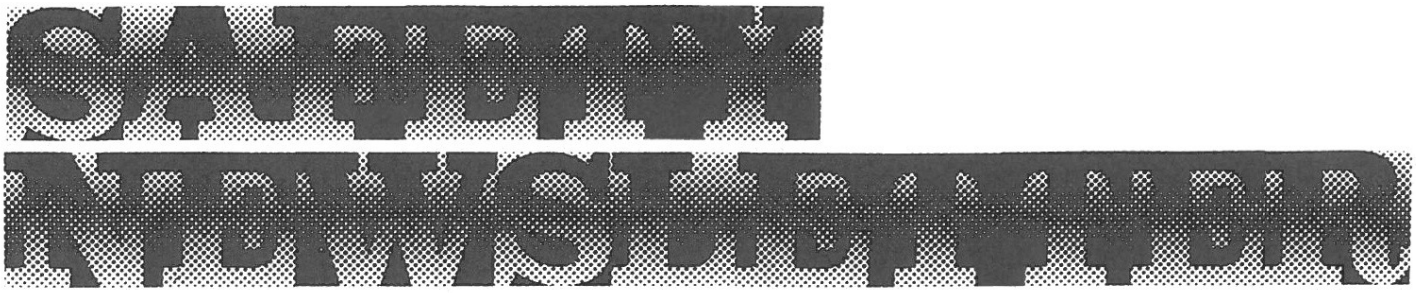


No. 164
ASSEMBLING, DISMANTLING, CONNECTING

164/1	Mounting of Actuators to Top Entry Valves
164/2	"Same Problem - Different Wrapper"
164/3	Nitrogen in a Different Context
164/4	Oxygen and Nitrogen Cross Connected — A Forgotten Modification

An Engineer's Casebook No. 64 — Pipe Freezing for Isolations on Oil Systems

IMPERIAL CHEMICAL INDUSTRIES LIMITED

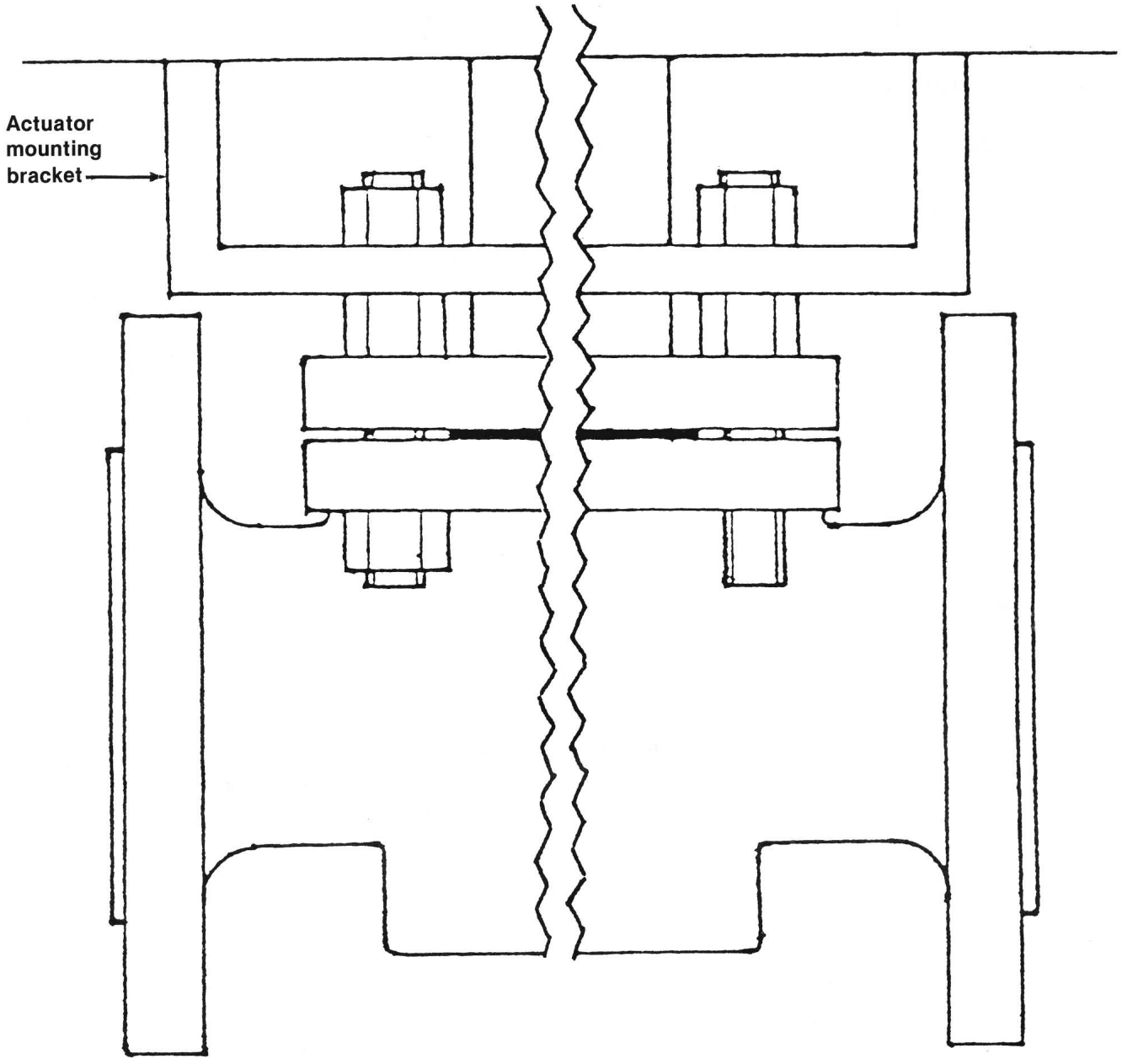
PETROCHEMICALS DIVISION

164/1 MOUNTING OF ACTUATORS TO TOP ENTRY VALVES

An incident has been reported (see Newsletter 146/3) in which an actuator was to be removed, but the bolts holding the bonnet were undone, in error, instead of those on the actuator. This resulted in the plug blowing out, subsequently causing an explosion and several fatalities.

Another and newer plant uses a large number of actuated plug valves. As supplied, the method of securing the actuator to the valve body was such that it was still possible to withdraw the bonnet bolts by mistake (see Fig. 1), though the design was, in fact, different to that in the incident referred to earlier.

Fig. 1. PLUG VALVE AS SUPPLIED TO PLANT

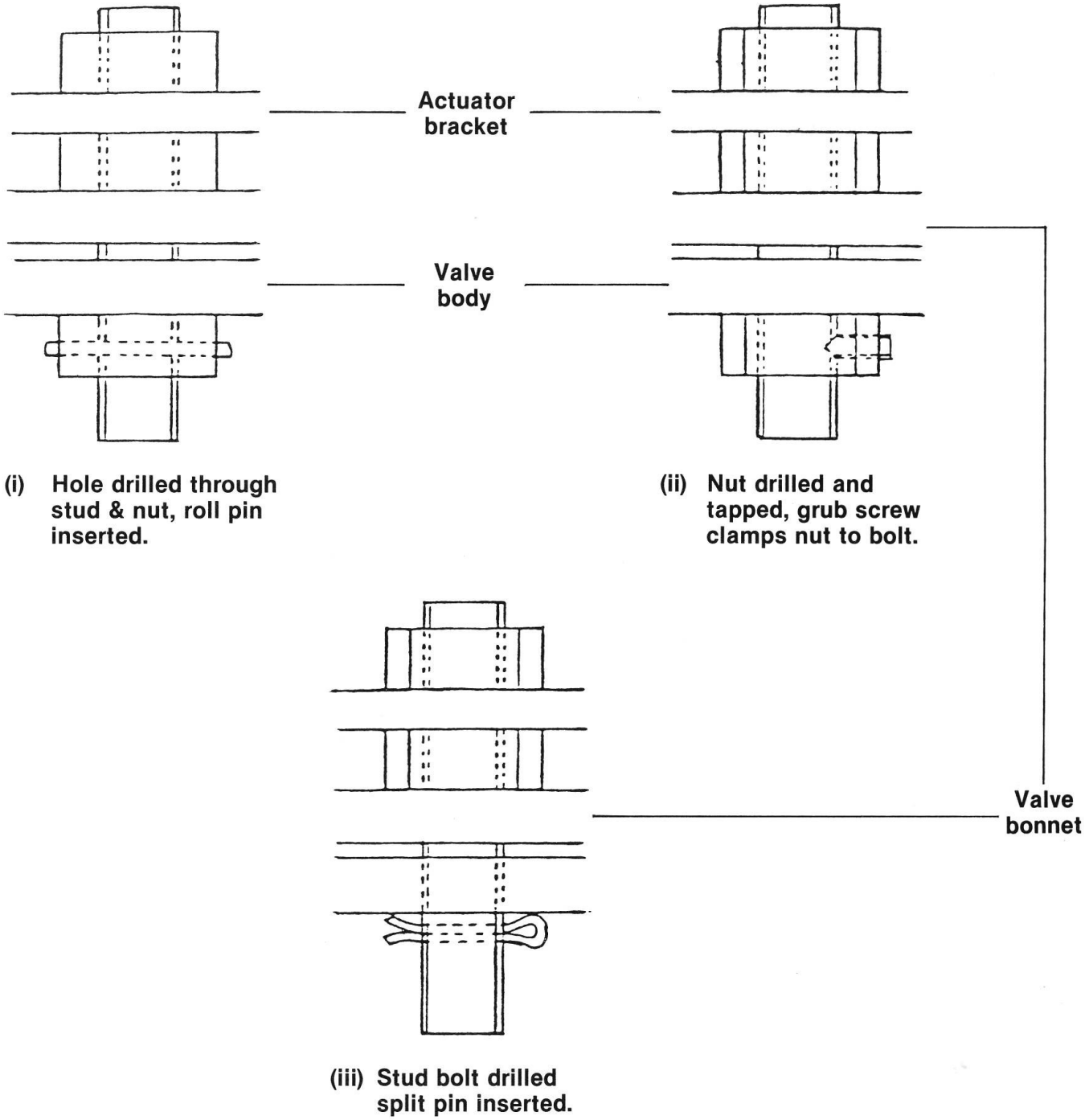


Type A. Stud bolt through clearance hole in valve body secured by nut

Type B. Stud bolt through tapped hole in valve body

The modifications undertaken on the plant to prevent this are shown in Fig. 2.

Fig. 2. ALTERNATIVE, SAFER METHODS OF FIXING ACTUATOR



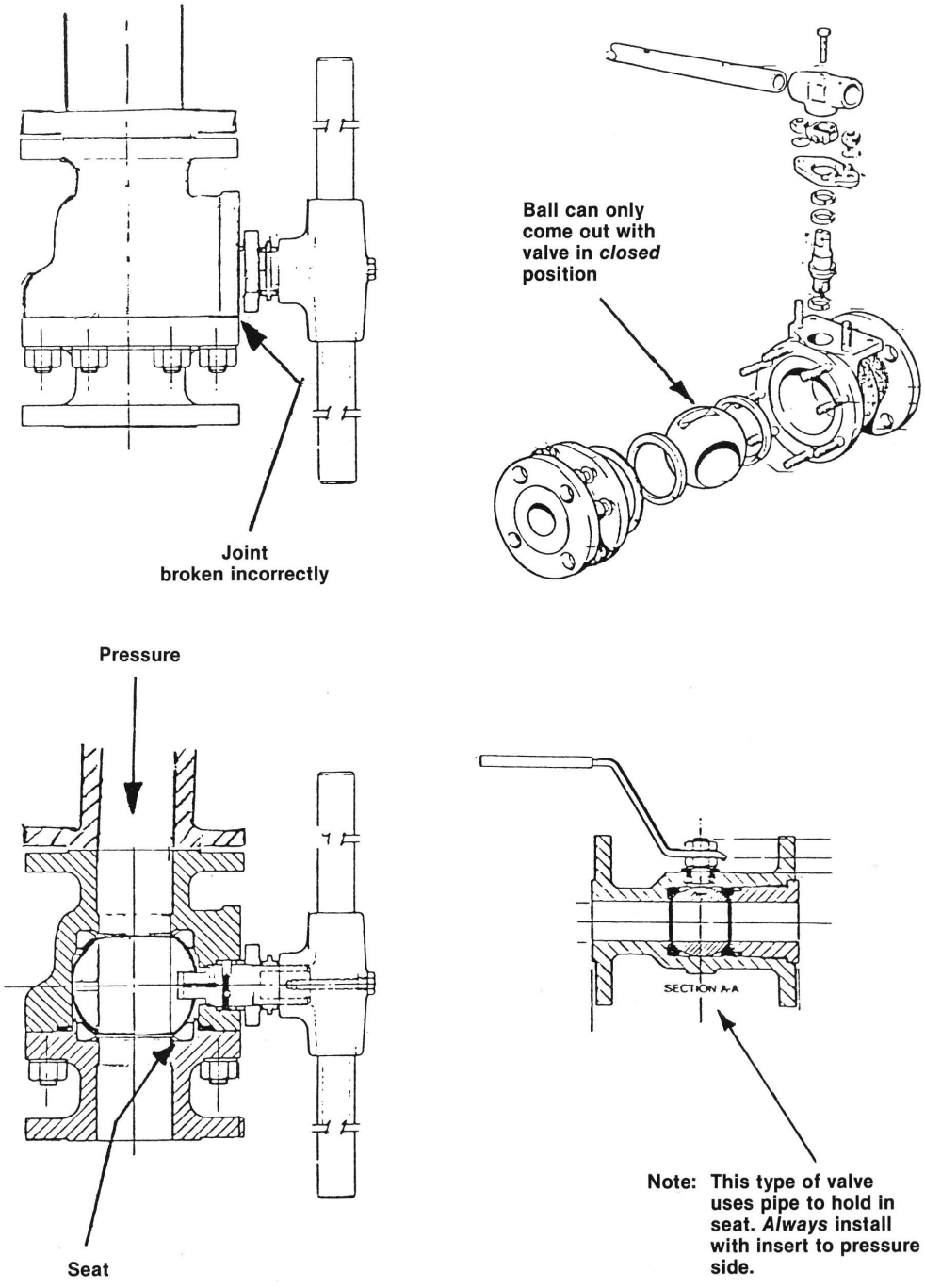
Another possible solution would have been to use a bolt with a head below the body, but in all cases the intention is to prevent the bolt being withdrawn, and hence releasing the bonnet.

In later design valves, mounting bosses are cast onto the flanges, thus eliminating the problem.

164/2 “SAME PROBLEM — DIFFERENT WRAPPER”

In another company it was desired to inject radioisotope tracer into an ethylene pipeline in order to calibrate a meter. The injection point was a ½” branch fitted with an ‘OBL’ ball valve. The team carrying out the tests found that their equipment did not fit the exposed flange, but matched another flange, closer to the valve. As they undid this, the ball blew out, releasing a large cloud of gas. Fortunately the gas was isolated elsewhere and the release dispersed before it created a major hazard (the main was adjacent to a roadway). Figure 3 shows why they thought that they could break the joint where they did and why the ball blew out.

Fig. 3



This incident was almost a carbon copy of one at a glass factory, where 5 tonne of propane was released via a 2” Weir Pacific ball valve. Because the smaller flange “closer to the valve” matched the one on the hose, the joint was slackened in preparation for fitting a hose to drain the tank. On this occasion the release was not immediate and occurred when no-one was present.

Do you have any valves of this type — there are many makes — if so, what precautions have you taken to avoid incorrect dismantling by maintenance personnel who may not be familiar with the valve design. Some people wire the bolts “to make them different” and thus alert the unwary. Where such confusion can arise, perhaps manufacturers should be persuaded to re-design the valves using one of the many “different” bolt type fasteners now available, which require special tools, making it more difficult to dismantle the valve *in situ*.

164/3 NITROGEN IN A DIFFERENT CONTEXT

At a recent inquest in Surrey it was reported that two men had been overcome by nitrogen in a trench in which they were working.

The men had been using liquid nitrogen to freeze water pipes to enable them carry out a repair. They had successfully repaired one pipe, taking about three hours, and were trying to cool down a hot water pipe when they were overcome. In the relatively confined space so much nitrogen had evaporated that the concentration of oxygen in the working area had fallen too low. No oxygen meter was being used.

No safety harnesses were being worn. A third man who had collapsed was rescued by a fourth who jumped into the trench and pulled him clear. It was lucky therefore that there were not four casualties altogether.

Safety Newsletter No. 158 reported other incidents of this sort with nitrogen in vessels.

The technique of freezing the contents of pipelines in order to make certain types of repairs on the lines is becoming more frequent. This month’s Engineer’s Casebook gives more information on the technique.

164/4 OXYGEN AND NITROGEN CROSS CONNECTED — A FORGOTTEN MODIFICATION

In a reactor containing a catalyst being purged with nitrogen it was noticed that the catalyst temperature was rising. It was then found that the nitrogen was contaminated with oxygen which was oxidising the catalyst.

A close inspection of the nitrogen lines revealed that in a nearby analyser house there was a cross connection between the nitrogen header and a header on the compressed air supply system and the air system was at a higher pressure. An isolation valve between the two must have been passing slightly.

Further investigation revealed that in an emergency some years ago the nitrogen system had been changed so that in one part of it air could be used instead of nitrogen. Unfortunately the part which had been changed over to air had not been physically disconnected from the nitrogen system.

It is most unlikely that, with the modification procedures used today, such an oversight would be made.

However this is a reminder to check that those procedures are being observed. It is hoped also that this report might jog some other memories of earlier modifications that might need checking.

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.

October 1982

An Engineers Casebook No. 64
PIPE FREEZING FOR ISOLATIONS ON OIL SYSTEMS

Pipe freezing techniques have often been used to effect an isolation on water pipelines prior to maintenance or modification. The flexibility offered by modern pipe freezing technology allows the Plant Engineer to maintain plant without extensive shutdowns, thus increasing plant availability.

The technique is simple, freezing being achieved by feeding liquid nitrogen from special cryogenic tanks at a controlled rate, into specially fabricated jackets attached to the outside of the pipework. This freezes the contents of the pipe, forming a plug capable of withstanding relatively high pressures. The plug can be readily maintained by the continued feeding of liquid nitrogen into the jacket until the job is complete.

Pipe freezing can also be used on systems containing liquids other than water and has successfully been used on a heating oil system. In this case the oil was Transcal N, a mineral oil capable of operating to 320°C yet with a pour point of -12°C (compared to nitrogen boiling point of -196°C).

The job involved the removal and replacement of 4 relief valves. In the past this has involved a lengthy cooling down period to allow safe drainage of the system content to drum, valve removal and replacement followed by system refilling with the invariable air locking problems. Total time from shutdown to start up was about 72 hours. Using pipe freezing techniques this was reduced to 8 hours, with no start up difficulties.

To check that the operation could be safely achieved, the contractor carried out trials on a sample of oil, the following is an extract from their report.

> “A test was done on a 2” N.B. pipe with a 2” long jacket and testing the plug to 500 p.s.i.g. A further test was carried out after heating the oil to 45°C and again a suitable plug was formed”.

Metallurgical Section also approved the operation, taking into account the pipe material and the locations for freezing relative to welds, stub pipes, fittings etc.

Two further points; caution must be exercised when breaking into a system that has been isolated by freezing, particularly when dealing with an aggressive fluid, and that the freezing operation is not cheap!

R H Cook

October 1982