IMPERIAL CHEMICAL INDUSTRIES
PETROCHEMICALS DIVISION

SAFETY NEWSLETTER NUMBER 41

By Trevor Kletz

41/1 VENTILATION OR WEATHER PROTECTION? — A SUCCESSFUL COMPROMISE

Newsletters 14/1, 35/2 and 37/4 described explosions in badly ventilated buildings. According to Factory Insurance, a large United States insurance group, a quarter of the fire and explosion damage they have to pay for is caused by leaks inside buildings (Loss Prevention, Vol. 3, 1969, p.11). Many of the compressor houses in the Company have been designed with open sides so as to achieve good natural ventilation. Many other compressor houses have been modified in recent years. When modifications to an existing compressor house are suggested, however, objections are often made that exposure to the weather will result in a poor standard of maintenance and more leaks. These objections are made even when similar equipment on other sites is used in open-sided structures. Report No. 0.21,387/B, available from Division Reports Centres, describes the action taken by another Company to modify their compressor house and at the same time provide weather protection for maintenance workers.

Screens 6 ft. wide by 7 ft. tall on ball bearing castors are used to form a wind break round the machines. Heat is supplied from a portable heater, mounted on wheels, and made from a 200,000 BTU/hr steam heater, using 75 psi steam, and an 18 inch propeller fan driven by ¼ HP 3-phase flameproof motor. The heated air has a temperature of 60°F during the coldest weather. Power and steam points are provided at frequent intervals throughout the compressor house. With this system maintenance work has been carried out successfully in rain, hail and snow, in 60 mph winds and in temperatures of 22°F (—6°C).

41/2 PHYSICAL DISCONNECTION OR SLIP—PLATING?

On some of the Works in Petrochemicals Division physical disconnection is always used to isolate a vessel for entry. Other Works use slip-plates.

Report No WMD/72/5, available from us, compares the merits of the two systems. Two plants which use physical disconnection were examined in detail. The report shows that slip-plates can be used instead of physical disconnection without any decrease in safety and recommends that this should be done for certain isolations for which physical disconnection is difficult and time-consuming.

The report points out the need to use slip-plates made to the same standard as the pipe-work. (See Engineering standards TDB 2400—2408). Some of the slip-plates seen were too thin. (See Newsletter 13, Item 1).

41/3 VIBRATION CAUSES FATIGUE FAILURE OF AN UNSUPPORTED PIPE

Extract from a dangerous occurrence report:

"Mr — was requested to check that the isolation valve at the foot of the vent pipe was closed. On grasping the valve handwheel, the vent pipe sheared from the transfer line at the stub weld and fell 35 ft to the ground. The vent pipe was of 2 inch NB stainless steel and was 15 ft long"

The vent pipe was not secured in any way so that vibration caused fatigue failure. Look out for

similar pipes on your plant. Fifteen more were found on the plant concerned.

41/4 THE WRONG JOINT IS BROKEN

The following occurred in the Division:

A process supervisor phoned the shift fitter and asked him to come over and remake a joint. He expected the fitter to report to him but did not actually tell him to do so.

The fitter went to the control room and reported to the process worker.

The process worker assumed the fitter had seen the supervisor and that he had come to break a joint — another job that had to be done. He showed the joint to the fitter. The fitter broke the joint and a jet of liquid came out.

No Permit-to-Work had been issued and the joint was not tagged.

Issuing a Permit-to-Work would not have prevented liquid coming out of the joint when it was broken but the supervisor knew that liquid might be trapped under pressure; he would have put this on the Permit and would have asked for protective clothing to be worn.

41/5 TEST IMPORTED NITROGEN BEFORE USE

Newsletter 27, Item 5, described an incident in another company in which a load of liquid ‘nitrogen’ was found to be liquid air.

Now a similar incident has occurred in another Division. A tanker of liquid ‘nitrogen’ turned out to be oxygen. Fortunately, on the Works concerned all liquid nitrogen is analysed before it is off-loaded. Your imagination can tell you what might have happened if this had not been done.

Do you analyse liquid nitrogen before it is off-loaded?

41/6 RELIEF VALVES SHOULD BE FITTED WITH TAIL PIPES

A steam relief valve lifted just as a man was bending over it to check the number. He was scalded in the face.

The accident could not have occurred if the relief valve had been fitted with a tail pipe. All relief valves should have tail pipes.

The tail pipes must not be bent back by jet reaction when the valve discharges (see Piping Section Instruction PDSD7) and must not fold up in a fire (see the next item).

41/7 A RELIEF VALVE EXIT PIPE SAGS IN A FIRE AND THE VESSEL IS OVERPRESSURED

Another company report that during a serious fire a number of relief valve discharge pipes became overheated. The pipes were not supported for this condition and sagged causing a fold in the pipeline and almost completely restricting the relief valve discharge. The rupture of at least one major vessel was attributed to the fact that it had lost its relief capacity in this way.

41/8 PLANT LAYOUT

Report No. 0.21,388/B, “Safety Aspects of Plant Layout — Review of Work Carried Out 1966—71” by Henry Simpson, available from Division Reports Centres, summarises the recommendations he has made for the control and safe disposal of oil spillages, fire access, fire breaks and safe distances from sources of ignition.

The following is a summary of the report:—

1. Main storage tanks constitute a big potential fire hazard and should be well separated from process areas. Methods for determining minimum separation distances are described in the report or, for liquefied flammable gases, in ICI Engineering Codes and Regulations, Group D, Vol. 1.6, “Liquefied Flammable Gases — Storage and Handling”.

2. The process area should be laid out on a block system to provide good access in emergency and fire breaks, and to subdivide the plant to limit the extent of loss in any one incident. Equipment in adjacent blocks should be separated by at least 50 ft. (15 m).

3. Loading/offloading and other operations involving regular traffic should be located on the periphery of the process area, and separated by at least 50 ft. (15 m) from other high risk fire elements.

4. Fire water should be available at all parts of the plant in quantity adequate for the type and size of fires expected, which may be as much as 10,000 g/m (2,700 M^3/hr) for a major fire at a large plant. Part of this total should be a piped supply at pressure, and the rest available from static tanks or a waterway from which Fire Brigade appliances can draw directly.

5. Service supplies should be protected so that they remain available during an emergency.

6. Plant areas should be paved and graded to direct spillage of flammable liquids away from equipment into a sealed drainage system, which should be of adequate capacity to deal with the storm water expected on the paved area, and also fire water likely to be used in the area, taking account of other safe means of fire water disposal.

7. Equipment should be separated from sources of ignition by a sufficient distance to ensure that any vapour which escapes is dispersed by diffusion in the surrounding atmosphere before it can be ignited.

Minimum safe distances from sources of ignition in storage areas should be as specified in the Home Office Code for Petroleum Spirit and the ICI Liquefied Flammable Gases Code. Safe distances in process areas should be worked out by the methods given in the report.

Where safe distances cannot be met, installation of an ICI Firewall and Steam Curtain vapour barrier should be considered.

8. Items of equipment known to be likely sources of plant fires, notably hot pumps, should be located so as to minimise consequential damage to other equipment.

41/9 FOUR YEARS AGO

“Two relief valves, identical in appearance, were removed from a plant during a shutdown and sent to the workshops for overhaul. One relief valve was set to operate at 15 psig and the other at 30 psi. The pressures were stamped on the flanges. The tie-on labels on the two valves became interchanged and the valves were installed wrongly.

When re-installing relief valves do your supervisors check the stampings on the valve bodies or just the labels?”

From Safety Newsletter No. 2, June 1968

41/10 WHAT THE LAW SAYS NO.2

Accidents often occur because someone has not followed the correct procedure. A recent accident

report is refreshingly frank. It states:

"There is, however some doubt as to whether or not the method Black used was condoned by Management. Black gave the impression at the enquiry that he had done this sort of thing before. White (Assistant Foreman) in his statement says the procedure was incorrect but at the enquiry gave the impression that the practice was not uncommon, thereby indicating he was aware of it.

The names have, of course, been changed.

Managers and supervisors sometimes turn a blind eye to incorrect practice, but after the accident we are not always as frank as in this case. What does the law say?

'Where an offence under this Act committed by a company is proved to have been committed with the consent or connivance of, or to have been facilitated by any neglect on the part of, any director, manager, secretary or other officer of the company, he, as well as the company, shall be deemed to be guilty of the offence and shall be liable to be proceeded against and punished accordingly.

"It is submitted that the expression 'connivance' so used connotes a specific mental state not amounting to actual consent to the commission of the offence in question, concomitant with a failure to take any step to prevent the commission thereof. The mental state referred to is that which is sometimes termed 'wilful blindness'; that is to say, an intentional shutting of the eyes to events of which in his own interests the percipient would prefer to remain unaware. This construction of the word 'connivance' accords both with its philology (the derivation is from the Latin 'connivere', literally 'to wink' and figuratively 'to wink at') and with the use made of it by the courts

From Redgraves Factories Acts, 21st edition, pages 388 and 396.

41/11 UNUSUAL ACCIDENTS NO. 11

lCl Australia report that on several occasions small live snakes have been found curled up under the valve covers of chlorine drums.

This is one hazard we don't have!

41/12 COMMENTS FROM READERS

(a) Newsletter 39, Item 2 pointed out that in many cases the stop buttons for compressor and pump motors should be placed some way from the machines so that the machine can be stopped from a distance if there is a bad leak or a fire.

These stop buttons should, of course, be additional to the normal stop buttons placed near the machines.

(b) Salt, grit and chemicals for mopping up spillages have to be stored in many of our plants. Plastic bins, for example, those manufactured by Glasdon Ltd., are cheaper in the long run than wood or metal bins.

(c) Newsletter 38, Item 6 suggested that we should make it more difficult for strangers to wander on to the plant without permission. A reader, a metallurgist who has to visit many plants, says it would help if the way to the control room was clearly marked.

(d) Newsletter 39, Item 4, recommended that overhead lines which cross roads should be painted with black and yellow stripes as a warning to crane drivers.

A reader suggests that if the route is used frequently by cranes there should be warning posts and a cross-beam about 1.5 jib lengths away from the pipe thus forcing the crane driver to lower his jib.

41/13 RECENT PUBLICATIONS

(a) Newsletter 39, Item 2, described a fire in a hydrocarbon processing plant. A full report, No. 0.21,380/B, available from Division Reports Centres has now been issued. The fire was due to a coupling failure and the report describes, in detail, the reasons for the failure and makes recommendations.

(b) The ICI Materials Handling Working Group publishes a monthly Review of new information. Copies can be obtained from your Division Library or from Mr A .P. Organics Division, Manchester.

(c) It is not very often that brittle fracture of a pressure vessel occurs during a pressure test. An instance in which this occurred is described and illustrated in Report No. A.127,919 (EDN 1291), available from Division Reports Centres.

(d) R & D Paper No. S72/12, available from Division Reports Centres, describes a computer programme for predicting the final temperature and pressure of a mixture of hydrocarbon and oxygen (or air) exploding in a closed vessel.

(e) Safety Note 72/7 recommends the types of hose that should be used for offloading sulphuric acid.

(f) A note dated 22 .5.72 describes the changes in the Highly Flammable Liquids Regulations made as the result of last year's public inquiry. The Regulations will probably become Law this year.

For copies of (e) and (f) 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.

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