

IMPERIAL CHEMICAL INDUSTRIES PETROCHEMICALS DIVISION

SAFETY NEWSLETTER NUMBER 40

By Trevor Kletz

40/1 A FIRE IN AN EMPTY FLOATING ROOF TANK

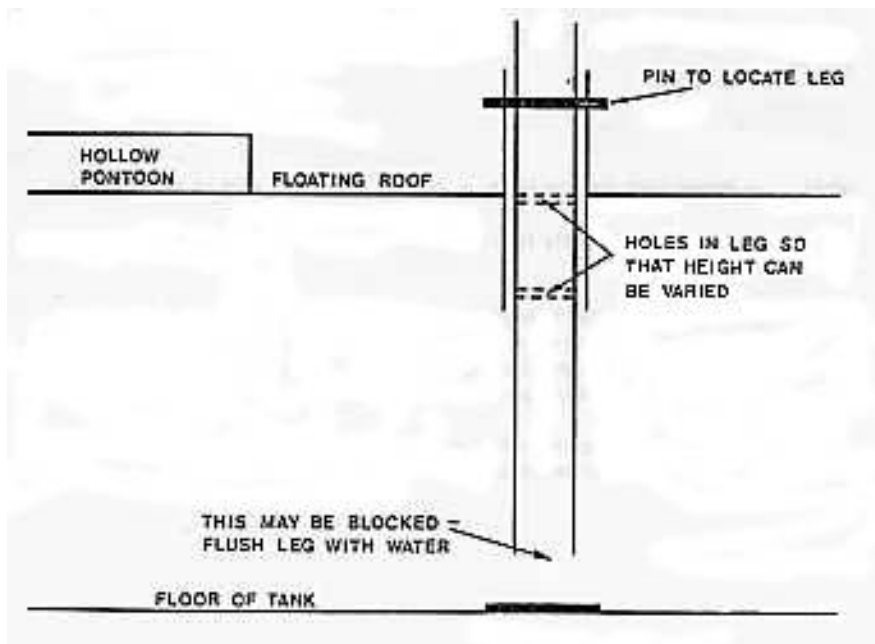
The roof of a floating roof tank had to be replaced. The tank was emptied, purged with nitrogen and steamed for 6 days. Each of the float chambers was steamed for 4 hours. Rust and sludge were removed from the tank. Demolition then started.

Fourteen days later a small fire occurred. About a gallon of petrol came out of one of the hollow legs which supports the roof when it is off float, and was ignited by a spark. The fire was put out with dry powder.

It is believed that the bottom of the hollow leg was blocked with sludge and that as cutting took place near the leg it moved and disturbed the sludge.

In future, before welding or burning is permitted on floating roof tanks, the legs should be flushed with water from the top.

On some tanks the bottoms of the legs are sealed. Holes should be drilled in them so that they can be flushed through.



40/2 DO NOT OBSTRUCT VENT OUTLETS

Seen in the Division:

A vessel was fitted with an explosion vent. The vent was fitted with a hood to protect it from the weather and a baffle to protect anyone who happened to be standing in front when it went off.

The result of all this protection was that the area available for flow was less than the area of the vent and in addition the vented gases had to go round some corners. This could have resulted in over-pressuring the vessel.

Vent outlets must not be obstructed.

40/3 A TANK EXPLODES

An incident in another Company shows what can happen if a tank is opened up before it has been gas freed.

A bottom man-hole was removed from a tank which was empty but still full of petrol vapour. Vapour came out of the man-hole and caught fire. As the vapour burnt, air was sucked into the tank through the vent until the contents became explosive and the tank blew up.

From the Bulletin, The Journal of the Society for Petroleum Acts Administration, October 1970, page 68.

40/4 A FORK LIFT TRUCK HITS A VALVE AND A PLANT IS DESTROYED

On several occasions recently fork lift trucks have collided with plant and caused minor damage.

"Fire Prevention", July 1971, page 43, describes a fire which started when a fork lift truck hit a valve on a crude oil distillation plant in Essex. This caused a leak of hot oil which caught fire. Other joints started to leak and the fire spread. In the end the whole unit was destroyed.

It may be worth surveying the routes used by your fork lift trucks to see if there are any places where they could cause serious leaks of flammable or poisonous materials.

The same issue of "Fire Prevention" describes a number of fires which occurred after oil had been spilt on water. It also describes several instances in which petrol was spilt and disappeared but came to the surface several years later after heavy rainfall.

40/5 ALUMINIUM CLADDING FOR LAGGING

Lagging on pipes and vessels has to be provided with weather protection. In non-corrosive atmospheres galvanised iron sheet can be used but it is not suitable for use on Teesside and aluminium sheet is used instead. The aluminium is secured with stainless steel bands; self-tapping screws are not satisfactory. Though a fire will destroy the aluminium, the stainless steel bands keep the lagging in place and prevent flaming fragments of aluminium falling off.

Sometimes a moisture-proof paper is attached to the aluminium. On several occasions, including a recent incident in another Division, the paper has encouraged the spread of fire.

Aluminium sheet should not be used with a paper backing. Other types of moisture protection such as a chromate primer should be used instead.

40/6 THREE YEARS AGO

"Another Division has now described another explosion in a centrifuge which resulted from the failure of the nitrogen blanketing. There was no alarm system on the supply and no regular analysis for oxygen content. There was no clearly visible indication of the flow of nitrogen. Ignition was caused by the friction between parts of the machine. The report on the incident recommends that:

- a The oxygen content of the gas within the centrifuge should be continuously monitored or regular checks should be made using portable equipment.
- b The purge nitrogen system should be modified to give a clearly visible indication of the flow to the machines."

From Safety Newsletter No. 10, May 1969

40/7 DO WE LEARN FROM OTHER PEOPLES' EXPERIENCE?

In 1965 two Handley Page Herald airliners crashed with the loss of 116 lives.

The cause was found to be "extensive internal skin corrosion" so that the skin ruptured when the plane reached a high altitude. Following these incidents all airliners of this type were thoroughly inspected to make sure that corrosion had not occurred.

These incidents might have provided a general warning of the need to look regularly for hidden corrosion. However; they were considered as something peculiar to Heralds and of little interest to the operators of other aircraft.

In 1971, a Vanguard crashed with the loss of 63 lives. The cause corrosion of the bulkhead, a part of the plane that is difficult to inspect.

This story is taken from the Sunday Times for 12 December 71. Has it got a message for us?

When an accident occurs we usually take steps on the plant concerned to make sure it cannot happen again. But on other plants, are we always so thorough?

For example, what about the incident described in the last item? On the plant concerned they have modified their centrifuges. Have you checked yours?

Perhaps the incident does not interest you as there are no centrifuges on your plant. What about other equipment which should be blanketed with nitrogen, such as flare stacks, vent stacks and storage tanks? Are you sure the blanketing is operating correctly? Is the oxygen content checked regularly? When did you last see the figures? Is there a flowmeter on the nitrogen line so that the flow can be checked? Do you know what flow is necessary? (If not, see the item below).

40/8 LOSS PREVENTION GUIDES

"Somebody did a note on this a couple of years ago but I can't remember who it was"

"This came up last year. There's a note in the file on what we decided to do but / can't find it"

How often have we said something like this. For this reason we have been trying to summarise and index our recommendations so that they are readily accessible. The summaries are called "Loss Prevention Guides". Twelve have been issued so far and more are in preparation. Here are extracts from a few of them:-

From No. 1, Relief Valves

Exclusion of Air

Flammable mixtures of gases or vapours with air should not be permitted in vent or flare stacks. To this end all-welded construction should be employed and joints should not be made except between machined surfaces. Maintenance on live systems should be carried out in such a way that ingress of air is avoided and the system should be purged with inert gas.

Oxygen monitoring should be carried out continuously on big stacks, at least daily on smaller ones. In the presence of hydrogen the oxygen content should not exceed 5% (preferably 4%). For hydrocarbons in the absence of hydrogen, up to 10% oxygen is permissible but a target of 5% should be set.

When hydrogen is present the minimum velocity in the stack should be 0.25 ft/sec, for hydrocarbons heavier than air 0.1-0.2 ft/sec. Inert or fuel gas should be used to maintain these rates and concentrations. Flowmeters should be used on these gas streams in preference to flow indicators.

From No. 9, Thermal Radiation.

Permitted Radiation Levels

The currently permitted radiation levels in Petrochemicals Division are as follows:

1.7 kw/m² (500 BTU/hr/ft²) for exposure of the general public or for continuous working.

5 kw/m² (1500 BTU/hr/ft²) for short time exposure of personnel.

13 kw/m² (4000 BTU/hr/ft²) for control room externals.

From No. 12, Electrical Area Classification

Pumps

The horizontal extent of the Division 2 Area varies with the volatility of the material being pumped. For pumps fitted with external throttle bushes, the distance varies from 10 m for naphtha below 10000 to 30 m for a C₃ stream, the vertical height being 1.5 m in both cases.

The subjects covered so far by the Loss Prevention Guides are: -

<u>Guide No</u>	<u>Title</u>
1	Pressure Relief
2	Hazard Analysis
3	Furnace Fires and Explosions
4	Vessel Entry Certificates
5	Storage Tanks
6	Static Electricity
7	Permits-to-Work and Isolation of Plants for Maintenance
8	Liquefied Flammable Gases - Safety in Plant Design and Operation
9	Thermal Radiation
10	Ignition Sources and Explosive Mixtures
11	Aluminium and Light Metals - Incendive Sparks
12	Electrical Area Classification

The following will be issued soon:-

13	Flame Arrestors
14	Some Toxic Hazards
15	Cylinders
16	Electric Cables
17	Flexes
18	Gas Detectors
19	Leaks

The Loss Prevention Guides can be obtained from your Division Reports Centre by asking for Report No 0.200,698/1-19/A.

You may also be interested in Safety Note 71/11A which lists all the reports on safety which we have issued during the last few years.

40/9 WHAT THE LAW SAYS, NO. 1

“(A person) is not of course, bound to anticipate folly in all its forms, but he is not entitled to put out of consideration the teachings of experience as to the form those follies commonly take.”

A House of Lords judgement quoted in ‘The Guardian’, 7th February, 1966.

40/10 UNUSUAL ACCIDENTS NO. 10

“A girl who felt the need of a snack during a break period had a harrowing experience.

She had two hard boiled eggs, already peeled, that she put in a microwave oven for a quick warm-up. They hadn’t been in the oven very long and were not hot to the touch when she bit into one.

An explosion ripped the egg apart sending yolk all over the place, but mostly over her face and eyelids. She was also burned on the lips, tongue and cheek.

It was no hand grenade - just an egg. But the microwave oven heated the interior and the hard boiled egg white was just strong enough to hold it together. Safety people were able to duplicate the egg explosion.

Microwave ovens have their merits, but also their problems. Nothing, particularly a can - nor as it seems, even an egg - that has a non-porous casing should be warmed in such an oven.”

MCA Case History No. 1769, quoted in the Quarterly Safety Summary of the British Chemical Industry Safety Council, October-December 1971.

40/11 RECENT PUBLICATIONS

- (a) "Summary of the methods of calculation of Rates of Escape of Flammable Materials from Chemical Plant and Dispersal of Resultant Vapour & Gas Clouds", Report No 0.21,372/B by H G Simpson, available from Division Reports Centres.
- (b) "Explosion Hazards in the Chemical Industry", a summary of a symposium held at Manchester on 16 and 17 September 1971, Report No MD.13,685/A by D J Lewis, available from Division Reports Centres. The report includes a detailed Code of Practice and purchasing specifications for nitrogen blanketing a centrifuge.
- (c) The Royal Institute of Chemistry have published a new edition of "Hazards in the Chemical Laboratory" by G D Muir, price £2. It lists 430 materials commonly used in laboratories and gives details of their toxic and fire hazards, methods of disposing of spillage and first aid.
- (d) Report No 0.200,751/A, available from Division Reports Centres, gives brief details of 100 fires and explosions in the oil and chemical industries that have been reported in the press during 1970 and 1971. The report has been prepared in order - to draw attention to the large number of incidents that occur and. to make it easier to locate details of past incidents.

For more information on any item in this Newsletter please write to Miss M N, Organic House, Billingham or ring B.3927. If you do not see this Newsletter regularly and would like your own copy please ask Miss N to add your name to the circulation list.

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