

IMPERIAL CHEMICAL INDUSTRIES PETROCHEMICALS DIVISION

SAFETY NEWSLETTER NUMBER 44

By Trevor Kletz

Congratulations to Services Works on working a million hours without a lost-time accident.

44/1 A VESSEL IS RUPTURED BY UNAUTHORISED PRESSURISATION WITH COMPRESSED AIR

A redundant vessel, intended for use at atmospheric pressure, had been installed on a plant structure by contractors. They decided to pressure test it and as they were unable to find a water hose to match the hose connection on the vessel they decided to test it with compressed air. They connected up a hose and the vessel reached at least 25 psi before it ruptured and damaged the structure. Fortunately the men concerned escaped without injury.

It is possible that the men concerned did not understand the difference between a pressure test, normally carried out with water, and a leak test, often carried out with compressed air at a pressure well below the test pressure.

This incident shows the need to define the limits of contractors authority.

It should be made quite clear to all contractors, including our own internal contractors, that at least two Permits-to-Work are required for the construction or installation of new equipment.

The first Permit is required to construct or install the equipment.

A separate Permit is required to connect the new equipment to existing plant, either temporarily or permanently. It is good practice for this connection to be done by the Works rather than by the contractor.

Once this connection has been made all work on the new equipment must be done under the normal Permit-to-Work system with close inspection by Process before each Permit is issued.

It is not sufficient to send copies of our instructions to the contractor's headquarters. We must make sure that the contractor's supervisors on the job are fully aware of them.

Pressure testing should be carried out under the supervision of a competent person who makes sure that the condition of the vessel is satisfactory and specifies the test conditions.

A compressed gas stores more energy than a compressed liquid; if failure occurs the hazard is greater; proof testing with compressed air is therefore permitted only in very special circumstances. The special requirements relating to pneumatic proof tests on vessels are detailed in BS 1515, Section 5.5.4 and in ICI such tests can take place only with the written agreement of the Division Engineering Director, as stated in the ICI PV Code, Group B, Vol. 1.4, Section 12.6. Special requirements relate also to pneumatic proof testing of pipelines and are to be found in ICI Specification B80. (See Safety Newsletter 28, Item 6).

44/2 A SIMILAR ERROR BY A CONTRACTOR

An incident similar to the one just described occurred a few years ago during the construction of a

new storage tank. The contractors decided to connect up the nitrogen line to the tank. They knew better than to connect up any process lines without authority but nitrogen was inert and, therefore, they thought, safe. They put the new tank on balance with the nitrogen blanketing supply to an existing tank, though isolated by a valve. This valve leaked; vapour entered the new tank with the nitrogen and was ignited by a welder. The roof was blown off the tank and it landed some distance away, in a patch of empty ground just big enough to contain it!

44/3 COMPRESSED AIR IS POWERFUL

The incident described in Item 44/1 above shows once again that many people do not realise how much energy is contained in compressed air. They look upon it as relatively harmless and are unaware of the damage it can cause.

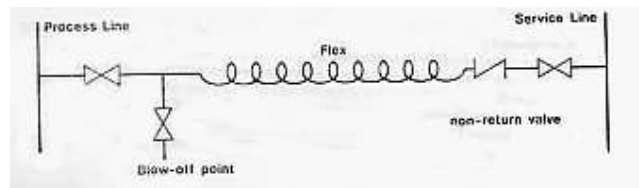
Two men were killed a few years ago when the line into a storage tank was being blown with compressed air to prove that it was clear. The vent pipe was choked. As a result the end of the tank was blown off. It was known that the vent pipe was liable to choke but this was looked upon as an inconvenience rather than a danger. Many of those concerned with the plant did not realise that the air pressure could burst the tank. (See Safety Newsletter No. 5, Item 2).

There have been a number of incidents in other companies in which men have been injured as a result of fooling about with compressed air hoses. A RoSPA leaflet on the subject is available on request.

44/4 THE WRONG AND THE RIGHT WAY TO RELEASE THE PRESSURE FROM A FLEX

Before removing a hose a man tried to drain it by loosening the coupling nut. Hot water came out of the coupling and scalded him. In the past, men have been burnt by corrosive chemicals in this way.

Whenever flexes are used at pressure, a valve should be provided for blowing off the pressure, as shown below:-



The best place for the blow-off point is at the process end as then it can be used to prove that the flex is clear, before it is used.

As mentioned in Newsletter 38, Item 2, we can let you have a list of suitable flex materials for the various liquids we handle.

44/5 STOPPING LEAKS BY FREEZING PIPES

The use of 'Drikold' and a liquid such as isopropanol for freezing water lines is now well established. One of the Works in Petrochemicals Division recently used 'Drikold' to seal off the suction and delivery lines of a large pump handling a liquid of freezing point 5°C. This allowed them to remove the pump for maintenance although the isolation valves were passing. The pressure of the liquid was 200 psig.

Further details are available on request. Note that an isolation made in this way should not be used to carry out an entire maintenance job but only to stop a leak while a slip-plate is inserted or a line is broken and blanked. Furthermore, a line should not be opened even to insert the slip-plate when the

only isolation is the frozen chemical. Freezing should be used to back-up a leaking valve; it should not be the only restriction.

A materials specialist should be consulted before pipelines, except stainless steel pipelines, are frozen.

See also item 46/5.

44/6 WHEN LIQUID OR GAS IS DISCHARGED TO ATMOSPHERE THERE IS A REACTION FORCE ON THE PIPE

When liquid or gas under pressure is released to atmosphere a reaction force is exerted on the vent or drain pipe. This reaction force can be very large and vent and drain pipes must, therefore, be securely fixed.

The supplement to Occupational Safety and Health, July 72 describes a fatal accident which occurred because a drain pipe was loose. The blow-down valve on a boiler discharged at a considerable height above the floor and a length of pipe had, therefore, been connected to the blow-down valve by a screwed elbow. Another elbow had then been attached to the bottom of the pipe so that the hot water and steam could be discharged horizontally into a convenient drain pipe.

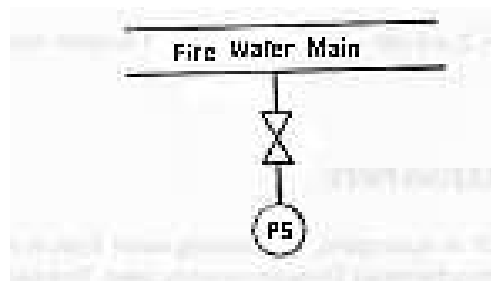
The blow-down valve was normally cracked open. One day it was accidentally opened fully. The outrush of steam and hot water caused the pipe to whirl round at high speed striking a man and knocking him to the floor where he was scalded with boiling water. He died later in hospital.

44/7 SPOILING THE SHIP FOR A HA'P'ORTH O' TAR

Sometimes we spoil a ship for a ha'p'orth o' tar, not because we want to save money but because we do not realise where the extra ha'p'orth o' tar is needed.

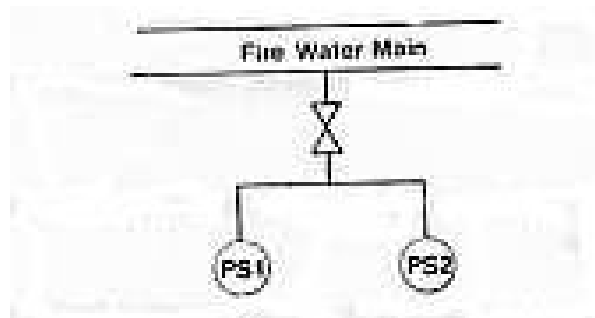
If an instrument is not sufficiently reliable we often duplicate it. The following example, taken from a Mond Division Safety Report, shows one of the pitfalls.

A pressure switch was installed on a fire water main as shown below.



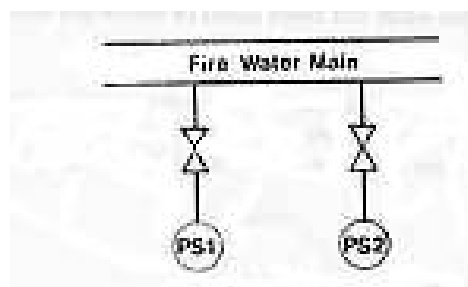
When the pressure in the main falls it is detected by the pressure switch and a pump is automatically brought into service. This happens about ten times per year. In addition, the system is tested about ten times per year to make sure it is working. Calculations show that we can expect the system to fail to work when needed once in 3.2 years.

This is not good enough so a second pressure switch was installed as shown below.



Surprisingly, this system is not much more reliable. It will fail to work on demand once every four years. This is because the most likely fault in the system is the choking of the impulse line and duplication of the pressure switch has not affected this.

A better system is shown below.



The impulse line has been duplicated as well as the pressure switch and the system will fail to work when needed once every 77 years.

The system shown in the first diagram is like wearing two pairs of braces but fastening them to the same buttons. Buttons are more likely to break than braces so we have not increased the reliability very much. If we wear two pairs of braces we should fix them to an extra set of buttons.

44/8 WHAT THE LAW SAYS, No 5

The Factories Act has a long history. The Bible tells us:— "When thou buildest a new house, then thou shalt make a battlement for thy roof, that thou bring not blood upon thine house, if any man fall from thence." (*Deuteronomy, Ch. 22, v. 8*) In the East the roofs of houses were often used as extra living space, so "Battlements" were needed to prevent people falling off.

A medieval commentary on the Bible, probably quoting older sources, states that the "Battlement" should be ten hand-breadths high. This is about 3 ft 4 in (if one-hand breadth equals 4 in).

The construction regulations issued under the Factories Act state that every workplace in which a man is liable to fall more than 6 ft must be securely fenced with a fence between 3 ft and 3 ft 9 in high.

Some laws have not changed very much.

44/9 THREE YEARS AGO

"Two recent incidents in the Division show the importance of working strictly within the limits defined on a Permit-to-Work and not going outside them.

In the first incident a Permit-to-Work was issued for modifications to the walls of a room. The

maintenance workers started work on the ceiling as well and cut through some live electric cables.

In the second incident a Permit-to-Work was issued for welding on the top only of a tank which had been removed from the plant. When welding was complete the welders rolled the tank over and started work on the bottom. Some residue which had previously been covered by a layer of water caught fire.”

From Safety Newsletter No. 13, September 1969.

44/10 UNUSUAL ACCIDENTS NO. 14

The July Emergency Services Report from a Petrochemicals Division Works states that two operators were overcome by sunstroke!

44/11 THE ROBENS' REPORT

The Report of the Committee on Safety and Health at Work, Chairman Lord Robens, was issued in July 1972. The following are some extracts from it.

“Our deliberations over the course of two years have left us in no doubt that the most important single reason for accidents at work is apathy.

We believe that by patient and unremitting effort it is possible to raise the status, so to speak, of the subject of safety and health at work in the minds of individuals. We should like to see it eventually command something like the degree of interest and attention commonly accorded to other subjects such as industrial relations — where the problems may be more controversial but are often less real and important in terms of human wellbeing. (Paragraph 13)

“The first and perhaps most fundamental defect of the statutory system is simply that there is too much law. The nine main groups of statutes are supported by nearly 500 subordinate statutory instruments containing detailed provisions of varying length and complexity. They are added to every year. The existence of such a mass of law has an unfortunate and all-pervading psychological effect. People are heavily conditioned to think of safety and health at work as in the first and most important instance a matter of detailed rules imposed by external agencies. *The primary responsibility for doing something about the present levels of occupational accidents and disease lies with those who create the risks and those who work with them.*” (Paragraph 28)

“We recommend, therefore, that greater emphasis should be placed in future on standard-setting by means of non-statutory codes of practice and standards. As a general rule statutory regulations should only be made when the alternative of a non-statutory code or standard has been fully explored and found wanting.” (Paragraph 147)

“The new legislation should contain powers enabling the proposed Authority to publish lists of voluntary codes and standards which they regard as conforming to the general purposes of the Act.” (Paragraph 152)

“We recommend that inspectors should have the power, without reference to the courts, to issue a formal Improvement Notice to an employer requiring him to remedy particular faults or to institute a specified programme of work within a stated time limit.” (Paragraph 269)

“In addition, an alternative and stronger power should be available to the inspector . . . He should be able to issue a Prohibition Notice.” (Paragraph 276)

“Inspectors should have power to issue improvement notices in individual cases, taking into account not only any relevant statutory regulation but also any relevant voluntary code or standard that has been formally approved by the Authority”. (Paragraph 1 53)

“The existing separate safety and health inspectorates for factories, mines, agriculture, explosives, nuclear installations and alkali works should be amalgamated to form a unified service within the new Authority”. (Paragraph 476)

“An important area for further research is the quantitative assessment of accident probability Until fairly recently, relatively little sophisticated work had been done on the question of establishing and comparing the probabilities of particular types of accidents. In essence, quantitative hazards analysis seeks to assign a numerical probability to each factor relevant to a particular happening and, by combining these, to arrive at some measure of the probability of an accident taking place The approach can be applied at various levels to a wide variety of problems as a contribution towards establishing priorities on an objective and systematic basis”. (Paragraph 414)

The complete report can be purchased from the Stationery Office or borrowed from your safety offices or division library.

44/12 RECENT PUBLICATIONS ETC.

- (a) Safety Note 72/12, “Overfilling of Road and Rail Tank Wagons — The Problem and the Action Required”.
- (b) American companies are more willing than we are to allow relief valves to discharge flammable materials to atmosphere. Are we being too careful? Safety Note 72/13 lists a number of fires which have occurred in recent years because relief valves have discharged to atmosphere.
- (c) Safety Newsletters Nos. 32 43 have been bound together and issued as Report No. 0.200,762/A, available from Division Reports Centres.
- (d) In seven 25 minute television programmes to be shown on BBC 2 on Tuesdays starting on 3 October, “Workers at Risk” examines new attempts being made to identify, control and eliminate hazards at work.
- (e) Please let us know if you would like a copy of our 1973 Safety Calendar. If you get our monthly calendars you will get one automatically.

For copies of (a) or (b) or 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.

September 1972