

CASEBOOK

NEWSPAPER

No 161

ROUTE INDICATORS:

TRAVELLING HOPEFULLY - AND SAFELY

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**IMPERIAL CHEMICAL INDUSTRIES LIMITED
PETROCHEMICALS DIVISION**

161/1 SOFTWARE MODIFICATIONS

After Flixborough every chemical manufacturing works worth its salt introduced procedures for the control of plant modifications. These are intended to ensure that the full implications of modifying a plant are understood, the modifications are properly designed and are put into effect.

Not as much attention has been paid to modifications to manufacturing processes and similar procedures, yet changes in procedures, if wrongly conceived can have equally serious consequences.

One type of change has caused problems in several cases recently. A vessel or tank has become spare for some reason and its use has been changed. Originally a tank has been used to store one product and then another has been stored in it instead. After a few weeks liquid has overflowed from the tank and there has been a considerable spillage.

Why?

The reason has been that the two liquids have had different densities. Level indicators, such as pneumaticators, have given false readings because they have not been recalibrated for the new duty.

When a different liquid is to be stored in a tank, collected in a vessel or distilled from a boiler, check that everything is suitable for the new duty.

Don't just check that the tank is clean and that it will hold the volume or weight you wish to put in it. Check the materials of construction, the heating and ventilating arrangements. Make sure that the level indicators and alarms are suitable or can be made so.

Then make sure they are made suitable before you make the operational change.

161/2 UNUSUAL ACCIDENTS NO 116: MID-SUMMER MADNESS

In our last Safety Newsletter we reported the case of a Fork Lift Truck with a mind of its own. A recent edition of the Marketing Safety Bulletin from BP Oil describes a motor boat with similar ideas of its own.

A small diesel engine fishing boat was operating near Kawau Island in New Zealand, when it began of its own accord to accelerate, without the fisherman touching the controls at all.

He closed the throttle, but the boat just kept charging on with its motor going at much higher speeds than the manufacturer ever intended.

It was not until he reached the island - in record time - that he was able to smother the rogue motor.

What had happened was that leaking LPG from the galley stove was sucked through the diesel intake and, of course away went the boat.

Those on board were playing a variation of Russian Roulette. Just one ignition cycle out of pattern, owing to the inevitable random ignition potential, and they would probably have become victims of another boat "explosion" not too uncommon in that area.

This has lessons for us at work as well as at home or on holiday.

There have been many incidents where major fires have followed “diesel runaway” caused by the engine ingesting low flash point vapours. Some of them, including one in the Division several years ago, have resulted in fatalities.

Take great care that the safety equipment on diesel engines is in good order. When they are used in locations where there might be a chance of a leak of combustible vapour take great care and be ready to take emergency action if a leak occurs.

Gas cylinders and portable gas fired equipment is now in common use in homes, in caravans, tents and boats.

Don't forget your safety training when you leave work and embark on your summer holidays. Otherwise you may arrive somewhere you did not intend to visit.

161/3 CRYING WOLF TOO OFTEN: A MODERN VERSION OF AESOP'S FABLE

A correspondent recently changed his job and location. Not an unusual event in these days of re-organisation and redeployment in industry. For several months after taking up his new job until moving house, each weekend he made the return trip between his new location and his home.

Time and time again he came across temporary road signs which either:

- a) notified of a hazard which was not present - the roadworks hadn't started yet or had been completed.
- b) notified of a hazard which in fact was different - the signs indicated closure of the inside lane when the outside one was closed.

The usual reaction to a sign which is seen every day and which fits either of these categories is to ignore it. Inevitably, one day the sign accurately reflects the hazard!

The lessons learned can be applied to the chemical plant situation.

- i) Signs and notices should always accurately identify a hazard that exists.
- ii) When the hazard no longer exists the signs and notices must be removed.

Of course there are some warped individuals who alter notices. A close watch must be kept to see that the signs are kept in good order when they are in use.

161/4 KEEPING UP TO DATE

Operating instructions are another type of message that must be accurate and kept up to date. Every plant should have one master set which is kept in the control room for everyone to refer to.

How should it be kept?

Should the record be typed or printed and kept in a handsome volume in the desk drawer?
Should it be in a data bank and sections displayed on request on a Visual Display Unit?
Should the key procedures be painted on the control panel itself?

There are as many answers as there are managers, supervisors and operators.

The dilemma is that the document or notice must be sufficiently robust to withstand the wear and tear of constant use, but it must not be so 'permanent' that it takes a lot of effort at

great cost to make changes when they have to be made.

Recently on one plant an operator followed some outdated start-up instructions on a control panel. The up-dated instructions were in a loose-leaf binder in the office. There was an explosion and the plant was damaged.

I don't need to ask the printer to put the obvious message in italics. I am sure you have worked it out.

Don't just congratulate yourself - check that there are no conflicting instructions on your plant.

161/5 THE GOSPELS AND THEIR INTERPRETATION

Some people fill operating instructions with pages of explanations. 'Whys' and 'Wherefores' abound. By the time the operator has read them the plant has done its own thing or the supervisor has gone and done the job himself!

Instructions should be short and direct. Must, shall, will, are words to be used for instructions. Avoid perhaps, maybe, ought and should.

However, just as biblical students need a concordance so do plant personnel need training manuals giving some of the reasons behind the right way of doing things and the penalties for not doing so. These reasons and penalties need to be fully understood.

Recently, in an incident inquiry an operator said 'we do this (referring to a procedure) because

The supervisor said 'oh, no, we do it because

When consulted, the manager and section manager gave two more different reasons.

There may have been some truth in all the reasons given or some may have been wrong. In either case there wasn't full understanding.

Examine your emergency instructions for the plant and make sure you understand why they say what they say. If there are different views discuss them with your training and safety advisers and see that a clear explanation is included in your training manual.

161/6 CHANGES WHICH YOU MAKE AFFECT OTHERS

An operator switched on a pump to transfer material from storage to tank A, which was empty. Instead all the material came out of the hose onto the floor.

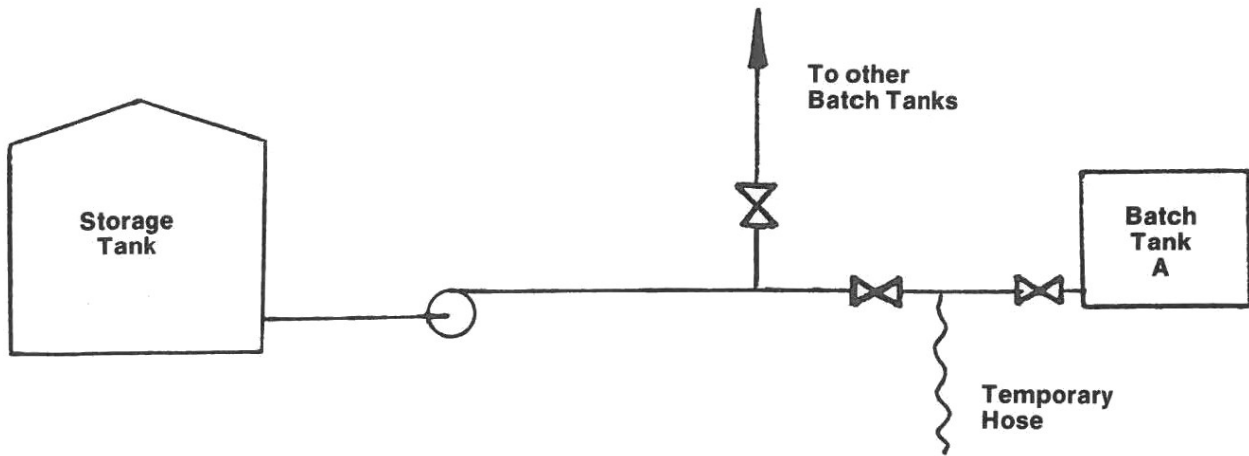
The previous shift operator had had quality problems with material in the storage tank, so he had emptied it into drums for re-cycling, using a temporary hose.

He spent the rest of the shift busily sorting out the quality problem and forgot to disconnect the hose.

At shift handover, there was no mention of the use of a temporary hose, so the new shift assumed that the plant was as they had left it.

Shift handovers must be thorough. Don't assume that the next shift will find out for themselves.

Remove a temporary modification as soon as you have finished with it, if not, record it so



that others will know, and when coming on shift, take a walk round and check.

161/7 A LOOK BACK

1 Safety Newsletter 23 said

"It is not the complete answer to call on design sections to remove the risk by the excellence of their design'....."

This quotation is taken from Report 0.21, 20018 'Prevention of loss through Fire Explosion and other Accidents: the Part to be played by Better Training, Auditing, Operating Methods, etc.' - which pointed out that perfect hardware would prevent only half our fires and explosions: to prevent the other half we need better software."

2 If after reading this Newsletter, you feel you want to lay out your instructions better, take a look at Safety Newsletter 94/4. A number of individuals in the Division have experience in the re-design of instructions. We can help you contact them.

For more information on any item in this newsletter please phone P2845 or write to us at Wilton. If you do not see this Newsletter regularly and would like your own copy, please ask us to add your name to the circulation list.

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To hear a recorded message on safety 'phone P2804.

If you are on an ICI Site use your inter-site dialling code for the Wilton HQ.

AN ENGINEER'S CASEBOOK – NO 61 PRACTICAL PLANT CONDITION MONITORING

For many years it was considered sufficient for a daily "Look, Listen and Feel" (L.L.F.) type surveillance on running machinery to highlight or predict early stages of failure.

Despite this surveillance it was estimated on one Works that 70% of the total maintenance bill was due to running machinery failures. More importantly, this machinery was responsible for many unscheduled plant shutdowns because spare machines failed whilst primary machines were off-line for maintenance. Whilst "Design Reviews" and "Quality Control" were obvious questions, a simple portable vibration meter was obtained from Noise and Vibration Section. It had been specially developed for condition monitoring of gearboxes and rolling-contact bearings, as well as general plant use on conventional hydro-dynamically lubricated bearings. A simplified form of the criteria which have been developed (Ref 1) was used to make numerate judgements.

To recognise a trend so that failures could be predicted and prevented, daily surveillance may often be desirable for the first few days to establish the "normal level" and thereafter at weekly intervals. If the initial readings are high, then daily surveillance should continue.

Following a six month trial period with this portable meter, we feel that significant improvements and savings are now being made. For simplicity we take only the acceleration RMS readings in the vertical plane with the criteria that below 2g for rolling contact bearings and below 10% for gearboxes, the equipment is running well. Should readings be above the established criteria, analysis may reveal that the machine is in no immediate trouble, e.g. a turbine driven gearbox had readings of 14g and steadily increasing, thus failure was possible. A reduction of 50 RPM on the turbine drive reduced the vibration readings to 10g allowing the bearings to be replaced four months later during a scheduled shutdown. We believe the technique allowed us to highlight the problem sufficiently early and further it gave us a measure of machine performance quality thus avoiding the subjective judgements implicit in LLF. The success of a surveillance programme is generally in direct proportion to interest of the people involved and it is essential that adequate preparation be undertaken in the form of training and devising simple recording methods.

E PINDER

Ref (1) F Crawley and J B Erskine "Monitoring of Rolling Bearings".
I Chem E Symposium Series No. 66