# IMPERIAL CHEMICAL INDUSTRIES
# HEAVY ORGANICS DIVISION

## SAFETY NEWSLETTER NUMBER 14

**By Trevor Kletz**

Congratulations to North Tees Works on Working One Million Hours Without a Lost-Time Accident.

What's more, during the 15 months this took there have been no claims for fire or explosion damage. This is an equally great, perhaps greater, achievement because fire and explosions, when they do occur, cause the worst sort of injuries.

### 14/1 IS YOUR PLANT A GOOD DIVE?

(Detection, Isolation and Ventilation Equipment)

This year I have seen reports on three explosions in closed-in, badly ventilated, buildings, all of which had fatal consequences.

In the first incident, in Africa, briefly described in Newsletter No. 12, Item 4a, a leak of light oil occurred in a pumphouse and was ignited by a diesel engine.

In the second incident, in Germany, a leak of ethylene oxide in a pumphouse was ignited by an unknown cause, possibly static.

In the third incident, in this country, a leak of gas in a compressor house was ignited by an unknown cause, possibly static, possibly faulty electrical equipment.

All these incidents show that causes of ignition cannot be completely eliminated and that mixtures of flammable gas or vapour with air may ignite.

All these incidents might have been prevented by better ventilation, by siting the equipment in the open air. There is no need whatever to put pumps in a pumphouse.

Compressors are more difficult; some protection may be necessary. In HOC Division we usually supply a roof and part-walls; there are no walls at compressor level; the walls start about 10 feet above the level of the compressor platform.

Tests show that even on a still day the ventilation in these part-open structures is many times (say 10 - 40 times) better than in a closed-in building supplied with forced ventilation.

One of the Divisions new plants, not yet finished, was supplied with an almost fully walled-in compressor house; the walls were put there to cut down the noise outside.

After we saw the reports on the three incidents, we pulled down the new walls.

Apart from the need for good ventilations two other lessons come out of' the reports on these incidents.

(A)The need for automatic gas detectors in places where leaks are liable to occur. (Obviously we can't put them in every place where a leak might possibly occur, but we can put them in places where leaks are more likely than usual, where the materials are particularly hazardous and where the leaks might not be spotted for some time).

(B)The need for remotely operated isolation valves (or extra hand valves) so that leaks can be isolated from a safe distance. (Again we can't fit them on every piece of equipment which might possibly leak, but we can fit them on equipment on which leaks are more likely than usual and where materials are particularly hazardous).

In H.O.C. Division, we already have, on the whole, good ventilation (supplemented sometimes by steam curtains), many automatic gas detectors and many emergency isolation valves (we learnt our own lessons some years ago). Nevertheless have a look round your plant and make sure the DIVE (Detection, Isolation and Ventilation Equipment) is O.K. I shall be glad to help if I can.

### 14/2 A LOOSE INTERNAL FITTING BLOCKS A RELIEF VALVE

Another company have reported an extraordinary accident. An internal ball float in a propane storage tank came loose and when the tank was over-filled the ball lodged in the relief pipe, in which it was almost an exact fit. When the tank warmed up a bit, the pressure increased its diameter by 6 inches.

The incident was noted when the access stairway was found to have broken away from the shell.

This is perhaps a one-in-a-million incident but nevertheless, I urge that you that you check the sites of all fittings in your pressure vessels to make sure this does not happen in the Division.

### 14/3 HOW TO FIX THE SIZE OF RELIEF VALVES

A new Process Design Guide on “Pressure Relief and. Blowdown” (J.S. Fitt, 15.10.69) describes how this should be done. The Guide is well written and. easy to read. The section dealing with “Traps, Snares and Pitfalls” should be read by everyone who ever has to size a relief valve.

On an existing plant, which is being modified, one of the reboilers is being replaced by a larger one. As a result the relief valve on the still will be too small. Instead, of fitting a larger relief valve, the steam supply is being limited by fitting a restriction plate in the steam line. (The steam supply will still be somewhat greater than before).

This restriction plate should be included in the relief valve register and inspected every time the relief valve is overhauled to make sure it is still there and that the orifice has not been enlarged by corrosion. It is a good idea to weld the restriction plate into a bobbin piece so that it cannot be easily removed when Process decide they would like a bit more steam.

Are there any similar restriction plates on your plant?

### 14/4 AN ERROR IN IDENTIFICATION

An electrician had to cut a cable and. join it to a new one. He traced the cable twice from the switch house to the point where it had to be cut. He isolated the power supply and then checked the cable with a “Bimec” cable tester; this confirmed that there was no current flowing through the cable.

A short time later the electrician cut the cable (using a spiking gun). Sparking occurred across the cut, causing a voltage drop across the whole site.

The electrician had made an error in tracing the cable. As the equipment supplied by the cable was taking little or no current at the time, the Bimec tester, which measures current, did not indicate any flow. It will not indicate a small current when large currents are flowing through neighbouring cables.

This limitation of the Bimec tester should be made known.

The report on the incident also recommends that the authorisation of the spiking, i.e. the issue of a Permit, and the actual spiking should be done by different people, both of whom should trace the cables.

### 14/5 TESTING STACKS AND TANKS FOR OXYGEN

In these Newsletters I have frequently stressed the need for regular checks of the oxygen content of tanks, stacks, centrifuges and any other equipment which is blanketed with inert gas. Many explosions have occurred because the flow of inert gas was stopped.

Some stacks etc. are fitted with permanent oxygen analysers. Others have to be sampled and analysed with portable apparatus. Agricultural Division Analytical Group Minute No. RD/A.1272 recommends the use of a Bacharach “Fyrite” Oxygen analyser by laboratory staff or, after some instruction, by plant staff.

The instrument can also be used when checking atmospheres for entry. It costs about £25 and is accurate to 0.5%.

If sulphur dioxide is present, it must be filtered out.

**14/6 DON'T WELD NEAR A LEAK**

Before Fire Permits are issued we all make sure that there are no leaks of flammable gas or liquid anywhere near (or no abnormal conditions that make a leak likely). The meaning of "near" depends on the nature of the material, the size of the leak, the slope of the ground, and so on, but 50 feet is often used.

One of the HOC Works has just introduced a new rule:

Whenever a Fire Permit is issued within 50 feet of the boundary of another plant, the supervisor of the other plant must countersign it. What methods are used on your Works to make sure that there are no leaks or abnormal conditions in the plant next door? Are these rules O.K. and are they followed?

**14/7 ISOLATION OF EQUIPMENT FOR MAINTENANCE (see also 20/7)**

Two more incidents have drawn attention to the need to follow the HOC rules.

A fuel gas leak on a furnace ignited. A gas burner had been removed but the isolation valve had not been locked-off and the gas line had not been blanked or slip-plated.

In another incident a fitter was affected by fumes while working on a steam drum. One of the steam lines from the drum was used for stripping a process column operating at 30 psig. A valve in the line to the column was closed but the line was not slip-plated. When the steam pressure was blown off vapours from the column came through the leaking valve into the steam line.

The HOC rules on the isolation of equipment for maintenance state:

(a) Equipment which is given to Maintenance must be isolated by slip-plates or other equally effective means unless the job to be done is so quick that fitting slip-plates would take as long and be as hazardous as the main job.

(b) Valves used for isolating equipment for maintenance, <u>including isolation for slip-plating</u>, must be locked shut.

When there is not enough spring in the pipe-lines to insert a slip-plate, slip-rings (or spectacle plates) should be installed during construction.

Slip-rings are usually distinguished from slip-plates by drilling two holes in slip-ring tags and one ring in slip-plate tags. These are easily confused, especially on lagged lines. New standards have therefore been agreed. Slip-rings have a washer welded to the tags and slip-plates have a disc welded to the tag.

Copies of the new standards (Nos. TDB 2400-2408) can be obtained from Standards Section, Engineering Dept.

**14/8 WHY DO WE NEED NEW RULES FOR PREPARING FOR MAINTENANCE?**

"We have become amphibious in time. We are born into and spend our childhood in one world; the years of our maturity in another. This is the result of the accelerating rate of change".

This quotation from the novelist B.W. Aldias, might apply to the petrochemical industry; those who have been 20 years or more in the industry have moved into a different world where new standards are needed.

Why do we need the HOC rules on the isolation and identification of equipment for maintenance? They were introduced about 2 years ago, but Billingham managed for 45 years without them.

During those 45 years there were no doubt many occasions when fitters broke into equipment and. found it had not been isolated, or broke into the wrong line because it had not been identified positively. But pipe-lines were mostly small, and the amount of flammable gas or liquid on the plant was not usually large.

Now pipe-lines are much larger and the amount of gas or liquid that can leak out is much greater. Several serious incidents in the last 3 years have shown that we dare not risk breaking into lines that are not properly isolated. As plants have got larger we have moved like frogs coming ashore for the first time, into a new world where new methods are needed.

**14/9 "HOW STRONG IS A STORAGE TANK?"**

Newsletter No. 7, Item 7, described how a storage tank was sucked in because the operators did not understand how fragile tanks can be. In Newsletter 9, Item 3, a hand-out on the strength of storage tanks, was reproduced.

This hand-out has now been made into a set of 14 35 mm. colour slides. Copies can be borrowed from Mrs. J.M. W, Organic House, Billingham (Telephone B.3927) who can also provide more information on any of the other items in this Newsletter.

4th November 1969