

# IMPERIAL CHEMICAL INDUSTRIES PETROCHEMICALS DIVISION

## SAFETY NEWSLETTER NUMBER 33

By Trevor Kletz

### 33/1 HOW STRONG IS A STORAGE TANK?

Newsletter 7, Item 1 described how a storage tank was sucked in because the men concerned did not realise how fragile the tank was and how easily this could happen. Now another incident has occurred in the Division. Fumes from a tank vent were coming out near a walkway so somebody put a loose blank over the vent. When the tank was pumped out, the sides were sucked in.

The operators then tried to blow the tank out with compressed air. As the tank was, like most storage tanks, designed to stand a pressure of only twelve inches water gauge, they were lucky that they did not blow the roof off.

The correct way to put the tank right would have been to fit a stand-pipe on the roof and then fill the tank with water — after an engineer had examined it and decided it was safe to do so.

A series of cartoons, 'How Strong is a Storage Tank', was issued with Newsletter 8. Copies are available if you have not seen them.

### 33/2 "WHAT WILL IT BE NEXT?"

The booklet enclosed with this Newsletter was produced very quickly and cheaply by a Petrochemicals Division Works after they had had a number of spillages.

If similar incidents occur on your plant you might like to give copies to your operators.

Better still, you may like to make a similar booklet describing the incidents that happen on your plant.

### 33/3 CHEMICALS ARE DANGEROUS TO THE EYES

While dealing with a spillage of a solvent—normally considered a fairly safe material—a man got a drop in his eye. He washed it out but did not go to the Medical Centre.

The next day his eye was sore and he was off work for three weeks.

All the chemicals we handle are dangerous if they get in the eye. If you get any chemical in your eye, wash your eye at once and then go to the Medical Centre. If possible use an eye-wash bottle to wash your eye but if there is no bottle handy, use cold tap water.

Water dripping off the structure may be contaminated with chemicals. If you get it in your eye, wash it out at once and then go to the Medical Centre.

To wash out the eye the eyelids must be held apart and irrigation should continue for a minimum of five minutes or until two eye-wash bottles have been emptied. Where the splash is from a known strong chemical, irrigation should continue until the arrival of the ambulance.

### 33/4 FAULTY ELECTRICAL EQUIPMENT SHOULD BE DEFUSED

The stirrer on a storage tank was known to be faulty and the operators were told not to use it.

Nevertheless, somebody switched it on and half a ton of petrol leaked out of the gland before a supervisor saw it and switched it off.

Faulty electrical equipment should be defused so that it cannot be switched on.

### 33/5 DUST EXPLOSIONS

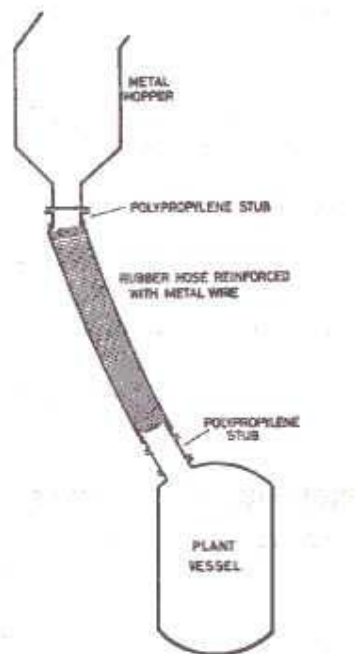
One difference between Petrochemicals Division and the old HOC Division is that there are now several plants in the Division where dust explosions might occur. If you would like to know more about dust explosions, the following are recommended:

Report No. D.74207/B, available from Division Reports Centres

'Dust Explosions in Factories', Safety, Health & Welfare Booklet No. 22, published by HMSO for the Factory Inspectorate and available from your Division Library. Some dusts can be ignited almost as easily as vapour-air mixtures and it is difficult to be certain that all sources of ignition have been eliminated. With these dusts the best policy is not to allow explosive mixtures to occur but this is not always possible. Alternatively, explosion vents can be provided or automatic systems can be installed for detecting the start of an explosion and injecting a quenching agent.

A discharge of static electricity can ignite a dust explosion and this is illustrated by a report from another Division of an explosion which resulted in a fatality.

A powder was emptied down a metal chute into a plant vessel. The chute was replaced by a plastic one, as shown below.



The flow of powder down the chute developed an electrostatic charge on the hose. The hose was conducting but the polypropylene end pieces prevented the charge leaking to earth. Finally, a spark occurred and ignited the dust cloud.

The original metal chute was safe as it was earthed.

A plastic chute would have held a charge but if the plastic was non-conducting, the charge could not all discharge at once; any spark that occurred would have been small and might not have been big enough to ignite the dust.

An unearthed conducting hose introduced maximum risk. It allowed a charge to build up and then allowed it all to discharge at once.

The incident described is a good example of how a modification to a plant can introduce a new and unforeseen hazard.

The full report (No. 0.76,223/C) can be borrowed from Division Reports Centres.

Similar effects occur with liquids. Newsletter 31, Item 4, described how a metal bobbin piece was introduced into a plastic pipe and reacted with the acid in the pipe, building up a pressure. The metal bobbin piece was also dangerous in another way; it could have accumulated a static charge.

### **33/6 SPILLAGES OF WATER SOLUBLE LIQUEFIED FLAMMABLE GASES**

Newsletter 29, Item 1 discussed the way to deal with spillages of liquefied flammable gas (LFG) — cover with foam and then remove a little of the foam and allow the LFG to disperse under controlled conditions, assisted by steam.

If the liquefied flammable gas is soluble in water (for example, ethylene oxide or methylamines) it should first be covered with foam and then it should be diluted with a large excess of water as it is run off to drain. You may need 50 or 100 times the volume of water to make sure the mixture is non-flammable. Take care you do not put too high a concentration of the LFG into the drains or you may have an explosion in them (see Newsletter 32, Item 4).

Adding an equal volume of water to a spillage of a water-soluble LFG will not do much good as the heat developed may actually increase the amount evaporated.

### **33/7 NON-RETURN VALVES**

Many thanks to the readers who commented on Newsletter 30, Item 3. They made the following points:-

1. If failure of a non-return valve is caused by corrosion, then it will not help to install a duplicate valve as both valves will probably corrode at the same rate.

If corrosion is liable to occur the two valves should be made of different types or materials of construction. Better still, an alternative device, such as a reverse rotation lock, could be used instead of one of the non-return valves. (Using two non-return valves is an example of replication or redundancy; using one non-return valve and a reverse rotation lock is an example of diversity. Diversity is the better method of protection as circumstances which cause one device to fail may not affect the other.)

2. The failure rate may depend on the number of times the non-return valve is required to operate rather than on the length of time it has been installed.
3. In the diagram, the NRV should have been shown inside the pump isolation valves, so that it can be got at for inspection and maintenance.
4. In the example quoted in Newsletter 30, Item 3, there was a logical error. I assumed that a non-return valve develops faults which will cause it to fail once in 330 years and that these faults will not be detected until the next routine overhaul, on average, 6 months later. The demand rate on the NRV was taken as 10 times/year and it was assumed that when a demand coincides with a fault there will be a hazard.

On average, therefore, a hazard will occur once in 330 years and half-way between two routine inspections.

If nothing is done to repair the fault before the next inspection is due then the next four demands will also result in a hazard. The average hazard rate will thus be once in  $330 \times 5 = 67$  years.

In practice, however, the fault should be repaired when the first hazard occurs and the hazard rate will then be once in 330 years. Similarly, if the brakes on my car fail once in 20 years, the hazard rate will be once in 20 years, provided I repair them as soon as they fail. If I wait until the next service is due the average hazard rate will be much higher.

### **33/8 ELECTRICALLY HEATED CLOTHING**

You may have seen advertisements for clothing heated by a small electric battery. It is, of course, unsuitable for use in areas where flammable liquids or gases may be present and we must take care that contractors do not use it.

### **33/9 UNUSUAL ACCIDENTS - No. 3**

This one occurred in the Division:

A stair tread collapsed—the result of corrosion—as a man was going up. He was suffering from a back complaint at the time and the sudden jolt put it right!

### 33/10 ADVICE TO YOUNG MEN

“If I were 20 years old today, and I had a desire to become Vice-President of a major corporation, I would become a safety engineer. Most major corporations today have Vice-Presidents in charge of marketing, purchasing, sales, engineering, and recently lawyers have made it. The next group to make it will be safety engineers. If I were a Board Chairman on a corporation today, the first thing I would do is get someone of vice-presidential status in charge of safety. The corporations that don't do this are going to have an unfavourable profit and loss picture”.

H. Philo, a US lawyer, quoted in 'Total Loss Control' by J A Fletcher and H M Douglas.

### 33/11 THREE YEARS AGO

“I would like to know if you find these Newsletters useful. Sometimes I feel like a man writing messages in bottles, throwing them into the sea and wondering if they ever reach land”.

*From Safety Newsletter No. 4, September 1968.*

Since this was written I have had many appreciative letters and valuable comments and I would like to thank all those readers who have written to me.

### 33/12 RECENT PUBLICATIONS

(a) Newsletters 22-31 have been bound together and issued as Report No. 0.200,710/A, available from Division Reports centres.

(b) On some LPG tankers the same line is used for filling and emptying. If the hose breaks there is nothing to prevent the contents of the tanker coming out (see Newsletter 28, Item 3). Safety Note 71/15 describes a remotely operated valve suitable for fitting to tankers of this sort.

For a copy of (b) or for more information on any item in this Newsletter, please write to Miss M N, Organic House, Billingham, or ring B.3927. If you do not see this Newsletter regularly and would like your own copy please ask Miss N to add your name to the circulation list.

October 1971

Sign on pylon:



The following pages were not part of the Newsletter but were added by a reader to the copies circulated in his Department

**WHAT WILL IT  
BE NEXT ?**

**SOMEONE ELSE  
HURT !!!**

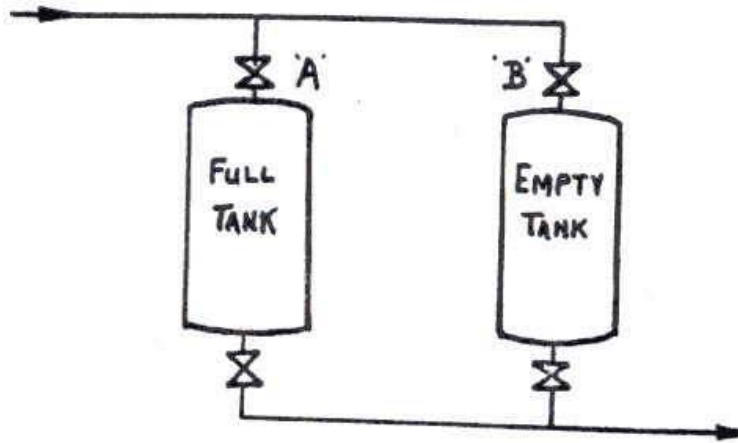
**FIRE !!!**

**EXPLOSION !!!**

RECENTLY SEVERAL OCCURENCES  
HAVE HAPPENED ON THE WORKS  
BECAUSE PEOPLE DID NOT  
FOLLOW LAID DOWN PROCEDURES!!

WE KNOW ABOUT THE INCIDENTS  
DESCRIBED IN THE FOLLOWING  
PAGES, BECAUSE SOMEONE DIDN'T  
GET AWAY WITH IT ON THOSE  
OCCASIONS.

YOU MAY BE GETTING AWAY  
WITH IT — BUT FOR HOW LONG!!!



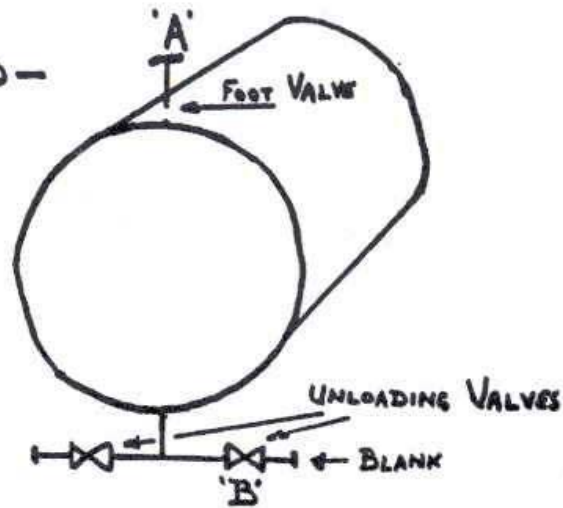
VALVE 'A' WAS OPENED INSTEAD OF VALVE 'B'



RESULT

TANK "OVER THE TOP."  
WASTE OF VALUABLE PRODUCT.  
SOMEONE COULD HAVE BEEN COVERED.  
WITH PRODUCT.

VALVES 'A' AND 'B' WERE  
THOUGHT TO BE CLOSED —  
IN FACT 'A' WAS  
COMPLETELY  
INEFFECTIVE AND  
'B' WAS PARTLY OPEN.



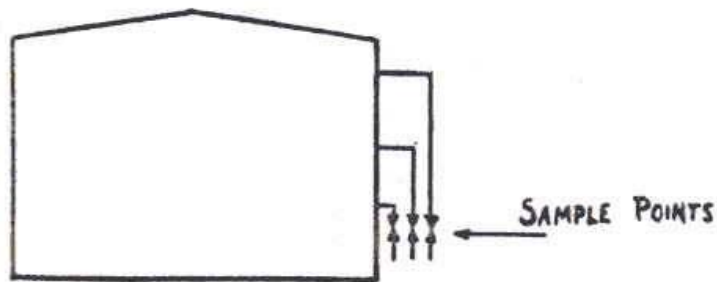
SO WHEN THE BLANK WAS REMOVED  
PRODUCT Poured OUT.

### RESULT

MAN WAS DRENCHED WITH PRODUCT.  
LOSS OF VALUABLE PRODUCT.

FORTUNATELY THIS PRODUCT WAS NOT  
PHENOL OR ACID!  
BUT THE VICTIM STILL FINISHED UP  
IN HOSPITAL.





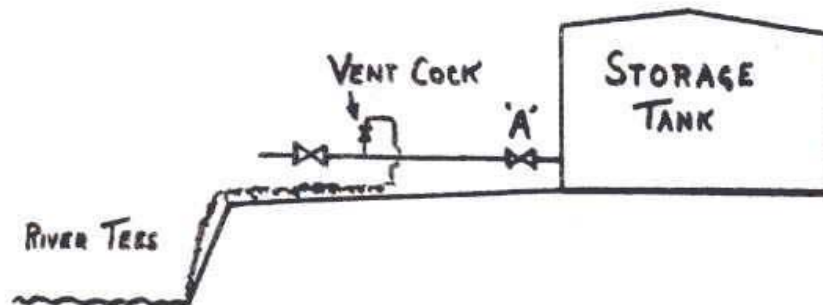
A SAMPLE POINT OF THIS TANK WAS FOUND TO BE OPEN AND DISCHARGING PRODUCT.

WAS IT LEFT OPEN? WAS IT KNOCKED OPEN?

### RESULT

10 TONNES OF VALUABLE PRODUCT  
DOWN THE DRAIN.

LUCKY ESCAPE HIGHLY INFLAMMABLE  
MATERIAL - IT DID NOT FIRE.

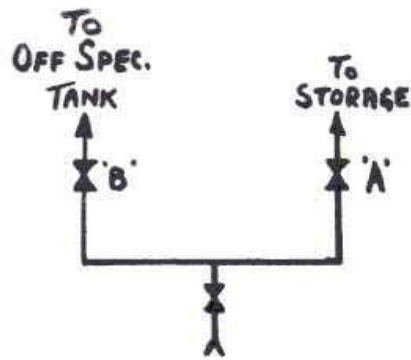


THE LINE WAS BLOWN WITH  $N_2$  INTO THIS TANK —  $N_2$  WAS THEN DISCONNECTED — THE VENT COCK OPENED TO RELIEVE THE PRESSURE. BUT VALVE 'A' WAS LEFT OPEN !!

### RESULT

LOSS OF ABOUT 4 TONNES OF EXPENSIVE MATERIAL INTO THE RIVER.  
CONTAMINATION OF THE RIVER.

FORTUNATELY IT DIDN'T CATCH FIRE.



VALVE 'A' WAS LEFT OPEN WHEN A MOVEMENT WAS STARTED THROUGH VALVE 'B'.

### RESULT

PRODUCT IN STORAGE TANK WILL HAVE TO BE RE-PROCESSED.

### COST

ABOUT £1000

THESE INCIDENTS SHOULD NOT HAVE  
HAPPENED.

THEY WERE CAUSED BECAUSE :-

i THE LAID DOWN PROCEDURES WERE  
NOT FOLLOWED.

ii OPERATORS FAILED TO CHECK  
VALVE POSITIONS BY HAND BEFORE  
AND AFTER MOVEMENTS.

DO YOU MAKE SIMILAR MISTAKES ?

SOME PEOPLE DO !!

IF WE CONTINUE TO BE CARELESS  
SOONER OR LATER SOMEONE ELSE  
WILL BE SERIOUSLY HURT.

IT COULD BE YOU OR YOUR  
WORKMATE.

MAKE SURE IT ISN'T.