IMPERIAL CHEMICAL INDUSTRIES LIMITED
PETROCHEMICALS DIVISION

SAFETY NEWSLETTER No. 60

60/1 WHO ARE THE HEROES? THE MEN WHO SHUT THE PLANT DOWN OR THE MEN WHO CARRY ON?

When there is a leak of a dangerous material there is a very natural temptation to try and isolate the leak with the plant on line. Often this is the right thing to do, for example, if the leak is small or if it can be isolated from a safe distance. But sometimes men have taken quite unnecessary risks to keep the plant on line. The following story, which occurred some years ago, is an example.

In 1956 there was a bad leak of propylene on a pump which was inside a building. Four men were badly were badly injured. Afterwards a lot of money was spent on moving the pumps into the open air, surrounding them with a steam curtain and fitting remotely operated isolation valves and blowdown valves to them. If another leak should occur, then it would be possible to stop the leak by closing the pump suction valve, opening the blowdown valve and switching off the pump motor without any need for anyone to go into the compound.

Eight years went by before another bad leak occurred. When it did occur the area round the pumps was filled with a visible cloud of propylene vapour several fee deep. Instead of using the emergency equipment, which would have stopped the flow of propylene and shut down the plant, two very experienced supervisors went into the compound, shut down the leaking pump and started the spare up in its place. Fortunately the leak did not fire.

Afterwards one of the supervisors went back to his office and realised the risk he had been taking. He complained that he should not be expected to take such risks. He had forgotten, in his eagerness to maintain production, that emergency equipment had been provided to avoid the need for such risk taking.

60/2 WATER IN THE LUBRICATING OIL CAUSES A BEARING FAILURE AND FIRE

A bearing failure on a pump was due, in part, to the presence of water in the lubricating oil. The bearing failure caused sparks which set fire to some oily residues nearby. Drums in the main lubricating oil storage area were found to be open with water on top of the drums.

In addition, there was no Denko Bottle on the lubricating oil point of a nearby pump that was shut down and this identified another way in which water can get into lubricating oil.

Fortunately the fire was not serious.

60/3 A CRANE IS BLOWN OVER ONTO A STORAGE TANK

Another Company have described how a crane fell onto a storage tank. The crane was hired for the construction of a new tank. The driver was told which route to take to the construction site, but on the way there he stopped and assembled his jib, which was 120 feet tall. A sudden gust of wind blew the crane onto a storage tank. The jib broke and landed across the top of the tank. The fittings on the tank were broken but fortunately it did not leak.

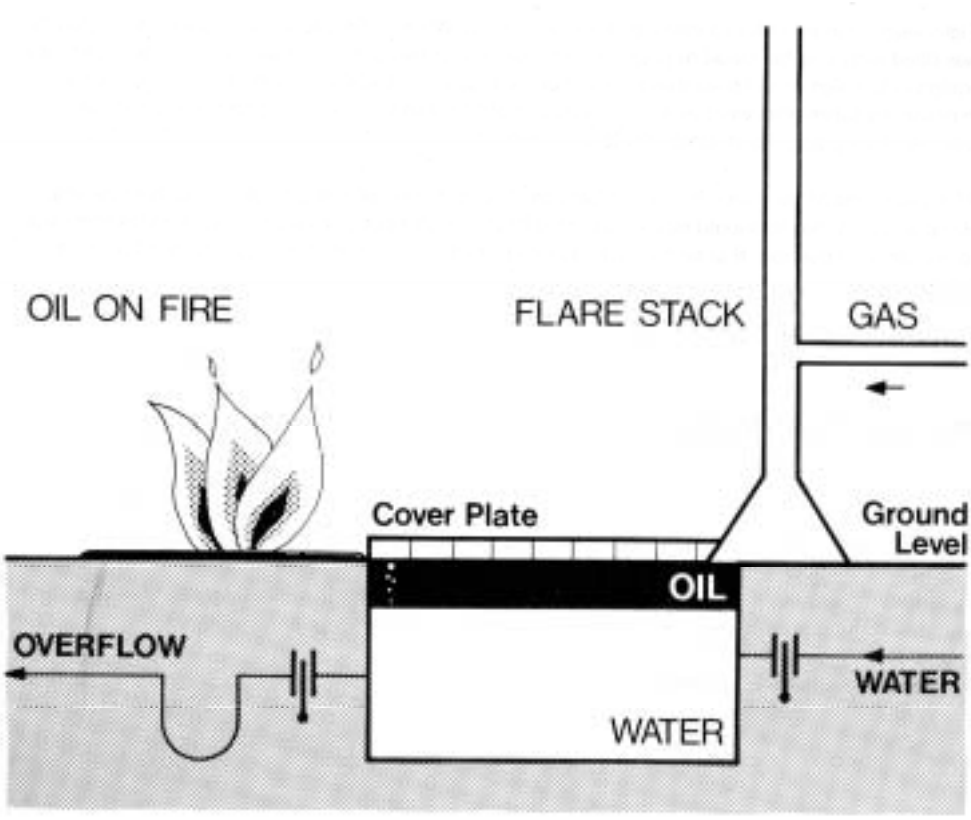
This incident is taken from the second issue of “IP Safety News”, a new venture, sponsored by the Institute of Petroleum Safety Sub-Committee. which appears every other month inside “Petroleum Review”. The first two issues (September and November 1973) were taken mainly from these Safety Newsletters, but the January issue shows that other Companies are now starting to contribute.

60/4 FIVE YEARS AGO

From Safety Newsletter No. 7, January 1969.

In almost all flare and vent stacks some liquid may collect at the bottom of the stack. Even if a knock-out drum is fitted some liquid spray may get past or vapour may condense on the sides of the stack; so-cal/ed dry flare stacks often contain materials which condense in cold weather.

What happens to liquid which collects at the base of the stack? A recent incident has shown the importance of knowing the answer to this question.



The incident occurred on a flare-stack which sits on top of a concrete sump. The sump was originally fitted with a water inlet line and overflow to drain to wash out any liquid which collected. These were both blanked off when the stack was changed onto a "dry" duty. Some oil nevertheless collected on top of a layer of water, dissolved the bitumen which sealed the sump cover plates and overflowed onto the surrounding ground where it was ignited by a spark from the stack.

The overflow line has now been brought back into use.

On your flare and vent-stacks, what happens to any liquid that accumulates? If it overflows through a lute, how do you check that the lute is full and not choked?

The fire, incidentally, showed the value of foam monitors. Ordinary foam branches failed to put out the fire; after an hour a large monitor was brought into use. It put the fire out in five minutes.

REMINDER

Newsletter 21, Item 3 described an explosion which occurred because oil accumulated in the U-bend of the overflow line from a sump on which welding was taking place.

60/5 HOW CAN WE TELL IF THE ACCIDENT RECORD IS REALLY BETTER?

Suppose that in a particular works, on average, over a period, there are 10 accidents (or 10 fires or 10 leaks) per month. Suppose that in the next month there are only 6. Would you congratulate the works on a better record or would you feel that the improvement might be due to chance?

If there are less than 5 accidents in a particular month you can be fairly sure that there has been a change for the better; 19 times out of 20 you will be right. If there are more than 15 you can be fairly

sure that things have got worse — 19 times out of 20 you will be right. If there are between 5 and 15 accidents — perhaps you had better wait another month or two before you say anything.

Suppose that instead of an average of 10 accidents per month there are 100 (or 100 fires or 100 leaks). What change is significant? If in a particular month there are less than 84 accidents you can be fairly sure that things have improved. You will be right 19 times out of 20. If there are more than 117 you can be fairly sure that things have got worse. You will be right 19 times out of 20.

60/6 EXPLOSIONS OF CLOUDS OF GAS OR VAPOUR IN THE OPEN AIR

If a cloud of gas or vapour explodes in the open air there is usually a slight 'pop' and a sheet of flame, followed by a fire at the place where the leak originated. Anything in the area covered by the cloud is damaged by the fire, but there is usually no blast damage, or at the most, a few broken windows.

Occasionally however a vapour cloud explodes with a loud bang and the blast causes a lot of damage. For example, at Pernis in Holland in 1968 pipebridges were pushed over.

A paper by R A Strehlow entitled "Unconfined Vapour Cloud Explosions — An Overview", summarises over 100 incidents which have occurred during the past 40 years. In the 1930's there was one incident every two or three years, now there are about five every year. The paper discusses some of the factors which are necessary before blast damage occurs — the cloud must be large and well-mixed with air and this usually means that ignition must be delayed.

For 81 incidents, the distance away of the ignition source was known. 58% of the leaks found a source of ignition within 50 feet, 76% within 100 feet and all within 300 feet.

We can let you have a copy of Strehlow's paper.

60/7 NEVER USE UNLABELLED BOTTLES

One of our overseas companies reports that an employee got some chemical in his eye. A fellow-worker saw an unlabelled squeezy bottle in a telephone box nearby. He assumed it was an eye-wash bottle, ran and got it and squirted it into the injured man's eye.

The bottle contained caustic soda solution which burned the man's eye.

60/8 WHAT THE LAW SAYS NO. 15— THE LABELLING OF CHEMICAL LOADS

The law requires that all vehicles carrying more than 500 kgs of scheduled hazardous materials must display on front and back a diamond-shaped hazard symbol and, in the case of tankers, the product name on each side. The list of materials that must be labelled in this way includes most flammable and corrosive liquids and will soon include liquefied gases, poisonous liquids and peroxides.

Petrochemicals Division's policy is to anticipate legislation and to improve on its requirements, particularly where information for the Emergency Services — Police, Fire and Ambulance — is concerned. While the Division's products are outside the factory gates and on the road, we try to make sure that, if an accident occurs, the people first on the scene take the correct action and thus minimise the risk to the public. A technical back-up service from ICI is available and is well-known to the emergency services but the first source of information is the label.

We therefore:-

(a) Label all tankers with the product name, hazard information and an emergency telephone number.

(b) Label them three times — on the back and both sides — since side labels are useless in a roll-over accident.

(c) Label all products, hazardous and non-hazardous, because, to the emergency services, no label does not mean no-hazard.

Red and white labels are used for hazardous materials and black and white labels for

non-hazardous materials.

A typical label is illustrated.

An example of a tanker label.

The original is 21 inches across and is printed in red on a white background.

By law, the haulier is responsible for labelling, though this may be changed, so that the firm that sends out the load is responsible. This is more sensible, as the people who handle a material know more about it than the haulier.

We must therefore make sure that no vehicle leaves our plants or filling stations incorrectly or inadequately labelled. So if you notice any of our products being moved in this way, please tell us. Our excellent reputation with the Emergency Services could be destroyed overnight by an accident enquiry that revealed that our standards were less than satisfactory.

Labels can be obtained from Distribution Dept. (B.2951).

60/9 HOW FAR WILL THE VAPOUR FROM A LEAK SPREAD?

If there is a spillage of petrol, the vapour will not spread very far — perhaps a foot or two above the surface of the liquid and ten feet downwind.

If there is a leak of a light gas such as hydrogen or methane, it will go straight up so long as there is a clear path overhead; it will not spread very far to one side.

The most dangerous materials are heavy gases like butylene, propylene, ethylene (especially when cold) and ethylene oxide. The vapours are heavy and unless there is a strong wind they can spread a long way. The following table gives some examples of the distance that leaks will spread in a 5 mph wind and in a 10 mph wind. The wind speed is less than 5 mph for about an eighth of the time, and less than 10 mph for nearly half the time.

Material	Size of hole	Leak Rate	Distance in feet that leak will spread before it is diluted to the lower flammable limit.	
		tons/hour	10 mph wind	5 mph wind
Ethylene at 280 psig and 30°C	¼ "	1.3	40	60
	¾ "	26.0	200	300
Propylene at 200 psig and 35 °C	¾ "	7.0	85	125
	2"	49.0	250	370
Mixed butylene at 45 psig and 35°C	¾"	3.8	60	90

The leak rates in the table refer to leakage through a long branch, as in a drain or sample point, except for the second line which gives the leak rate through a short nozzle

These figures have been confirmed by experience. Many leaks have spread 500 ft. or more.

So you see why it is important to prevent leaks of liquefied flammable gases. All drain and sample points should conform to the ICI Code ("Liquefied Flammable Gases — Storage and Handling" IC! Engineering Code and Regulations, Group D, Volume 1.6, available outside ICI from The Royal Society for the Prevention of Accidents) In particular, they should be fitted with two valves or, if used only occasionally, fitted with a single valve and blanked. The maximum size of a drain pipe should be ¾ inch and the maximum size of a sample point should be ¼ inch.

Equipment which is liable to leak should be fitted with emergency isolation valves.

60/10 DR A PUGH

Alan Pugh retired at the end of 1973 after more than 34 years service, the last 3 ½ as a member of Safety and Loss Prevention Group. He brought to his work as a safety adviser many years of experience in plant design. His advice was always sensible and practical and as a result people were always ready to listen to him. We shall miss his willingness, at all times, to drop whatever he was doing, to talk to people who came round with problems. It will be difficult for the rest of us to fill the gap he has left.

60/11 UNUSUAL ACCIDENTS NO 30

Newsletter 58, Item 2 described how new instruments are being used instead of canaries or mice for detecting dangerous amounts of certain gases or vapours. The new instruments have one advantage which was not mentioned in the Newsletter. The November Emergency Services Report from one of the Works in the Division reports that the works ambulance had to attend a man who was bitten by a mouse!

60/12 RECENT PUBLICATIONS

(a) A report dated 20 November 1973 describes the French Government's rules for oil refineries and hydrocarbon depots.

(b) A note dated 5 December 1973 summarises the papers presented at the recent Loss Prevention Symposium organised by the American Institute of Chemical Engineers.

(c) "Over-pressure and Other Risks — some Myths of the Chemical Industry" — a paper to be presented at a Symposium on Loss Prevention to be held next May. (For a copy of the Symposium programme write to Loss Prevention 1974, c/o KIvl, 23 Prinsessegracht, The Hague, Holland). [This paper was later expanded into a book, "Dispelling Chemical Engineering Myths", now in its 3rd edition and published by Taylor and Francis. Myths are defined as widely held beliefs that are not wholly true but usually accepted uncritically

For copies of (a) — (c) or for more information on any item in this Newsletter, please write to me or ring B.3927. If you do not see this Newsletter regularly and would like your name added to the circulation list, please let me know.

From January — September 1973 there were 31 fatal road accidents in Teesside. Seven occurred on A1085 (Redcar Trunk Road).

Note added later: According to a leaflet issued by the local road safety group the seven incidents on the A1085 occurred at the same roundabout and all were due to road user error. It did not occur to the authors that the design of the roundabout might be at fault.