Hydraulic system contamination control for operating systems?

If your hydraulic systems have been designed and supplied by a company that conforms to BS EN SIO 4413:2010 it will have the components to help you manage contamination when running. The problem is most systems out there do not comply and won't be fitted with:

1. Suitable filters with blockage indicators.
2. Reservoir breathers with blockage indicators.
3. Test points for oil sampling.

The manual may say sample the oil at a certain intervals but it won't tell you how and how to interpret the results. It will also likely tell you to change the oil every 12 months, but it does not tell you why.

Cleanliness control for existing hydraulic systems starts with knowing what cleanliness code to ISO 4406 should apply to the hydraulic system you have. There are plenty of guides available from filter suppliers. Once you have decided the target cleanliness code you start sampling if you have not done already. Choosing a suitable sample point means not sampling downstream of a filter. Sometimes drawing a sample from a reservoir, when it has been running for at least 15 minutes is a good place to start. Your sampling must be consistent as you will need to trend your results to see if you are improving and meeting the target cleanliness level.

Once you have set up cleanliness monitoring you need to ensure your hydraulic filters are maintained and the elements are changed when the blockage indicators indicate. If you don't have blockage indicators you should fit them. The breather will have to be replaced on a frequency basis. If you have to top up the oil are you doing it will a filter trolley as new oil should be filtered before transfer to the reservoir. If your filters are effective then you should see an improvement, if you have a contamination issue the filters may need changing more regularly until you find the source and have replaced the component or problem area.

To further improve your contamination, control your maintenance team will need to understand the importance of clean hydraulic fluid and then implement processes should components needs changing or the system modified. If components are changed are pipes and manifolds plugged with clean plugs to prevent contamination ingress? Are components cleaned with contaminant free cleaning fluid and rags that do not shed fibres?

If you are modifying the system are the components you are fitting clean and have any pipes or hoses been flushed with clean oil. Cleanliness control is about making sure you keep outside contaminants out of your system during maintenance, maintaining filters that remove contamination and then monitoring.

Good oil analysis reports will give you the ISO 4406 cleanliness code, which you can trend. It will also tell you quantities of wear metals such as iron and brass which you can also trend. An increase in iron may mean a component is wearing fast such as a pump or cylinder. Details of water content and the oil additive package should also be detailed. You normally don't have to change your oil each year, instead you can monitor it and change it when it is degrading. It may last 5 years or more!

The picture below shows a heavily contaminated sample of oil from a new hydraulic system. The suppliers did not clean any part of their system before despatch. This sample is a worst case scenario and it has been proven that keeping hydraulic system oils clean greatly improves the reliability of hydraulic components in the system