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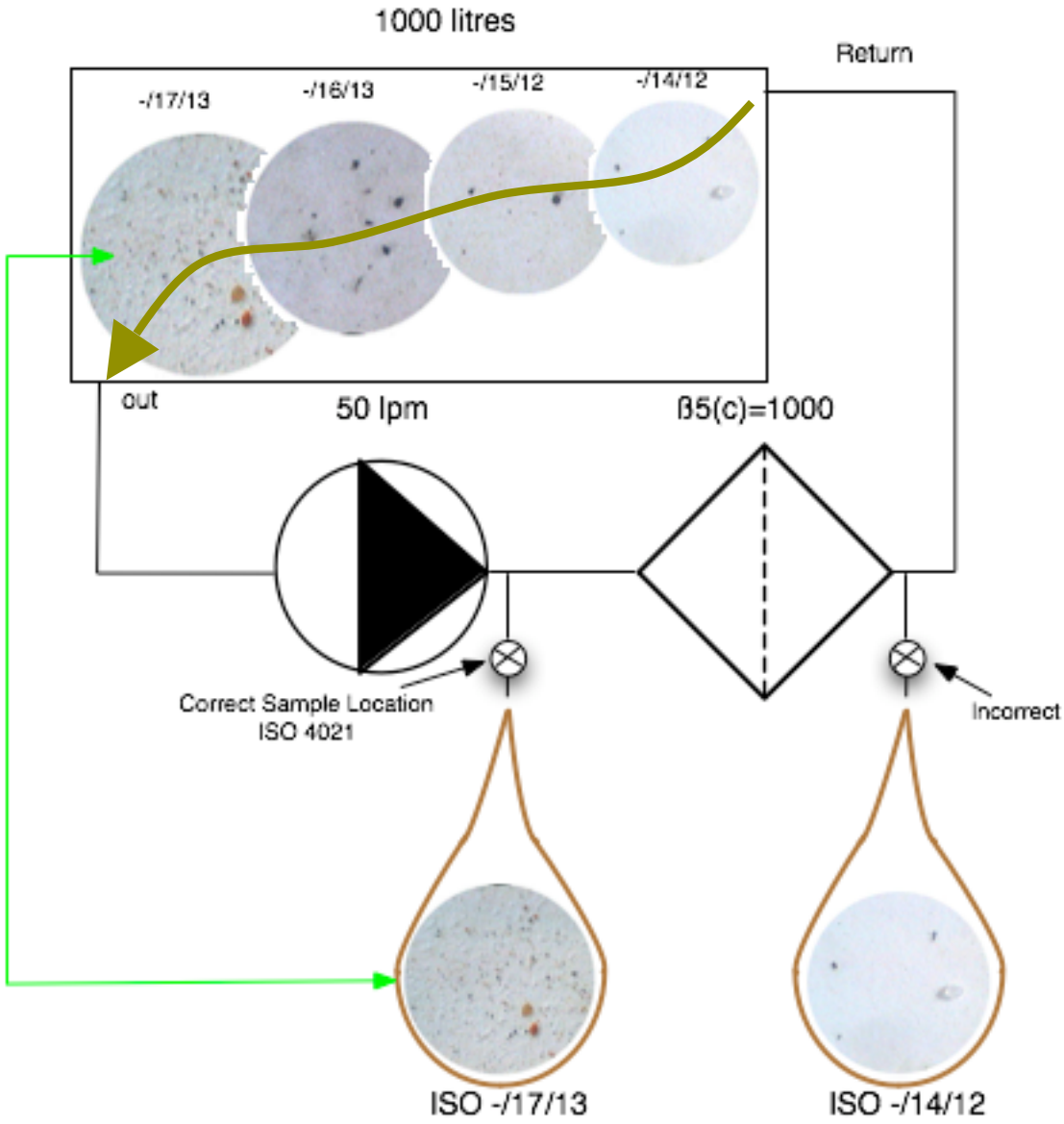
Correct Sampling Location when Kidney Looping.



1. Preamble.

Some confusion exists regarding the correct sampling location to determine the outcome following kidney looping a compartment (whether it be a reservoir or axle).

The **correct** location is **upstream** of the filter and not downstream.

This discussion will establish why upstream of the filter is the correct location to establish the outcome of the activity.

2. Discussion.

Firstly we need to establish what we mean by the *outcome of the activity*.

Kidney looping (kidney loop filtration) is conducted in an attempt to remove the particulate from ***all*** of the oil contained in the compartment to a target ISO code. (The code is reported in accordance with ISO 4406-1999).

Therefore, we need to obtain a representative sample from within the system to determine if ***the oil in the reservoir or compartment*** meets the ISO Code targeted.

Kidney looping is nothing more than a dilution exercise. Dirty oil is taken from the reservoir, cleaned, and this oil - which now contains less particles - is returned to the reservoir thus diluting the total particle numbers in the reservoir oil volume.

How fast this dilution occurs is dictated by the pump flow rate and of course the efficiency of the filter element.

Obtaining a sample downstream of the filter may provide us with an indication as to how the filter may influence this part of the dilution rate equation, but it does not address whether the particle numbers in the oil volume in the reservoir have been sufficiently diluted in order to achieve the target ISO code.

It is the dilution of the total particle numbers in the reservoir volume that dictates the final ISO code, not the rate at which the dilution process occurs.

When using ß5(c)=1000 filter media it is sometimes possible to achieve a 2 to 4 improvement in the ISO code in a single pass of a hydraulic filter. (depending on initial level of contamination, and depending on the type and brand of filter).

Therefore, if your starting code is ISO -/19/16, you may achieve an improvement downstream of the filter to ISO -/17/13. And likewise as you continue circulation you will find when your incoming level improves to ISO -/17/13 you may achieve an improvement to ISO -/14/12 downstream of the filter.

In this example (eg; the diagram above), obtaining the sample downstream of the filter provides a significantly different result to that obtained before the filter. The sample prior to the filter provides the best representative indication of the reservoir volume cleanliness. It is the further most fluid from the clean fluid being returned and is that which will be again sent to the filtration process. When the particle count tells us fluid from this location is at our target level, we can be reasonably assured that all fluid in the reservoir, has been well mixed and the total particle numbers diluted.

If your target level was ISO -/14/12, it is clear that it was not achieved in the above example.

Where the filter removal efficiency has been relaxed to say 10 micron there is unlikely to be a measurable result between samples obtained from upstream and downstream. (depending on the make and brand of filter). Needless to say, in this instance where the sample is obtained is irrelevant. Obviously, where there is little difference between the upstream and downstream results the rate of dilution will be compromised and excessive time will be required to clean a reservoir. Using elements with such a lax removal efficiency is not recommended for kidney looping.

Conclusion.

1. Ensure your kidney looping unit has a good flow rate. This ensures the activity is conducted in a minimal time frame. It also helps provide some turbulence in the compartment or reservoir to encourage particles that may have settled to be removed and better mixing.

2. Ensure you use filters with high efficiency (eg: ß5(c)=1000 to maximize the effect and reduce the time taken to achieve the ISO targeted.)

3. Always measure your result. Circulating the lube for “X” hours does not guarantee the result targeted. Make sure you take the sample from the correct location.