# IMPERIAL CHEMICAL INDUSTRIES
# HEAVY ORGANICS DIVISION

## SAFETY NEWSLETTER NUMBER 18

**By Trevor Kletz**

### 18/1 DRAIN HOLES IN RELIEF VALVE TAIL PIPES (see also 19/1)

When relief valves discharge to atmosphere there is usually a small hole in the tail pipe so that rain water will not accumulate in it. Sometimes this drain hole is provided as part of the relief valve assembly and, if so, it must be blocked off if the relief valve is discharging into a flare header or other closed system. All relief valves made to the API specification are supplied with these drain holes.

A few years ago on starting up a new unit a leak of poisonous gas occurred because a drain hole had been left in the tail pipe of a relief valve which discharged into a fuel gas main. Fortunately the leak was spotted by smell before anyone was hurt.

Now another incident has occurred. Thirty tons of oil were lost through a drain hole on a relief valve which discharged into a storage tank. The relief valve was supplied with a drain hole fitted with a plastic plug. This was not spotted during installation. When the relief valve lifted the plug was blown out and as the relief valve was in a remote part of the Works many hours went by before the leak was spotted.

### 18/2 SPLASHING ACETONE CAUSES A STATIC FIRE

Everyone knows that if a hydrocarbon such as petrol is splashed, a charge of static electricity may accumulate on the petrol or its container and may cause a spark which will set light to the petrol. The precautions necessary to prevent this happening are well known. If you are not sure of them, ask us for a copy of Safety Note 69/11.

It is usually assumed that there is no danger from a high conductivity liquid such as acetone because the charge soon leaks away. However if the splashing forms a lot of mist this is not true; the charge cannot leak away because the droplets are not in contact with each other. A German paper, translated as Report No. 0.200,652/A, describes an actual fire which was caused in this way. A can was filled with acetone from a tap. There was considerable spraying and a charge accumulated on the can and on the man who was holding it. When he was about to close the tap a spark jumped from his hand to the tap and set fire to the acetone. The report says there was considerable damage to the building but does not say what happened to the man.

Tank wagons, drums, cans or other containers which are being filled with flammable liquids should always be earthed, even though the liquids have a high conductivity.

### 18/3 PRODUCTION OF STATIC CHARGES IN GAS JETS

It is well-known that gas jets containing liquid droplets or solid particles can produce static electricity. If there are any unearthed conducting objects in or near the jet, then they collect the charge which may then cause a spark as it jumps to earth.

It has been suggested that electric discharges can take place directly from the droplets on a gas jet –rather like lightning which is a discharge from the water droplets in a cloud.

A discharge of this sort was seen one night recently in a steam leak and i; described in full in Safety Note 70/3. The discharge was not a spark but a partial electrical breakdown or corona discharge and looked like a small flame.

It is not known whether or not discharges of this sort have enough energy in them to ignite mixtures of flammable gas and air. The possibility cannot be excluded. Inside a steam leak the steam would prevent ignition but a similar phenomenon might occur in a leak of flammable vapour containing liquid droplets.

There is no way of preventing corona discharges. Spark discharges can be prevented by making sure that all metal equipment is earthed and by not leaving bits of unearthed metal lying around.

Corona discharges are sometimes seen on ships' masts during storms, they look like balls of fire, and are known as St. Elmo's fire. St. Elmo is the popular name of St. Peter Gonzalez (c. 1190-1246), the patron saint of seamen. The fire used to be interpreted as a sign of his protection though sometimes as a sign of impending doom.

### 18/4 RELIEF VALVES FOR RECIPROCATING MACHINES

In Newsletter 15, Item 3, I described a dangerous incident which occurred because a reciprocating compressor had been fitted by the manufacturer with a relief valve which was too small.

A reader has now described another incident.

A pump was ordered capable of delivering 2 $m^3$/hr. The manufacturer supplied his nearest standard size pump, capable of 3 $m^3$/hr, but sized the relief valves for only 2 $m^3$/hr. When the pump was operated at full rate against a restricted delivery, the connecting rod was bent — fortunately it was the weakest part of the system.

The incident shows again the need to check the safety features of package deals — particularly the sizing of relief valves.

### 18/5 WHY DO WE DISARM TRIPS?

In Newsletter 17, Item 7, I asked how the disarming of alarm and trip systems is authorised.

A reader comments: "Why do operators want to disarm alarms and trips? Often it is because they are giving false readings — the alarm is "crying wolf" or the trip is shutting the plant down unnecessarily".

The chance that this will happen can be greatly reduced by using a 2 out of 3 voting system. For example, three temperature indicators are installed and two of them have to indicate a high temperature before the trip operates. The cost of the extra equipment can often be recovered by the saving in production. HOC Instrument Design Section or Instrument Development Group will be pleased to tell you more.

### 18/6 UNAUTHORISED CONNECTION OF INERT GAS TO A VESSEL

Another Division has reported the following incident.

Two maintenance men working inside a tank complained of fumes. Their supervisor told them to connect up a compressed air hose. One of the men connected up a nitrogen hose in error.

Fortunately the mistake was discovered in time.

Could this happen elsewhere? Should you publicise this as a cautionary tale?

### 18/7 ANOTHER THREE MONTHS IN THE LIFE OF AN OIL COMPANY

In Newsletter 12, Item 4, I summarised the incidents that had occurred in one of the major oil companies during a three-month period.

You may like to know how they faired during a subsequent three months. All but one of the incidents caused serious damage or injury. Put a tick in the box on the right if the incident could happen to you.

(a) The temperature indicator on the exit line from a furnace failed and gave a constant, low reading. The fuel controller therefore opened fully, the oil in the tubes was overheated and the oil line exit the furnace softened and split. A high temperature alarm has now been installed on the oil stream.

(b) Vibration — from relief valve chatter — and inferior bolting caused the joint underneath a relief valve to spring. Hot oil came out and caught fire.

(c) A pressure gauge on the delivery of a hot oil pump came unscrewed as the result of vibration; hot oil was sprayed over a wide area and caught fire.

(d) A pump was handed back from maintenance with a pressure gauge missing and its isolation valve open. When the pump was started up, oil came out and caught fire.

(e) The roof was blown off an empty tank while a welder was repairing the roof. Although the tank had been cleaned and gas-freed, the welding vaporised traces of heavy oil which were trapped between the plates. The report states:

> "It should be recognised that hot work on an "empty" tank or vessel which has contained petroleum is potentially hazardous unless all proper precautions have been taken. Traces of products can be retained in the tank despite thorough cleaning. Tanks which have held heavier fractions, such as kerosene, gas oil or bitumen, may in these circumstances, be even more dangerous than those which have held gasolines. The heavy products vaporise more slowly and they may not be detected by explosimeter tests." A similar explosion occurred in HOC Division a few years ago.

(f) Two filters blew up because the inert gas used for blanketing them was contaminated with 10% oxygen.

(g) During cold weather, water froze in the drain line of an LPG vessel and caused the line to fracture where it was screwed on to a valve. Screwed joints should not be used on LPG duty.

(h) The casing of a steam turbine fractured because the exhaust valve was shut while the inlet valve was open. There was no safety relief valve.

(i) A road tanker was overfilled because the filler allowed his attention to wander. The emergency stop button was so close to the tanker that no one could reach it.

Several of the major oil companies are equipping their road tankers with high level trips which close a valve in the filling line. We are going to try them out.

**18/8 TECHNICAL LITERATURE ON HOC PRODUCTS**

HOC Publicity Section issues technical literature on the Division's products, including product leaflets, industrial hazard bulletins and booklets on storage and handling. This literature is intended primarily for sales staff and customers but is available to ICI staff. You should be familiar with the leaflets on the products you manufacture or handle or which are going to be made on the plant you are designing. Copies can be obtained from Mrs. V. H, Publicity Section, Ext. 6.2164. If you are not sure which leaflets you need, Miss M. A, Ext. B.2743 may be able to help you.

**18/9 DON'T PUT PETROL IN PLASTIC CONTAINERS**

Never keep petrol in a plastic container. The plastic can harden after contact with the petrol and become brittle. Some plastic cans are made in two halves which are stuck together; the petrol may attack the glue.

If you have to keep petrol for your lawnmower or for the car, keep it in a metal can.

**18/10 ONE WAY TO STOP EXPLOSIONS**

An interesting insight into motivation was given by Crawford Greenewalt, while President of duPont. He said that his company had had a safety programme for 150 years. The programme was instituted as the result of a French law requiring an explosives manufacturer to live on the premises with his family!

**18/10 RECENT NOTES**

(a) One of the Oil Companies has sent us copies of the training booklets they give to employees engaged in marketing, i.e. storage, filling and transport of their products. They are excellent little booklets, and cover such topics as Gas Freeing and Tank Cleaning, Tanker Loading and Discharge, Electrical Equipment, Static Electricity and the Law and Truck Operation. We can let you have copies and if you like them we can get copies for you to hand out.

(b) I have recently visited Shell, Union Carbide and B.A.S.F. Copies of my notes are available to IC! staff who are interested.

(c) Safety Note 70/4 describes an accident which occurred with high-pressure water washing equipment and makes recommendations.

(d) A recent report (No. D.74207/B) from another Division includes an excellent summary of the information available on explosive properties. The subjects covered include the explosive properties of dusts and the ways in which they are defined, the effect of temperature pressure and diluents on the explosive limits of gases and vapours, the effect of turbulence and venting on the pressure developed in an explosion and the rate of rise of pressure.

For those who want more detailed information on flammability limits the U S Bureau of Mines has published two excellent reports, Bulletin 503 by H F Coward and G W Jones~and Bulletin 627 by M G Zabetakis.

For more details on any item in this Newsletter, please write to Mrs. J. M. W, Organic House, Billingham or phone B.3927. If you do not see this Newsletter regularly and would like your own copy, please contact Mrs. W or your Works Safety Officer.

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