IMPERIAL CHEMICAL INDUSTRIES LIMITED
PETROCHEMICALS DIVISION

SAFETY NEWSLETTER No.98

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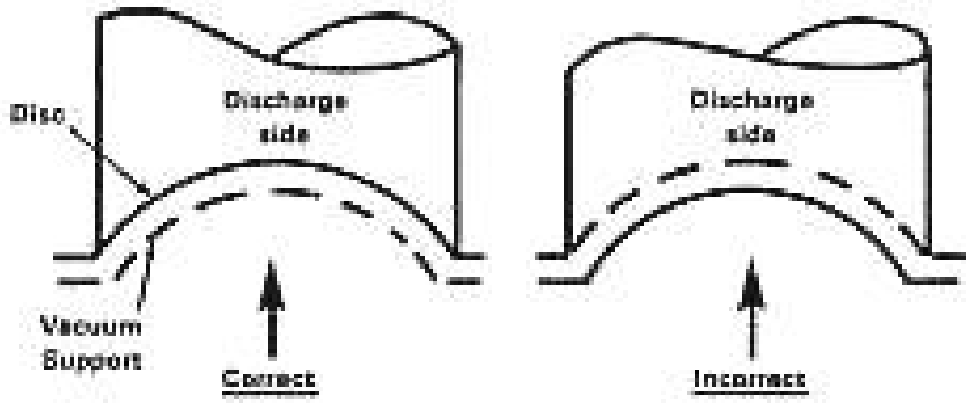
98/1 A REACTOR IS COVERED IN TREACLE TOFFEE

One of the most spectacular incidents that occurred in the Division last year was a runaway reaction on a batch polymerisation reactor. The bursting disc failed to burst and the polymer escaped through some of the flanged joints, burying the reactor in a brown polymer that looked like treacle toffee.

Calculations show that on class 150 flanges of the size fitted to the reactor branches, the bolts will stretch and the flanges will leak before the vessel or pipes burst but this may not be the case if the flanges have a higher pressure rating.

The bursting disc failed to burst because it had been fitted on the wrong side of the vacuum support, thus raising the bursting pressure from 150 psig to 400 psig.



We are developing new designs for bursting disc assemblies which will be harder to assemble incorrectly and which can be checked after assembly. The discs will be permanently attached to the vacuum support by the manufacturer and will have projecting tags attached to them carrying the words ‘vent side’ on one side. An arrow on the holder will show the direction of flow and, whenever possible, the holder will be designed so that the disc cannot be put in upside down.

Details can be obtained from Marston Excelsior Ltd., Wobaston Rd., Fordhouses, Wolverhampton WV10 6QJ.

Two other points of general interest came out of the investigation:

1 After the reaction was complete the batch had to stand for several hours before it could be discharged. No temperature readings were taken, as the reaction was over, and no-one noticed that — for reasons which are not clear — the temperature started to rise.

Temperature readings should be taken if a batch cannot be discharged immediately and has to stand.

2 At the operability study on the design, more information was requested on the effect of higher than normal temperatures on a batch — it was known that storage at normal reaction temperature does not matter. This investigation was never carried out.

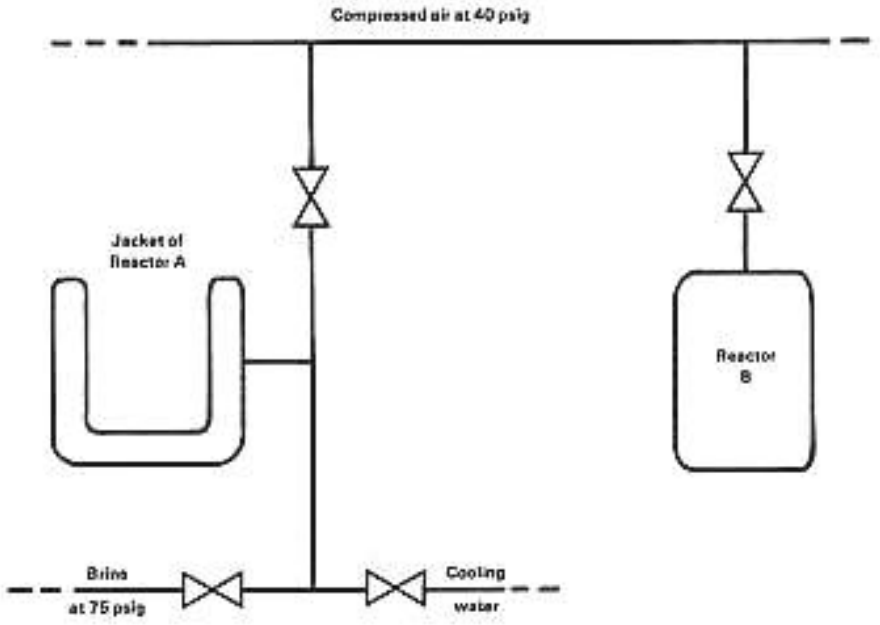
All operability studies should be followed up to check that actions have been completed.

For more details see Report No PC.21,760/B.

Reminder: Newsletter 97/1 described another incident which occurred because something was assembled the wrong way round.

98/2 CONTAMINATION OF SERVICES BY PROCESS MATERIALS— 1

An unusual incident of this type occurred in another Division.



The jacket of reactor A can be supplied with refrigerated brine or with cooling water and can be blown out with compressed air. There is only a single valve on the air line and this leaked. Brine at 75 psig got into the 40 psig compressed air header and then into the reaction mixture in Reactor B where it reacted violently.

To repeat Newsletters 5/4 and 21/6,

"When a service such as air or nitrogen is used intermittently, it should be connected to the process equipment by a flex which is disconnected when not in use. A vent must be provided for venting the flex before disconnecting it. Double block and bleed valves may be used instead of a flex.

If the service is in continuous use then it may be connected permanently. If the service is liable to fall below the normal process pressure, then a low pressure alarm should be provided on the service supply; if the process pressure is liable to rise above the normal service pressure, then a high pressure alarm should be provided on the process side.

Non-return valves should be fitted on the service fines."

98/3 CONTAMINATION OF SERVICES BY PROCESS MATERIAL - 2

During the commissioning of an overseas plant, in another Company, it was necessary to bring in a rail tanker of chlorine as the local chlorine unit was not yet in operation. It was decided to blow the liquid chlorine out of the rail tanker with instrument air, as this was conveniently available.

While the off-loading was in progress, a power failure occurred and the instrument air compressor stopped. When it re-started — only a few minutes later — three control rooms filled with chlorine and, many instruments were damaged.

No non-return valve was fitted at the purge inlet point and, in addition, the air line had been fitted to the bottom of the rail tanker instead of the top.

Always fit a non-return valve at purge gas inlet points and do not purge into a liquid space if you can purge into a vapour space.

98/4 THE DANGERS OF USING SCRAP EQUIPMENT

Another company reports that while some employees were unrolling a roll of copper instrument tubing some corrosive chemicals flowed out from the line and hit one of the employees in the face, causing serious and unpleasant injuries.

On investigation it was found that, rather than go to the store for a new roll of copper tubing, the employees had picked up some old tubing from the scrap dump. It was contaminated with chemicals.

Do not use scrap material.

Clean scrap material before putting it on the dump if **it contains dangerous chemicals.**

98/5 AN UNDERGROUND EXPLOSION IN A REFINERY

Another company has described an unusual explosion in a refinery built on recovered ground on a river estuary in the UK.

The ground beneath the concrete subsided and hydrocarbon vapours accumulated in the empty space.

When welding was taking place nearby the vapours were ignited and the explosion cracked the concrete. Fortunately there were no injuries or serious damage.

98/6 MOVING A LEVER THE WRONG WAY

Earlier Newsletters (86/2, 74/3 & 66/3) have described accidents which occurred because someone pressed the wrong button.

"Destination Disaster" by P Eddy, E Potter and B Page, Hart-Davis and MacGibbon, London, 1976, price £4.95, pages 182-185 describes a number of aircraft accidents which occurred because someone moved a lever the wrong way.

Most modern jets are fitted with ground spoilers, flat metal plates hinged to the upper surface of each wing, which are raised *after* touch-down to reduce lift. They must not be raised *before* touchdown or the aircraft will drop suddenly.

On the DC-8 the pilot could either:

(a) *Lift* a lever before touch-down to arm the spoilers; they would then lift automatically after touch-down.

or

(b) Wait until after touch-down and pull the same lever.

One day a pilot *pulled* the lever before touch-down. Result: 109 people killed.

The accident was not the fault of the pilot. It was the result of bad design. It was inevitable that sooner or later someone would move the lever the wrong way.

The reaction of the US Federal Aviation Administration was to suggest putting a notice in each cockpit alongside the spoiler lever saying *"Deployment in Flight Prohibited"* They might just as well put up a notice saying *"Do Not Crash This Plane".*

The manufacturer of the DC-8, McDonnell Douglas, realised the notice was useless but wanted to do nothing. After two, perhaps three, more planes had crashed in the same way they agreed to fit locks to prevent the ground spoilers being raised before touch-down.

98/7 ANOTHER INDUSTRY—FAMILIAR PROBLEMS

A note from the Health and Safety Executive describes how a man was nearly killed in a battery farm. Slurry (as they now call it) from the beef house falls through a slatted floor into a collection area. The slurry was rather thick, so, to make it easier to pump, some waste silage liquor was added to it. When a man went down into the collection area he was overcome by hydrogen sulphide and carbon dioxide and was lucky to get out alive. Tests showed that these two gases are liberated when the silage liquor is mixed with the slurry.

The lessons from this incident are familiar ones:-

Do not change a process without careful consideration of possible consequences (see Newsletters 83 and 97/6).

Do not let people enter confined spaces without making sure that it is safe to do so (see Newsletters 88/4 and 77/1).

Before you mix two substances ask if they are compatible. If necessary, try mixing them on a small scale.

98/8 UNUSUAL ACCIDENTS No 65

A road tank wagon in another company, used for internal transport, looked as if it was made of stainless steel. It was therefore filled with 50% caustic soda solution. Twelve hours later the tanker was empty.

The tanker was made of aluminium and the caustic soda had dissolved a hole in it and leaked out. The material of construction has now been stencilled on all tank wagons used for internal transport.

Not all that tempts your wand'ring eyes
And heedless hearts, is lawful prize;
Nor all that glisters, gold.
(Thomas Gray)
Nor all that shines is 18/8.

Reminder: Newsletters 61/7-4, 71/6 and 78/4 described other incidents which occurred because a material of construction was not what it seemed.

98/9 SOME QUESTIONS I AM OFTEN ASKED—29

DO WE SPEND TOO MUCH MONEY AND EFFORT REMOVING THE HAZARDS THAT THE PRESS AND TV MAKE A FUSS ABOUT, SO THAT THERE IS NOT ENOUGH LEFT FOR DEALING WITH OTHER SERIOUS HAZARDS?

In recent years we have seen big public reactions to Flixborough, asbestos and the road transport of chemicals. As a result, industry and the Health and Safety Executive have put a lot of effort into reducing the chance that another Flixborough will occur, into preventing industrial disease and into making the road transport of chemicals safer. But could we go too far? A lot of people are killed by accidents that get no publicity.

This question brings out one of the dilemmas of a democracy. We in industry, like the Factory inspectorate, are the servants of the public. Our job is to produce goods that the public want and so improve the quality of life. Should we give our masters what they want or should we give them what we, because of our expert knowledge, think they ought to have?

In many parts of the World this would be no problem; people get what somebody else thinks is good for them, but this is not the democratic way.

Although we are servants of the public and must ultimately do what the public wants, a good servant

(such as Jeeves in the P G Wodehouse novels) does not uncritically obey his masters. He points out the consequences and suggests alternatives. In the same way, we should try to educate the public so that they base their decisions on correct information. We should point out, for example, that every year in this Country:-

50 000 people die as the result of smoking

1 0 000 people are killed in their homes

7 000 people are killed on the roads [Note added in 2007; now 3500.]

1 000 people are killed at work

2 people are killed as the result of the transport by road of chemicals and petrol.
[Note added in 2007: now an average of less than 1.]

Following a recent incident in which a petrol tanker was involved in an accident and some houses were destroyed, it was suggested that petrol should be carried in stronger tankers. This could be done — but would the money be better spent in trying to prevent some ordinary road accidents or some accidents in the home or some accidents in industry?

98/10 RECENT PUBLICATION

A note dated 1 April 1977 summarises the papers presented at the recent Loss Prevention Symposium organised by the American Institute of Chemical Engineers.

For a copy of this note or for more information on any item in this Newsletter please ‘phone E.T. (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.

April 1977

Who's Who in Safety?

Dr J McQUAID

Jim McQuaid was born in Ireland and graduated in mechanical engineering from University College, Dublin in 1961. He then joined British Nylon Spinners Ltd at Pontypool as a graduate apprentice. He left BNS in 1963 to do a PhD in the Department of Aeronautics at Cambridge. With mechanical, textile and aeronautical engineering under his belt, he decided in 1966 to turn to mining engineering and joined the Safety in Mines Research Establishment in Sheffield, now part of the Health and Safety Executive, as a Senior Research Fellow on a three year contract. This time Jim decided to stay and has worked on problems in the fields of fluid mechanics and economics.

Jim was seconded to Petrochemicals Division as a safety adviser for one year from September 1976 under the Bondi scheme for the interchange of scientists and engineers between Government, industry and the universities. His stay in ICI is intended to give SMRE a better understanding of the needs and problems of industry and he is actively engaged on the hazard analysis and gas dispersion problems referred to Safety Group.

He commutes weekly to Sheffield and, in between trying to compress seven day's fatherly responsibilities for three young children into two days, he finds time for his interests in ornamental turning, carpentry and gardening.