

No. 108

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**IMPERIAL CHEMICAL INDUSTRIES LIMITED
PETROCHEMICALS DIVISION**

108/1 FOUR MISTAKES IN A ROW — THEN A GAS LEAK OCCURRED

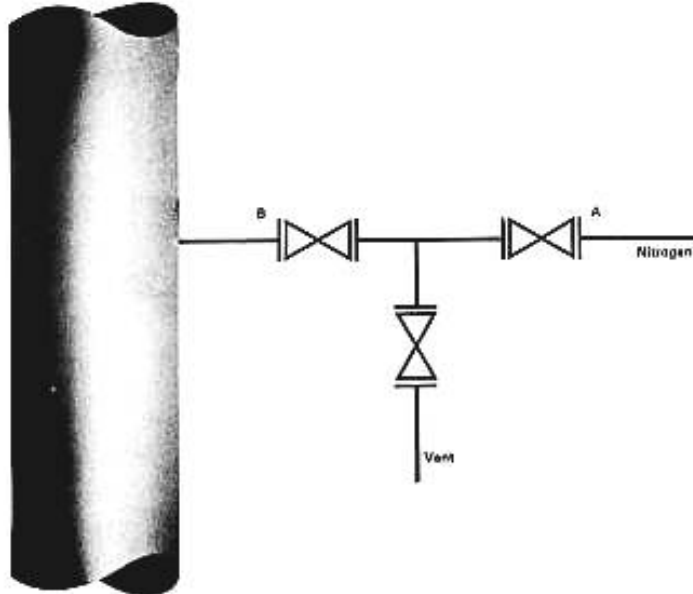
Newsletter 102 described a number of incidents which occurred because the correct clearance procedure was not followed. Here is another.

ACTIONS

A clearance was issued to connect a nitrogen line at point A and then disconnect it after a leak test had been carried out.

ERRORS AND OMISSIONS

Two separate clearances should have been issued.



When it was time to disconnect, the acting process supervisor asked the fitter to break joint B and blank.

He should have asked him to disconnect joint A which should have been tagged. As this job is done several times per year there could be a permanent tag.

The fitter, who was new to the Works, broke joint B and blanked the nitrogen line.

This left an open end on the vessel.

The lead fitter signed off the clearance

without inspecting the job.

The acting process supervisor also signed off the clearance

without inspecting the job.

When feed was started to the plant toxic gas came out of the open end, fortunately without injuring anyone.

This incident would not have occurred if either:

The correct joint (A) had been tagged.

The fitter had realised that we do not leave open ends on vessels.

The lead fitter had checked the job before signing off the clearance.

The acting process supervisor had checked the job before signing off the clearance.

How thorough is the training of the deputies on your plant?

108/2 UNUSUAL INSTRUMENT READINGS ARE SOMETIMES RIGHT

Newsletter 50/12 described an incident which occurred because instrument readings were not believed. Another company have described an unusual incident of this type.

Following some modifications to a pump, it was used to transfer some liquid from one tank to another. When the movement was complete the operator pressed the stop button on the control panel and noticed that the pump running light went out. Several hours later the high temperature alarm on the pump sounded. As the operator had stopped the pump several hours before he assumed that the high temperature alarm was faulty and ignored it. Soon afterwards there was an explosion in the pump.

As a result of an error in the circuit, pressing the stop button caused the pump running light to go out but did not stop the pump. It continued running, overheated, and this caused an explosive decomposition of the contents.

108/3 A LIFTING ROPE BROKE BECAUSE NO-ONE KNEW THE WEIGHT OF THE LOAD

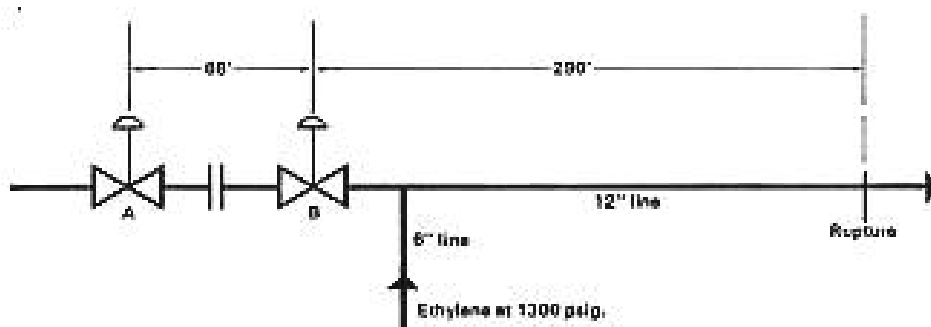
While the top half of a compressor casing was being turned over, the wire rope being used for this purpose broke. Fortunately no-one was injured and damage was slight.

The weight of the half-casing was twice the safe working load of the rope. No-one knew the weight of the half-casing, it was not marked on it, and even the manufacturer did not know the weight.

When large pieces of equipment have to be lifted regularly, their weights should be marked on them.

108/4 A PIPELINE RUPTURE — FOR AN UNUSUAL REASON

An article in Hydrocarbon Processing, November 1977, page 487 describes an unusual pipeline rupture.



Ethylene at 1300 psig was flowing along the 6 inch line and into the 12 inch line. The two motor operated valves A & B were closed so that the flowmeter between them could be maintained — the space between them contained air.

Valve B was opened. A few minutes later the paint on the 12 inch line was bubbling and after 15 minutes the line burst.

When valve B was opened taking -3 seconds - the high-pressure ethylene acted like a piston, compressing the air between valves A & B and raising its temperature to about 800°C. At this temperature ethylene decomposes, giving out heat — it burns without air — and the “flame” travelled along the ethylene in the pipeline. After 290 feet the flame speed and flow rate were such that the flame stayed in the same place and overheated the pipe until it burst.

The amount of air between A & B was insufficient to cause an air/ethylene explosion and the result would have been just the same if the space had contained nitrogen.

To prevent similar incidents happening again, pipelines containing ethylene or other gases which can decompose should be brought up to pressure slowly.

The compression of one gas by another, producing heat, is well-known (See, for example, H.O. Pritchard, Quarterly Reviews, 1960, p 46 and M Steinberg and W E Kaskan, Fifth Symposium on Combustion, Reinhold, New York, 1955, p 664) but not to pipeline operators. It is another example of knowledge being in the wrong place (See Newsletter 105/1).

108/5 SOME NEW CLEANING & DEGASSING MATERIALS

(a) A new method for removing sludge from tanks

Using a new Petrochemicals Division product, "Synperonic" sludge cleaning chemicals, deposits of sludge can be emulsified and pumped away.

This new method of cleaning is **safer** than traditional methods, as manual cleaning is not required.

It is also **quicker** than traditional methods as initial gas-freeing is not required and the problems caused by liberation of gas during manual cleaning do not arise. Recently 400 tonnes of crude oil sludge were removed from a tank in two weeks. Conventional methods would have taken six to nine **months**.

The emulsion produced breaks down after standing for a day or two and the hydrocarbons can be recovered.

More information can be obtained from Petrochemicals Division Works Safety Managers, Division Safety Advisers or from Mr E G Bryan at Petrochemicals Division HQ (Ext. 2395).

(b) A new general purpose cleaning material

A new petrochemicals Division product, "Synperonic" TC3OC, makes it possible to clean almost any surface or piece of equipment with a single material.

In the past different cleaning materials had to be stocked for different applications. "Synperonic" TC3OC can be used for many different applications provided it is dissolved in a suitable solvent. One of the solvents used already on the plant is usually suitable.

Used with water "Synperonic" TC3OC can be used for tank cleaning.

More information can be obtained from the people mentioned in item (a) above.

(c) A New Product Makes Degassing Easier

ICI is developing a new NALFLOC, product N5602, which absorbs vapour from plant equipment and thus reduces the time needed to prepare plant for maintenance. The new compound is added to wash water and emulsifies hydrocarbon vapours. During trials a petrol storage tank was gas freed in eight hours instead of three or four days, a crude oil unit in two hours instead of 1 - 1½ days.

Details can be obtained from NALFLOC Ltd., P0 box 11, Northwich, Cheshire or Keld House, Allensway, Thornaby, Cleveland.

108/6 A LOOK BACK AT NEWSLETTER 8 (March 1969)

Recent Newsletters (particularly 103/3, 98/6, 97/3, 96/7, 93/4, 86, 74/3 and 66/3) have described accidents caused by operator error and have suggested that the errors might have been foreseen — and designed out.

An incident of this type was described in Newsletter 8/1.

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 operator's 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.

108/7 SOME QUESTIONS I AM OFTEN ASKED

33—WHAT'S NEW?

The answer, usually, is very little. Most of the accidents that occur in ICI and other companies have happened before.

Newsletter 93 described some major accidents that have recurred after ten or more years while an article in Loss Prevention, Volume 10, p 151 described "Some Accidents of the Coming Year", accidents which repeat themselves every year or so. (Copy on request).

We cannot turn lead into gold because we do not know how to do so. By contrast, very few accidents happen as the result of lack of knowledge of ways of preventing them; they occur because the people concerned do not know that an accident is possible or do not really believe that it can happen.

Organisations have no memory. Only people have memories and they move.

How can we keep alive the memory of accidents that have happened?

These Newsletters attempt to do this. So do our weekly discussions of accidents that have happened. Another way is by a plant black book — see Newsletter 72/5.

108/8 UNUSUAL ACCIDENTS No.75

While working in South America an Englishman was asked to take a sample from the east tank of a group of two. The results of the analysis were very odd and, as the man was sure that he had sampled the right tank, they could not be explained.

Later on he realised that he had sampled the west tank. He had forgotten that the sun was in the north.

Reminder: Other incidents in which people went to the wrong piece of equipment were described in Newsletters 102/5, 99/2 and 91/1.

108/9 RECENT PUBLICATIONS

— BY PETROCHEMICALS DIVISION STAFF

- (a) "... and now for start-up", practical aspects of hazards in plant commissioning, from Hydrocarbon Processing, August 1977.
- (b) "Olefine Plant Safety during the Last 15 Years", from Chemical Engineering Progress, September 1977.
- (c) "What you don't have, can't leak", Society of Chemical Industry 1977/8 Jubilee Lecture.
- (d) "Some Myths on Hazardous Materials", from Journal of Hazardous Materials, Vol 2, No 1.
- (e) "A Survey of Fires and Explosions in Hydrocarbon Oxidation Plants", "Practical Applications of Hazard Analysis" and "The Reduction of Risk in Adipic Acid Manufacture by Improving Software Systems", papers to be presented at the next American Institute of Chemical Engineers Loss Prevention Symposium.
- (f) Report No PC.200,862/A, available from Division Reports Centres, continues our annual summaries of press reports of fires, explosions and releases of toxic materials in the oil and chemical industries. Transport incidents are included and a few incidents in other industries. The incidents reported in 1977 include:
 - explosions in banana warehouses
 - a drum of formaldehyde was punctured; over 80 people were taken to hospital, many affected by hysteria rather than fumes.
 - a fire on a vehicle made worse by the presence of asbestos!

—BY OTHERS

The official Norwegian report on the blowout on the Ekofisk North Sea platform in April 1977 shows that, as at Flixborough, the faults lay in the management rather than the design. In particular:-

- (i) The men in charge had long practical experience but little theoretical training.
- (ii) There was a failure to heed warning signs.
- (iii) The planning and supervision were poor.

A copy of the summary is available on request.

For copies of these papers (except (f)) or for more information on any item in this Newsletter please 'phone Eileen Turner (Ext. P.2845) or write to her at Wilton. If you do not see this Newsletter regularly and would like your own copy, please ask Mrs Turner to add your name to the circulation list.

February 1978

An Engineer's Casebook No 8 — Routine Test Pressure

Occasionally it may be necessary to apply a hydrostatic test to equipment which has been in service for a period of time as a means of demonstrating that it is fit for further service. In general such tests are of limited value confirming only that, at the time of test, the equipment is satisfactory and giving no indication of future life. Tests which measure metal thickness, allow visual examination, avoid contamination through the use of test water etc. are therefore the preferred methods. Nevertheless it will be necessary to hydrotest where other forms of examination are impracticable, major repairs or modifications have been carried out with a need to apply a proof test, a second-hand vessel is involved etc.

When a hydraulic test is to be applied one must first check to see if the weight of water has been allowed for in the foundation/support structure design and that due allowance is made for the effect of static head. Then one has to establish the value of the test pressure itself.

In the past it was always fairly safe to assume that all equipment was designed on the basis of it being full of water and that, the test pressure was 15 times the design pressure. Nowadays things have changed and it is essential to consider each hydraulic test as a separate exercise. Except for simple routine testing operations it is appropriate to consult the Design Authority to establish the viability of a hydraulic test and the magnitude of the test pressure.

It is a matter of policy in Petrochemicals Division to design foundations and support structures for any vessel on the basis that it is full of water. It is not the practice however to design the shell thickness of larger vessels, for example, distillation columns over 100 ft. tall, on the basis of hydrostatic pressure at the base when full of water plus the maximum design operating pressure.

Vessels are built to one or other of a variety of design codes. The less stringent of these, measured through factors of safety, constructional standard, evaluation of stress, utilisation of material properties, for example, BS 1500, use a test factor of 1.5 based on the as-built thickness at the weakest part. Advanced design codes invariably use proof test factors which are less than 1.5, allow for any loss of material strength at temperature if in hot service, and deduct any corrosion allowance when calculating the test pressure. The factor for BS 1515 is 1.3 and for BS 5500 1.25.

Equipment registration cards often quote 'routine test pressure' whilst manufacturers drawings quote 'initial test pressure'. It is advisable not to use these figures as the basis for any hydraulic test applied to equipment which has been in service but rather to ask the Design Authority for guidance on the pressure to be applied.

E H Frank

WHO'S WHO IN SAFETY



No 23 T WELSH and No 24 J PARSONS

Two of the Wilton Shift Fire Officers were the subject of our "Who's Who?" in November 1977 (Newsletter 105). This month we introduce Tom Welsh and John Parsons.

Tom spent nearly six years in the Infantry, serving in North Africa, Italy, Greece and Austria. He settled down to the ICI Fire Service in January 1952 and became a Shift Fire Officer four years later. He is now D' Shift Fire Officer~

His hobbies include gardening, collecting antiques, wine making and, not surprisingly, travel.

The 'C' Shift Fire Officer, John Parsons, served in the RAF Fire Service for five years at home and in Aden before joining ICI in 1966. He became a Shift Fire Officer in June 1974.

John is a (disillusioned) supporter of Middlesbrough's football team and enjoys wine-making and home decorating. He is also chairman of his staff social section and a member of the 'local' darts team. He is married with two young daughters.