SAFETY NEWSLETTER

No. 158
CARRY ON THE GOOD WORK

An Engineers Casebook — No 58 Steam Traps and Energy Conservation

IMPERIAL CHEMICAL INDUSTRIES LIMITED

PETROCHEMICALS DIVISION

158/1 WHAT YOU OUGHT TO KNOW

In his last Safety Newsletter Trevor Kletz reminded us that safety work is never done. One of his important tasks was to help to solve new problems. Another, more important, was to remind us of old ones. Throughout 157 issues of this Safety Newsletter Trevor, in partnership with his readers, carried out those never ending tasks in a unique and successful way. Nevertheless, the tasks remain and although the style may change I hope that a new successful partnership will develop.

In taking up my pen to write Safety Newsletter No 158 I am conscious that I am unable to tell you all you ought to know. I will try to help you tell each other and sometimes reinforce the message. I do not promise never to tell you what you don't want to hear! (See 'Favourite Cartoons' Safety Newsletter 157).

158/2 AN OLD WOLF IN SHEEP'S CLOTHING

At a recent discussion on the 'Three Mile Island' incident, a manager said that he sometimes felt that safety discussions thrived on too much hindsight. Certainly there is a lot of hindsight or afterwit about. But it can be used to make predictions, change procedures and publish warnings. The sad thing is that lessons, often dearly bought, are sometimes not learned or are easily forgotten. Re-learning can be a painful process for all of us and some do not survive the experience.

NITROGEN is colourless and has no odour. In fresh air, mixed with the normal proportion of oxygen, we breathe it safely. Used to blanket flammable materials, it has been a boon to the chemical and petrochemical industries. But make no mistake, the use of nitrogen must be carefully controlled because it is a **SILENT KILLER.**

In 1972 A Safety Information Note (No. 3, The Hazards of Inert Gases and Oxygen Deficiency) was published in the former Plastics Division. It was based on hindsight — with knowledge of past incidents — but prepared with foresight, at the request of some managers about to start up a plant in which large amounts of nitrogen were to be used. Perhaps the Note, and many others before and since, contained too much information. The essential messages may have got lost in pages of data, they are (*1) Keep out of nitrogen enriched atmospheres yourself* and *(2) If someone else has been affected do not rush in to help, summon a rescue team with breathing apparatus.*

Compare these two abstracts from the Safety Information Note with the accounts of two recent events:-

(**1a) 1972 WARNING**

In the event of a person entering an atmosphere of pure nitrogen *unconsciousness is immediate*. The person falls as if struck down by a blow on the head and he may die in a few minutes. In 1968 IMI (Kynoch) Ltd studied this and concluded that "in practical terms the investigation suggests that a man, after moderate exertion such as running up a flight of stairs, would lose consciousness about 20 seconds after entering an inert gas atmosphere and without any warning symptoms. Indeed the striking thing is the complete absence of any kind of respiratory distress. Death would be expected to follow 3-4 minutes after losing consciousness".

(1b) 1981 FATAL ACCIDENT

On one of our plants, an experienced supervisor climbed about 24 metres to the top manhole platform of a column. He went to investigate whether there was an adequate flow of water from a hosepipe into the column through the open manhole. Sodium nitrate solution in the column was being

‘roused’ with nitrogen so the column had a nitrogen atmosphere. Shortly afterwards the man was found with his head and shoulders inside the manhole. He had died of asphyxiation.

(2a) 1972 WARNING

In 1972 the Safety Information Note said “one aspect of fatal accidents caused by asphyxiation in a combined space is the readiness with which the first person to find the victim will plunge into the vessel to attempt a rescue without any breathing equipment. This is instinctive and understandable but often results in further lives lost or nearly so”.

2(b) 1982 FATAL ACCIDENT

In 1982 in our Company there has been an accident of just this sort. “A reactor was being water tested. Because the water was taking too long to empty after the test a discussion was held between the works personnel and the examiner from the authorities and it was agreed that nitrogen should be used to speed things along. When the reactor was empty the ICI personnel went to the lift, ten metres away leaving the examiner alone at the reactor. While waiting for the lift to come, they saw the examiner climbing in. He took no notice of shouted warnings and collapsed immediately. An ICI fitter took a deep breath and went in also but collapsed immediately. A second fitter threw in a welding torch containing oxygen and called for help. The ICI Emergency Team brought both men out but the examiner died and the fitter recovered only after being in intensive care for several days.

The reason why this experienced man broke every rule of vessel entry will never be known.

158/3 FREEZING COLD ADDS TO THE ECONOMIC DEPRESSION

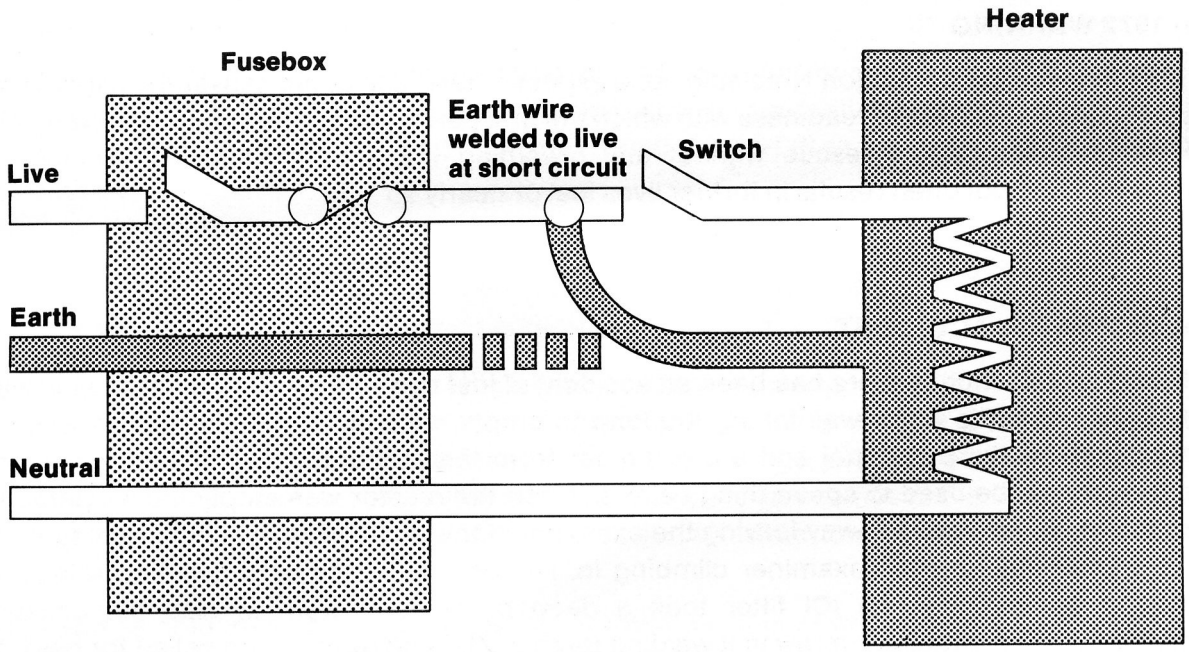
Some of our plants and some in other companies have been operating in short campaigns between shut-downs because of the low demands for their products. In some cases steam has been condensing in unused branch lines which have been isolated near the shut-down plant rather than near the main pipeline. In one or two cases condensate has collected in pipelines because the residual steam flow has not been high enough to keep the line warm. When normal flows were being re-established damage was caused by water hammer as slugs of condensate were pushed through the system.

In some branch lines which normally contain hydrocarbon vapours the recent extremely cold weather has caused liquid to condense and cause similar problems. Worse still, in one or two instances the liquid has solidified and cracked a pipe. The crack has then been revealed at a later date when the solid has melted and liquid or vapour has escaped.

Process teams on idle plants could usefully spend time trying to locate places where these problems could arise and take steps to avoid them happening in future.

158/4 ELECTRICAL HAZARDS - A CASE FOR CHECKING

An incident described in a recent edition of the 'British Engine Bulletin', No 35, September 1981, provides a useful reminder applicable to both the industrial and domestic situations.



The heater shown failed to work and the 30 amp fuse was found to have blown. It was assumed that the fuse had aged and it was replaced. The unit appeared to work but later an operator received a severe shock from the casing.

The live conductor had shorted and welded to the earth conductor which had parted on the fuse box side.

Never replace a fuse before determining the cause of it blowing or checking out the total circuit.

158/5 A MESSAGE FOR OFFICE WORKERS

A Gevafax X-10 printing machine was found with smoke coming from the vent. The exit tray was removed and a piece of paper was trapped in the unit and was smouldering. At the time of the incident the office was not occupied. Inspection by the Engineer indicated that charred paper had been wound back into the machine and it was suspected that a paper blockage had initially occurred and this had not been cleared correctly. Similar problems might be caused by overloading paper shredding machines.

158/6 "GULLIVERS'S TRAVELS" - DO PROCESS OPERATORS NEED KITCHEN TIMERS?

There have been several reviews of those of our storage tanks containing the most hazardous materials. Most have been fitted with high level alarms and extra high level trips which can switch off the feed pump. That does not mean that all other materials are completely without hazard and can be allowed to overflow with impunity. In any case losses, when they occur, can be expensive. In several recent incidents process operators have started pumps to transfer materials from one tank to another. The operators have then been distracted or diverted to other work and an overflow has resulted. They have forgotten to go back and switch off the pump at the right time.

Gulliver, during his voyage to Laputa, observed that many important people were accompanied by servants carrying flappers, small rattles tied to a short stick. When these people forgot what business they were about their servants used the flappers to jog their memories or even, on occasions, to waken them up! We cannot provide everyone with a servant with a flapper. Nor is it always sensible to install more and more alarms and trips. An alternative might be for some operators to carry small portable alarms to do the same job as a kitchen timer. They could set them to give a warning *just before* a transfer or similar operation was due to be started or stopped.

For more information on any item in this newsletter please phone P2845 or write to us at Wilton. If you do not see this Newsletter regularly and would like your own copy, please ask us to add your name to the circulation list.

ALAN RIMMER

April 1982

An Engineer's Casebook No 58
STEAM TRAPS AND ENERGY CONSERVATION

Recently there has been an increasing incentive to investigate steam traps because they are a large source of energy loss. The basic popular types of steam trap are thermostatic (bellows, bimetallic), thermodynamic (disc) and mechanical (inverted bucket, float) and all have claims for particular duties. For superheated steam mains the preference would be between Inverted Bucket (very robust but an N.R.V. is required in case of loss of water seal) and the disc type (preferred for high pressures, but there is a small steam loss during normal operation); for steam tracing the bellows or bimetallic type is preferred but they will need strainers and care is needed to provide a leg to the trap to prevent condensate backing up and causing water logging.

It has been suggested that a rough estimate of the number of steam traps is given by 1 trap/100 lb/hr steam consumed, and the average loss/trap is 10 lb steam/hr. On Olefine 5 for example this would approximate to a loss of some £1 M/year — Fantastic? A recent survey by a manufacturer showed that out of 270 traps inspected, 97 were satisfactory, 103 were blocked or isolated, and 72 were wasting steam in various quantities.

Having justified a need for maintenance a determined effort must be made to carry it out.

After dividing the plant into manageable areas, identifying the number and types of traps and the steam systems on which they operate, deciding the frequency of inspection (normally 6 months) and the checking methods and tools (ultrasonic tester to listen to the trap opening and closing, surface pyrometer to check the condensate temperature upstream of the trap) the time comes when the decision whether to replace traps with identical units, or reconsider a different type, has to be made.

It is advisable to keep the number of types of traps as small as possible, 4 or less; to choose reliability and insist on stainless steel internals, to protect against erosion by wet, flashing steam, rather than initial cost. It is important to consider whether a trap is oversized and to either use a smaller trap or reduce the number of traps. Oversizing can lead to rapid wear, and so-called "machine gunning" in the disc type of trap. Sizing, or the estimation of condensate produced, is difficult but manufacturers will provide guidance on choosing the correct type of trap and tables to help in ensuring that traps are not unduly oversized.

A B Cleary