

GETTING THE GUNK OUT!

by Ian Speer

"I was getting the gunk out" I seem to recall that was a line used by Bill Cosby when explaining to an officer of the law why he was speeding in a Shelby Cobra. What has Bill Cosby got to do with compressors? Very little, to be truthful but while I was researching this article I just happened to recall a very funny tape Bill made some years ago.

Recently on a job I was confronted by a large two-stage, oil-flooded rotary screw compressor that had been filled with quality synthetic oil. Unfortunately someone had topped the system up with 10 litres of diesel engine oil. The result a compressor lined with a black slimy film of GUNK!

How to get the gunk out? Over the years I have seen a number of strategies used to clean out systems and I need to say that most of this article is my opinions and observations, unless specifically attributed to others. Once the gunk is in the unit it can be in two forms. Fresh gunk as a result of a recent contamination or old hard deposits which have resulted from previous contamination that has been baked on or as a result of breakdown of the oil in use leading to formation of varnish and such on the internal surfaces of the unit.

Is gunk a problem? Well yes; it reduces the effectiveness of the cooling system and in extreme cases can result in blocked coolers. It results in particle contamination which is not good for the rolling element bearings. It contaminates oil in the system. It

blocks filters and can if filter restriction indicators are not working result in the system operating with no effective filtration.

What can we do about gunk? Unfortunately when contamination of a system occurs most of us do not have the time to spend researching the options so what follows is a result of my inquiries to a number of sources and their responses. Along the way I discovered some useful information and got more than a little ticked off with several companies.

To get the ball rolling fairly I wrote out a little script and then called the lubrication service lines of a number of companies. This was a time-consuming part of the exercise with a lot of hold music and mind numbing messages.

I explained to the person who answered what the problem was and I then told them that I was researching an article so there was no ambush. I then offered to put my questions to them by email.

Below is a copy of the questions posed to all parties except Mobil as they did not call back and hence I did not have an email address to forward them to. As usual I am sure the editor will allow them to respond if they choose to at some time in the future.

Dear XXX,

As we discussed it is a not uncommon event for rotary screw compressors on drilling rigs to

occasionally have an incorrect oil used to top them up. Another source of carbon contamination occurs where diesel powered units are used underground where they end up ingesting diesel exhaust fumes into the compressor. Some times the results of these occurrences are the formation of extensive carbon deposits on all the internal surfaces of the compressor where they are contacted by the oil.

The resulting carbon deposits harden over time and result in degraded cooling system performance as well as reduced lubrication efficiency. I am interested to know if XXX makes or supplies a product that can be added to the compressor to remove such carbon deposits prior to them going hard and becoming "baked on" or if XXX has a recommended procedure to clean out systems which have been contaminated.

I intend to write an article in relation to this problem and any information provided will be attributed in full. I am not interested in negative items and always try to be focused on solutions that will be of use to the readership of the magazines that I write for.

Such an article will hopefully be able to provide a quick and sensible approach for a compressor owner to embark on if they have the misfortune to have a contaminated unit. I propose to use both information sourced from the suppliers if it is forthcoming as

well as to discuss approaches that have been used in the field to date.

Thanks in advance for any material that you are able to provide.

Best regards,
Ian.

The initial results appear below,

MOBIL. Once I explained that I was writing an article there was no comment. My details were taken and I was told that the Chief Engineer Paul Forster would be in touch. I am still waiting so getting gunk out does not seem to be a priority for Mobil.

BP. I was provided with the following reply and I quote. *"Firstly we do not have a product to clean carbon deposit from compressor internals. Secondly, we have not seen the problems you refer to, the only area we see carbon deposits is on the valve plates of reciprocating compressors which are mechanically cleaned at service."* Gunk does not seem to be a problem for BP.

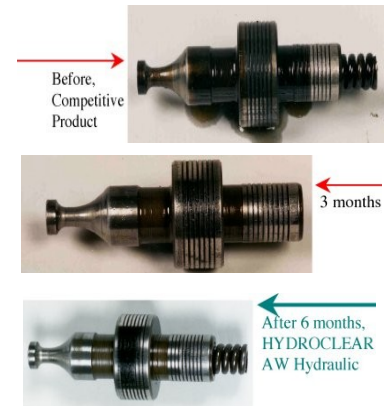
SHELL. A very polite person took my details and promised that a response would be forthcoming. I then received a call back to say that my query had been forwarded to one of their engineering specialists and a couple of days later received the following reply and again I quote. *"The internal cleanliness of the compressor and system components is amongst others a function of the machine lifetime, the quality of oil that has been used, oil drain intervals and running conditions. It is strongly recommended to carry out an oil sample evaluation and/or compressor inspection to establish*

the oil condition and the level of cleanliness. If this shows the unit to be contaminated it is advised to run the compressor for about 500 hours on a high detergent type compressor oil after which the flushing procedure including draining the oil whilst hot, replacing oil filter, fill with a minimum quantity of new oil and run compressor under light load for 30 minutes prior to re-draining (oil hot), then replacing oil filter & separator and refilling with new oil charge." Well Shell has heard of gunk and they have a plan with good advice.

CALTEX. I was told over the phone by a very helpful person that there was no easy answer but that their first advice would be to drain the contaminated oil from the system and refill with the same type of oil but one grade lighter and fit new oil filters as a thinner oil would be more effective in removing deposits and carrying them to the filters. I was promised that additional information would be sought from the technical people overseas and I told them that would be acceptable to me. I have since had a follow up call informing me that the inquiry is still under consideration but no final reply to date.

CONOCO PHILIPS. I was provided with a detailed explanation of how their products work by the person who answered the phone. I then received a follow up call from an engineer, a written response and an interesting power point presentation that showed the results of using their products in a system that had previously been coated with varnish due to long running and oxidation issues rather than gunk. I have taken the liberty

of including several photographs from the article of a before and after situation of some hydraulic system components.



It is fair to say that the pictures address a hydraulic system but I was told that similar results could be expected in rotary screw air compressors.

LUBRICATION ENGINEERS (LE). I received a faxed response giving a background to varnish and sludge formation (gunk) in compressor systems. The following two paragraphs are a direct quotation.

"One way to prevent and remove these deposits (varnish and or carbon) is to use 2300L-X@ Heavy Duty Chemical Supplement from LE Inc. as an additive to the compressor oil. It is recommended that a small amount of the 2300L-X@, less than 5% by volume be added to the compressor fluid/lubricant and run for several hours just prior to draining the oil from the unit for an oil filter and separator change. This helps to remove these deposit materials from the surfaces of the compressor and flush them out when the oil is drained.

If the deposits have been allowed to collect for too long in the

compressor, they become hardened and baked onto the surfaces. These types of deposits become harder to remove and sometimes are not removed by the procedure above. If this is the case a much stronger cleaning method must be used including harsh chemicals or possibly even a tear-down and mechanical cleaning of the parts”.

CASTROL. I called their help line and stated the reason for the call. I was asked to submit my request in writing on the company web site. That did not work as the web site would only accept brief questions so I called Castrol again and explained the problem. The response was sorry but you cannot email us but please fax your questions to us. A fax was duly sent and to date no response has been forthcoming.

Well they are the responses from the majors as well as some of the specialty people. There was another very interesting development however as one of Shell’s people had the good grace to suggest another type of product which I was unaware of.

I was surprised and must compliment Shell on their candour in providing this information and I quote “Shell does not at present have a compressor cleaning fluid per se such as Kluber Varnasolv which is widely used for screw compressor cleaning.” This gem sent me off to investigate the Kluber product range and the results were interesting,

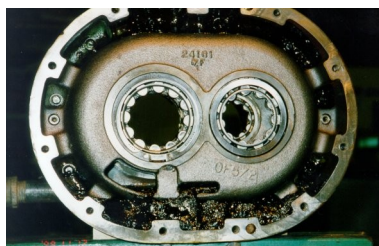
KLUBER. I had never heard of them but I discovered that they are a very large German outfit that makes a huge range of specialty

lubricants. I was referred to their WA representative (Allwest Engineering, usual disclaimer) and forwarded my questions to them. I received several very detailed packages of information as well as some useful information in relation to what needs to be done if one wants to change from one type of oil to another in a compressor.

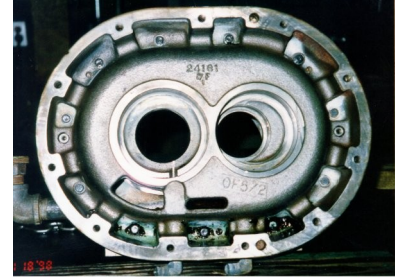
Kluber make a product called Varnasolv which is specifically intended for use in cleaning out contaminated systems. Their literature advises that it is suitable for use with all types of synthetic and mineral oils and they provide the following instructions for use.

Add one gallon of Varnasolv for every nine gallons of compressor oil in the unit, first draining enough oil to allow the addition of Varnasolv. Continue to operate the compressor for 40 to 60 hours, allowing the treated oil to dissolve and suspend the varnish and carbon. To avoid re-depositing the suspended contaminants, drain the oil while hot and replace the existing oil filter. Refill the compressor with new oil.

The pictures below show before and after shots of a compressor gearbox that had been previously contaminated.



Oil flooded screw compressor prior to use of Varnasolv



The same unit after using Varnasolv

OTHER APPROACHES.

I would like to now add a couple of remarks in relation to other possible methods used to clean out compressors. These remarks apply to situations that the author has either seen or knows to have happened but use your own judgment if using them.

Some years ago (more than 15 as I recall) Mobil produced a product called Mobil Sol-A which was flushing fluid that could be added to systems in modest amounts and worked in a similar way to that described in the LE and Kluber information. I believe this product is no longer available in Australia. Even earlier there was a US product called Thermosolve which was to be used in the same way. I have no first hand experience with Thermosolve, however, I have used the Mobil Sol-A in the past.

The next point relates to a far more recent application where a compressor filled with a synthetic fluid was contaminated and became internally coated with a soft gooey carbon material.

In this instance another product, Mobil Delvac Super a high detergent fully synthetic diesel engine oil was used to clean out the unit. In this case the filters in

the unit had to be changed several times in quick succession as they quickly became blocked with material that was moved off the internal surfaces of the compressor. The compressor was eventually judged to be clean enough and the engine oil was drained (and kept) and the unit was returned to compressor oil. It is still in service many months later.

It needs to be said that this same procedure was subsequently applied to another situation where a two stage oil flooded high pressure rotary screw compressor had been operating in a very dirty environment. It frequently drew in engine exhaust gases. Over a period of almost 2 years the unit ran well with 200 hourly oil changes (ATF) however it started to run hot and the problem was traced to an internally blocked compressor oil cooler.

The Mobil Synthetic Diesel engine oil was not successful in this case in removing deposits that had baked on over a long period. In this case the cooler was removed and cleaned using very aggressive chemicals.

It is fair to say that these applications are outside Mobil's application guide and in the latter case it was a very severe test with the results accurately mirroring the advice from LE.

CONCLUSIONS.

- First whatever you do you must use your best judgment and the ideas presented herein are

designed to provide a basis for thought and discussion which will hopefully result in improved results when cleaning contaminated units.

- Second whatever you do change the oil and filters immediately that you become aware of a contamination issue.

- In very dirty environments, consider using one of the flushing fluids prior to oil drain intervals from time to time and watch the filter restriction indicators.

- Have a plan. Discuss this issue with your field people as they are in the best position to minimise any damage due to inadvertent contamination of a system.

- Think about the type of responses given and maybe see if your lubricant supplier has something to add to what is written here.

- A couple of the big suppliers could have a look in the mirror as selling products is half the issue. Backup service is really important when a problem arises.

- There was a lot of compelling evidence from a number of companies that ongoing use of their premium synthetic products would stop the formation of deposits in compressors. We were looking for an answer to the issue of an already contaminated system.

Kluber and LE both offer products; the LE product appears to be an engine cleaning fluid that could be applied to a compressor.

The Kluber product is offered specifically for compressor systems and it is stated in their literature as being suitable for use in systems with all types of synthetic oils.

Well there you have it a way to get the GUNK out but really let's try not to get the GUNK in, in the first place.

I would like to thank all of the people and companies who contributed to making this article possible. Without their support and information (where provided) we would all be a little less informed. At least there is a little light at the end of the tunnel and hopefully more companies will address this issue which can result in serious plant damage and production losses.

The usual disclaimer applies to this article. No payment was received from any party mentioned and there is no business arrangement between the author and any party although offers of cheaper fuel will be favourably considered! All of the material from manufacturers was presented as received aside from correcting a couple of typos, using an abbreviation for one company name and adding a few words in brackets to make a reference in a quotation clear.

Should any of the parties mentioned wish to respond or add to any of the content in this article I am sure that the editor will provide space in a future edition of the Australian Drilling magazine, within reason.