SEPARATORS, AND STRATEGIES TO IMPROVE THEIR LIFE

By Ian Speer

Over the years, particularly on mobile equipment, there has been a trend toward larger compressors which, in many cases, operate at high pressures.

Coupled with this have been requirements from rig designers and vehicle licensing authorities to limit the mass of drill rigs. One outcome of these forces at work has been a trend towards smaller and lighter air/oil receivers with lower volumes of oil in the compressor circuit and smaller air/oil separator elements.

To maintain efficient air/oil separation pleated and dual element separator elements have been developed. The media used in the separators themselves has also been improved as has the quality of the oil used in the compressors.

In spite of all of the developments, many compressor operators have observed that the effective life of separator elements is not as long as they would desire. In this article I will explore a few ideas that have, when applied in the field, resulted in increased separator life and reduced compressor oil consumption.

Some of the ideas are structural changes to the actual setup of the pressure vessel and require a lot of work and approved welding procedures, not a field upgrade. Others are simple changes in operating procedures easily accomplished in the field by the driller.

A: Let us look in general terms at what happens when air is compressed to say 350 psig (25 bar) inside a separator vessel. Suppose that the separator vessel has an internal volume of 20 cubic feet (a bit over 0.5m_) then the compressor has to compress 20 x 25 = 500 cubic feet of air from the atmosphere and push it all into the separator vessel to raise the internal pressure to 350 psig. (This is offered as a simple example and, yes, I am well aware that those with a knowledge of the gas laws will arrive at a slightly different result, however, the example stands)

Once the separator vessel is pressurised to 350 psig the driller then opens the main air valve and the compressed air rushes out down the hole.

Most compressors have a Minimum Pressure Valve (MPV) located directly after the air separator. This valve serves to maintain a safe operating pressure to ensure the compressor lubrication system functions correctly, as well as providing some protection to the separator element. However, as most MPVs are set around 150 psig (10 bar) there is still a lot of compressed air in the vessel that can flow out when the main air valve is opened quickly. (About 15 x 20 = 300 scf in the case of the previous example.)

Manufacturers have responded by in many cases fitting hydraulically operated main air valves that open slowly to reduce the rush of compressed air through the separator. This improves the situation considerably, however there are many rigs that still have manually operated main air valves and if these are operated quickly with high pressures in the receiver then shortened separator life will occur.

The solution is in two parts,

1. Open all air taps gently.

2. More importantly, just before the end of each rod, when you are ready to lift off the bottom of the hole or after you have completed a quick run up and down the hole to ensure that it is clear, but before you add the next drill rod, switch the compressor to low pressure and let the receiver pressure fall BEFORE turning the main air valve off.

The result of these simple actions will be an improvement in separator element life, reduced compressor oil consumption and an increase in the service life of the service life of your compressor particularly the life of the HP element in 2-stage compressors. The benefits are even greater for 500 psig compressors.

I have seen really significant improvements in compressor life accompanied by increased separator element life when drillers have adopted these procedures.

B In the area of hardware design it is interesting to see that Schramm have introduced two outlets from their air receivers on recent rig designs. This is a clever idea as it allows the compressed air to leave the receiver at half the speed that would be the case if there was only one outlet of the same size. As the outlets are on opposite sides of the separator the stresses on the separator element are reduced.

Other manufacturers draw the compressed air from the inside of the separator, thus inducing a more even flow of air through the separator. This is also an effective design.

Obviously modifying an existing system will not be easy and in some cases it will be impractical or unnecessary; in any case it will need a full approval from the relevant authorities. However, if you have a post-1990 Schramm, check it as you may be able to upgrade it with only a couple of new hoses and fittings.

C. In the case of booster systems it can be difficult to turn down the pressure of auxiliary compressors, particularly if they are remote from the rig. The first step is to observe the behaviour of the receiver pressure gauge on the compressor in question while the system is coming up to pressure after the main air valve is turned on.

If the compressor pressure falls quickly from say 350 psig to 150 psig then you will probably be replacing separator elements more often than necessary. To resolve this issue an audit of the booster control system will be required as it may well be that the rate that the booster loads up may need to be addressed.

So here's the checklist:

1 Turn the pressure down first.

2 Turn off the main air valve once the pressure has dropped.

3 Turn on the main air valve.

4 Turn up the pressure.

5 Check the speed of your main air valve and slow down the turn on cycle. Ensure that the

turn OFF cycle remains fast for safety.

6 Check to see if you can fit a second outlet to your receiver.

7 Increase your separator and compressor life, save some fuel and money.

Well that's it for my first column.

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