

IMPERIAL CHEMICAL INDUSTRIES PETROCHEMICALS DIVISION

SAFETY NEWSLETTER NUMBER 47

By Trevor Kletz

47/1 IDENTIFICATION OF EQUIPMENT FOR MAINTENANCE

In an incident in another Division a fitter was sprayed with caustic soda because he broke into the wrong pipeline. A process supervisor misinterpreted his handover and issued a clearance for the outlet line on a vessel to be replaced. Actually it was the inlet line that had to be replaced.

The maintenance supervisor received the clearance; he knew that the inlet line had to be replaced and without reading the clearance carefully he set the fitter to work on it.

The practice of tying a numbered tag on to a pipeline which has to be broken or a valve which has to be changed is widely practised in Petrochemicals Division and would have prevented this misunderstanding.

47/2 WORKS INSTRUCTIONS -

I have received from one of the Works in the Division a revised safety instruction on the precautions to be taken and the procedure to be followed before men are allowed to enter a confined space, or before welding is allowed in areas where flammable gas or vapour may be present.

The instruction runs to 23 pages plus 33 pages of appendices, 56 pages in all. It is easy to say this is too long but there are many special circumstances which have to be covered and most Works have similar instructions, though not perhaps quite so long.

How do we make sure that supervisors and other people concerned really read and understand these instructions? People are human and many people on receiving a 56 page report will put it aside to read when they have time. On the Works concerned the new instructions were discussed in draft with groups of supervisors and the changes pointed out. This is time-consuming both for the supervisors and the managers but it is the only way in which we can make sure that the supervisors really understand the changes which are being made and the managers can find out whether or not it is possible for the new instructions to be operated as intended.

Before you issue a new instruction or make important alterations to an old one do you discuss it in the same way with the people who have to carry it out? It is easy to send out lots of paper but most people absorb new information better through discussion.

Before we issue an instruction we could ask ourselves, have we written this instruction and put it out to help the people concerned or have we done it to protect ourselves?

47/3 A FILTER IS THE CAUSE OF TRAPPED PRESSURE

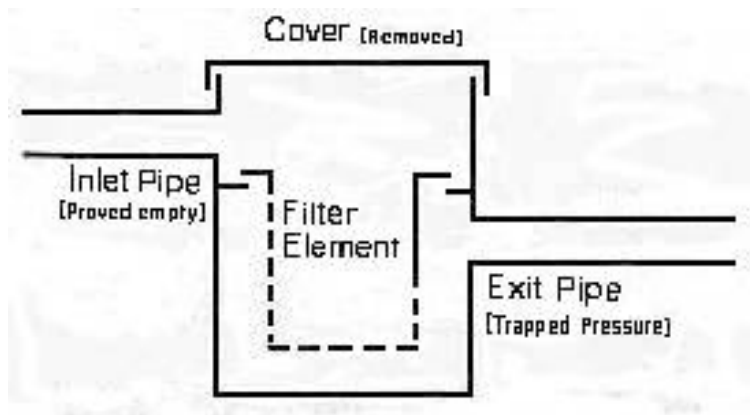
A filter had to be dismantled for cleaning. The inlet side was isolated, emptied and proved clear. The operator, as usual, assumed that the exit side would also be clear as any liquid left in it would have passed backwards through the filter into the inlet side.

The operator therefore removed the top cover and then tried to remove the filter element. It was stiff,

so he tried to ease it out with a bar. It came suddenly, hitting the equipment overhead. -

There was trapped pressure on the exit side of the filter and this blew out the filter element. The filter was choked and so the pressure could not be released through it.

Before opening up a filter assume it may be choked and vent both sides. All filters should be fitted with drain and vent connections so that this can be done safely. A filter cannot be treated like a piece of pipe — it is more like a closed valve. This is particularly true if the filter has a real job to do and is not just there as a precaution to prevent damage to a pump.



47/4 THICKNESS MEASUREMENTS ON DISTILLATION COLUMNS

Corrosion was suspected on a distillation column. Ultrasonic thickness measurements were therefore made on the outside of the shell. These showed that although some corrosion had occurred, the thickness was still well above the design minimum.

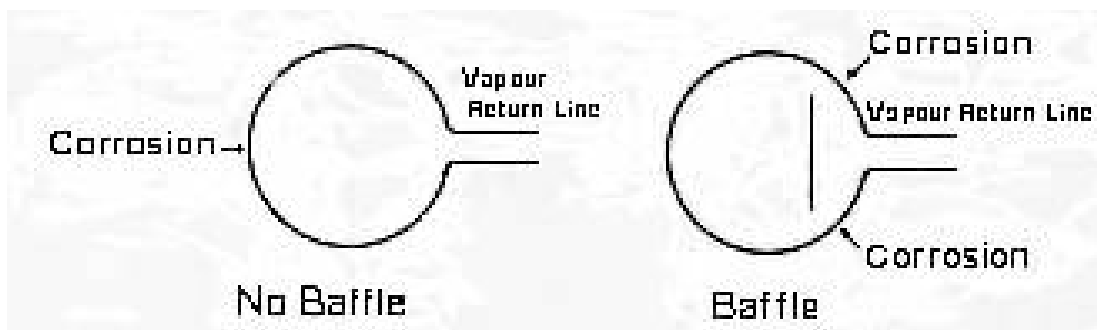
Some months later, when it was possible to take the column out of use, the lagging was removed and it was discovered that part of the column was so thin that it could be flexed by hand.

The thin spot was immediately opposite the vapour return line from the reboiler. The thickness measurements had been made on the other side of the column where the staging and ladders made access more convenient.

The lessons to be learned are:—

1. Thickness measurements in distillation columns should be made at the points at which corrosion is most likely to occur. In the case described above, this was opposite the vapour return line. Often there is a baffle near the return line and corrosion is then most likely near the edges of the baffle.

The geometry of the column must be studied. -

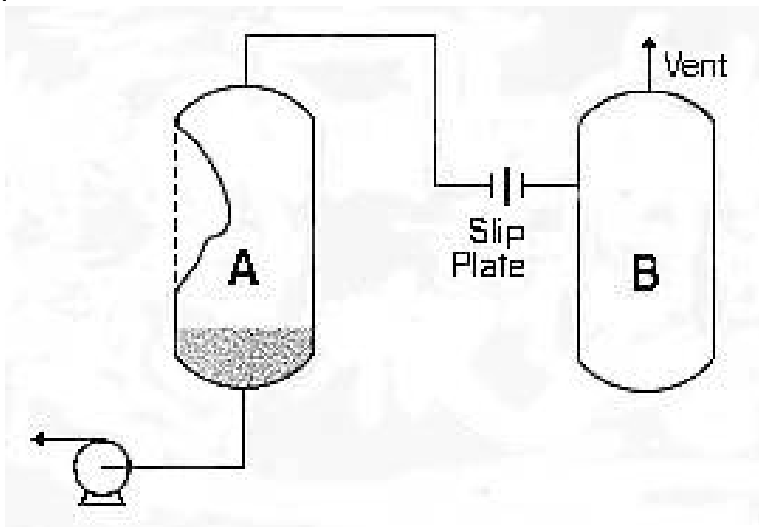


2. During design, access ladders should be positioned to facilitate thickness measurements at the points where corrosion is likely to be heaviest.

For further details see Engineering Technical Services Progress Report, October 1972, Ref. No. AI 7,880/72/10.

47/5 COMMENTS FROM READERS

- (a) Newsletter 45, Item 4 pointed out that a number of expansion bellows have been damaged before delivery. Engineering Department Piping Section Design Note No. PDS9 gives the recommendations of an inter-Divisional working party on the storage and installation of bellows. Copies are available from Miss A L, Ext. 83210
- (b) Newsletter 42, Item 1 described six ways in which storage tanks have been sucked in. Readers have now supplied another two.
 - (i) A tank was carefully cleaned out in preparation for the storage of a very pure material. In order to make sure that no dirt got in, somebody tied a polythene bag over the vent pipe. It was a hot day; there was a sudden shower of rain and this cooled the tank sufficiently to suck it in.
 - (ii) Vessel A was vented through vessel B. Vessel B had to be prepared for entry so the line leading to vessel A was slip-plated off. When liquid was pumped out of Vessel A, it was sucked in.



- (c) Newsletter 42, Item 3 described five ways in which flarestacks have been choked. A reader points out a sixth way by the water seal in the base freezing in cold weather. For this reason water seals are not recommended.
- (d) Newsletter 45, Item 6 described how a motor valve in a cross-over line between two flarestacks failed in the open position, the result of a broken impulse line. As a result air was sucked down one stack, but this was spotted by a high reading on the oxygen analyser. -

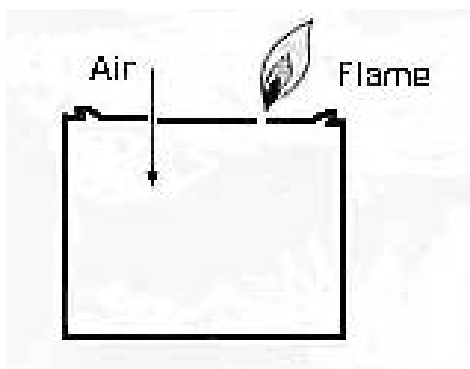
The Newsletter suggested that the motor valve should have been designed to shut on air failure. A reader points out that this cannot be done, as at maximum flaring rates too high a back pressure would be developed in one of the flarestacks.

- (e) Newsletter 45, Item 5 recommended that heat exchanger tubes should be vented to the shell side before plugging so that a dangerous pressure of hydrogen cannot build up inside the tube. Several readers have asked why we need to vent tubes **as** the usual reason for plugging is a hole in the tubes and they will, therefore, be vented already.

Tubes are sometimes plugged because there is a leak between the tube and the tube plate. By fitting a plug in the tube we expand it against the side of the tube plate and stop the leak. These tubes should be vented before plugging.

- (f) Newsletter 40, Item 3 described how a tank blew up in another company. The bottom man-hole was removed while the tank was still full of petrol vapour. Vapour came out and caught fire. As the vapour burnt, air was sucked into the tank through the vent until the contents became explosive and the tank then blew up.

Tom Hay recalls that as a boy he used to punch two holes in a golden syrup tin and then fill it with town gas through a rubber hose. The gas coming out of one hole was lit, and for a while a small flame burnt. Air was drawn in through the other hole until there was an explosive mixture in the can and then the lid blew off.



Do not try it!

47/6 SPARKING ELECTRICAL EQUIPMENT — A GAS DETECTOR IS USED INSTEAD OF PURGING

In one of the plants in the Division process liquids have to be piped to a room in which there is some sparking electrical equipment. It would be possible to put the electrical equipment in a purged or pressurised box, but this would be expensive and inconvenient. Instead, therefore, a Sieger combustible gas detector has been installed in the room and if any leak of gas is detected the electric power is isolated automatically.

The gas detector can detect one tenth of the lower explosive limit and this gives a margin of safety. The power is switched off before the gas concentration reaches the explosive level.

Possibly there are some other places where this system could be used. Although Sieger gas detectors are very reliable, it is possible for them to fail and a hazard analysis should therefore be carried out to make sure that the chance of a failure coinciding with a leak is so low that it can be accepted.

The placing of the gas detector is important — it must be in the path of the leaking gas.

If only a small amount of gas or vapour is liable to leak into an area when there is sparking electrical equipment, it may be possible to provide so much ventilation that the maximum possible leak is diluted to a safe level.

47/7 UNUSUAL ACCIDENTS NO. 17

A Swiss hotel cook lost a finger in a meat-cutting machine and claimed damages from his insurance company.

Suspecting negligence on the cook's part, the company sent a representative for an on-the-spot

investigation. He asked to see the machine in operation and lost one of his own fingers.

The insurance company paid the cook without reservation!

47/8 THREE YEARS AGO

THE TANK'S STORY — A CHRISTMAS FAIRY TALE

From Safety Newsletter No. 15, December 1969.

It was 3 a.m. on a cold Christmas Eve. The operators were all in the control room and the plant was deserted. Father Christmas, looking for somewhere to stop for a rest, landed on the roof of a storage tank. He had stopped there once before, a few years earlier.

"I haven't seen you for some time", said the tank.

"I've been too busy", said Father Christmas, "I have fewer assistants now. How are you?"

"Frightened", said the tank. "I've been terrified since the last time I saw you. They used to keep petrol inside me. For months the nitrogen blanketing was switched off; I was full of explosive vapour and every day I expected a static electricity spark to blow me up. One of my friends blew up. Things are better now; a tank inspector comes round every week to check that the oxygen content is below 5%".

"Then they took the petrol out and put heavy oil inside me. 'Hurray' I said, 'I can't blow up'. But my steam coil leaked, the oil used to come in hot and heat up the water, and the steam nearly burst me. One of my friends burst this way. Things are better now; water is drained off every day and the incoming oil is kept below 100°C".

"Then they took out the heavy oil and put a nice safe liquid in me, non-hydrocarbon so there is no danger from static, and stored cold. 'Hurray', I said. 'I can't blow up and can't burst'. But for over a year now they haven't cleared my flame traps. I can feel them clogging up. Every time some more liquid is pumped in I feel I am going to burst and every time some more liquid is pumped out I feel I am going to collapse. One of my friends has collapsed already"!

"Cheer up", said Father Christmas, feeling in his sack, "I've brought you a present".

"What is it?", said the tank.

"A new sort of flame trap", said Father Christmas. "Your operator can pull it out, hold it up to the light to see it's clear, and put it back. He can check it every day if he wants to".

"Thank you", said the tank, "and a Merry Christmas".

The new design of flame trap is described in Report No, 0.200,625/A, "A Guide to the Venting of Storage Tanks", by B. G. D.

47/9 RECENT PUBLICATIONS

- (a) A code of practice has been issued for the production and use of ethylene oxide, Report No. 0.200,774/A.
- (b) Newsletter 45, Item 1 described the ways in which fires in reciprocating air compressors can be prevented. A recent fire is described in detail in Report No.0.21,425/B. The pulsation dumpers on the compressor were so designed that it was impossible to clean them and finally the carbonaceous deposits caught fire.

- (c) Report No.0.21,422/B discusses the suitability of a particular tip for industrial development. The report concludes that as nearly half the material in the tip is combustible the chance of a fire and consequent collapse of the tip is too great for industrial development to be permitted.
- (d) Report No. EDN 1323, "Coping with Failures in the Steel Industry", by C. E describes a different way of life to the one we are used. Equipment failure is not recognised as a problem until it loses production. If there is no loss of production the remedy is to repair it, strengthen it and carry on.
- (e) The United Kingdom Atomic Energy Authority Data Bank has issued a list of 900 items of equipment on which reliability data is available. Copies can be obtained from Mr. J.F. Ablitt, SYREL Data Bank, UKAEA, Wigshaw Lane, Culcheth, Warrington, Lancashire WA3 4NE.
- (f) Materials Handling Review, October 1972 contains a five-page illustrated feature showing the ways in which pallets get damaged. Copies are available from Mr A Pickles, Productivity Services Dept, Organics Division.

ICI Reports can be obtained from Division Reports Centres.

A few spare copies of our 1973 safety calendar are available. First come, first served.

For copies of the calendar or for more information on any item in this Newsletter please write to Miss M.N, Organic House, Billingham, or ring 6.3927. 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.

Best wishes to all our readers for a Merry Christmas and a Safe New Year.

December 1972

