

# **IMPERIAL CHEMICAL INDUSTRIES LIMITED**

## **PETROCHEMICALS DIVISION**

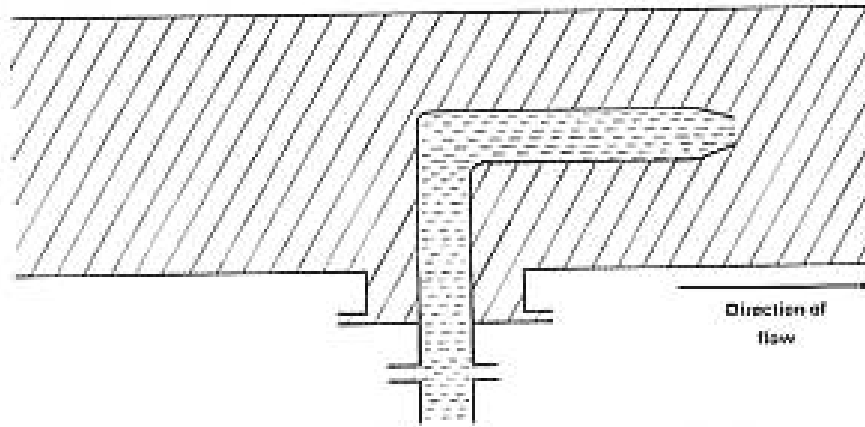
### **SAFETY NEWSLETTER No.97**

#### **CONTENT**

- 97/1** An aqueous stream had to be injected into an oil line. The system was designed to ensure good mixing but corrosion still occurred
- 97/2** Everyone knows that pipes contract when they get colder and that metal gets softer when heated — but sometimes we seem to forget.
- 97/3** A mistake while testing an alarm caused 1½ days lost production.
- 97/4** If a trip operates frequently, testing will not improve reliability.
- 97/5** A column of liquid in a pipeline can come out with more force than we expect when the pipeline is broken.
- 97/6** Two more occasions on which we failed to foresee the results of plant modifications.
- 97/7** An unusual accident while assembling a compressor.
- 97/8** Is the Safety Newsletter issued free?
- 97/9** Alarms which sound too often are frequently ignored.
- 97/10** There are new publications on portable electrical apparatus, nitrate stress corrosion and the calculation of explosion pressures.

## 97/1 HOW TO ADD WATER TO OIL

Newsletters 30/1 and 27/1 described the correct way to inject water or an aqueous solution into an oil line in order to ensure good mixing. The following diagram is taken from Newsletter 30/1.



Another company installed a system like this but nevertheless experienced severe corrosion of the main pipe. A split occurred and hot oil was sprayed over the plant.

The incident occurred because the nozzle was installed pointing the wrong way — upstream instead of downstream. The two liquid streams met head on and the aqueous solution was forced against the side of the main pipe.

Last year, in Petrochemicals Division, a similar device was installed the wrong way round, but fortunately it was spotted soon afterwards.

Whenever possible equipment should be designed so that it cannot be assembled incorrectly. It should be impossible, for example, to interchange reciprocating compressor suction and delivery valves.

## 97/2 A FAILURE TO USE ELEMENTARY KNOWLEDGE

Accidents sometimes occur because we fail to use elementary knowledge that we learned at school. We keep our knowledge in one part of our mind and deal with “real life” in another.

A recent report by the US National Transportation Safety Board describes a town gas explosion which killed 20 people and injured 39.

In the summer of 1974 a plastic gas main was laid in a street of Fremont, Nebraska, alongside a hotel, and was fixed to metal mains at each end by compression couplings. In the following winter the pipe contracted and nearly pulled itself out of the couplings. The next winter was colder and the pipe came right out. Gas leaked into the basement of the hotel and exploded.

The pipe was 348 feet long and contracted about 3 inches. Everybody knows that materials contract when they get colder, but nobody applied this knowledge and left sufficient slack in the pipeline to allow for contraction.

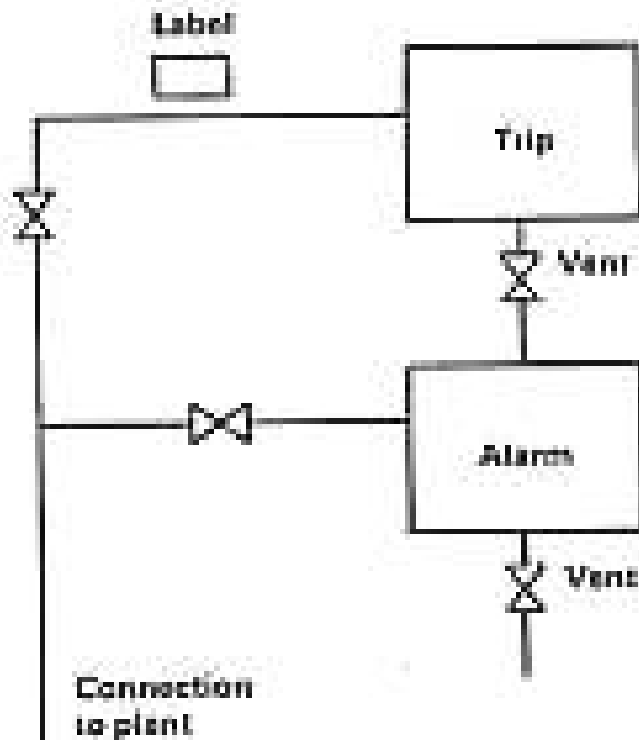
For another example of failure to use elementary knowledge see Newsletters 73/4 and 66 (page 8). Everybody knows that when metal gets hot it becomes soft, but we are still surprised if a pressure vessel bursts on exposure to fire. In many cases people have failed to cool a vessel exposed to fire with water because they thought the relief valve would prevent it bursting. They had not realised that a vessel will burst at (or below) its design pressure if it gets too hot and the metal loses its strength.

## 97/3 HUMAN ERROR DURING TRIP AND ALARM TESTING -2

One incident was described in Newsletter 96/7. Here is another.

A plant is provided with a low pressure alarm and an independent low pressure trip (as recommended in Safety Newsletter 92/4).

They are arranged on the plant as shown below. There is no label on the alarm but a small one on the trip.



An instrument artificer was asked to test the alarm. The procedure is to isolate the alarm, open the vent to blow off the pressure and note the pressure at which the alarm sounds.

By mistake the artificer isolated the trip. When he opened the vent valve, the pressure fell, the trip operated and the plant was shut-down. It took 36 hours to get it back to normal.

It would be easy to blame the artificer but we all make mistakes like this occasionally (see Safety Newsletter No 86). In this case the chance of a mistake could be reduced by:

- (a) Better labelling
- (b) Putting trips and alarms further apart.
- (c) Painting trips and alarms different colours.

**Note:** Trips and alarms should be connected to the plant by separate impulse lines if there is any possibility of choking. See Safety Newsletter No 90, page 24.

#### 97/4 A TRIP TEST THAT CANNOT IMPROVE RELIABILITY

On one Works, drums are filled with liquid product by an automatic device which weighs the drum and closes a valve when a pre-set weight is reached.

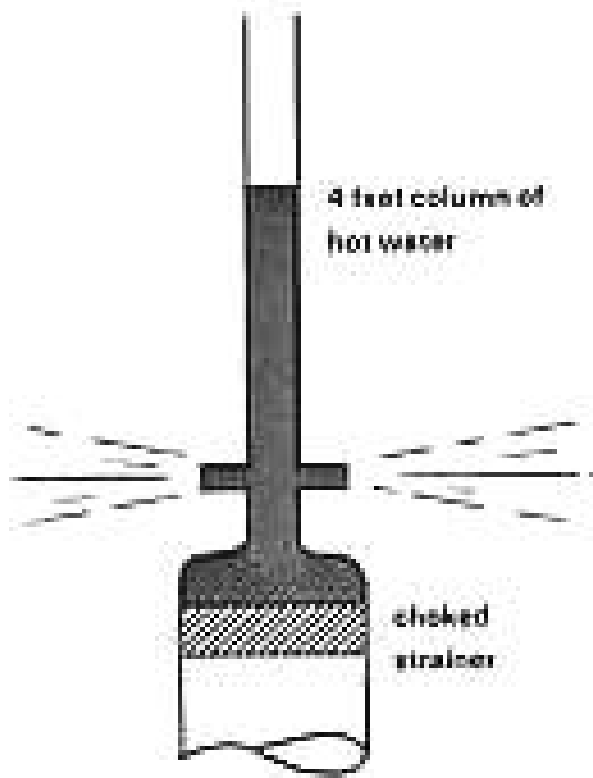
One day the valve failed to close. The drum was overfilled and the liquid splashed the filling operator's legs and feet. He tripped the supply manually and went to the locker room to change his overalls. While doing so he slipped and twisted his knee.

The investigation revealed that this was not the first time that the valve had failed to operate. The operators said that it had happened "once or twice before in the last year or two".

Amongst the actions proposed to "try to eliminate" the incident was the institution of trip testing once every two weeks. This will have no effect on the failure rate because 700 drums are filled every week and the trip is therefore tested 700 times per week! Failure of the trip mechanism will almost certainly be followed by a drum overflowing; a test is very unlikely to detect the fault.

The investigation report also suggested a much more effective way of reducing the failure rate — check the mechanism for adjustment and look for signs of wear — and for this, a lower frequency would seem appropriate, say once per month.

#### 97/5 HOW MUCH PRESSURE IS THEREIN A COLUMN OF LIQUID?



A choked strainer had to be removed (in another company). Above the strainer was a column of hot water no more than four feet tall. It was decided to break the joint above the strainer and let the water run out. It came out with such force that two men were sprayed and scalded.

People are often surprised by the pressure produced by a column of liquid. Eight feet of water will produce 4 psig — enough to cause liquid to spread out up to 8 feet horizontally through a joint that has been cracked open.

A rough rule of thumb — if the column of liquid is x feet tall, it may spray x feet through a broken joint.

## 97/6 TWO MORE FAILURES TO FORESEE THE RESULTS OF PLANT MODIFICATIONS

Newsletters 83, 71/7, 67/7d and 63/7 described a number of incidents which occurred as a result of failure to foresee the results of plant modifications and Newsletter 83 suggested ways of preventing similar accidents in the future. In particular, Part 1 Section B described accidents which occurred because simple modifications authorised by only a clearance certificate or workshop chit had unforeseen results. It is now our policy that all modifications should be authorised by plant managers or engineers who should first of all go through a systematic procedure to make sure that, as far as possible, all consequences have been foreseen.

Here are two more occasions on which we failed to foresee the results of plant modifications.

- (a) The first is taken from the accident book of Brunner Mond, one of the predecessors of ICI, for March 20, 1891.

*“About 8.30 pm yesterday Mr Broom (1173) 30 years of age, and residing at No 4 Old Brewery Yard, Witton Street, was passing the tank into which the steam traps deliver their steam, “when it burst” “scalding his foot” After having it dressed he was sent home in the ambulance and Dr Brown is to call and see him this morning.”*

The following is added underneath in a different handwriting, presumably that of the manager:

*“This vessel was connected up to delivery of steam traps without my knowledge. It has since been disconnected.”*

- (b) A new loading bay was built for road tankers of liquefied petroleum gas. The ground was sloped so that any spillage would run away from under the tank wagon. Unfortunately, nobody realised that if the road tanker stands on sloping ground the level indicator will give an incorrect reading. The design is now being modified so that the wheels stand on level ground but the space in between and around is sloped.

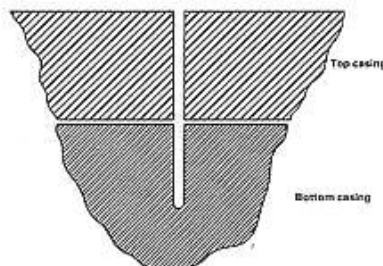
## 97/7 UNUSUAL ACCIDENTS No 64

The top casing of a turbine is located on the bottom casing by two 3/8 inch dowels, which are designed to move freely. There are blind holes in the bottom casing and open holes in the top casing.

When the top casing was removed, one of the dowels stuck to it, perhaps because water or dirt had got into the hole. When the top casing was replaced the dowel did not slide easily into the lower hole — perhaps there was some sealing compound in it or perhaps it was compression of the air. Whatever the reason, when the cover was tightened the dowel was ejected and hit the fitter above the right eye.

Perhaps the dowel should have been screwed into the bottom casing or perhaps a groove should have been machined in the dowel.

It is good practice when putting a peg into a hole to make sure first that the hole is clear and deep enough to receive the peg.



## **97/8 SOME QUESTIONS I AM OFTEN ASKED —**

### **28— IS THE SAFETY NEWSLETTER ISSUED FREE?**

No, you pay a very high price for it.

It is true that I do not ask for cash, credit cards or even job numbers in exchange for your monthly copy, but a very high price in injuries, damage to plant and lost production is paid for the information in every issue.

Are you getting value for money or are you going to wait until the same incidents occur on your plant or on the plant you are designing?

## **97/9 ALARMS WHICH SOUND TOO OFTEN**

We all know that alarms which sound too often are ignored.

According to the *Sunday Times* for 13 January 1977, burglar alarms go off so often that they are now frequently ignored — 98% of the alarms are false.

## **97/10 RECENT PUBLICATIONS**

- (a) "Portable Electrical Apparatus", ICI Engineering Codes and Regulations, Volume 14, can be obtained from Division Standards Sections.
- (b) "Nitrate Stress Corrosion of Mild Steel", Technical Data Note No 53/2, can be obtained free from any office of the Factory Inspectorate.
- (c) Loss Prevention Volume 10, obtainable from the AIChE, contains the papers and discussion from the 1976 Loss Prevention Symposium.
- (d) Safety Note 77/4, "Estimation of Peak Incident Overpressure from the Explosion of Unconfined Vapour Clouds" describes the method recommended for use in the Division.

For a copy of (d) or for more information on any item in this Newsletter please phone ET. (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 T. to add your name to the circulation list.

March 1977

## Who's Who in Safety?



**No. 11 - MRS E TURNER**



**No. 12 - MRS M WALTON**

**AND**

Eileen Turner started work in the Middlesbrough branch of a building society after a secretarial course, and worked for an accountant and an architect before joining ICI in August 1974. As secretary to the Division Safety Adviser she deals with many queries from all over the world as well as normal secretarial duties and has become one of the most well-known members of the Division.

Her hobbies are reading and listening to music but she found (rather to her amazement) that the fell walking, rock scrambling and primitive camping she had to take up when she got married became very enjoyable as time went by. Her husband is an engineer.

After attending Middlesbrough High School Margaret Walton started work as an accounts clerk. After leaving to bring up two sons she decided to begin a new career and returned to college to complete a secretarial course. She has now worked at ICI in the Safety and Loss Prevention Group for eighteen months.

Hobbies are somewhat restricted, running a home and a full-time job, but Margaret has assisted her husband in his term of office as Social Secretary of Runswick Bay Sailing Club. She likes cooking, meeting new people and an active social life. Her husband is a bank manager.