# SAFETY NEWSLETTER

# No. 113

## *IN THIS ISSUE*

### WHAT'S IN A NAME?

**This Newsletter describes some accidents which occurred because materials with similar names, or similar in appearance, were confused or because the names did not indicate the hazards.**

**113/1 Are we all sure what is meant by "boiling condensate", "nitrogen blanketing" and "inert gas"?**

**113/2 What is "hypo"?**

**113/3 & 4 More accidents caused by the wrong material of construction.**

**113/5 What is a "working day"?**

**113/6 When is a plant on-line and when is it shut-down?**

**113/7 Kerosene was mistaken for water.**

**113/ What are "walls" and what is the "top"?**

**113/9 What is meant by "Safety First"?**

**IMPERIAL CHEMICAL INDUSTRIES LIMITED**

**PETROCHEMICALS DIVISION**

## 113/1 SOME MISLEADING NAMES

### Condensate

Boiling condensate is one of the most dangerous materials we use. For example five men were killed last year in another Company, when a plastic hot water tank split along a seam (Chemical Engineering, 5 December 1977, p 67).

On many plants hot condensate is used for clearing chokes and sometimes men get scalded. Perhaps they do not realise that “hot condensate” is boiling water. On one plant in the Division they now call it “boiling water”. Everyone knows that it is dangerous and more care is taken.

### Blanketing

On many plants the vapour spaces of storage tanks are filled with nitrogen in order to keep out air and prevent the formation of an explosive mixture. This is usually called “nitrogen blanketing”. On one plant it was found that some operators thought that the nitrogen formed a literal blanket — a thin layer resting on the surface of the liquid — and that therefore just a whiff of nitrogen was sufficient. They did not realise that sufficient nitrogen is needed to fill the whole vapour space or at least to reduce the oxygen content down to 5%.

Perhaps we should use another name instead of “nitrogen blanketing”.

### Inert gas

Nitrogen is often referred to as “inert gas”. This suggests to some people that it is harmless. In fact, many people have been killed by it (see Newsletters 88/4, 25/3, 1 7/5), and others have been overcome (see Newsletters 111/2, 95/7a, 22/1 and 3/6). Perhaps we should avoid the term “inert gas”.

## 113/2 DIFFERENT MATERIALS WITH SIMILAR NAMES

Newsletters 99/6 and 55/5 described how accidents occurred because people confused:

Washing soda and caustic soda

Nutrimaster and Firemaster

Ice and dry ice

Another incident is described in the Mond Division Safety Report for October 1977. The word ‘hypo’ is sometimes used as a short name for sodium hypochlorite (familiar to most of us as Domestos). However, the name is sometimes used as a short name for sodium thiosulphate (photographers ‘hypo’).

By mistake a tanker of sodium thiosulphate solution (photographers ‘hypo’) was off-loaded into a stock tank containing sodium hypochlorite. The two different sorts of ‘hypo’ reacted together giving off heat and fumes.

Another incident occurred in Japan. Sodium hydrosulphide was put into a reactor instead of sodium sulphide. Hydrogen sulphide gas was given off and the operator collapsed. In Japanese, the two names are even more similar than in English.

## 113/3 WRONG MATERIALS OF CONSTRUCTION

Newsletters 61/7-4, 71/6, 78/4 and 104/2 described incidents which occurred because the wrong material of construction was used and Newsletter 71/6 described the checking necessary on a new plant.

In a paper presented at an American Institute of Chemical Engineers meeting in August 1977, G C Vincent and C W Gent of lCl Agricultural Division described the results of the checks carried out on the materials supplied for a new ammonia plant. Altogether 5450 items (1.8% of the total) were delivered in the wrong material. These included 2750 furnace roof hangers; if the errors had not been detected, large sections of the roof would probably have failed in service.

> *"Some of the material wrongly supplied was perfectly acceptable when known. In fact, one of the more interesting features was that vendors often sent without notice what they regarded as "superior" material. Thus, if asked to supply 20 flanges in carbon steel of a given size, the vendor, if he had only 19 such flanges available was quite likely to add a 20th of the specified size in "superior" 2¼ % Cr. When challenged the vendor was often very indignant because he had supplied "superior'~ i.e., more expensive, material at the original price. We had to explain that the "superior" material was itself quite suitable if we knew about it. If we didn't we were likely to apply the welding procedures of carbon steel to 2¼ % Cr steel with unfortunate results."*

## 113/4 WRONG MATERIALS OF CONSTRUCTION AGAIN

The Chemical Safety Summary (issued by the Chemical Industry Safety and Health Council of the Chemical Industries Association) for October 1974 - July 1975 described how fitting the wrong sort of blank to a road tanker resulted in a serious incident.

A stainless steel road tanker was loaded with 96% nitric acid. A run-off pipe not normally used had been blanked with mild steel instead of stainless steel. This was attacked by the acid and a leak occurred. Fire hoses were run out and used to dilute the leaking acid but the fumes prevented a clear sight of the area. Nobody could see that there was a full oxygen cylinder lying against the kerb close to the tanker. A pool of nitric acid formed between the cylinder and the kerb and this corroded the cylinder so much that it burst. As it did so it took off, going over the top of a building at a height of 40 feet and landing 200 feet away. Fortunately, it did not injure anybody or cause further damage on landing.

## 113/5 WHAT IS A WORKING DAY?

**A** recent misunderstanding shows how easily words can be misunderstood.

According to The lonising Radiation (Sealed Sources) Regulations, all sealed radioactive sources must be checked by an Authorised Person each working day, to make sure that they are still there.

On one plant, they took this to mean that the Authorised Person must check the presence of the sources on Mondays to Fridays, but not at weekends.

**However, each working day means each day that the radioactive source is** working, not each day that the Authorised Person is working!

## 113/6 WHEN IS A PLANT ON LINE AND WHEN IS IT SHUT-DOWN?

Newsletter 98/1 described a temperature runaway that occurred because no temperature readings were taken on a batch of reaction product that was left standing after reaction was complete. If readings had been taken the rise in temperature would have been spotted before it got out of control.

A similar incident was described in Newsletter 87/3.

> Now two more incidents have occurred in the Division because readings were not taken on plants which were shut down.

(a) The level measuring instruments on a feed tank had given a lot of trouble so the operators dipped the tank every shift. When the plant shut down they stopped taking readings and they stopped dipping the tank. The high level alarm on the tank had been removed for repair. The producing plant which supplied the raw material was not shut down and the level in the tank went on rising until it

overflowed.

There were some errors in the stock sheets and there was more in the tank than the operators expected. However, if they had continued to dip the tank every shift the error would have been spotted.

(b) When another plant is shut down for a short time a small flow of steam is passed through it to prevent the contents setting solid. The steam is condensed in a cooler and the condensate collects in one of the storage tanks.

Fumes were seen coming from the tank and the Fire Brigade were called in to cool it. It was then found that the cooling water had been isolated. As no readings were being taken the gradually rising temperature in the tank was not spotted.

**113/7 UNUSUAL ACCIDENTS No 79**

One of our overseas companies reported that a piece of rag in a workshop caught fire. A fitter picked up a bucket of what he thought was water and threw it on the fire.

The bucket contained kerosene!

*Do not use kerosene for cleaning. Use Genklene instead. But if you must use flammable solvents keep them in closed containers.*

**113/8 A LOOK BACK AT NEWSLETTER 13 (Sept 1969)**

A Permit-to-Work was issued for modifications to the wails of a room. The maintenance workers started work on the ceiling as well and cut through some live electric cables.

In the second incident a Permit-to-Work was issued for welding on the top only of a tank which had been removed from the plant. When welding was complete the welders rolled the tank over and started work on the bottom. Some residue which had previously been covered by a layer of water caught fire.

**113/9 OTHER MEN'S VIEWS No 9**

**What is meant by 'Safety First'?**

The early slogan "Safety First", which made safety sound unattractive because it seemed to put safety ahead of every other consideration in human affairs, grew from an unfortunate circumstance.

At the beginning of the 20th century, a man named Henry C Frick, president of the Henry C Frick Coke Company, inaugurated the country's first industry-wide safety campaign with the slogan, "Safety First, Quality Second, Cost Third". "Safety First" was lifted out of context and widely used by other companies. No longer was safety "first" only to quality and cost; the slogan seemed to put it ahead of everything.

The safety movement never advocated safety as the number one objective in life. It never asked Americans to live by a timid and faint-hearted code. It never opposed adventure, because adventure and discovery are the very essence of life.

From "Family Safety", Summer 1972

## 113/10 READERS' COMMENTS

Newsletter 111/1 described how a 57 $m^3$ container made from 16 gauge mild steel was bowed out by compressed air, though the liner made from 700 gauge polythene did not burst.

Readers have asked for the actual thicknesses.

16 gauge steel is 0.064 inch thick 700 gauge polythene is 0.007 inch thick.

The polythene is not, of course, stronger-than the steel but the polythene liner was bigger than the steel container so the steel gave way first.

## 113/11 SOME RECENT PUBLICATIONS ON HAZARDS

### (a) Canvey Island

The official report "Canvey — an Investigation of Potential Hazards from Operations in the Canvey Island/Thurrock Area" (HMSO, £10, summary only £1) attempts to calculate the chance that people living on the island will be killed as a result of an explosion or toxic gas release on one of the neighbouring refineries. Though the details of the calculations may be questioned, the report is interesting as an official acceptance of the view that risks cannot be completely eliminated and that therefore we should put them in a numerical "batting order" so that we can deal with the biggest ones first.

### (b) Nuclear Energy

Another official report, "The Hazards of Conventional Sources of Energy" (HMSO, £1.00) shows that although nuclear power stations might kill people by radiation the alternative sources of energy actually do kill and injure people in a variety of ways.

### (c) Oxygen

A third official report, "The Fire on HMS Glasgow, 23 September 1976", (HMSO, £2.75) describes (in great detail) a fire in a destroyer under construction in which eight men were killed. Oxygen had leaked into the compartments through hoses which had been left connected to the oxygen supply overnight. When a welder started work, cable ties and cables caught fire.

Before work started several men lit cigarettes. They burned rapidly. "The men's conclusion appeared to be that the cigarettes were defective. What the men had seen but not recognised were the signs of an oxygen enriched atmosphere".

One recommendation is: Always look for the cause of an unusual observation. Surprisingly, the report does not recommend the use of portable high oxygen concentration alarms.

### (d) Hazards of all Sorts

If you have a taste for the macabre, a 792-page paperback "Darkest Hours" by J R Nash (Pocket Books, New York, 1977, $8.95), lists all known accidents — natural and man-made —which have killed 20 or more people and provides descriptions of many of them. Entries extend from 3500 BC (Egypt's first recorded famine) to 1975 AD (many entries). The list of marine disasters (35 pages and another 4 for wartime sinkings) is by far the longest; the runner-up is storms (20 pages). A glance at the book helps us to keep our problems in perspective.

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.

July 1978

# An Engineer's Casebook— No 13

## INSPECTION OF PROTECTIVE DEVICES

Sometimes the obvious is overlooked during inspections or tests carried out to check function, perhaps because the tests are not sufficiently demanding. Two recent, true cases can be used to illustrate these points.

Small sized bursting discs, particularly those of 1 inch diameter and less, which are designed to fit into union type holders rather than carriers, are often supplied with a gasket glued onto each side of the disc. This facilitates handling and reduces the chance of accidental damage to which small discs are particularly prone, a typical thickness being 0.005 inch.

An investigation into the failure of a disc to operate when it should have done so discovered that the manufacturer had inadvertently supplied two discs which, nested one on top of the other, appeared as though they were one. The bonding-on of the gaskets prevented the edges being checked to verify that only one bursting disc was there. A check by the supplier, who in this case acted as a stockist, revealed three more 'double' discs in his stock. The check was done by weighing each disc including its bonded-on gaskets. Double discs weigh 0.6 g more than the 11 to 1.2 g of a single disc with gaskets.

Most discs are supplied as 'singles' individually boxed to avoid damage; however some of the heavier discs may be found in a stack. It is worth a look at your instructions to see that there is a built-in check to ensure that 'double' discs are not fitted.

In another case a tank roof was ruptured by overpressure only 3 months after the atmospheric vent had been checked and apparently proved clear. After the accident the vent pipe was found to be choked with rust scale at a bend beneath a vertical leg which led upwards to the atmosphere. The tank was only designed for 2½ inches water gauge pressure under the roof.

The test to prove the vent line clear was to disconnect it from the tank top, insert an air hose into the then open end of the vent line and turn on the air. Provided that the air disappeared up the vent line and did not blow back unduly the vent was assumed clear. Such a test is completely non-quantitative; quite a large amount of air could pass through a line obstructed to the equivalent of a 1 inch diameter hole. It was not possible to see through the vent line; it is rarely possible to do so.

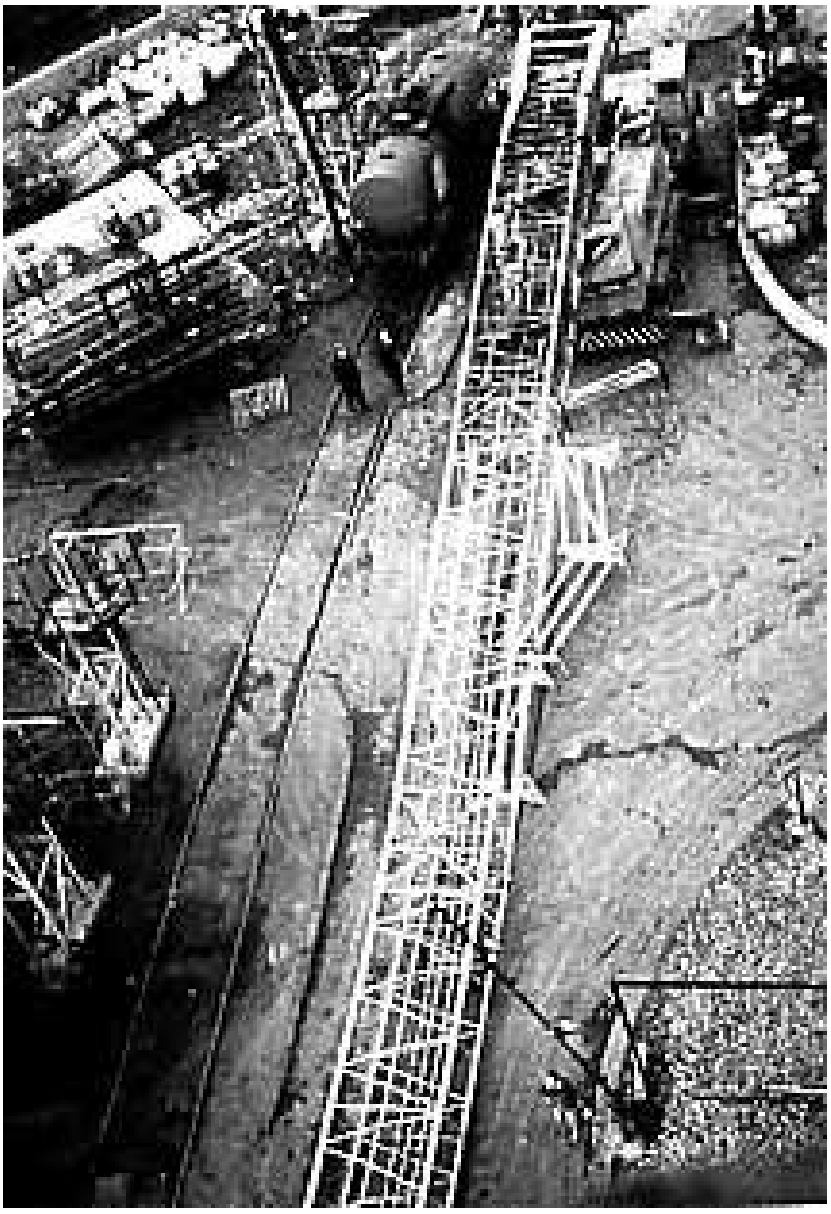
Vent lines and relief valve discharge lines are an integral part of protective devices which prevent equipment being overpressured. Their inspection forms part of the protective device examination and the nature and extent of the examination is at the discretion of the Competent Person. Judgement has to be exercised. Part of that judgement must be based on the likely effect of back pressure on the protected equipment. Clearly tanks designed for only a few inches water gauge pressure cannot tolerate vents choked with pipe scale, perhaps not even with bird's nests! Vents from such tanks must be subjected to checks designed to show that they are completely unobstructed.

E H Frank

Note: "A Survey of Fires and Explosions in Hydrocarbon Oxidation Plants" (mentioned in Newsletter 108/9e and available on request) describes how a 1 inch vent on an instrument air line was plugged by a wasp's nest. This caused an explosion. However, the incident occurred in Texas where the wasps are no doubt bigger than elsewhere.

Regular testing would have spotted the blockage.

# Photographs from Our Archives No.1



The Mond Division Safety Report for April 1978 reports that a crane was left overnight with its jib raised and was blown over by a strong wind. Fortunately, it felt without damaging any plant.

The photograph above shows an overhead view of a similar incident which occurred in the Division in 1965; again by great good fortune the crane fell along a road and did not damage any plant. The jib was 150 feet tall.

For each crane a minimum parking radius is specified and cranes should not be left overnight with their jibs at a smaller angle to the vertical.