

IMPERIAL CHEMICAL INDUSTRIES HEAVY ORGANICS DIVISION

SAFETY NEWSLETTER NUMBER 10

By Trevor Kletz

This Newsletter appears sooner than usual after the last one as a number of incidents worth reporting have occurred. Lots of them have happened before and are described in earlier Newsletters.

They will happen again **ON YOUR PLANT** unless.....

Before describing these incidents, can I remind you of the HOC rule that before equipment is handed to maintenance it must be isolated by slip-plates (or equivalent. 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. Valves must be locked shut while slip-plates are fitted or removed or, if slip-plates are not used, throughout the job.

Observation of this rule would have prevented:

A serious fire in 1967 in which three men were killed.

A gas escape which killed one man (Newsletter 4, Item 1).

An explosion which killed two men (Newsletter 6, Item 1), (not I.C.I.).

Several less serious accidents (Newsletters 1, Item 2 and Newsletter 3, Item 2).

10/1 IDENTIFYING EQUIPMENT FOR MAINTENANCE

Item 1 in the last Newsletter described some accidents which had occurred because equipment had not been properly identified. There have now been two more.

(a) A fitter was shown a steam valve and told to remove the bonnet. By mistake, he unbolted the bonnet on a compressed air valve; the bonnet flew off grazing his face.

(b) A fitter took a blank off the end of what he thought was a nitrogen line. Fuel, gas came out just as a welder was starting work nearby.

These accidents - which might have been more serious - could have been prevented by fixing a numbered tag on the valve or blank and putting the number on the Permit-to-Work.

Identifying equipment by describing it or by showing it to the fitter is not sufficient.

If it is any comfort, similar incidents happen elsewhere. One of the major oil companies recently hot-tapped and drilled what was thought to be a nitrogen main. Later it was found that they had tied into an ethylene line. The error was discovered when the 'nitrogen' valve was seen to be frosted.

In this case the line was tagged but the process supervisor put the tag on the wrong line. He did not walk the line back to a point at which it could be identified unmistakably. As a result:

A 150 psi branch and valve was fixed onto a line operating at 500 psi

Welding was being carried out on a line carrying ethylene at pressure – dangerous because the ethylene might decompose explosively! (The line must first be depressured).

Ethylene might have been used for sweeping air out of a plant!

10/2 FAILURE OF NITROGEN BLANKETING LEADS TO AN EXPLOSION

Newsletter No. 3, Item 3, Newsletter No. 5, Items 3 and 6, described explosions which had resulted from the failure of nitrogen blanketing systems and Newsletter No. 5, Item 6, after describing an

explosion in a centrifuge, said "This incident shows the importance of regularly monitoring nitrogen blanketing to see if it is in operation and is being effective. This applies to tanks, stacks, crank-cases and anywhere else where nitrogen purging is used as well as to centrifuges. In addition a low pressure or high concentration oxygen alarm is desirable in a centrifuge due to the ease with which a source of ignition can turn up in a system containing moving parts".

Another Division has now described another explosion in a centrifuge which resulted from the failure of the nitrogen blanketing. There was no alarm system on the supply and no regular analysis for oxygen content. There was no clearly visible indication of the flow of nitrogen. Ignition was caused by the friction between parts of the machine. The report on the incident recommends that:

- a) The oxygen content of the gas within the centrifuge should be continuously monitored or regular checks should be made using portable equipment.
- b) The purge nitrogen system should be modified to give a clearly visible indication of the flow to the machine.

I would urge all managers who are responsible for equipment which is protected by gas blanketing or purging to pay attention to these recommendations before the list of explosions grow longer.

A recent report by Dr. H.G. Simpson ("Purging of Relief and Blowdown Systems", 7.5.69) lists all the stacks in the Division, and tabulates the precautions taken to prevent explosive mixtures forming. There are still a few stacks which are not sampled and analysed regularly and others which are analysed only once/month. On a number of stacks the inert gas flow is not measured and there is no indication that it is in commission.

Dr. Simpson's report recommends suitable inert gas flows for the various stacks and also recommends special precautions necessary when venting hydrogen and hot gases; the latter may cool and suck air back into the stack. See the report for details.

10/3 AN ESCAPE OF LPG

Two tons of propylene escaped to atmosphere when a valve spindle blew out. Fortunately it did not fire.

The valve was not the type recommended in the Division for LPG duty and in other ways the installation was below standard. There was only a single valve on the sample line, it was not directly onto the tank and the diameter of the line was too great; the tank was too near a road, it was not lagged. Almost everything possible was wrong with it.

Since the Feyzin disaster three years ago much has been written on LPG storage and a lot of money spent on improving our old installations.

Are there any out-of-the-way corners in your area where LFG tanks have been overlooked.

10/4 A HYDRAULIC SYSTEM IS ISOLATED

The emergency blow-down valves on a plant are kept shut by a hydraulic oil supply. One day the plant started to blow itself down and it was then discovered that, unknown to the managers, the supervisors had developed the practice, contrary to instructions, of isolating the oil supply valve "in case the pressure in the oil supply system failed" - a most unlikely occurrence and less likely than the oil pressure leaking away from an isolated system.

10/5 OIL SPILLAGES

When petrol or oil are spilt they can soak into the ground and come up years later when the water level rises.

In 1966 there were several petrol spillages at Thurrock in Essex. Some of the petrol soaked into the ground and in September 1968 was brought back to the surface by heavy rain. The vapour accumulated on the ground floor of a house, ignited and blew a floor in the staircase. Two people were injured. A 22 feet deep trench has now been dug to try to recover the rest of the petrol ("The Times", 9. 4. 69 and "Petroleum Times," 11. 4. 69).

10/6 OVER RIGID CLAMPING OF A PIPE CAUSES A FIRE

Another company has told us about a serious fire which occurred when a length of stainless steel piping ruptured.

“The piping at the point of rupture is solidly anchored by means of a cylindrical steel support column welded directly to the stainless steel pipe wall and bolted to a concrete pier. A second similar support is located five or six feet away. Any movement or vibration of the pipe such as might occur during an emergency shutdown would produce tremendous stress in the pipe wall at the welded joint. Examination of the rupture indicates that such a force was applied as a segment of the stainless steel pipe wall was literally torn out, the fracture extending almost completely around the weld. Also the four anchor bolts attaching the support leg to its concrete base were bent, indicating the application of severe stress.”

10/7 CHANGING RELIEF VALVES WITH PLANTS ON LINE

When it is necessary to change relief valves with a plant on line, we use twin relief valves fitted with isolation valves on the plant side. These isolation valves are fitted with interlocks so that one relief valve is always connected to the plant.

On the flare side of the relief valve it was the practice in the past to remove the relief valve and quickly fit a blank before too much air was sucked into the flare lines. This was possible with small lines but with large lines it is impracticable and flanges have therefore been installed in the flare lines so that slip-plates can be fitted before the relief valves are removed. This system has the disadvantage that the slip- plates may be left in in error.

Engineering Department Instruction No. PDS7 describes a new system which has been tried out and which will be used on all new plants. A special sealing plate is inserted as the relief valve is removed and the plate is so designed that it cannot be left in in error.

After the relief valve has been removed an elbow is fitted in its place and the sealing plate removed. If the interlocked valves are changed over in error the plant will be open to blow-down but it will not be without relief protection.

PDS7 also describes the design standard for relief valve discharge pipes. This follows a recent incident when a discharge pipe on a large relief valve discharging to atmosphere had not been secured sufficiently and became bent into a “Z” shape when the relief valve lifted.

10/8 FAILURE OF A PUMP COUPLING

Another failure has now been reported. The spacer and guard from a Metastream DIS were thrown 20 feet. The report states that this type is unsafe and recommends that it should not be used.

10/9 PROTECTION OF CABLES AGAINST FIRE

In recent years several minor fires have burnt overhead cables and caused long shut-downs. A Panel has considered ways of preventing further incidents. Their report (No. 0.200, 624/A by V.F. Lord) recommends that overhead cables should still be used but that they should either be run away from possible sources of fire or protected by fire-resistant materials. Details of the latter are given.

10/10 RECENT PUBLICATIONS

The following are available from Mrs. J.M.W. Organic House, Billingham (Ext. 3927), or from the authors.

“A Guide to the Legal Responsibilities of Plant Managers and Engineers”.

“The Storage and Movement of Liquid Products: A Guide to Suitable Tank Linings and Handling Materials”.

A List of References on the Handling of Hazardous Products (Codes of Practice, Regulations and Recommendations) (I. A. D. Gale, 2.5.69).

“Safe Transport of HOC Products by Road Tanker” (I. A. D. Gale, 23.4. 69).

This survey describes:

- (1) A new procedure for dealing with emergencies.
- (2) Some of the horrible practices seen at tanker loading points.

and (3) Some of the horrible features seen on tankers.

Recommendations for improvements are made and there is a check list for off-loading points.

The report should be read by every manager concerned with road tanker loading or operation. Here are a few snippets to tempt you to read the lot.

“There are several examples of overfilling on record and one got the impression that there are many more that were left unrecorded. The general practice throughout the Division is to use preset meters and for the operator to go away during the operation, returning when he expects the loading to be near completion. Discussions with plant managers and operators indicate that the reliability of the meters in cutting off the flow on completion of the pre-set quantity is poor.”

“The official requirement as to whether a man should stand by during a loading operation varies across the division, but in practice it seems universal that no one does stand by and the attitude of management is that it would be almost impossible to enforce it”.

“One of the most hair-raising installations is at a plant where a spillage would drain into the sump of the weighbridge”.

“The driver has gloves but no goggles. A box on the ‘horse’ was supposed to contain a PVC suit, safety boots, goggles and respirator. The box was locked and there was no key”.

“The engine of the fork lift truck was left running throughout the filling operation 10 yards away”.

10/11 NEW FLEX COLOUR CODE FOR THE HOME

Regulations for the colour coding of electrical flexes are to be introduced by the Home Office on the 1st July 1969. In future the live wire will be brown, the earth green and yellow and the neutral light blue. This new code is international.

10/12 ACCIDENTS IN THE HOME

The U.S. Chemical Industry keeps records of these. For 1968 the lost-time accident frequency rate was 0.72 for home accidents and 0.327 for accidents at work (Chemical & Engineering News, 3.3.69, p.18).

10/13 “HUMAN FAILING”

There were 30 minor accidents in April in one of the Division’s Works. Over half were recorded by the supervisor as caused by “human failing”. It is an easy way out for the supervisor or manager as then he has to do nothing except tell the man to be more careful.

These accidents were discussed individually with the supervisors and in all but two cases they agreed that there was something they could do to prevent the accident happening again.

If you don’t believe that over 90% of all accidents can be prevented by better management let me know and we can discuss a few examples.

20 May 1969