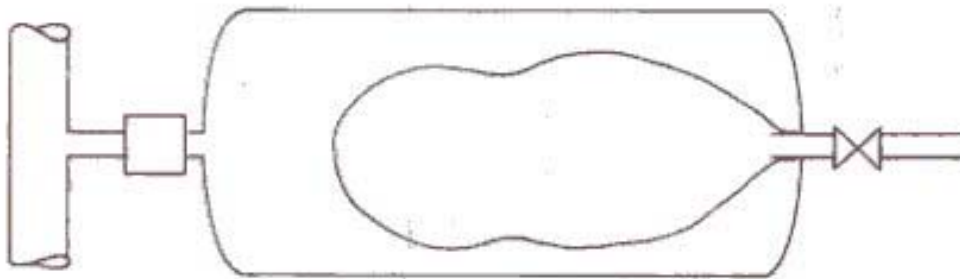


CAUTION NEW SUBSTANCE

No. 122

SOME ACCIDENTS WHICH OCCURRED BECAUSE PEOPLE DID NOT UNDERSTAND HOW THINGS WORK



122/1 Accidents which occurred while dismantling a canned pump and a pulsation dampener

122/2 Liquid can be trapped in a valve

122/3 A ball float came loose and blocked a pipe

122/4 A new self-sealing coupling

122/5 Before you redesign it, make sure you need it

122/6 Don't carry cylinders in closed vans

122/7 Leaking nitrogen can knock you out

122/8 Should we always extrapolate a graph?

122/9 Should new cars be tested like new drugs?

An Engineer's Casebook— Eyebolts



IMPERIAL CHEMICAL INDUSTRIES LIMITED

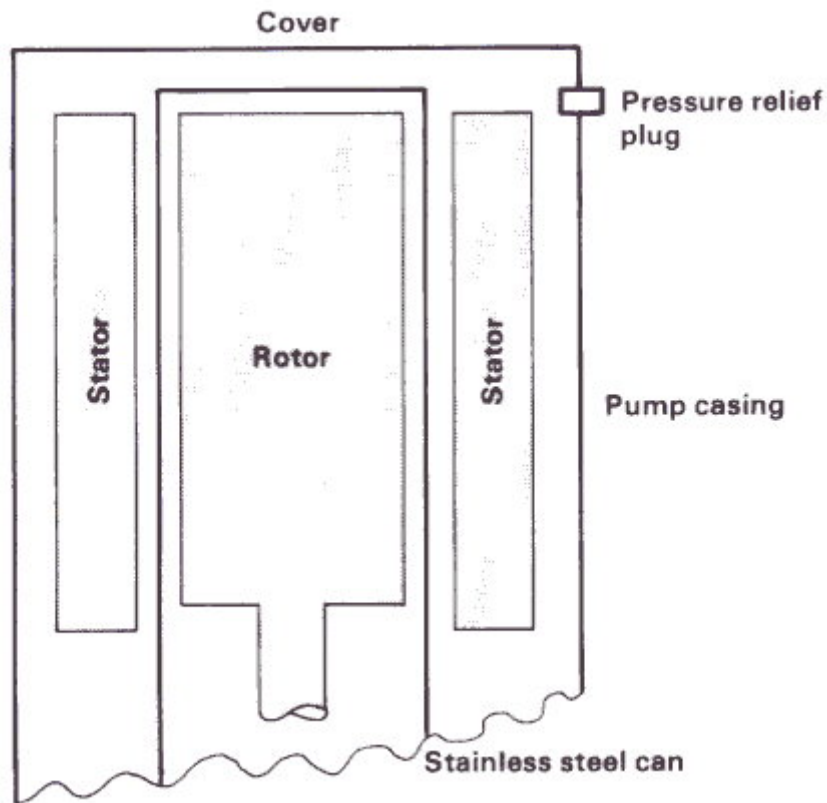
PETROCHEMICALS DIVISION

122/1 SOME ACCIDENTS WHICH OCCURRED BECAUSE PEOPLE DID NOT UNDERSTAND HOW THINGS WORK

(a) Canned Pumps

In canned pumps the moving part of the electric motor — the rotor — is immersed in the process liquid; there is no gland and gland leaks cannot occur.

The fixed part of the electric motor — the stator — is not immersed in the process liquid and is separated from the rotor by a stainless steel can.



If there is a hole in the can, process liquid can get into the stator compartment. A pressure relief plug is therefore fitted to the compartment and should be used before the compartment is opened for work on the stator. Warning plates, reminding us to do this, are often fitted to the pumps.

The stator compartment of a pump was opened up without the pressure relief plug being used. There was a hole in the can and this had caused a buildup of pressure in the stator compartment. When the cover was unbolted it was blown off and hit a scaffold pole 6 feet above. On the way up it hit a man on the knee and the escaping process vapour caused eye irritation.

The men who were working on the pump did not know the purpose of the plug and the warning notice was missing.

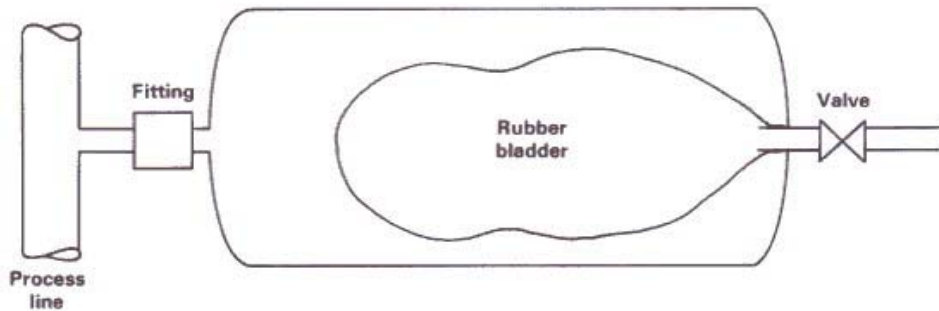
For a more accurate diagram and description of a canned pump, see the article by G R Webster in *The Chemical Engineer*, Feb 1979, p 91.

If you have had any problems with canned pumps, we would like to know.

(b) Pulsation Dampeners

A pulsation dampener was being overhauled in a workshop. The dampener is a steel vessel

containing a rubber bladder filled with nitrogen. The dampener is connected to a pipeline. If there are any rapid changes in pressure in the pipeline, they are absorbed by compression and expansion of the nitrogen in the bladder.



The nitrogen pressure was blown off through the valve on the bag and the fitting at the other end was dismantled. Suddenly liquid — actually caustic soda — sprayed out. It missed the man who was doing the job, but hit another man.

The man concerned thought that when he blew the pressure off the bag, he also released the pressure on the liquid. This was not the case because there was some gas present on the liquid side of the bladder, and also because of a fault in the fitting — the fault he had been asked to repair.

(A poppet valve, held open by a spring, prevents the bladder being extruded into the fitting. The spring was broken so the valve acted as a non-return valve).

(c) Drum Filling Machines

A drum filling machine was giving trouble — the valve was slow to open so the operator chocked it open and started the flow using a hand control valve. He did not realise that the flow could not now stop automatically when the drum was full.

None of these incidents would have occurred if the men concerned had had a better understanding of the way the equipment they were repairing or using worked.

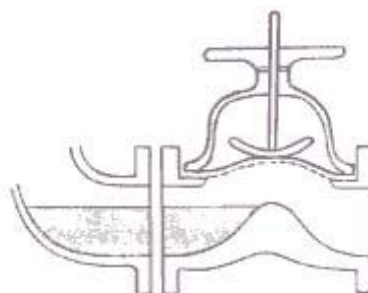
If you do not use canned pumps, pulsation dampeners or drum filling machines on your plant, is there any other equipment whose workings may not be understood?

122/2 LIQUID CAN BE TRAPPED IN SOME TYPES OF VALVE

The diagram shows how liquid can remain in a Saunders valve after the line has been drained, and then leak out when the joint is broken.

A similar problem can occur with globe valves and some other types.

Are people who issue clearance certificates and those who break joints aware of this?



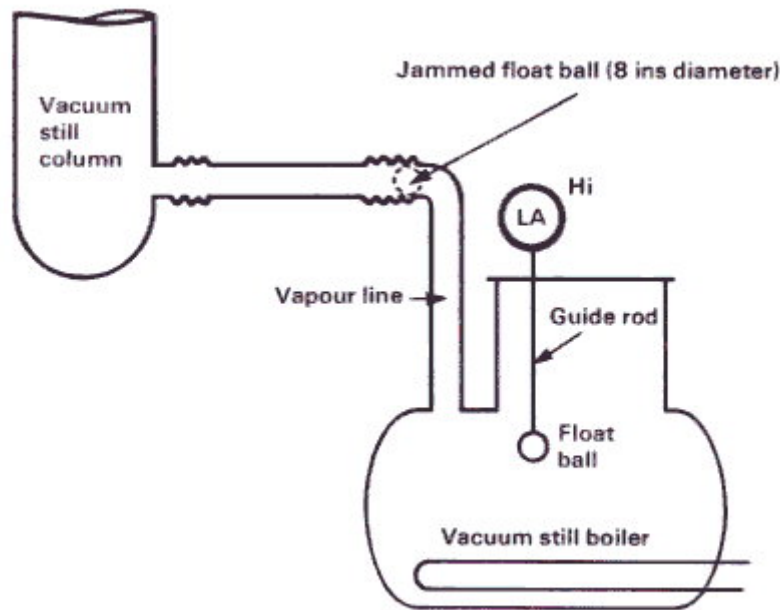
122/3 PIPES BLOCKED BY FITTINGS THAT HAVE COME LOOSE

Newsletters 14/2 and 69/5a described an extraordinary incident. An internal ball float in a propane tank came loose and when the tank was overfilled the ball lodged in the relief pipe, in which it was an exact fit. When the tank warmed up, the increase in pressure caused its diameter to increase by 6 inches.

The incident was noted when the access stairway was found to have broken away from the tank.

Now a similar incident has occurred in another Division. A high temperature was noted in the boiler of a vacuum still. It was assumed that the vapour line was choked with packing but when it was dismantled it was found that the ball from the ball float had come loose and had been pulled into the expansion bellows by the vacuum.

Could a similar 'balls up' occur on your plant?



122/4 SELF-SEALING COUPLINGS

When loading or unloading road tankers containing toxic chemicals we use self-sealing couplings, which can be uncoupled without any of the liquid being spilt. The various types available have all given trouble — they are liable to leak and they soon become very stiff.

A new design has therefore been developed. Details from Mr W L Alderson, N. Tees Works (0642-560560, extension 548).

122/5 BEFORE WE REDESIGN A PIECE OF EQUIPMENT, MAKE SURE IT IS NEEDED

A leak occurred from a filter, one of six in parallel streams. The investigation traced the cause to a badly made joint on the cover — an 'O' ring was not fully seated in its groove. Perhaps the operator who last replaced the lid did not realise that the ring had to be fitted into a groove. Some recommendations were made for training and improved design.

Further investigation suggested that the filters were not needed as some had never been cleaned and none are scheduled for regular cleaning. A recommendation was made to remove the filters.

122/6 COMMENTS FROM READERS — Carrying cylinders in vehicles

Newsletter 115/11 said that cylinders of flammable or toxic gases should not be carried in a closed van, in case they leak.

A reader points out that this applies to all cylinders.

Small cylinders of carbon dioxide, used to pressurise soft drink vending machines, are fitted with bursting discs. Some of these cylinders were being carried in the passenger's foot well of a small van when one of them burst. The driver braked but realising he was being asphyxiated, jumped out of the moving van. Fortunately he escaped injury.

122/7 A LOOK BACK AT NEWSLETTER 22 (September 1970) Leaking nitrogen can knock you out

Two recent incidents have shown that leaking nitrogen can cause men to feel unwell or even pass out. The nitrogen is not poisonous but can cause oxygen starvation. In the first incident, a vessel was being purged with nitrogen and the top man-hole was open. A member of a cleaning squad decided to recover a rope which was half inside the vessel and which was caught up on something inside. While kneeling down, trying to disentangle the rope, he was overcome by nitrogen.

What was more disturbing, the injured man admitted that, if necessary, he would have gone into the vessel to recover the rope.

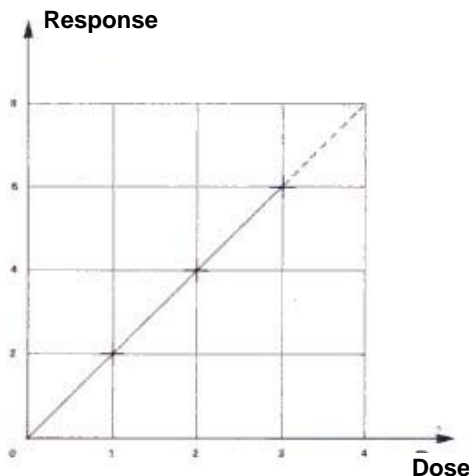
In the second incident a fitter and mate were affected by nitrogen while turning a spectacle plate in a line which was under slight nitrogen pressure. The job was completed by the supervisor working upwind. The clearance certificate said "Beware of trapped pressure" but did not point out the danger of asphyxiation.

These incidents raise several questions:-

1. Does everyone on your plant know that nitrogen coming out of a pipe or a hole in a vessel can asphyxiate someone who is close by?
2. What do you do to explain entry procedures to contractors?
3. Do you leave open manholes on vessels into which entry is NOT authorised? Must you? If so, can the opening be covered by a grid or some other barrier or can you put up a warning notice?

122/8 CAN WE EXTRAPOLATE A GRAPH?

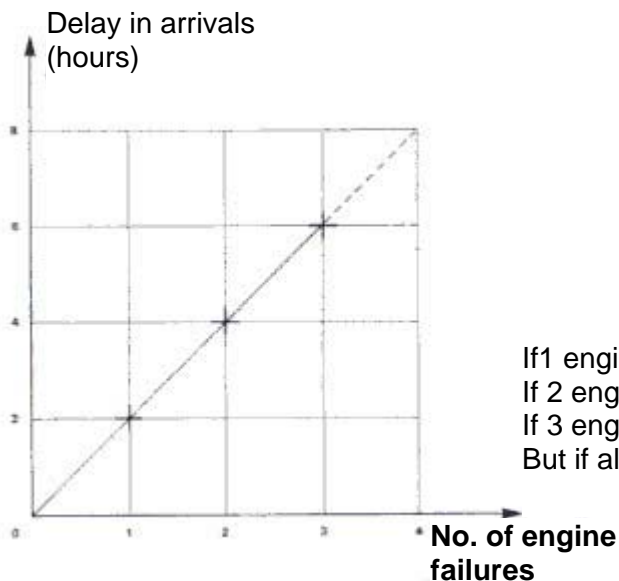
Look at the graph below; the horizontal axis is a measure of the 'dose' or 'action' and the vertical axis is a measure of the 'response' or 'effect'.



When the dose is 1, the response is 2
When the dose is 2, the response is 4
When the dose is 3, the response is 6
Can we say that when the dose is 4 the response is 8?

A lot of people would say that we can. A lot of toxicological work, for example, uses extrapolation.

In the graph below I have added meanings to the figure. The horizontal axis gives the number of engines that have failed in a 4-engine aircraft. The vertical axis gives the delay in arrival at the destination.



If 1 engine fails the plane will be 2 hours late
If 2 engines fail the plane will be 4 hours late
If 3 engines fail the plane will be 6 hours late
But if all 4 engines fail the plane will not be 8 hours late!

Next time you extrapolate a graph, remember that it might lead to a wrong conclusion.

122/9 OTHER MEN'S VIEWS No 12

As with most major innovations, the benefits which have been obtained from improved crash performance over the last decade or so, have been enormous. I am thinking here of the savings in deaths and injuries from items such as anti-burst door locks, seat belts, non-penetrating steering columns and high penetration resistant laminated windscreens. If you think of traffic accidents as a public health problem, then the benefits obtained or obtainable from these items, are quite analogous to the benefits which have been achieved from the discoveries of insulin, polio vaccine or immunisation against diphtheria. Numerically, the benefits are quite comparable. Pursuing this medical analogy, we should consider the contrast between the exhaustive testing and trials required of a new drug before marketing, with the random, indeed cavalier manner, in which vehicle design changes and their associated legislation, which may be having as great an influence on our collective health, are introduced.

From a paper by M MacKay at a Conference on Road Safety organised by the Department of Transport and held in London on 13 June 1978.

122/10 UNUSUAL ACCIDENTS No 85

Another temporary change with unforeseen results.

While repairs were being made to a BBC transmitter mast, some bales of straw were placed on the roof of the hut at the bottom of the mast, to protect the roof from falling objects.

Welding sparks set the straw alight and damaged the roof.

From the Worcester Evening News for 18 July, 1978

122/11 RECENT PUBLICATION

As in previous years, we have prepared a summary of fires and explosions, releases of toxic and corrosive materials and transport accidents involving hazardous materials, reported in the press

during 1978. It has been issued as Report No PC.200, 886/A and can be obtained from Division Reports Centres.

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 her to add your name to the circulation list.

April 1979

An Engineer's Casebook No 22

EYEBOLTS

Eyebolts are screwed into tapped holes in things which have to be lifted, for example electric motors, compressor cylinder heads, or pulled, for example, heat exchanger bundles, compressor piston rods. It is clearly essential for safe operation that eyebolts should be screwed only into holes with which they are compatible. The Casebook article in Newsletter 110 drew attention to the error potential which existed between various thread series which are in current use for nuts and bolts. Eyebolts are a particularly important case of a threaded component where compatibility between male and female parts must be achieved.

When only the BSW and BSF ranges of eyebolts existed the possibility of mismatch was unlikely. The introduction of UNC and UNF eyebolts increased the chances of mismatching, but such mismatching was not really dangerous, although in some cases a rather weak combination resulted.

The introduction of metric dimensions and ISO threads has greatly increased the possibility of mismatching and highly dangerous situations can result. Not only can metric eyebolts be mismatched with Whitworth and Unified threaded holes but they are also capable of almost complete mismatch within their own range. Almost all sizes will engage with the next size up and the thread pitch is the same or alters by only $\frac{1}{2}$ mm giving a very weak loose fit.

Eyebolts come under the definition of lifting gear and as such are subject to periodic examination and test as well as initial certification. This ensures that they are marked either on the collar or, in the case of new eyebolts to BS 4278 on the raised flats which are provided. It ensures also that the threads are periodically examined by a competent person as part of the regular examination.

Holes into which eyebolts may be screwed as a routine job must also be identified and this can be done by stamping identification of the thread alongside the tapped hole.

The Health and Safety Executive have issued a useful Guidance Note No PM 16 on this subject. It is published by HMSO and available through Government Bookshops price 30p.

E H Frank

WHO'S WHO IN SAFETY



No 30 O A Evans

Owen Evans is Assistant Fire and Safety Officer on North Tees Works.

He started his career as an electrician with the EMI theatre group and finds his theatrical experience useful in his present job. As well as being responsible for the day to day activities of the North Tees Works Fire Service he lectures on safety matters. His methods make use of his stage experience, which ranges from pantomime to opera. His signature tune for fire training is "Blaze Away".

As an aid to training, Owen has set up a studio to produce cassetted TV programmes for distribution to plant control rooms. The first programme was acted, produced, directed and edited by Owen.

He joined ICI in 1968 as a shift fireman and was a shop steward for 8 years. He has been a works First Aider throughout his time on the Works and takes a keen interest in the operation of the works medical service. His experience as a shop steward taught him that safety training should be based on good working practice and not on some of the complex topics which tend to cloud present-day safety discussions.

He lives at Darlington with his wife and son. He is prominent in local politics and spends a lot of his off duty hours working on behalf of Darlington Pensioners Association. He produces and acts in a concert party to raise money for the Pensioners Association.

He is an accomplished organist and impressionist (bookings welcomed!).