IMPERIAL CHEMICAL INDUSTRIES
PETROCHEMICALS DIVISION

SAFETY NEWSLETTER NUMBER 48

By Trevor Kletz

48/1 RELIEF VALVE REGISTERS — SOME ITEMS THAT ARE SOMETIMES MISSED

Every Works maintains a register of relief valves. It shows the size of each valve, its duty, how often it should be tested, and so on.'

The registers should include certain special sorts of relief valves, and items which restrict flows and thus affect the size of relief valve required. Are the following included on your register?

1. The simplest relief valve of all a hole or an open vent pipe

The size should be registered. Regular checks should be made to make sure the hole is clear and that its size has not been altered. On some plants an annual check may be sufficient. On other plants, where vent pipes are liable to choke, a daily or shiftly check may be necessary.

2. A vent pipe fitted with a flame trap

The flame trap should be inspected regularly to make sure it is clear. Tanks have been sucked in because the flame traps have not been kept clean.

3. A restriction plate controlling the flow into a vessel or the input of energy to a vessel. If this restriction is taken into account in sizing the relief valve on the vessel, it should be registered and checked regularly. Do not use a slip-plate with a hole drilled in it —it can be removed too easily. Use a length of narrow pipe or weld a restriction plate to a bobbin piece.

4. If a control valve limits the flow into a vessel or the energy input into a vessel and this has been taken into account in sizing the relief valve, then the size of the trim should be included in the relief valve register. Some Works put labels on these control valves. Labels tend to disappear, so in one works, the following is stamped on the instrument data books.

"TRIM SIZE AFFECTS RELIEF VALVE SIZES. DO NOT ALTER WITHOUT INSTRUMENT MANAGER'SAPPROVAL" -

Of course, not all control valves have to be registered in this way. Very often, the size of the control valve by-pass determines the size of the relief valve.

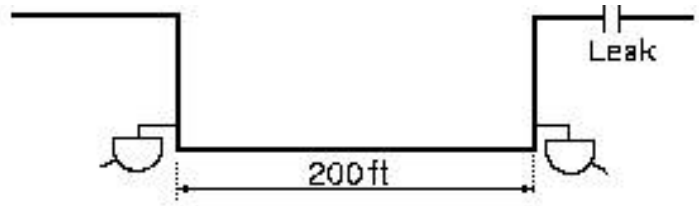
5. Non-return valves used as part of a relief system should be included in the register and inspected at a prescribed interval. Because non-return valves are less reliable than relief valves, before they can be accepted as part of a relief system they have to be duplicated or, better, supplemented by an alternative device such as a reverse rotation lock. (The first fatal accident to occur at Billingham (April, 1924) was the result of a non-return valve failing and allowing gas at high pressure to pass backwards through a pump into a low pressure gas line.)

48/2 ANOTHER STEAM MAIN IS DAMAGED BY WATER HAMMER

Newsletter 43, Item 4, described how a steam main burst, injuring several men, as the result of

water hammer. Report No. 0.200,760/A gives a full report of the incident.

Now another incident has occurred. There was a dip in a steam main with a trap at each end.



The traps were not working. The flow was small and the main filled with condensate. When the flow was increased the sudden movement of the water caused two loud bangs and a flange started to leak at the point shown.

The report recommends:-

Before *requesting the operation of a valve on a steam supply main (LP or IP) which* will result in a significant change in flow, either in quantity or direction, any low points in the main must first of all be proved clear of condensate. Recognition must be taken of the fact that isolation of a valve on a ring main can cause a large increase in flow through other parts of the system and the possible results of this must be carefully examined.

Operation of the valve must then be done in a slow and steady manner.

48/3 FLAMMABLE OR INFLAMMABLE?

The letters “in-” at the beginning of a word usually mean ‘not’. Thus “indestructible” means “not destructible”.

“Inflammable” however means the same as “flammable” the material will burn. Which word should we use?

According to the Petroleum Consolidation Act all tanks containing hydrocarbons with a flash point below 73°F must be labelled “Highly Inflammable”

According to the Highly Flammable Liquids Regulations, which come into force in the middle of 1973, all tanks containing non-hydrocarbons with a flash point below 90°F must be labelled “Highly Flammable”.

Teesside Fire Brigade, who are responsible for administrating the Petroleum Acts in the Teesside area, have agreed that “Highly Flammable” may be used in all cases.

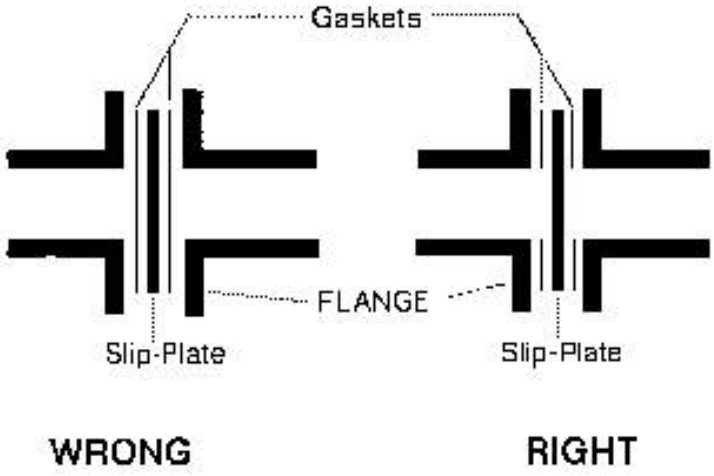
48/4 DON’T USE FULL DIAMETER GASKETS

Two incidents in the Division have drawn attention to this point.

In the first incident a full diameter gasket was used with a slip-plate. When the slip-plate was removed the gasket was left in the line. Flow could not be established through the line until the gasket burst. The sudden rush of liquid caused a leak.

In the second incident a mild steel blank was put on the end of an acid line. The mild steel corroded causing a leak of acid. The first reaction on the Works concerned was to say that a full diameter

gasket should be used in future. However, this is not good practice as the gasket may leak. Furthermore it is possible when breaking the joint to leave the gasket behind and it might then be blown off by trapped pressure. The blank should be made of the same material as the pipeline so that it is resistant to corrosion.



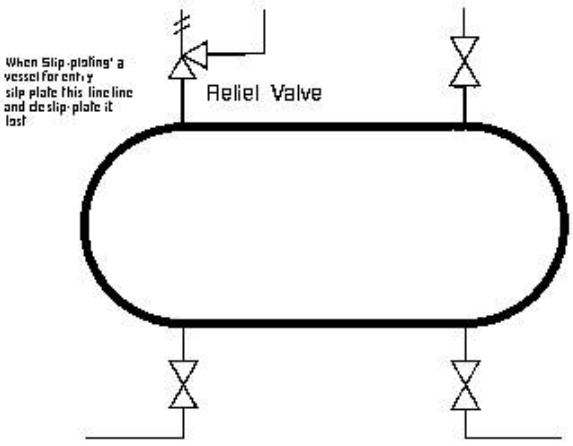
48/5 SLIP-PLATE THE VENT AND DE-SLIP-PLATE IT FIRST

Newsletter 35, Item 1 pointed out that if a vessel has to be slip-plated for entry, instead of slip-plating the vent it is better to disconnect it and blank the open end of the vent header. There is then no danger of forgetting the slip-plate and leaving the vessel without relief protection.

If the vent line is very large, it may be impracticable to do this and we have to rely on administrative procedures to make sure the slip-plate is removed (Newsletter 37, Item 5c). If a vent has to be slip-plated, then put in all the other slip-plates first and slip-plate the vent last. If this is not done, the vessel could be overpressured.

When the slip-plates have to be removed, de-slip-plate the vent first.

This should be included in plant instructions and written on the clearance certificates for slip-plating and de-slip-plating.



48/6 NEARLY FIFTY YEARS AGO

I have been reading a report, No A.102 145, which describes the accidents which occurred in the Billingham factory between 1924 and 1928. The report makes depressing reading because the accidents are so similar to many which have occurred in recent years and have been described in these Newsletters. There were several serious accidents in which men were killed because they broke into pipelines which had not been properly isolated. We have learnt very little over the years.

Considering the small size of the factory at the time the number of serious accidents that occurred seems rather large. On the other hand, the lost-time accident rate was 0.4, rather better than in Petrochemicals Division today.

The recommendations made in the reports are similar to those we make today — equipment which is handed to maintenance must be isolated by slip-plates; do not rely on valves which may leak.

The men who were injured and the men who wrote the reports have long since retired. The plants have long been demolished. But the messages in the reports are as true as on the day they were written and in this and future Newsletters I shall describe some of the incidents.

On 18 January 1928 a fatal accident occurred in the Billingham factory.

A 36 inch diameter gas main was being modified and a number of joints had been broken. The line was isolated from a gas-holder by a closed isolation valve. This valve leaked and allowed gas to diffuse through the whole length of the main. The gas ignited, there was a loud explosion and flames appeared at various joints on the main. One man was killed.

The source of ignition was a match struck by one of the workmen so that he could see what he was doing. However, once an explosive mixture is formed a source of ignition is always liable to turn up and the real cause of the explosion was not the match but the leaking valve. The following are the conclusions of the original report;

1. *Never trust an open gas main which is attached to a system containing gas, and keep all naked lights clear.*
2. *When working on pipe bridges at night, adequate lighting should be available.*
3. *Never place absolute reliance on a gas-holder valve, or any other gas valve for that matter. A slip-plate is easy to insert and absolutely reliable.*

48/7 UNUSUAL ACCIDENTS No. 18

Another Division report that a man who was trapped in a lift sounded the alarm bell, but it was half-an-hour before anyone came.

The alarm was tested regularly but unfortunately the man who would normally take action on hearing it was the man who was trapped.

48/8 WHAT THE LAW SAYS No. 8

(The Judge) pointed out that a reasonable and prudent employer should take positive thought for the safety of his workers in the light of what he knows or ought to know. Where there is a recognised and general practice which has been followed for a substantial period without mishap in similar circumstances he would be entitled to follow it unless in the light of commonsense or newer knowledge it is clearly bad. Where knowledge is developing he must keep reasonably abreast of it

and not be slow to apply it. Where he has, in fact, greater knowledge of the risks he may thereby be obliged to take more than the average or standard precautions. He must balance the risks in terms of likelihood of injury occurring and the potential consequences if it does, and he must balance against this the probable effectiveness of the precautions that can be taken to meet it and the expense and inconvenience they involve.

48/9 THREE YEARS AGO

The following appeared in Safety Newsletter No. 16, January 1970:

FREE OFFER to all readers of this Newsletter £100,000 OF INFORMATION
No joke - this is the sum that had to be paid in damaged plant or lost production to buy the information given in this Newsletter.

You can buy this knowledge yourself at the same price — by waiting until the accidents happen on your plant — or can join the club now on our subscription. Safety Newsletters 13-21 have been issued as Report No. 0.200,647/A.

48/10 RECENT PUBLICATIONS

(a) Five more Loss Prevention Guides have been issued. They deal with the following topics:

No 21	Reliability
No 22	Explosion Venting
No 23	Fire Extinguishers
No 24	Legal Responsibilities of Plant Managers and Engineers
No 25	Plant Layout

They can be obtained from Division Reports Centres by asking for Report No 0.200,698/ 2 1-25/A.

(b) In 1966 a serious fire in which 18 people were killed occurred at Feyzin in France. While water was being drained from a tank of propane the drain valve stuck open and the propane which came out caught fire. This incident led to a detailed examination of all our equipment handling liquefied flammable gases and standards were drawn up. These are described in “Liquefied Flammable Gases Storage and Handling”, ICI Engineering Codes and Regulations Group 0, Vol. 1.6 and in Report No 0.21,186/B, which was summarised in Newsletter 26.

Safety Note 72/19 describes a fire in Brazil in which 37 people were killed and which was very similar to the incident at Feyzin.

(c) Safety Note 72/18 summarises an American research report which shows that the relief valves on LPG rail tankers are too small. They will not cope with the maximum heat input and, more important, they are far too small if the vehicle is on its side and the relief valve is discharging liquid. The investigation was undertaken following a series of incidents in which rail tank cars were heated by spillage from other tank cars and exploded. The conclusions should not be applied uncritically to road tank cars which are unlikely to be exposed to heat from other vehicles.

(d) An article in “Where” for December 1972 shows that if pop groups played in the factory, ear protection would have to be worn. People who listen to pop groups regularly may suffer permanent damage to their hearing after a few years.

(e) Safety Note 72/20 surveys hazards associated with level glasses and sight ports and makes recommendations.

(f) Safety Note 72/23 describes and illustrates ways of locking off awkward valves.

For copies of these publications (except (a)) or for more information on any other item in this Newsletter please write to Miss M.N, Organic House, Billingham, or ring 8.3927. 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 1973

IF YOU DIAL B.3944

YOU WILL HEAR A RECORDED MESSAGE ON SAFETY

(7.3944 FROM WILTON, 8-3944 FROM NORTH TEES)

The message is changed every few days