

IMPERIAL CHEMICAL INDUSTRIES HEAVY ORGANICS DIVISION

SAFETY NEWSLETTER NUMBER 12

By Trevor Kletz

12/1 ISOLATION OF EQUIPMENT FOR MAINTENANCE

This comes up in nearly every Newsletter. The latest incident occurred on a flare stack. A Clearance was issued to erect staging. The gas line to the stack was slip-plated off but the steam line up the side of the stack was isolated by a locked valve only. The valve was passing, with the result that condensate accumulated in the steam pipe and eventually puked out of the top and scalded the riggers. This incident, like many others, emphasises that single locked valves cannot be relied on as a satisfactory method of isolation when equipment is given to maintenance and that slip-plate (or physical disconnection and blanking) is necessary unless the job to be done is so quick that fitting slip-plates would take as long and be as hazardous as the main job.

12/2 BURSTING OF A VESSEL

A man was severely injured in another Division when a plant vessel burst and sprayed him with a corrosive chemical. The vessel was leaking and the material in it was therefore being blown into another vessel with compressed air. The leaking vessel was protected by a bursting disc designed to burst at 5 psi and the process man was told to watch the pressure in the vessel and not let it reach 5 psi. Nevertheless, he opened the air valve too far and the vessel burst. The valve leading to the bursting disc was closed.

A number of things were wrong.

1. It is bad practice and also illegal to fit a valve between a vessel and its bursting disc. This valve had probably been closed for some time. The valve had been fitted to stop escapes of gas into the plant after the disc blows and while it is being changed. The correct way is to fit two bursting discs, each with its own isolation valve, the valves being interlocked so that one is always open.
2. The process operator, who was a lone-worker, had worked on the plant for only 7 months, and during this time had received five warnings for lack of attention to safety or plant operation. Clearly a most unsuitable man (or inadequately trained man) for a lone-worker job.
3. When air or nitrogen have to be blown into a vessel which cannot stand the full pressure of the air or nitrogen supply, then it is good practice to fit a reducing valve and relief valve on the gas supply, set to below the safe working pressure of the vessel. This is not always possible - sometimes air or nitrogen have to be used to blow liquids into a vessel and if their pressure was reduced it would not be sufficient to move the liquid - and in these cases the relief device on the vessel must be sized to take the full rate of air or nitrogen. See "Guide to the Venting of Storage Tanks". H.O.C. Report No. 200,625/A by B.G. D, 24.6.69.

12/3 THE CORRECT WAY TO BREAK A JOINT

Everyone knows that the correct way to break a bolted joint is to remove some bolts, slacken the others and then wedge the joint open. If there is any pressure in the line or vessel, then the leakage is limited and the joint can, if necessary, be hardened up again. Nevertheless, accidents keep happening because fitters, even experienced ones, undo all the bolts and pull the joint apart.

In a big fire two years ago, in which three men were killed and extensive damage was done, a fitter removed the cover from a pump which he thought was isolated. Unfortunately the suction valve was open and oil came out above its auto-ignition temperature and caught fire. One of the contributory factors was the way in which the joint was broken. The fitter removed all the nuts and wedged off the

cover. It blew off under the internal pressure in the pump and oil poured out at a high rate. (see HOC Report No. 0.21,100/B).

Another Division have now reported a similar accident which resulted in two men being badly scalded. They were removing the cover from the large inlet valve to a water heater; all the nuts were removed, the cover was attached to a chain block and attempts were made to lift it. The cover was rocked manually while under tension from the blocks; it suddenly released itself allowing hot water to flow over the legs of the fitter and his mate. The pressure of the trapped water was only 9 ins water gauge.

Previously the two men had removed the cover of the outlet valve the correct way. The flow of water was small and they assumed that no water would be trapped in the inlet valve. It was, however, of a different design.

12/4 3 MONTHS IN THE LIFE OF AN OIL COMPANY (see also 18/7)

One of the major oil companies has sent us its Safety Report for the first three months of this year. Most of the incidents reported are similar to ones that have occurred on Teesside.

a) Two explosions occurred in closed-in poorly ventilated pump-houses. Leaks of light oil were ignited, in one case by a hot bearing on a pump and in the other by a diesel engine. The leaking vapour was sucked into the air inlet of the diesel and flashed back.

Closed-in pump houses and compressor houses should be avoided when flammable materials are handled. A roof may be provided but there should be no walls below 10 ft. height. If, for some special reason, a closed-in pump-house or compressor house is essential then arrangements should be provided for detecting leaks, dispersing them by forced ventilation and isolating them from outside the building so that men do not have to enter the vapour cloud. The use of diesel engines in these conditions is also bad practice unless they are adequately flame-proofed. This is difficult and they are best avoided when possible. A note on the conditions under which diesels should be used is under discussion.

b) The vent on an empty petrol tank was ignited by lightning. It flashed back and blew open two manhole lids. It was fortunate that the explosion was of such low intensity that it could be relieved through the manholes; the tank might easily have been split.

The tank should have been blanketed with nitrogen or other inert gas to prevent an explosive mixture forming. If for any reason this was impossible - this particular incident occurred on a ship where inert gas is not usually available - then a flame arrestor should have been fitted in the vent pipe..

c) A hydrogen leak occurred inside a plant chromatograph analyser and was ignited by a thermostat. The door was blown off as it was held by only one bolt instead of the 26 provided.

This type of analyser, which contains gas and electric circuits in the same box, is being superseded by a safer type, in which flammable materials and ignition sources are separated. Nevertheless, the older type in a flameproof box is quite safe if it is assembled correctly.

d) A heavy oil tank had to be cleaned. Some light oil was put into it and heated up by the steam coil in the tank. There was a layer of water below the oil. Though the temperature recorded was only 170°F., the tank roof was blown off.

The level in the tank was only 4 ft. and the thermocouple was placed 5 ft. from the bottom so it did not record the liquid temperature. The steam coil heated up the oil and the heat slowly passed to the water layer underneath.. When the water reached boiling point, the turbulence caused rapid mixing with the oil and rapid vaporisation of the water so that the roof was blown off by the steam produced. (Have you seen my note of 26.8.68 on "Heated Tanks Containing a Water Layer"?).

e) A level controller fractured at a weld causing a massive release of gas oil, hydrogen and hydrogen sulphide. Fortunately it did not fire.

The failure was a result of poor workmanship and, to quote from the report, "emphasises the need for clear instructions on all drawings and adequate inspection during manufacture".

f) A crude oil pump caught fire as a result of overheating and crude oil leakage, the result of incorrect fitting of the bearing housing covers.

g) During very cold weather, -20°C., a flare stack, which was supplied with steam injection at the base, froze solid.

The weather is never as cold as this on Teesside but nevertheless a vent stack has been frozen. In our case ethylene was being vented and the ethylene vapour froze the steam in the vent stack. Steam should not be used on stacks which might freeze.

h) Two road tankers caught fire. Both were being filled with gas oil and both had carried petrol on their previous trip. The cause of ignition was static, the result of splash filling as the fill arm did not reach the bottom of the tanker. Both tankers were correctly earthed.

Gas oil is not flammable at ordinary temperatures and normally it does not matter if it is splash filled or filled very fast, as even if a static charge occurs there is nothing for it to ignite. However, if the tanker contains flammable vapour from a previous load, ignition can occur. Most fires on road tankers are the result of this "switch filling" as it is called.

i) During a thunderstorm a rim fire occurred on a floating roof tank. It had not been fitted with shunts, small metal bars at frequent intervals, connecting the floating roof to the sides. Earthing the roof to the sides via an earthing cable or the ladder is not sufficient as a lightning discharge will take the shortest route. No fire has occurred on a floating roof tank fitted with shunts. Weather boards, if fitted, will not usually function as shunts, they do not make good enough electrical contact with the sides.

Note that it is not necessary to have a direct lightning discharge on the tank. A thunder cloud induces a charge on the roof and this discharges to earth via the tank walls. Sometimes several tanks, hundred of feet apart catch fire in this way at the same time.

12/5 EXPANSION UNITS

Engineering Department Piping Section have issued a Guide to the installation, setting up, inspection and maintenance of expansion units. This has been prepared as the result of a recent survey which showed that most expansion unit failures were the result of mal-treatment before, during, or after installation.

12/6 DRENCHING OF STORAGE TANKS

It is the practice in HOC Division to fit dry risers on storage tanks so that if a neighbouring tank is on fire the tank can be drenched with water and kept cool. These dry risers have proved their worth in several fires as they enable the tanks to be cooled using less water and fewer men than by other methods.

Tanks can now be made to a new standard (B.S. 2654., Part 3, 1968) which allows the use of thinner walls, provided they are reinforced with wind girders. These girders interfere with the flow of cooling water. This was not realised until some new tanks were constructed and we have now had to fit deflector plates to return the water back to the wall of the tank. In future the wind girders should be fitted inside the tank.

According to Whessoe the new design is economic on tanks of 40 ft. diameter and above.

12/7 ON-LINE TESTING OF PRESSURE VESSELS

As plants get larger it costs more to keep them shut-down so it would save a lot of money if pressure vessels could be tested with the plants on-line. A Symposium on On-line and Non-Destructive Testing was held recently and the conclusion was as follows.

"The aim of eliminating orthodox visual inspection is not attainable except in the long term. Improved off-line inspection techniques can however reduce the time required and increase the certainty of orthodox inspections. On-line monitoring can lead to better planning of maintenance and

more convenient timing of shutdowns, and combined with off-line techniques can allow more realistic inspection intervals. Major savings are possible by these approaches”.

12/8 A KEROSENE FIRE

Another company has reported a fire which occurred while a crude oil distillation unit was being painted. The painters ran out of the detergent used for cleaning their equipment and so they helped themselves to some kerosene from the plant. They took the kerosene from a point where it was above its flash point and it caught fire.

12/9 HUMAN FAILING

I have often commented on our readiness to write down “human failing” as the cause of fires and accidents (see Newsletter 10, Item 13). Over half our accidents are given this cause, though there is nearly always something that managers or supervisors could do to make a repetition less likely. If we say that an accident can be prevented by better design, better training, better methods of working, better systems of inspection and so on then we are led on to do something to prevent it happening again, But if we say that an accident is due to “human failing”, then there is nothing we can do to prevent it occurring again, except telling someone to take more care.

A similar point is made in a recent Penguin Book, “Disaster”, by Sheila Tidmarsh (5/-). She points out how politicians and newspapers, when commenting on floods, earthquakes, famines and similar disasters, use phrases such as “cruel fate”, thus implying inevitability and discouraging constructive thinking on ways of preventing them or minimising their consequences.

If you do not see the Newsletter regularly and would like to do so or if you would like further information on any item please write. to Mrs. J.M.W., Organic House, Billingham, or 'phone B.3927. If you do not need to see this Newsletter in future, please return your copy so that we can reduce the circulation.

11th August 1969