men concerned probably did not realise how easily loose salt can slide and that it is impossible to pull out a man who is buried in the salt. At the Works concerned the employees are given considerable freedom in the way they do their jobs. Admirable as this is in many ways, it is not a suitable philosophy where vessel entry is concerned. Before anyone enters a vessel or other confined space a senior supervisor should satisfy himself that suitable precautions have been taken and issue a written permit to enter. In the UK this is required by the Factories Act, Section 30.

77/2 ANOTHER TANK IS SUCKED IN

Newsletters 42/1 and 47/5b described eight ways in which tanks have been sucked in. One of the methods was tying a polythene bag over the tank vent.

Believe it or not, but this has happened again. The pressure-vacuum valve was removed for overhaul from an empty tank. To keep the tank clean a piece of polythene sheet was tied over the end of the vent. A few days later the plant was short of storage space and it was decided to use the tank to store a high boiling liquid. A pressure-vacuum valve is not necessary for this material.

As the liquid was pumped into the tank the air was forced out past the polythene sheet. When the tank was emptied the polythene sheet was pulled tight against the vent and the tank collapsed. Everybody on the plant was surprised to find that the polythene was stronger than the tank.

In the earlier incident, described in Newsletter 47/5b, there was nothing at all in the tank when it collapsed. It was a hot day, there was a sudden shower of rain and this cooled the tank sufficiently to suck it in.

A six page supplement, "How Strong is a Storage Tank", was issued with Newsletters 9 and 59. We can let you have a copy.

77/3 TWO INCIDENTS COMPARED

ICI 1967

ANOTHER COMPANY 1974

What Happened?

A pump had to be dismantled. When a fitter removed a cover, hot oil came out and caught fire. Three men were killed, and the plant was destroyed.

A pump had to be dismantled. When a fitter removed a cover, hot condensate came out and sprayed him. He received second degree burns to his neck, shoulders and feet.

The suction valve had been left open

The suction valve had been left open.

The supervisor checked that the suction valve was closed but a short time elapsed before work started. He issued a clearance (permit-to-work) for work on the bearings but later in the day it was decided to dismantle the pump.

The operator thought the fitter was going to work on the coupling only. Therefore he locked-out the pump motor but did not close the suction valve.

The fitter did not notice that the suction valve was open, although he hung something on the projecting spindle of the open valve.

The fitter did not notice that the suction valve was open although it was only one foot from the pump.

WHAT SHOULD BE DONE

Valves isolating equipment under maintenance must be locked shut with a padlock and chain and in addition, the equipment must be isolated by slip-plates (or an equally effective means) unless the job to be done is so quick that fitting slip-plates will take as long and be as dangerous as the main job. Plants must be designed so that slip-plates can be inserted safely (for details see Engineering Specification PR 0310, available from your Works Drawing Office or from Standards Section, Extension P.2646).

If there is a change of intention and work is required outside the scope of the clearance certificate then the original certificate must be withdrawn and a new one issued.

77/4 A DESIGNER VISITS A PLANT— AND HAS A SURPRISE

A design engineer recently had to visit a plant where full protective clothing has to be worn, pvc suit, wellingtons, gloves, goggles and hard hat—the full regalia. While climbing a cat ladder he realised that our standard design does not give enough room for people wearing full protective clothing.

On his return he suggested the following changes to our specification, for plants where full protective clothing has to be worn:

- (a) Platforms should be at least 1 metre wide.
- (b) Staircases should be used whenever possible instead of ladders. If ladders are used they should be at 5 degrees to the vertical.
- (c) The rungs should be special extra width to give more footroom.

77/5 ANOTHER AIR COMPRESSOR FIRE

Newsletters 45/1 and 47/9b described some fires in air compressor delivery lines and listed the precautions necessary to prevent them occurring, in particular, keeping the delivery temperature below 140°C and keeping the delivery pipework clean. (See *a/so Newsletter 54/12d*).

A fire has now occurred on an air compressor in the Division, although the discharge temperature of the air was only 90 °C. The discharge piping became very hot and was on the verge of bursting.

The fire occurred because the compressor is an oil-injected rotary one, and, as is normal on these machines, the oil is removed from the discharge gas by a reclaimer or separator and recirculated. A very large surface area of oil is exposed to the air and some oxidation occurs. The heat evolved is removed by the air and the oil. If the air flow is reduced or the oil flow stops, the oil in the reclaimer can get so hot that it catches fire.

To prevent fires occurring on rotary air compressors the compressor should be tripped if the oil circulation stops or the air is 20°C or more above the normal discharge temperature (usually about 100°C). Lubricating oil should be changed as recommended by the manufacturers. Frequent changes may be necessary, perhaps as often as every 1000 hours. For more details, talk to Dennis Summers-Smith (B.3065).

Rotary compressors can overheat in another way. On this type of machine a minimum flow has to be maintained to prevent surging. This is normally achieved by recycling some of the delivery gas through a kick-back line. The kick-back should come after the after-cooler or the recycled gas may get too hot.

77/6 ALUMINIUM PAINT

Another company has reported that a shower of sparks was produced when a steam trap which had been painted with aluminium paint was struck with a “non-sparking” hammer. As stated in Loss Prevention Guide No. 11, aluminium paints should not be used except when production of an incendiary spark does not matter. For example, it can be used on a furnace.

Loss Prevention Guide No 11 also gives advice on the use of aluminium. Fixed items of aluminium, as distinct from thin smears or films, are normally permissible so far as sparking is concerned but the widespread use of aluminium is not recommended because it is destroyed so easily in a fire.

77/7 SOME QUESTIONS I AM OFTEN ASKED

12—WHY DOES THE PETROCHEMICALS DIVISION BOARD ISSUE SO FEW DIRECTIVES ON SAFETY?

Some of my colleagues in other Companies seem to spend a lot of their time persuading their Boards to issue directives. I feel it is better to persuade people, at all levels, to do what I think they ought to do. For example, it is better to persuade them not to tie polythene sheets over tank vents than to ask the Board to instruct them not to do so.

Whenever instructions are given, people still have to be persuaded that the instructions are reasonable and should be carried out. Otherwise they will not carry out the instructions with energy and enthusiasm (if indeed they carry them out at all). If we have to persuade them in any case, then do we need instructions?

Of course, it is not quite as simple as this. One can persuade 90% of the people, but it is sometimes difficult to persuade the last 10%. If it is a very important matter we may have to get the Board to issue an instruction so that this 10% are brought into line, but only after most people are agreed that what we want is reasonable. For this reason there are instructions on entry to vessels and the isolation of equipment for maintenance. But the number of instructions should be kept small. With the time and effort it takes to get them agreed, 90% of the people can be persuaded to take a few more actions.

77/8 FLAMMABLE OR INFLAMMABLE?

As pointed out in Newsletter 48/3, the words “flammable” and “inflammable” mean the same — the material will burn. On the whole we prefer to use the word “flammable”.

A recent paper argues, very amusingly, the case for the word “inflammable”. The following are some extracts from it.

“.... any liquid having a flash-point below 73°F must be marked ‘inflammable’ — according to the 1971 Labelling Regulations, whereas liquids with a flash-point below 90°F may be marked ‘highly flammable’ according to the regulations subsequently made by the Department of Employment.

Obviously it is time that the various UK Government Departments decided to use the same adjective to denote that a particular substance or preparation is liable to inflame or catch fire. The choice is between the word ‘inflammable’ which has long-since appeared in English dictionaries, or ‘flammable’ which is listed in recent English dictionaries as being ‘American’~

*The adjective ‘inflammable’ is derived from the English verb ‘to inflame’ and this has its origin in the Latin verb *inflammare*. Other words such as ‘inflamed’ ‘inflammation’ and ‘inflammatory’ are, of course, derived from the same verb. As there is no verb ‘to flame’ (one cannot flame anything), the adjective ‘flammable’ does not exist nor has it (yet) been suggested— even by those who advocate using ‘flammable’— that one should speak of flamed tissue or of flammation of the eyes. Indeed, even in today’s American literature and in EEC publications the terms ‘inflamed’ and ‘inflammation’ are still used.*

There are, of course, many words in English in which ‘in...’ is used as a negative prefix — but there are many words where this is not so. One says that a chemical can cause intoxication or that a person is intoxicated, but this does not call for the invention of another verb ‘to toxicate’ Indeed, if one accepts the curious premise that words beginning with ‘in...’ have to be abandoned (in order to avoid confusion?) one could arrive at an interesting (teresting?) situation whereby a distribution manager might announce his tention of troducing a new system for dealing with the creasing number of dents and voices.”

A copy of the complete paper is available on request.

77/9 UNUSUAL ACCIDENTS No. 47— A TANK IS OVERFILLED.

The accident is not unusual, only the nature of the spillage.

Hundreds of gallons of malt Scotch whisky flowed into the sea when stillman Angus Bowie pressed a button too soon at a distillery on the Sound of Islay, Western Isles.

The button allowed the whisky to flow into warehouse vats ready for the barrels. But the vats had not been completely emptied of the previous week's supply. The Scotch flooded the warehouse, then ran into the sea. Sunday Times, 23 February 1975.

77/10 RECENT PUBLICATIONS

- (a) The Company have published a handbook for the drivers of powered industrial trucks; copies can be obtained from Central Stationery Stores, Millbank.
- (b) An article by two Amoco engineers shows that suspected leaks in underground gas pipelines can be located by covering the ground with fire-fighting foam and looking for the place at which gas can be seen bubbling through the foam. Leaks in underground liquid lines can be located in the same way if the liquid is displaced by nitrogen.
- (c) Who are ICI's experts on

Agitation
Below ground
Crystallisation
Drying of solids
Extraction
and other engineering subjects?

If you would like to know see the new edition of "Divisional Contacts for Some Engineering and Allied Subjects", obtainable from Engineering Services Department, Head Office.

- (d) Two more Codes of Practice have now been published for the safe design, construction and use of plants producing or consuming hazardous chemicals. They are:

Bromine Report No HO/SD/73006/6

Ethylene Oxide Report No HO/SD/73006/7

Copies can be obtained from Division Reports Centres. A list of the other Codes appeared in Newsletter 70/7.

For a copy of (b) or for more information on any item in this Newsletter, please phone E.T. (P.2845) or write to her at Wilton. If you do not see this Newsletter regularly and would like your own copy, please ask Mrs T to add your name to the circulation list.

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SUPPLEMENT TO SAFETY NEWSLETTER No 77

The diagram illustrates a problem which we met while uprating an old plant.

Two new sources of heat were required, a feed vaporiser heated by pump-circulated hot water and a new steam heated reboiler. Calculations indicated that the two existing relief valves on this section of the plant would not afford adequate protection in the uprated system against a downstream block in.

Because of limitations in the relief-header system, additional protection could not be achieved by re-sizing the existing relief valves. One possibility was the installation of a third relief valve with its own header, but this would be very expensive.

What would you do?

The solution we devised is described in "Chemical Engineering", May 12 1975, page 81. We can let you have a copy.

