IMPERIAL CHEMICAL INDUSTRIES
HEAVY ORGANICS DIVISION

SAFETY NEWSLETTER NUMBER 8

By Trevor Kletz

8/1 THE TUBES IN A FURNACE ARE DESTROYED

The pump feeding process oil to a furnace heater failed. The supervisor isolated the oil valve and intended to open a valve supplying steam to the furnace. Unfortunately he opened the wrong valve, there was no flow to the furnace and the tubes were overheated and collapsed.

This sort of incident is usually attributed to human failing - the fault is the operators and there is nothing that management can do to prevent it. In fact, the incident might have been prevented by management action. The access to the valves concerned was poor and this made it difficult to see which was the right valve. There was no indication in the control room to show that there was no flow through the furnace coils. There was no low flow alarm or trip on the furnace. The supervisor concerned had not been long on the job and had perhaps not been adequately trained.

8/2 DO OPERATORS KNOW WHY THEY TAKE READINGS?

The temperature controller on the base of a still went out of order at 5 am and drew a straight line; this was not noticed. Between 5 am and 12 noon the temperature of the 19th tray rose from 14.5°C. to 255°C; this was not noticed. Five other temperatures also rose, as indicated by charts or by entries on the log sheet. The level in the base of the still fell, the level in the reflux drum rose and the take-off rate also rose. All these readings were put down on the record sheet but their significance was not realised.

Finally at 12 noon liquid came out of the reflux drum vent.

From 7 am onwards the operator was a trainee but a leading hand was in the control room throughout and two supervisors visited it from time to time.

In another incident, some product was transferred to tank B instead of the usual tank A. The level in A rose, due to a leaking valve; the level was entered on the record sheet but its significance was not realised. Later on, another movement was made into B, again the level in A rose and again the new level in A was entered on the record sheet. When a third movement was made, A overflowed.

What can we learn from these two incidents?

I said in Newsletter 7, Item 1, “There is a danger that our training of process workers may be too sophisticated. We try and teach them elementary chemistry and. chemical engineering, and it is right that we should do so, but not before we have taught them that tanks and other vessels are not always designed to withstand the pressure to which they can be subjected, that air and fuel mixed together will go “bang” and that addition of hot oil to water will cause steam to be formed with explosive violence”.

Our training of process operators (and supervisors) needs to be even more fundamental. It is clear that many do not know why they take readings and do not realise that if a reading is unusual and they don’t know why, they must at least ask.

At the risk of stating the obvious, can I suggest that throughout the Division we make a special effort to get every operator to realise what the instrument panel is for. Could managers use these two incidents as the basis for a discussion with every operator (in groups)?

Finally, can I thank the managers who publicised and allowed me to use these incidents. In many Works they would have been hushed up.

8/3 EXPLOSION IN MESS -ROOM

An explosion occurred recently in a mess-room and blew down a partition wall. Two men in the room at the time were shocked but not hurt.

The mess room was pressurised, so how did the vapour get in?

A drainage gully ran alongside the outside wall of the mess-room. When the pressurising fans were shut down for a few days for repair, vapour from the drainage gully entered the mess-room through a 1 inch hole in the wall. The vapour may have been sucked in by a chimney effect caused by the flow of warm air up the ventilation inlet pipe. At one time a drain pipe had gone through the hole but when the pipe was removed the hole was not blocked up. The vapour accumulated in a cupboard under a sink.

While the pressurising fans were shut down, smoking was stopped in the mess-room and the electric equipment was not used. The explosion occurred 7 hours after the pressurising was restored and was ignited by a hot-plate. The cupboard had not been opened and the vapour had not dispersed.

It is clear that:

(1) All pressurised buildings in areas where flammable materials are handled should be examined carefully to make sure there are no openings which have been overlooked and through which vapour can enter. This examination should be repeated every year.

(2) If the pressurising fan has been shut down, when it is started up again and before smoking etc. is permitted, the nooks and crannies in the building should be checked with an explosimeter.

(3) On new plants obvious sources of vapour, such as drainage gullies, should be located away from pressurised buildings.

8/4 RADIOACTIVE LEVEL INDICATORS

A level indicator on a still base was reading “empty”, although there was ample evidence that there was a level in it. The level indicator was of the radioactive type in which the source is on one side of the still and the detector on the other side. When there is a high level in the still, the liquid absorbs the radiation and little of it falls on the detector. When the still is nearly empty, more radiation falls on the detector.

Radiography of pipe-welds was in operation 70 yards away from the still and the gamma-ray source was shining in the direction of the still detector. This detector could not distinguish between the two sources of radiation and therefore indicated a low level in the still.

At first sight the chance of this happening again seems so remote that preventive measures can be ignored. On the other hand in some circumstances a false reading could be dangerous. Before a Permit-to-Work is issued to carry out any radiography the issuing supervisor should therefore check round to see if there are any radioactive instruments in the area which might be affected. In addition, radiographers should be issued with a list of places on the site where radioactive instruments are used.

8/5 A STORAGE TANK IS SUCKED IN

Newsletter No. 7, Item 1, described an incident in which a storage tank was sucked in because the supervisors concerned did not realise how easily this could happen. A new “Guide to the Venting of Storage Tanks” has just been issued (B.G Drummond, 3.2.69); it describes the various ways in which tanks can be over or under-pressured and the method of calculating the size of vent hole required to prevent this happening. The following examples are taken from the report:

“<u>OVERPRESSURING</u>- can occur

By blowing in air, gas or steam.

By pumping hot oil into a tank containing water, causing the water to change explosively into large amounts of steam.

By pumping into a tank at too rapid a rate (or at any rate if the vent is blocked).

By a rise in temperature of the tank contents. A 6°C. rise is all that is required to create an internal pressure greater than 8 inches w.g. if the tank has no venting.

A VACUUM can be created inside a tank by the condensation of steam, It is possible for steam to condense so rapidly that the vents, even if' free, cannot pass enough air into the tank to prevent a dangerous vacuum forming. The same can happen when a tank is being emptied rapidly by gravity. Vents can be inadequate to cope with the rapid inflow of air required, even if clear.

With a blocked vent, a drop in the temperature of the tank contents of only 2°C is enough to create a vacuum in excess of $2^1/_2$ inches w.g.

Pumping material out of a tank can cause collapse unless the vent is adequate.

8/6 FIRE ON A FURNACE EXIT LINE

A joint on a furnace exit line leaked and caught fire. The leak occurred because:

a) Some feed was leaking into the furnace through a leaking isolation valve. The feed pump had to be kept on line as it was feeding other furnaces as well.

b) The steam purge line into the furnace had not been isolated. This caused the pressure on the exit pipe to rise from a normal 5 psi to 30 psi.

To prevent this happening again, in future the feed line will be slip-plated when the furnace is shut down and the exit line will be vented. (It had been the original intention to vent the exit line but this had not been carried out because a slip-plate had to be removed from the vent line and the access to it was awkward),

8/7 TEMPERATURE POINTS WITH SHEATHS

Newsletter No. 7, Item 8, described an incident in which an artificer removed a Rototherm, thinking it was inside a sheath, but it was not and oil splashed out.

I have now been reminded that a similar incident happened a few years ago on another plant, on an air compressor. The artificer concerned was slightly injured and a day's production was lost.

This underlines the recommendation made in Newsletter 7, that if some of the Rototherms on a Works are in sheaths and some are not, those without sheaths should be clearly marked in some way.

8/8 DOUBLE ISOLATIONS

Double isolations with a blow-off in between are widely accepted as a satisfactory method of operation when isolating equipment for maintenance, provided the main valves are locked shut and the blow-off valve is locked open.

Newsletter No. 3, Item 1 described an incident in which toxic gas got past a double isolation and. blow-off because, the size of the blow-off was small compared with that of the main pipe-line and because the blow-off was connected to a long line leading to stack, along which a back-pressure developed.

Another incident has now occurred which emphasises the limitations of a double isolation and blow-off. In this incident a number of blow-off lines went into a communal vent line. One isolation valve was passing so much that a pressure developed in this communal line and came back through a leaking vent valve into another part of the equipment.

8/9 A FIRE PREVENTED

In most of the incidents described in these Newsletters we are learning (we hope) from our mistakes.

For once, we can learn from a success.

On one of our plants the reaction volume was increased a little at a time over a period of years until ultimately it had increased several times. As a result in an emergency such as a fire or a leak it took

40 mins. to blow off the pressure and empty the plant instead of the original l2 mins. After much debate - rightly, because the cost was considerable - extra lines were installed to reduce the blowdown time back to 12 mins. The persistence of the plant staff was rewarded when a. bad leak occurred only 30 ft. from a furnace and the plant was blown-down quickly without the leaking catching fire.

8/10 A MAN STEPS INTO AN UNCOVERED DRAIN

The attached poster was circulated widely a few years ago and various times since. Almost the same incident has now occurred twice more, once on the original Works, and once on a different Works.

8/11 RELIE.F VALVES

An exhibition has recently been on show of springs removed from relief valves. The examples of bad practice shown included the following:

Identification numbers stamped on springs

The sides of springs ground down so that they fit

Corroded springs

A smaller spring - chosen at random - put inside a corroded spring to maintain its strength.

Sometimes the second spring was wound the same way as the first spring so that the two interlocked.

Indiscriminate use of washers to maintain spring strength.

Unauthorised welding of springs to end caps

Do all supervisors know that these practices are dangerous?

8/12 WHAT DO I DO IF I AM POISONED?

“Information on the features and the treatment of specific poisonings is available to doctors on a 24 - hour basis by telephone from:

National Poisons. Reference Services

BELFAST 30503 (S.T.D. 0232-30503)

CARDIFF 22010 (S.T.D. 0222-33101)

DUBLIN 45588

EDINBURGH Fountainbridge 2477 (S.T.D. 031-229-2477)

LONDON HOP 7600 (S.T.D. 01-407-7600)

Additional Poisons Reference Services

NEWCASTLE 25131 (S.T.D. 0632-25131)

LEEDS 30715 (S.T.D. 0532-30715)”

From “Is it Toxic”, a leaflet published by The Chemical Industries Association Limited at 1/6d, listing sources of’ information on the toxicity of chemicals.

8/13 A QUOTATION

The following quotation occurs in the report of an enquiry into accidents in factories, carried out by the Factory Inspectorate.

“It also produced evidence to confirm that established and generally accepted methods of accident prevention did succeed; and several impressive examples were found of improvements achieved by the energetic and diligent application of principles which had long been advocated, but which had not earlier been put into practice with sufficient thoroughness.”

Employment and Productivity Gazette, October 1968, p. 827

8/14 TEESIDE'S FIRST SERIOUS ACCIDENT

When an accident occurs we take it for granted nowadays that first-rate medical attention is available for the injured. Matters were very different when Teesside's first serious industrial accident occurred over 100 years ago.

> "On a summer's day in 1858 a terrific explosion occurred at Waterside rolling mill of Snowden and Hopkins. One of the standing boilers that supplied steam for the working of the mill and the steam hammer burst with a tremendous report. Part of it hurtled into the river carrying several workmen, part tore with terrific violence through a thick wall scattering debris on the men working below, and a workaday boiler room was made a horror of scalding steam let loose. Some seventeen men were injured and the nearest hospitals were at Newcastle and at York. Two men died on the way to Newcastle, one or two were taken home, and some too bad to move were placed in the stables of the Ship Inn, Stockton Street where the stench from the nearby Steel was unbearable. One man died through shear fright".
>
> From the "The History of Middlesbrough" by W. Lillie, 1968, p. 173

Following this incident Teessides' a first hospital, which later became the Ormesby Hospital, was founded.

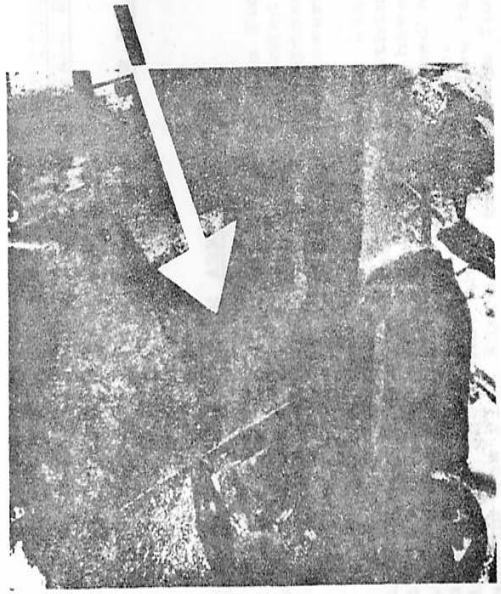
8/15 DISCHARGES OF STATIC ELECTRICITY FROM BALL VALVES

The note referred to in Newsletter 7, Item 11 has been revised. For copies or for more information on other items, please telephone B 3927

4th March 1969

A NEAR MISS —OR THIRD TIME LUCKY

A MAN'S FOOT SLIPPED THROUGH THIS GAP AND WAS SCALDED



Two similar incidents have caused LOST-TIME ACCIDENTS

DONT TRUST TO LUCK

REPORT defective or missing duct covers PROMPTLY