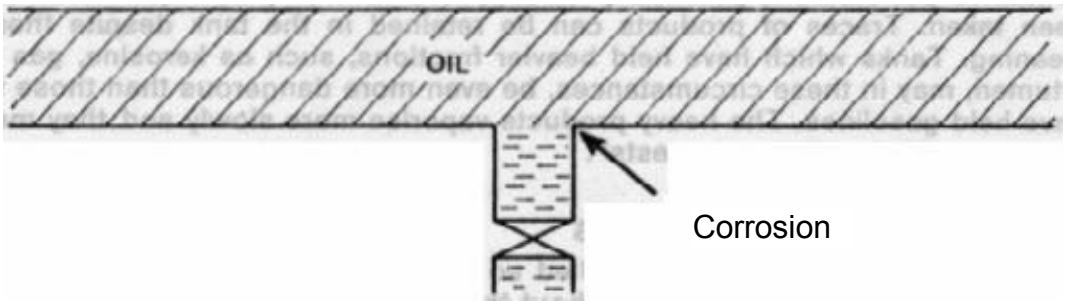
IMPERIAL CHEMICAL INDUSTRIES
HEAVY ORGANICS DIVISION

SAFETY NEWSLETTER NUMBER 27

By Trevor Kletz

27/1 OIL & WATER MAY MEAN CORROSION

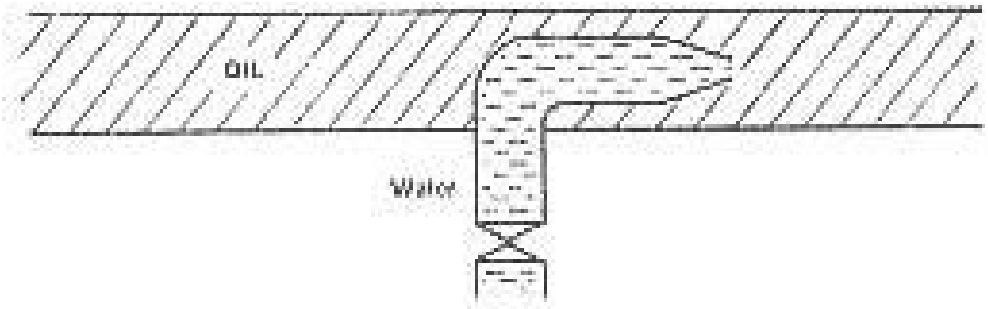
Several recent incidents, some of them serious, in the Division and elsewhere have shown that rapid corrosion can occur when oil and water meet.



The oil alone is not corrosive. The water alone is not corrosive. But when they meet the water may react with impurities in the oil to produce corrosive products.
For example, if water is added to an oil line through a branch, rapid corrosion can occur at the welds.

WATER

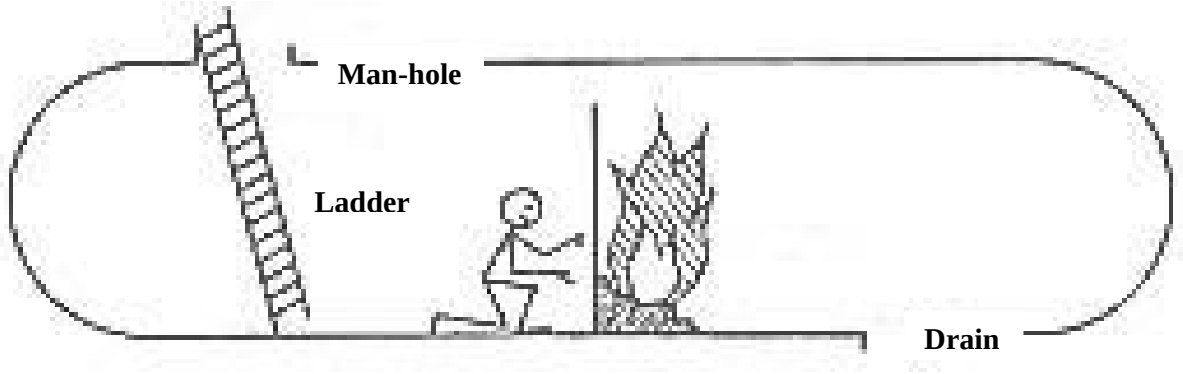
If there is any similar situation on your plants, CHECK THEM FOR CORROSION.
The best way to add water is like this:



27/2 IF YOU CAN'T SEE IT IS CLEAN, ASSUME IT IS DIRTY

A vessel was divided into two halves by a baffle which it was decided to remove. The vessel was cleaned out, inspected and a permit issued for a man to enter the left-hand side of the vessel to burn

out the baffle. It was impossible to see into the right-hand half but as the left-hand half was clean and as no combustible gas could be detected it was assumed that the other half was also clean.



While the welder was in the vessel some deposit in the right-hand half caught fire. The welder got out without serious injury but bruised himself in his haste.

If a part of a vessel cannot be inspected and seen to be safe, then we must assume the vessel contains hazardous materials.

If the previous contents were flammable, we must assume there is some flammable material out-of-sight.

If the previous contents were poisonous, we must assume there is some poisonous material out-of-sight and breathing apparatus must be worn for entry.

Gas tests alone are not conclusive. There may be some sludge present which gives off gas when heated or disturbed.

A similar incident in another Company was described in Newsletter 18, Item 7(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 kerosine, 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".

27/3 REMOTE ISOLATION VALVES

"Motorised valves should be installed so that equipment which is liable to leak can be isolated from a safe distance, without the need for operators to enter the cloud of leaking gas or vapour. (In some cases, remotely operated blow-down valves will be needed as well).

Obviously we cannot install these valves on all equipment which might leak but we can install them on equipment on which experience shows that leaks are quite likely to occur, especially if the inventory is large.

Many remotely operated valves of this nature are installed already in HOC Division, but there may be some further places where they should be installed."

From Report No. 0.21,156/B (available from Division Reports Centres) which applies the recommendations of the report on the 1969 Polythene Explosion to HOC Division.

A similar statement occurs in Engineering Department Instruction 2.13, "Essential Safety Considerations".

These remotely operated isolation valves are not cheap but the value of having them was demonstrated at the end of last year when a bad leak occurred on a pump gland containing LPG. The leak was due to a bearing failure, causing collapse of the gland, and the heat which developed caused the leak to ignite immediately. If remotely operated isolation valves had not been fitted the fire might have continued until all the LPG in the vessel feeding the pump had been burnt.

Somebody remarked that this incident has paid for all the remotely operated isolation valves that the Division has installed in recent years.

27/4 A STORAGE TANK IS SUCKED IN BECAUSE THE P & V VALVE HAS BEEN ASSEMBLED INCORRECTLY

Another Company has reported that a storage tank was sucked in because the pressure and vacuum weights in a pressure/vacuum relief valve were interchanged.

In HOC Division we use two sorts of pressure vacuum relief valve - the BlundeII and the Shand and Jur. The Blundell cannot be assembled incorrectly. However, on the Shand and Jur type ST-7575 Tite Seal Breather Valve it is possible to interchange the pressure and vacuum pallets - they are identical in size and shape but one is made of brass and the other of aluminium.

Shand and Jur have now produced a conversion kit for modifying the 4 in. and 6 in. size valves so that the pallets cannot be interchanged; it costs £3 per set and is “good value for money”. They do not produce a kit for the 3 in. size and it is necessary to replace this by the latest design No. 4020. This design should be ordered for all new tanks.

27/5 TEST IMPORTED NITROGEN BEFORE USE

If you bring in nitrogen by road tank wagon, do you analyse it before accepting it?

Another company has reported that a load of ‘nitrogen’ was recently found to be liquid air. They used the ‘nitrogen’ to sweep out a catalyst bed and, not surprisingly, the catalyst got rather hot.

27/6 THE DESIGN ASPECTS OF ISOLATING EQUIPMENT FOR MAINTENANCE WORK

Four years ago there was a serious fire in the Division in which three men were killed and plant was extensively damaged. Maintenance workers were dismantling a pump; when they removed the cover, hot oil, above its auto-ignition temperature came out and caught fire as the suction valve on the pump had been left open.

Report No. 0.21,100/B (available from Division Reports Centres) describes the incident in detail.

Following this fire the HOC Division Board issued an instruction on the preparation of equipment for maintenance which included the following:

> “Before any item of equipment is handed over to Maintenance it must be isolated by slip-plates, blanks, removal of a section of pipe or other equally effective means, unless the job to be done is so quick that fitting slip-plates etc. would take as long and be as hazardous as the main job.
>
> If isolation is made by removal of a section of pipe, the open end leading to the rest of the plant must be blanked off immediately the section of pipe is removed.
>
> A single isolation valve is never an ‘equally effective means’ of isolation.
>
> Before any joint is broken, even to insert a slip-plate, the valves isolating the equipment or section of line must be locked shut with a padlock and chain.
>
> The three stages in the operation, isolation, maintenance and removal of the isolation, must be separately authorised, e.g. by issue of three Permits-to-Work.”

It was realised that in order to carry out these instructions, proper provision must be made at the design stage of new plants and a design note and specification were written describing in detail how this should be done. This design note and specification have now been revised and copies of the new edition are available on request.

27/7 ELECTRICAL EQUIPMENT FOR USE IN HAZARDOUS AREAS

Intrinsically safe equipment has a long history. In the 18th Century attempts were made to illuminate a gassy coal mine by the phosphorescent glow from putrefying fish skins.

27/8 OPERABILITY STUDIES

Most people know something about operability studies but if you have not taken part in one you may be a bit vague.

Operability studies are a technique for finding out during plant design if there are any snags which would make it unsafe or inoperable.

Each pipeline is considered in turn and a number of questions asked.

These are:

None

More of

Less of

Part of

More than

Other

For example, ‘more of’ means:

Could the flow be more than design? How could this arise? What would happen if it did? How can this be controlled?

Could the pressure, or temperature, or concentration of one component be more than design? How could this arise? What would happen if it did? How can this be controlled?

By asking these questions, a number of faults in the design are shown up. The study team must be experienced people. An operability study is not a sausage machine for turning out the right answers, so long as someone winds the handle. An operability study is a way of harnessing the knowledge, experience and ability of the team members and the results will be as good as this knowledge, experience and ability.

Underlying operability studies is the assumption that errors in design are due to the complexity of the plant and not to a lack of knowledge; operability studies provide a way of harnessing and applying the knowledge that is available in the minds of the team.

When operability studies were started, the answers were all written down and the team were driven up the wall. Gradually a more streamlined technique was developed —only points for action or further investigation are now written down — and the technique has been made acceptable to creative minds. The latest form of the technique is described in Report No. 0.200,637/A by H B Charman, available from Division Reports Centres.

We now carry out operability studies on all new plants — though not always on off-sites. It is significant that on our latest, highly successful plants, the biggest ‘dangers’ have been on off-sites.

27/9 RECENT PUBLICATIONS

(a) “Eye Protection, Wilton Code of Practice,” available from Miss E Crane, Services Works, Wilton (W.6963).

(b) “Company Emergency Procedure — Hazardous Freight”, available from the HOC Transport Manager or from Central Literature Store, P0 Box 21 6, Witton, Birmingham.

(c) A note on the Public Inquiry on the Highly Flammable Liquids Regulations.

(d) A report from one of the oil companies on some fires which have occurred during the loading and unloading of road tank wagons.

(e) A lot of information has been published on the effect of temperature on explosive limits and on the effect of inert gases on explosive limits (see for example, U.S. Bureau of Mines Bulletins 503 and 627 and ICI Report No. D.74207/B). Little has been published on the effect on explosive limits of varying the temperature and adding inert gas at the same time A review of the information that is available has been produced by another Division.

For copies of (c) to (e) or 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.

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