IMPERIAL CHEMICAL INDUSTRIES
PETROCHEMICALS DIVISION

SAFETY NEWSLETTER NUMBER 36

By Trevor Kletz

36/1 PORTABLE GAS ALARMS

Portable gas alarms have been needed for a long time. They are now available and a big increase in safety can be obtained at a low cost.

If we have to do a welding job in an area where flammable liquids and gases are handled, we test the atmosphere beforehand with a combustible gas detector such as a Sieger or MSA. If the test is negative, a fire permit is issued, usually valid for the rest of the day.

During the day, a leak may develop and may be set alight by the welding.

For a long time, we have needed a gas detector which could be set down near the welder and which will make a warning noise if a leak occurs. Now several devices are available and two are recommended. They have been officially approved for electrical safety.

The Sieger 1601 is a big robust yellow machine, known as the Dalek. It is very loud and can be heard on a noisy plant. If necessary, the sensory head can be 10 metres away from the machine. It costs about £200.

The Draeger Normalair is lighter and costs only about £100 but does not make such a loud noise. It is suitable for use in confined spaces where there is not much noise and the Sieger might be difficult to carry.

Every Works should have several of these instruments and within a year or so it should be normal practice to use them whenever burning or welding is taking place (unless the plant is shut-down and gas free or there is a permanent gas alarm nearby). They should also be used when diesel engines are operating inside the plant area.

Mr E Y (Extn B.2771) of Instrument Development Group can supply further details.

Another new instrument that has been developed by Sieger and is now available in a pocket-size device which sounds an alarm if the amount of oxygen in the air gets too low. It costs £55. In a few years it will be normal practice to use them on every vessel entry job. Now is the time to order one and try it out. Again, Mr Y can supply details.

36/2 STEAM TRACING ON INSTRUMENTS SHOULD BE CHECKED REGULARLY

The lines leading to orifice plates, pressure gauges and other instruments are steam traced if the process material Is liable to freeze, for example, if the process material Is benzene, cyclohexane, steam or a viscous oil.

If the steam tracing freezes up, for example, because a steam trap is choked, then the instruments will not work. This caused a serious fire in another company.

A furnace feed pump tripped out but the flowmeter was frozen up and the low flow trip did not operate. Two tubes burst causing a long and fierce fire. The structure and tubes of the furnace were seriously damaged and the stack collapsed.

In cold weather the steam tracing on key instruments should be inspected regularly. A good plan is to make It part of the trip test routine.

36/3 IN A FIRE, SHOULD WE EMPTY PLANT VESSELS OR LEAVE THEM FULL OF LIQUID?

In Newsletter 28, Item 7 I suggested that in a fire plant vessels containing liquid should be depressured but *not* emptied as the evaporating liquid cools the vessel.

I would like to thank those readers who sent me their comments. Few disagreed but several additional points were made:

If the people on the job feel that a liquid leak is likely to develop, then it wilt be safer to empty the vessel.

If a vessel is protected by fireproof thermal insulation, the Insulation must stand up to water jets. If the insulation is seriously damaged it may be safer to empty the vessel.

Vessel skirts are the most vulnerable part of a vessel and must be fireproofed.

If some vessels are depressured, they may get so cold that they become brittle. We must make sure that they cannot be depressured accidentally.

If a pipeline is exposed to a fire, try to keep the liquid flowing in order to absorb heat and prevent overheating of the pipeline.

In a paper presented to the Symposium on Loss Prevention held in Newcastle in July (see Newsletter 35, Item 10), the Shell Chemical Safety Co-ordinator, P J Klaassen, advocated leaving the liquid in a vessel:

"A prolonged fire may heat up various parts of equipment to such a temperature that the strength of the metal is reduced considerably.

Two methods can be used to reduce this danger:

(a) Emergency liquid blowdown

(b) Emergency vapour depressuring

For emergency liquid blowdown, facilities are provided to lead the liquid contents of the various vessels, columns, and so forth away from the plant area to a safe place. This can either be done by remotely (pneumatically or hydraulically) operated valves or by locally operated valves which have then, of course, to be situated in a safe place, so that they can be operated even if the plant is on fire. Although both systems in principle offer the possibility of removing the bulk of the liquid content in a reasonable time, they also have some disadvantages such as: -

1 By removing the liquid from columns and vessels one removes, at the same time, the cooling effect of the boiling liquid inside the equipment if there is an outside fire. This may lead to overheating of the construction material and to failure of the equipment.

2 The piping involved has to be installed at a low elevation and will, therefore, normally be in a vulnerable area below vessels and columns where pumps and the like are very often located. Such areas normally constitute the major fire hazard.

3 If locally operated valves are used the number of pipes under process pressure and at low elevation will be substantially increased.

In our opinion vapour depressuring has the following advantages: -

1 The depressuring valves can normally be located at a reasonable elevation so that they are in a less vulnerable area in case of fire.

2 As they are situated in the vapour space there is less chance of fouling from sediments.

3 In case of leakage, of which the chance is comparatively small as indicated above, this will be a vapour leak so that the loss of product is reduced.

4 Not much extra piping is involved because in most cases the piping can be installed as a by-pass over a relief valve.

5 The pressure within the equipment can be reduced within a reasonable time to near atmospheric.

We take as a basis for the sizing of such depressuring valves the requirement that the pressure inside the equipment should be reduced from operating pressure to 50% of design pressure within 10 minutes. Finally the pressure in such equipment will drop, of course, to near atmospheric".

If a fire occurs on your plant do not rush in and empty the vessels. In most cases it would be safer to leave them full - provided they can be depressured. On many plants this can be done through existing valves provided for process reasons.

It has been agreed that on new plants it will be possible to depressure all sections of the plant operating above (say) 30 psig. If necessary remotely operated by-passes will be fitted round some of the relief valves.

36/4 MANAGERIAL RESPONSIBILITY AND SAFETY

"With the workers of 70 years ago the only way to obtain strict observance of the regulations was by having a rigid disciplinary system. This necessitated the employment of those whose sole function was to ensure that all rules were observed, and severe penalties were meted out to offenders.

Times have changed and such an attitude on the part of management is out of character in the present industrial climate, which recognises that the present day employee is an intelligent, thinking person who does not require to be rigidly disciplined by outsiders with rules for which he may not know the reasons, but can be expected to exercise self-discipline.

While we would not suggest that a return should be made to the regimentation of 70 years ego, we do feel that the level of awareness of the operators to the hazards to which they may be exposing themselves, has not increased at the same rate as has the level of personal responsibility which has been delegated to them."

Extract from the Report of Her Majesty's Inspectors of Explosives for 1970.

The Inspectors remarks are illustrated by the following incident:

36/5 AIR + FUEL = BANG

On one of our plants waste product is dissolved in methanol. Waste product is put into an empty vessel. The vessel is boxed up and evacuated and the vacuum is broken with nitrogen. Methanol is then added. When the product has been dissolved, the solution is moved to another vessel, the dissolving vessel is evacuated and the vacuum broken with nitrogen. It is then ready for the start of another batch.

If this system is followed an explosion is impossible as air and methanol are never mixed.

However the operators got into the habit of adding methanol as soon as the waste product was in the vessel, without bothering to evacuate or add nitrogen. One day a fire occurred. One man was injured, fortunately not seriously. The source of ignition was never found.

It is easy to say that the fire was caused by the operators not following the rules. But why didn't they follow the rules? Have we as managers and supervisors failed to give them the right *"level of awareness …… of the hazards to which they may be exposing themselves".* Have we failed to teach them that mixtures of fuel and air will catch fire, even though we keep out all known sources of ignition?

36/6 FOUR YEARS AGO - AND TODAY

"A hose, fastened by a Jubilee clip, came apart and sprayed a man with liquid. Jubilee clips are not suitable for industrial use ....."

From Safety Newsletter No. 1, May 7968.

"…… another man has been injured in the same way. This time it was an air hose that burst and the end of the hose hit someone in the eye".

From Safety Newsletter No. 2, June 1968

"..... a man was injured when a Jubilee clip failed to holds flexible hose on to a steam connection".

From Wilton Site. Safety Report, 1st Quarter, 1970

"..... a man' a feet were sprayed with hot water when a hose came off a connection; this hose had been secured with a Jubilee clip".

From a Wilton accident report, November 1971

USE BOLTED CLIPS, NOT JUBILEE CLIPS

36/7 DO WE HAVE TO PUT STORAGE TANKS IN BUNDS?

As storage tanks get bigger, so do bunds. In an article in the Bulletin, The Journal of the Society for Petroleum Acts Administration, October 1970, page 66, J. R. Hughes of BP suggests two alternatives:

1 Sloping the ground towards a catchment pit, which could serve a number of tanks.

2 Building a double-skin tank. If the inner tank is damaged or overfilled, the outer tank will hold the spillage.

36/8 UNUSUAL ACCIDENTS NO. 6

A girl attendant at a Brighton petrol station put three gallons of petrol into the engine of a rear-engined van, instead of into the petrol tanks. The engine burst into flames as soon as the ignition was switched on. The manager said the driver himself had removed the oil filler cap on the engine, watched the girl put the petrol in, and then said: "I've a funny feeling you've put it in the wrong hole."

The Guardian, 23rd June 1971

36/9 RECENT PUBLICATIONS

(a) Notes on some of the papers presented at the Loss Prevention Symposium held in San Francisco in November 1971.

(b) *"Accidents in the Oil Industry, No. 4",* a report from one of the oil companies on some incidents which have occurred during the loading and unloading of tank wagons.

(c) *"Hazard Analysis — A Quantitative Approach to Safety",* a reprint of a paper presented to the Symposium on Loss Prevention held in Newcastle In July 1971.

(d) "Some Notes on Numerate Decision Making or the Quantification of the Unquantifiable", Report No. 0.200,739/A, available from Division Reports Centres.

(e) The Report on the 3rd inter-Divisional Meeting on Fire & Explosion Hazards (Report No. 0.21,317/B) contains papers on the discharge of flammable vapours to atmosphere, the dispersal of flammable vapours by water sprays and steam curtains, electrostatic hazards associated with jets, sprays and mists, aerial detonations and the design of explosion cubicles.

For copies of (a), (b) or (c) or for more information on any other 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.

January 1972

FROM A NOTE FOR CONTRACTORS

"There are No Smoking restrictions" I wonder what was meant.