SAFETY NEWSLETTER

No. 163
AUTUMN LEAVES FROM A SAFETY SCRAPBOOK

IMPERIAL CHEMICAL INDUSTRIES LIMITED

PETROCHEMICALS DIVISION

163/1 A NARROW DIVIDE BETWEEN NEAR FARCE AND POSSIBLE TRAGEDY

The following accident has an element of farce about it but in truth it could have had very serious consequences:

A Process Operator required a length of hose to use for a washing down operation in a particular Plant area. He searched high and low to find the right size and length and eventually came across just the item he needed — only it was attached to the discharge point on an acetic acid measure vessel. As he was removing the hose from the discharge point he suddenly realised his error — but too late! The hose suddenly came free and although the valve was turned off a small amount of residual acetic acid flicked onto his eyelid (he was not wearing any form of eye protection or gloves or acid suit, etc).

Although there was a demineralised water line, an emergency shower and an emergency eye irrigation cabinet within three feet of him he did not see them and ran in panic to another floor where he remembered he had seen an eye irrigation cabinet.

On reaching this cabinet with the acid by this time burning his eyelid, he found he couldn't get the cabinet door open. He was trying to open the door the wrong way! (— but it did have a rather stiff catch). He put his fist through the 'Perspex' panel to grab the eye irrigation bottle and in doing so he badly lacerated his hand on the jagged edges of the shattered panel!

Subsequently he received medical treatment for an acid burn to his eyelid and for cuts to his fingers.

The lessons here are for ALL of us to digest:

a Don't get so pre-occupied with resolving a problem that you develop a 'blind spot' on safety.

b Don't improvise with unsuitable materials or equipment.

c Make a mental note of emergency shower points, fire escape routes, fire points, eye irrigation cabinet location, etc., in your work area.

d Make sure that you know how to operate and use the various items of safety equipment in your area.

ACT NOW! - DON'T WAIT UNTIL AN EMERGENCY OCCURS!

163/2 DEVELOPMENT WORK, MODIFICATIONS AND MACHINE GUARDS

Over several months work was carried out to devise a satisfactory design for guards on a series of machines. Eventually new guards, to the new design, were fitted to the cutters on all machines in routine production use.

In the meantime, technical staff were carrying out trials on another machine. When the trials were concluded the machine was handed over for routine production use. On this machine the cutters were covered by an unsatisfactory guard which it was possible to open without stopping the cutters. The fastening arrangements for the guard defeated the operation of the trip switch designed to stop the drive motor.

The inevitable soon happened.

An operator had trouble with the cutter. On two occasions he stopped the cutters, removed the guard and then cleared strands of polymer tape from the blades. On the third occasion, soon afterwards,

the cutter blades had not stopped when the operator again inserted his hand to remove strands of tape.

We often discuss the extent to which old equipment should be brought up to the latest standards and the answer may depend on a whole variety of circumstances. However new equipment should not be offered or accepted for routine use unless it has been made to current standards. The same applies to experimental equipment being brought into routine use — it should at least be made to match current practice and preferably to match current standards which may be a little ahead of current practice.

Much sound advice on machine guarding is contained in BS 5304.

163/3 UNUSUAL ACCIDENTS NO 117: ANOTHER HELPER GETS HURT

Several times recently I have drawn attention to the need for 'helpers' to take as much care as the 'doers' in tasks where two or more people are co-operating and for everyone to understand what is being done. There has been another case of a helper being hurt. In this case it was because he was not fully aware that there had been an improvisation by his colleague and what that might entail.

A gland housing had been removed from a pump and taken to a workshop for repair. The housing was split into two parts and two men began to work on them separately, one on the mechanical seal and one on the housing.

The man working on the housing tried to remove a broken nipple. There was no "easy out" extractor readily available so he ground down the end of a piece of $^{5}/_{8}$ inch steel bar, drove it into the nipple and then loosened the nipple by using 'Stilsons' on the bar. This man then laid the 'Stilsons' aside.

At this point the second man, having stopped work on the seal, decided to help. He took hold of the bar intending to complete the unscrewing of the nipple by hand. However the bar was still hot from grinding and the man's hand was burned. He had no reason to suppose that the bar might be hot!

163/4 USE OF SOLVENTS FOR CLEANING

The Fire Brigades deal with over 5000 incidents/year in the UK involving the use of flammable solvents for various purposes such as cleaning, many of these cases involving petrol. There have been several references in previous Newsletters (76/9, 105/7, 113/7, 115/12) on the hazards of flammable solvents.

Petrol should never be used for cleaning or degreasing owing to its low flash point. Kerosene (paraffin) is safer, but it is still flammable. A non-flammable chlorinated solvent such as ICI 'Genklene' is best. A booklet, 'The Safe Use of Genklene' is available from ICI Mond Division, Runcorn.

A recent article in Fire Protection, June 1982 pp 11-15 'Fire Prevention Guide to Non-Flammable Solvents' gives some very useful data on a range of chlorinated solvents, together with the names of UK suppliers and trade names. Their effect upon a range of commonly used plastics is also given.

There is some useful advice on using them:

1. Even the more toxic of the commonly used non-flammable solvents listed are **less** toxic than, say, xylenes or toluene, but they have a relatively high vapour pressure, so only use them cold.

2. Only use them in a well ventilated area.

3. **Never** use them near open flames or hot surfaces. These solvents can decompose to give toxic and acidic products such as hydrochloric acid, phosgene and carbon monoxide.

4. Never use chloroform or carbon tetrachloride for cleaning.
5. Avoid contact with the skin — these solvents are efficient degreasers!

163/5 ROAD SAFETY - PARKING

At Wilton there will be a road safety campaign in October. As the days get shorter and the weather worsens we ought to take even more care in driving — both on ICI Sites and the public roads — wherever we are. I have borrowed the following advice from another safety newsletter —its messages apply to all of us.

Patience Remedies Parking Problems

Choked with cars and pedestrians, especially during shift changes, plant car parks provide plenty of opportunities for mishap. Good driving practices and attention to pedestrian and vehicular movements have kept our car parks fairly safe, but continued conscientiousness will eliminate potential for serious injuries to drivers and pedestrians.

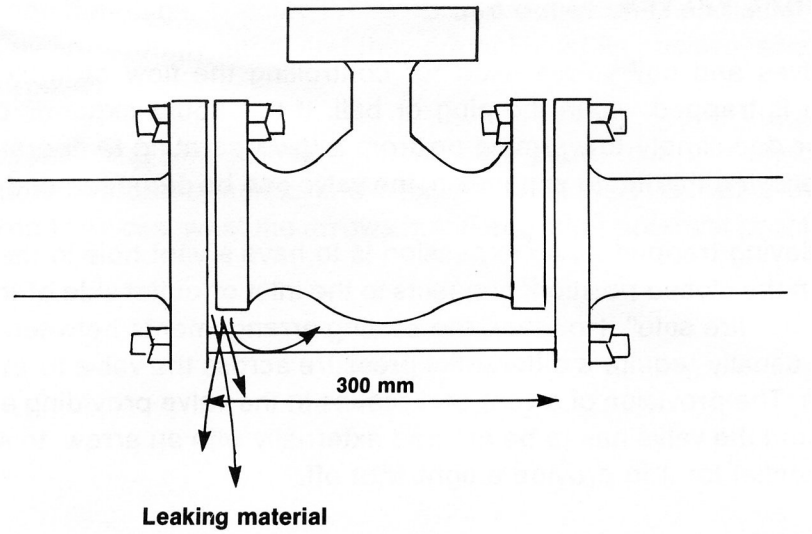
At the end of your shift, remember that other people are tired too. Be aware that they are just as anxious to leave as you are and may have their thoughts momentarily distracted. This, coupled with congested driving conditions, make shift change a likely time for an accident. With this in mind remember to:

- ✔ Drive slowly
- ✔ Reverse with caution
- ✔ Stop for pedestrians
- ✔ Observe one-way lanes
- ✔ Make sure your vision is unobstructed
- ✔ Park only in authorized places
- ✔ Pass with care

Also, when you are waiting for passengers, use the designated passenger pick-up parking zones. Blocking pedestrian crosswalks or traffic lanes creates congestion.

Do your part to prevent a serious accident in our car parks and site roads.

163/6 WHAT CONSTITUTES A MODIFICATION?



On another company's plant, it was decided as an energy conservation measure to insulate a 'Camflex' valve located in a line operating at 310°C and about 90 psig pressure. Shortly afterwards a large leakage of flammable liquid/gas occurred and this immediately ignited with flames about 40 feet long which were directed towards an adjoining hydrogen unit.

The leakage was a result of the elongation of the 'Camflex' long bolt which became much hotter than previously and had expanded relative to the valve body, which having hot liquid passing through it was at much the same temperature as before the lagging was applied.

Would this job have been treated as a modification on your plant? — and would your check procedure have highlighted the potential hazard?

There was, of course, the same risk of a leak if the valve had been engulfed by fire. A HAZOP may have highlighted this and the valve would have been lagged from the start for fire protection purposes.

For more information on any item in this newsletter please phone P2845 or write to us at Wilton. If you do not see this Newsletter regularly and would like your own copy, please ask us to add your name to the circulation list.

September 1982

An Engineer's Casebook No 63
UNIDIRECTIONAL VALVES

When plug valves and ball valves used for controlling the flow of liquids are in the closed position, liquid is trapped within the plug or ball. If this liquid expands due to heat from an external fire, or due simply to warming up from a low operating temperature, and there is no provision for relieving this liquid expansion, the valve can be damaged and become inoperable.

One way of relieving trapped liquid expansion is to have a vent hole in the plug or ball, which, with the valve in the closed position, connects to the inlet or outlet side of the valve. This design is often known as "fire safe". However, the sealing arrangements between the plug ,or ball and the valve body usually require a differential pressure across the valve to prevent leakage in the closed position. The provision of a vent port results in the valve providing a tight shut-off in one direction only and the valve has to be marked externally with an arrow, to show the direction of pressure differential for it to provide a tight shut off.

The direction of this arrow can however be in the opposite direction to that of fluid flow through the valve, unlike the arrow on a non-return valve, which shows the direction of flow for the valve to operate in the open position.

A unidirectional plug or ball valve on the delivery line from a pump would need to be fitted with the directional arrow pointing towards the pump, as this is the direction of pressure differential with the pump isolated and drained with the delivery valve shut. The direction of flow is away from the pump thus it is important to know what type of valve is being used and what the directional arrow indicates.

Unidirectional ball valves fitted with lip seals need to be installed with the ball vented to the low pressure side of the valve when it is closed, as pressure on the lip of the seal on the high pressure side prevents leakage.

Conversely, unidirectional plug valves, which have PTFE sleeves, must be fitted with the plug vented to the high pressure side of the valve, to avoid extrusion of the sleeve into the plug by external pressure in the closed position.

Ball valves with spring-loaded metal seats on one side of the valve only, are unidirectional and must be fitted with the seat on the high pressure side of the valve, as pressure differential reinforces the spring force on the seat for a tight shut-off. It is important however that the seats are lapped to the correct wedge profile otherwise the valve can give a tight shut-off with a low pressure differential, when fitted the wrong way round, but then leak at a higher pressure differential.

On low temperature duties, PTFE lip sealed ball valves were thought to be self-relieving, without the need for a vent hole, as pressure built up within the ball in the closed position would lift the lips of the seals. Unfortunately, at temperatures around -40° these seals contract, lose their flexibility, and do not lift to relieve trapped pressure in the ball, causing balls to go out of shape and the valves becoming inoperable.

Because of these variations in types of seals, seats, direction of arrows, direction of vent port and so on, which characterise unidirectional valves, they are best avoided as "general currency" isolation valves because the consequences of fitting them "the wrong way round" can cause significant problems.

Non-return valves, control valves, and some butterfly valves which are marked with arrows for the direction of flow are unambiguous and are needed to control flow in a fixed direction, thus although unidirectional, they have specific locations and duties on a particular plant and it is readily apparent if

they are wrongly fitted, and they are not used as positive isolations for safety and maintenance purposes.

If there are unidirectional plug and ball valves used on a plant, then it is important for plant operating and maintenance personnel to know exactly what types of valve they have, what limitations there are on their use, what the arrows mean and what potential problems to expect.

P F E Dutton

September 1982