Is your new oil really clean oil?

Created by: KLEENOIL

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New oil is rarely clean: many users don't realize this or know what ISO rating a clean oil should be. And why should they?

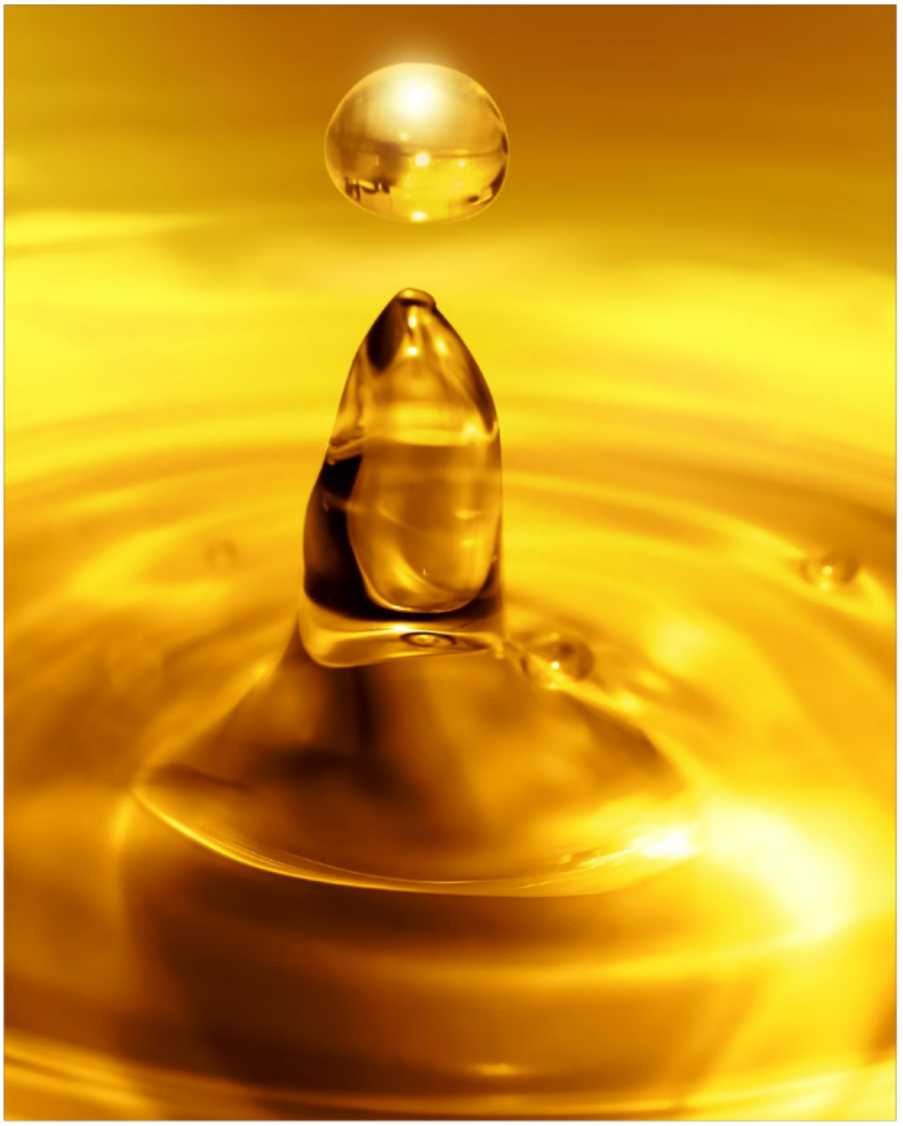
Surely buying a new product, you would expect it to be clean, but then how can it be?

Consider the production and route of oil before it even gets to the user.

Although improving, oil manufacturing facilities are not the cleanest. At the points of production, blending, storage and then transfer, the drums, hoses, tanks, and IBCs are not clean. They're often recycled or stored outdoors in varying temperatures.

In your own transfers from drum to machinery or storage, are pumps, hoses, storage really clean and secure?

Once in use, there is external ingress, such as dust in the air entering through breathers and water if positioned outdoors. These all carry contaminants at levels far above most machine tolerances.



And then is the machine even clean at the start point? Have you just had a refurbishment? Were pipes, cylinders, and pumps thoroughly flushed of swarf and material?

When you fill or top up the unfiltered new oil into a machine, it immediately overwhelms the standard OEM filtration capacity.

And of course, the micron level filtration, if there, is invariably on the pressure side, after the pump; most pumps have finer tolerances.

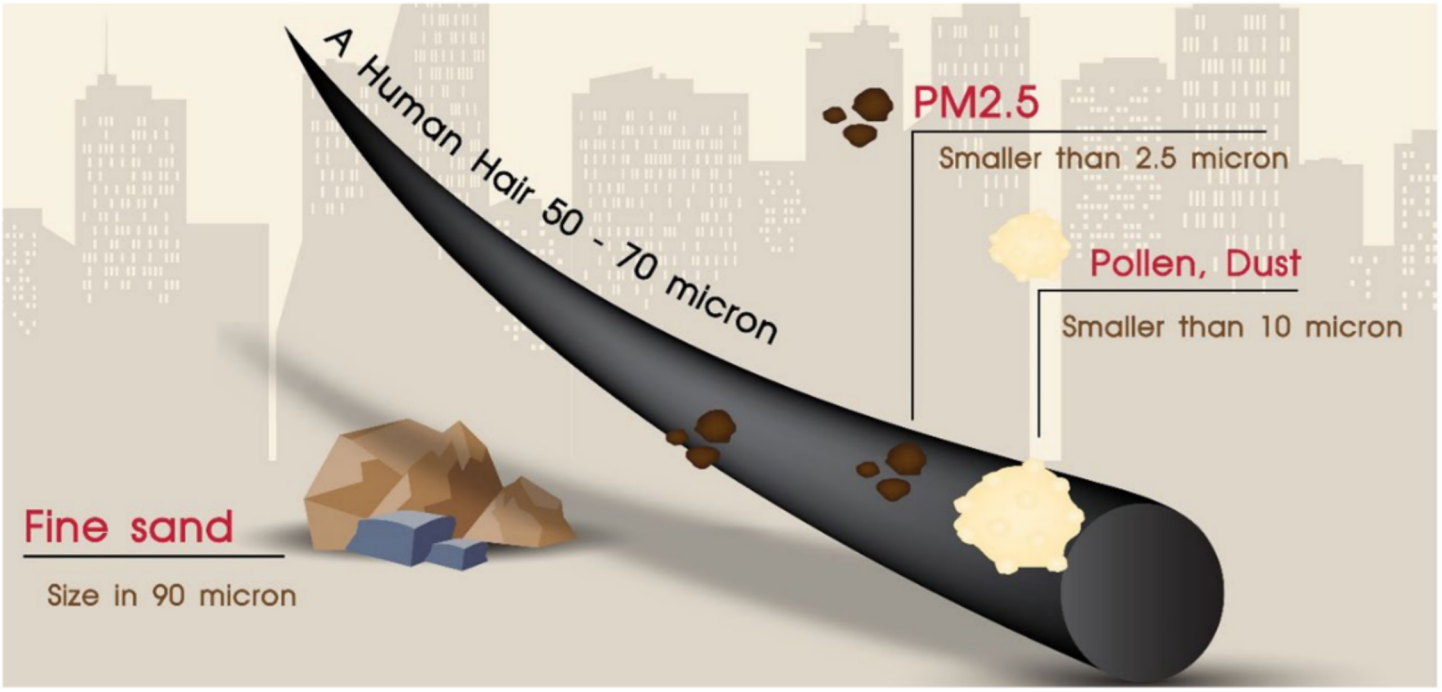
When it comes to lubrication, to ensure efficiency, nothing is more important than the fluid's contamination control.

Oil Cleanliness ratings — what does it mean?

In oil standards, we constantly relate particles of "dirt" to micron size. So, how would we relate these particles to such sizes?

- **1 Micron = 1 Millionth of a Meter**
- **1 Micron = 1 Thousandth of a Millimeter**
- **1 Micron = 39 Millionth of an Inch (0.000039)**
- **25.4 Micron = Visible with Magnification**
- **40 Microns = Visible with Magnification**

So more relatable: 50 to 70 Microns = Diameter of a Human Hair.



The ISO codes, according to the ISO 4406:1999 standard, relate to only three different ranges of particles: ≥4 µm, ≥6 µm, and ≥14 µm.

In simple terms, this pulls out the number of microns in a sample at greater than 4 microns, greater than 6 microns, and greater than 14 microns.

To quote from Testoil:

"According to a study performed by Caterpillar, it takes approximately ½ teaspoon of particulate to contaminate a 55-gallon drum of oil to an ISO code of 18/16/13.

Where 19/17/14 is one ISO code higher than 18/16/13, it would be considered twice as contaminated; the result can be interpreted as approximately 1 teaspoon of particulate per 55 gallons of fluid.

Considering new oil cleanliness is typically around an ISO code of 20/19/16 (give or take a code), which is 2 or 3 codes higher than the 18/16/13 reference, it can be appreciated that this equates to between 2 and 4 teaspoons of particulate in every drum of new oil, as received.

This should serve as a reminder of the need to pre-filter lubricants for most applications."

What is the cleanliness of new oil?

Typically, turbine and hydraulic oils leave the blend plant at a cleanliness of ISO 19/17/14. But as we've defined, once it is put into transit trucks or drums, the delivered oil will not be as clean and will worsen the longer its route.

There are manufacturers offering filtered hydraulic oil on request, achieving a cleanliness rating of 14/11/9. There is a heavy cost for this process to offer such an assurance of cleanliness.

The Benefits of Cleaner Lubricants

In most lubricated assets, contamination accounts for as much as 70% to 80% of lubrication-related reliability problems. In hydraulic systems, it's 90%.

Cleaning lubricants by just one cleanliness code can provide a 35% increase in equipment life.

Contaminated oil can be a direct result of poor reliability and consequent downtime.

Filtering Before Use

For those who want to clean oil before use, what is the best course of action?

Filtering stored oil for “too long” can be pointless. You will not damage the oil, but it’s a pointless exercise if you’ve achieved an optimum level and there is no further likelihood of the ingress of contamination in a sealed container.

But then there are oils that aren’t filtered long enough, and so dirty or wet oil is put into the equipment.

Having confidence in filtration through experience is the most affordable way, but this takes time and expertise. We all want validation of cleanliness levels; investing in a particle counter offers this on the spot but can be expensive.

The best and cheapest method is always a traditional independent laboratory analysis, provided you are prepared to wait a few days.

Which Filtration?

The levels and types of filtration are extensive. Each kind varies massively in differing results: from simple “rock catchers,” such as metal mesh or pleated cards, through to the glass fiber and woven or non-woven, to the finest levels of cellulose depth.

Using cellulose depth filtration is one of the finest levels of oil filtration that also removes moisture in the same application. Using this method of filtration as a single pass transfer will ensure one of the best levels of cleanliness. And better still, you can leave it to circulate cleanse in storage, whether drum or IBC. The rule of thumb is seven times, so if your IBC is a full 1000 liters, let it cleanse seven passes at a flow rate of, say, 1000 lph. Simply seven hours, or a day shift, to get it ready for transfer.

The value of this simple improvement in your lubrication program cannot be overstated.

With few exceptions, oils should not be put into service without filtration. The length of time oil should be filtered will vary considerably based on the lubricant's initial cleanliness level, the filter's ability, and the flow rating of the pump on the filtration unit.

Ongoing cleanliness is a balancing act!

It is a challenge to achieve desired contamination control targets due to so many factors:

- **Tank size**
- **Dirt ingression rates**
- **Oil flow rates**
- **Operational changes**
- **Temperatures**
- **Filtration changes**
- **Maintenance**
- **Repairs**

This all influences particle-capture efficiency, so the initial solution is to balance how contamination and moisture are removed to a rate greater than contamination ingress and assess through planned condition monitoring.

The obvious way is to run the filtration 24/7 as opposed to just machine operational hours — that way, the filtration is gaining pace when ingress is minimized.

And it's worth acknowledging that it is just not possible to adequately remove contaminants at a sufficient rate with full-flow filtration to maintain this balance. This is not a criticism; it's just that most standard filtration has to work in full flow and cannot allow itself to inhibit the pressures. So the media is just not fine enough to take particle capture down to smaller sizes, but enough to remove the visible pieces.

Yet most machines have pumps or valves that have finer tolerances and will not cope with the next finer level of contamination not captured in full flow.

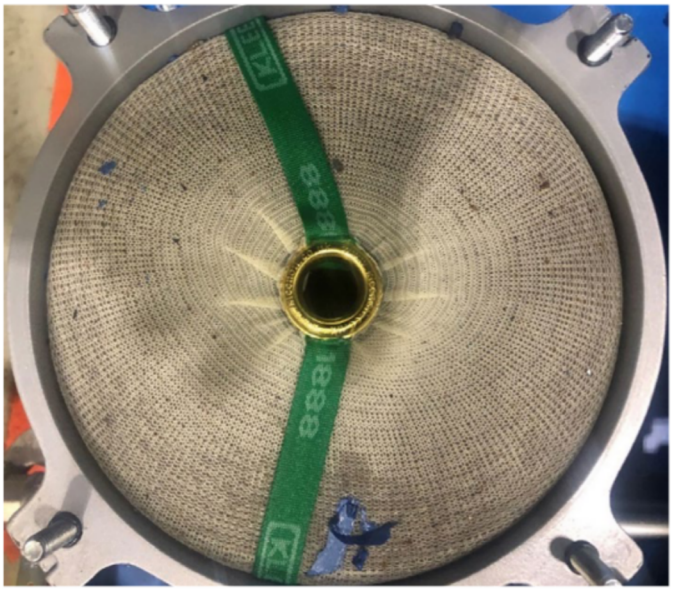
OEMs often add "staged" filtration to try and address this, so while the first level might remove down to 40 microns, the next may take it to 25 microns. Still, this is often not enough, and with full flows, you will often still see bigger pieces being pushed through, as can be seen in the adjacent image; here, the standard filtration has allowed these pieces through to before the cellulose depth filter.

Where full filtration proves ineffective at maintaining balance, offline filtration, permanent or as a routine cleanses, is the solution.

The goal of balanced filtration is to ensure that the oil remains at or below the target cleanliness and dryness levels for optimum system reliability.

Routine monitoring will allow for assessments to ensure the balance in cleanliness by tweaking filtration changes or pinpointing looming pump and cylinder wear that can avoid breakdowns.

It's no secret that maintaining good filtration alongside routine condition monitoring will ensure the best productivity and least downtime.



KLEENOIL FILTRATION manufactures and supplies the finest and most affordable cellulose depth filtration to act as a bypass system in cleaning and maintaining your lubricants to the finest cleanliness levels.

Kleenoil

Established in 1976, Kleenoil is a UK-based manufacture of the Kleenoil cellulose depth filtration system, serving all applications where oil cleanliness is key, whether it be heavily worked engines, production machinery, or oil tanks for large systems such as balers and shears in the recycling industry.

Kleenoil manufactures the entire system and the replacement filter cartridges to ensure source reliability and continual service, offering the system through established distributors across the World.

In the UK, Kleenoil offers a service-based package to alleviate the work of machine condition-based monitoring from the client, allowing for quarterly servicing, independent laboratory oil sampling, and full reporting to achieve predictive alerts to potential issues.

A Worldwide distribution network offers the Kleenoil system as a direct installation or mobile unit to suit any application. Even in the most aggressive environments, Kleenoil can address the issues of moisture, particulates, varnishing, and component failures due to poor oil hygiene.

The Kleenoil ethos is to reuse your oil rather than change it — reduce your oil consumption to merely top-ups, and you will save not only your own resources but also the rest of the World's.