IMPERIAL CHEMICAL INDUSTRIES LIMITED

PETROCHEMICALS DIVISION

SAFETY NEWSLETTER No. 82

82/1 I THOUGHT WE WERE BETTER THAN THIS

The following occurs in a note by an Instrument Manager on the testing of trips and alarms:

"Obtaining the positive commitment and involvement of Process has always been difficult. It appears to Instrument/Electrical staff that Process regard this as an unwelcome task and give it less than enthusiastic attention and a low priority. For Instrument/Electrical section alarm and trip testing is one of our most important activities. It is a responsibility we will not neglect, but we would appreciate wholehearted support from Process at all levels."

If a trip fails to operate then it is Process who have to cope with the resultant plant upset, spillage, fire or explosion. It should be Process who are most concerned to see that trips are tested regularly.

Perhaps this Works is exceptional and elsewhere Process do give wholehearted support?

82/2 SOMEBODY DOES NOT READ A CLEARANCE CERTIFICATE CAREFULLY AND AN ACCIDENT NEARLY OCCURS

One day a clearance certificate was issued to remove a pump for overhaul; the pump was defused, removed and the open ends blanked. Next morning the maintenance supervisor signed the clearance to show that the job - removing the pump - was complete.

The morning shift lead operator glanced at the clearance, and, seeing that the job was complete, he asked the electrician to replace the fuses. The electrician replaced them and signed the clearance to show that he had done so. By this time the afternoon shift lead operator had come on duty. He went out to check the pump and found that it was not there.

The job on the clearance was to remove the pump for overhaul. Clearances are often issued to remove a pump, overhaul it and replace it, but in this particular case the clearance was just for removal. When the maintenance supervisor signed the clearance to show that the job was complete, he meant that the job of removal was complete. The lead operator however, did not read the clearance thoroughly and assumed the overhaul was complete.

The message is clear: Read clearances carefully; don't just glance at them.

In addition, when handing over or handing back a clearance, the maintenance and process people should speak to each other. It is not good practice to hand over or hand back a clearance by one person signing it and then leaving it on the table for the other man to sign when he comes in.

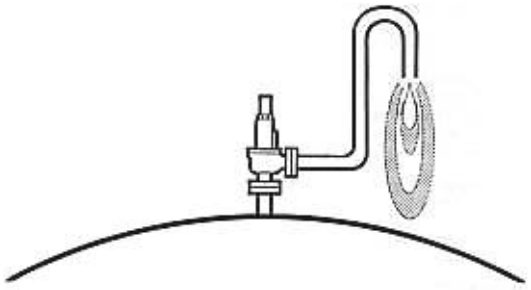
82/3 FIRE RELIEF VALVES WHICH DISCHARGE TO ATMOSPHERE

Sometimes fire relief valves on liquefied flammable gas containers or other pressure vessels are allowed to discharge to atmosphere.

The discharge from the relief valve may fire, but this will not matter provided the flames do not impinge on any equipment. It is most important to make sure that the flames cannot impinge on the vessel itself. Failure to do so has caused several serious fires.

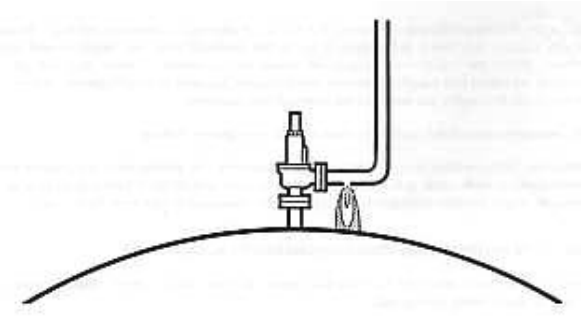
In July 1956 19 firemen were killed at Sun Ray, Texas, when a sphere containing a mixture of pentane and hexane at 15 psig ruptured.

The relief valve lifted because the tank was overfilled and the vapours ignited at a furnace 350 feet away. According to the National Fire Prevention Association Quarterly, October 1956, p. 77, the relief valve tail pipe was fitted with a return bend to keep out rainwater.



This caused flames to impinge on top of the tank and the metal got so hot that it lost its strength and burst, even though the pressure was only 15 psig. The sudden failure of the tank produced a huge ball of burning vapours which killed the fire-fighters, though they were 300-400 feet away. **Spectators 1,200 feet away were injured.**

It seems incredible that a relief valve tail pipe could be designed in this way and another report is more likely to be correct. According to this version a small drain hole on the relief valve tail pipe allowed a small flame to impinge on the vessel and weaken it.



The precautions necessary to protect pressure vessels against fire are described in an article in “Fire Prevention”, May 1974, p. 17 (copy on request). They are:-

Sloping the ground so that spillages do not accumulate underneath the vessel.
Thermal insulation
Cooling with water
Lowering the pressure in the vessel

Cooling with water might not be effective in cases such as those illustrated where an intense torch is impinging on the vessel.

It is important to make sure that this cannot occur. Drain holes should be located or shaped so that flames coming from them do not impinge on plant equipment. {See also Newsletter 84/5(b) and (c)].

The incident at Sun Ray also emphasises another point:-

KEEP WELL AWAY FROM A FIRE IF THERE

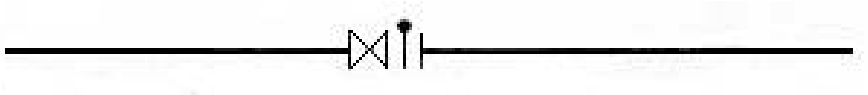
IS NOTHING YOU CAN DO. SPECTATORS

ARE NOT WANTED.

It is a curious fact that an explosion sends people running — but if there is a fire they come out to watch.

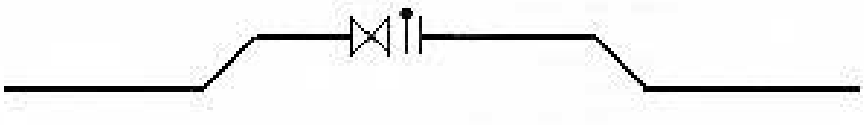
82/4 LINES SHOULD BE SLIP-PLATED AT HIGH POINTS RATHER THAN LOW POINTS

Suppose a pipe-line has to be slip-plated regularly:

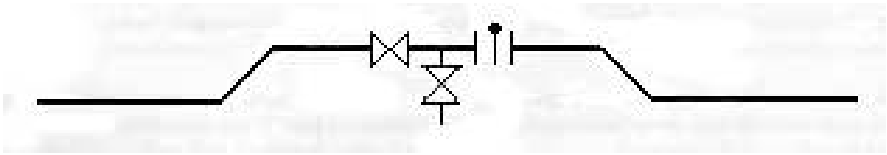


Even if the pipe-line is blown clear, some liquid will run out when the joint is broken.

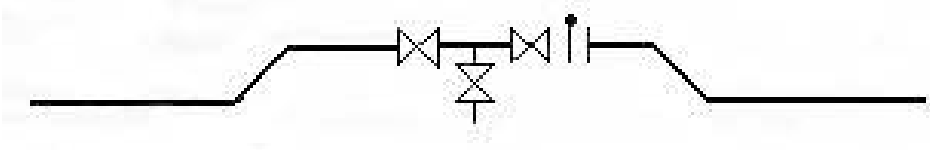
The amount of spillage can be reduced by making a rise in the pipe at the slip-plate position.



For highly flammable, toxic or corrosive materials it is usual to fit a drain point, but even so it is a good idea to reduce the amount of spillage in this way.



Note: For highly flammable, corrosive or toxic materials above 300 psig it is usual to fit a double block and bleed.



For details see Engineering Specification PR 0310.

82/5 WELDING ON STORAGE TANKS WHICH HAVE CONTAINED HEAVY OILS

Earlier Newsletters (18/7e, 24/6 and 51/2) have described a number of fires and explosions which occurred while welding was taking place on tanks which had previously contained polymers or high boiling materials. Although attempts had been made to clean the tanks, some residue was stuck to the sides or roof, possibly behind rust or between lap-welded plates. This residue was vaporised by the welder's torch and then exploded.

It is almost impossible to clean completely tanks which have contained heavy oil or material which polymerises, and these tanks must, therefore, be filled with nitrogen before welding or burning is allowed. Filling with water can reduce the volume which has to be inerted. Foam generated with nitrogen can be used instead of pure nitrogen and does not leak out so readily.

Some people have suggested that the tanks should be filled with foam generated with air. Tests undertaken on behalf of the Health and Safety Executive have shown that foam made with air is not satisfactory and will not prevent fires occurring. It cannot be used to make a tank safe for welding.

82/6 NON-SPARKING TOOLS — A MAGIC CHARM TO WARD OFF EXPLOSIONS?

Newsletter 72 summarised a paper on some myths of the chemical industry—deeply ingrained beliefs that are not wholly true. (The full paper appears in "Loss Prevention and Safety Promotion in the Process Industries", Elsevier Publishing Co, 1974, page 309, and we can let you have a copy). Another myth was discussed in Newsletter 81/3.

"Non-sparking" tools provide another example of a myth. They seem to be regarded as a sort of magic charm to ward off explosions, though a series of reports over thirty years has shown that they have little value.

The American Petroleum Institute has published a Safety Data Sheet, No PSD 2214, which summarises these reports. It does not say when the tools were first introduced, but as far back as 1930 a number of engineers were asking if they were really necessary. In 1941 an API report showed that it was very unlikely that petroleum vapour could be ignited by the impact of steel on steel produced by hand, and that power operation is required to produce an incendive spark. It may be possible to ignite hydrogen, ethylene, acetylene and carbon disulphide by the impact of steel on steel using hand tools, but we should never let anyone carry out a maintenance job in an explosive atmosphere of hydrogen, ethylene or anything else.

Safety Note 69/7, issued in 1969, recommended that non-sparking spanners should never be used as they are poor as spanners, but that where hydrogen, ethylene, acetylene and carbon disulphide are handled, non-sparking hammers should be available for use in hardening up leaking joints. If possible the use of hammers of any sort for this purpose should be avoided. Non-sparking spanners should not be used even for hardening up leaking joints; it is better to use a good solid spanner and harden up the joint as quickly and effectively as possible.

There is no harm in using non-sparking hammers for all purposes but it is an unnecessary expense. Care must be taken that small particles of grit do not get embedded in the hammers or they will be more dangerous than steel ones.

Copies of the API Data Sheet and of Safety Note 69/7 are available on request.

82/7 A RAILWAY ACCIDENT CAUSES A FLAMMABLE GAS EXPLOSION

Railways provide many illustrations of the principles of accident prevention (see Newsletter 80/6 and the supplement to 76). A recent incident tells us something about the psychology of accidents. It occurred

because two major companies went on blaming each other for a year for minor incidents, neither company taking positive action, until finally a major incident occurred.

The full story is published in an official report from the National Transportation Safety Board. In 1974 a rail tank wagon containing butadiene was shunted at excessive speed; it ran into an empty wagon and was punctured. The butadiene escaped and a few minutes later the vapour cloud exploded. One man was killed, 15 were hospitalised and another 220 received minor injuries.

The excessive speed of the tank wagon was due to contamination of the wheels and track with resin which prevented the braking system working properly. A number of similar incidents had occurred during the previous year. After the first incident the railway company asked a local factory, a branch of a major international company, to take steps to prevent resin getting on wagon wheels. The company said that they thought that this was not the cause, and that it was due to faults in the retarding equipment in the marshalling yard. The meetings between the company and the railroad seem to have been rather acrimonious, judging by the correspondence and the minutes reproduced in the report. For example, "After ca. 45 minutes of disparaging remarks relative to our operation in this area, Mr - - - addressed me saying if this was anyone but - - -, and in consideration of the gross revenue they received from this plant, he would spike our switches and leave them".

Meanwhile, similar incidents continued to happen, but neither side took any preventative action. The company continued to send out contaminated wagons and the railroad did not inspect the wheels to see if they were contaminated. Like two small boys the company and the railroad went on blaming each other. Finally, one of the incidents resulted in rupture of a butadiene wagon. The correspondence between the company and the railroad is reproduced in the report, no doubt to the great embarrassment of both parties.

The full report is entitled "Hazardous Materials Accident at the Southern Pacific Transportation Company's Englewood Yard, Houston, Texas, September 21, 1974", Report No NTSB-RAR-75-7, and can be obtained from the National Transportation Safety Board, Washington, DC 20594. The NTSB publish reports on railroad, road and pipeline accidents and will add to their mailing list any organisation with a legitimate interest in the subject.

82/8 SOME QUESTIONS I AM OFTEN ASKED

17 DO YOU PUT FORWARD MINIMUM STANDARDS?

CAN WE GO FURTHER THAN YOU SUGGEST SO LONG AS WE DO NOT DO LESS?

Many of my colleagues in other companies call the standards they put forward "minimum standards". Individual works or design engineers can do more if they wish, but they may not do less.

I have never felt very happy about this arrangement. The resources available to spend on safety are large but they are not unlimited; there is only so much time and money and effort. If we spend too much on one plant or problem, there is less left for others. So I feel we should try to pick out the biggest hazards and deal with these first. If I see an individual putting too much effort into the removal of a small hazard, I try to persuade him not to do so.

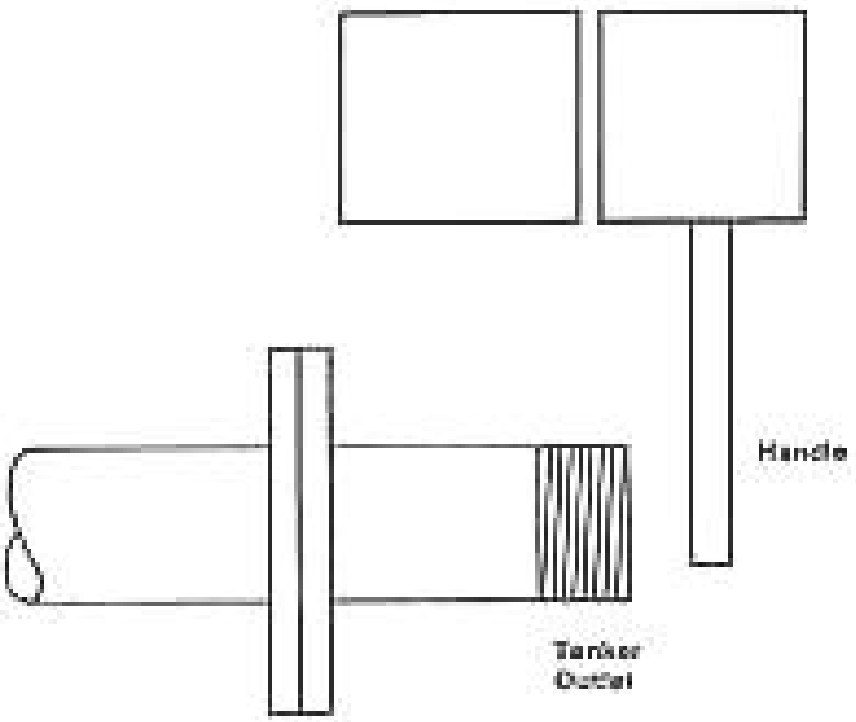
Of course, most of my time is spent persuading people to do something which will make the plant safer. But quite often I say, "There is no need to do that; the hazard is slight. Let's spend our time and effort on dealing with this bigger hazard first".

82/9 A SIMPLE DEVICE TO PREVENT ROAD TANKERS DRIVING AWAY BEFORE THEIR HOSES HAVE BEEN DISCONNECTED.

On many occasions road and rail tank wagons have been driven away before the filling or emptying

hoses have been disconnected. See Newsletter 50/2. Now a cheap and simple device is available to prevent this happening.

A handle is fixed in front of the point on the tanker to which the hose is connected. To attach the hose this handle has to be moved to one side. This movement of the handle puts the brakes on and they cannot be released until the hose has been removed and the handle put back to its original position.



The device costs less than £50 and it is being fitted to all ICI Wilton road tankers. A variation is being designed to fit above the manhole lids of tankers which are top filled. It will then be impossible to drive the tanker away before the manhole lid has been closed.

Further details of the device can be obtained from R.R. Productivity Services Manager, Petrochemicals Division, Wilton (Telephone Eston Grange 4144, Extension 6203).

82/10 "PROTECTION OF PRESSURE VESSELS AGAINST EXCESSIVE TEMPERATURE"

A recent Report, No H0/SD/740010/2, on this subject was mentioned in Newsletter 79/7a. Section 3.2 of the Report describes and illustrates the use of an infra-red camera to detect hot spots on the outside of a vessel, a technique known as thermography. Another technique which can be used is thermal imaging. In this technique the surface of the vessel is scanned with a pyrometer and the results displayed on a television screen. Details can be obtained from Physics and Radioisotopes Services, Petrochemicals Division, Billingham.

82/11 SEVEN YEARS AGO

When tankers are filled with LPG and similar low-boiling materials the vapour is vented to a stack or back to the plant through a vapour return line which is fixed to the top of the tanker. The Annual Report

of the Inspectors of Explosives for 1967 describes a fire at a large oil refinery which occurred because the fillers had not bothered to connect up the vapour return lines and were venting tankers to atmosphere. Seven men were severely burnt.

Within the last few weeks it has been found that the operators on one of our plants were also forgetting to connect up the vapour lines.

From Safety Newsletter No 6, December 1968

82/12 UNUSUAL ACCIDENTS No 52

Several Newsletter items have drawn attention to the unforeseen results of changes in plants and processes. The following incident shows how difficult it is to foresee all the results of a change and how effects can be produced a long way downstream of the place where the change is made.

Some radioactive bromine (half-life 36 hours), in the form of ammonium bromide, was put into a brine stream as a radioactive tracer.

On another plant 15 miles away the brine stream was electrolysed to produce chlorine. Radioactive bromine entered the chlorine stream and subsequently concentrated in the base of a distillation column which removes heavy ends. This column is fitted with a radioactive level controller. The radioactive bromine affected the level controller which registered a low level and closed the bottoms valve on the column. The column became flooded. There was no injury, but production was interrupted.

Reminder: Newsletters 8/4 and 43/8 reported false readings on radioactive level indicators as a result of pipeline radiography 70 yards away. Another incident occurred earlier this year.

82/13 INCENTIVES

A Works achieved a million hours without a lost-time accident.

The Safety Officer received

A cheque for £100
A plaque
A bill for £75 for the plaque!

For more information on any item in this Newsletter please ‘phone Mrs E.T.(Ext. 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.

Best wishes to all our readers for a Merry Christmas and a Safe New Year.

December 1975

82/14 SOME COMMENTS SEEN OR HEARD DURING THE YEAR

1. *Whether the bear was too strong for the cage, or the cage too weak for the bear, may be a subject for investigation.*

Daily Mail.

2. *You might think a man is very experienced after five years on the plant but it might be five years of nothing.*

A process operator.

3. *The dewpoint of the instrument air is always -20°C but sometimes it is difficult to get a sample because of water in the air line.*

A laboratory supervisor.

4. This report analyses the accidents that have occurred to ICI employees, broken down by age and sex.

A statistician.

5. *If it works, it's obsolete.*

US electronics industry.

6. A year in which there are a large number of fires will be a good year for wine. Both are results of a hot summer.

Anonymous.

7. "If a manhole or other kind of escapeway is designed to suit the 'average man' HALF THE PEOPLE CANT GET THROUGH IT."

From "Safety Matters" published by Organics Division

8. Don't relax because you are following the book — it may be out of date.

A comment made at one of our weekly discussions.

[Note added later: A foreman once said to me, "We are having a lot of problems with the laboratories. I had to send them six samples before they gave me the right answer." TAK.]