– CUSTOMER SUCCESS STORY –

Avista Oil, Dollbergen, Germany

The upcycling of used oil began here decades ago

Used oil has become a valuable raw material, the reuse of used oils a sustainable way to meet the world's demand for mineral oil products. Avista Oil AG is a German company at the forefront of developing and optimizing the processes required for the treatment and reclaiming of used oil.

Relevant for: base oil, lubricants

Refining and re-refining

The reuse of used oil requires “rerefining”, a process which removes the impurities, both soluble and insoluble, accumulated in used oils and redistills the used oil to produce base oil. Keeping oils in a continuous loop of use, collection, rerefining, reuse, collection, and so on makes an enormous saving of CO_2 emissions. Every tonne of used oil collected and rerefined prevents the need for the use and transport of 29 tonnes of crude oil.[1]

Avista Oil has the only base oil upcycling process to have received an environmental award from the EU commission. “Everyone knows what ‘recycling’ is,” explains Jens Lenk, head of the Lubrication Laboratory at the Avista Oil AG premises near Hanover. “But ‘upcycling’ is more accurate in this case. ‘Recycling’ makes something new from something old. With ‘upcycling’ the new product is just as good as, if not better than, the old one. The base oil we produce from used oil has the same high quality as base oil made directly from crude and even better properties, in fact.”

The story of Avista Oil began in 1951, before anyone had heard of ‘sustainability’ and ‘upcycling’. What started with a small rerefining plant in North Germany grew to include specialized oil collection companies with fleets of tankers, a patented rerefining plant, and subsidiaries and affiliates in Europe and the U.S. The company is now the largest sustainable rerefinery group in the world, with a capacity for upcycling over 300,000 t of used oil per year.

At work in the Lubrication Laboratory: Dr. Jan Otto (right) and Jens Lenk (left)

Pioneering technology

Avista Oil developed and patented the rerefining technology “expanded selective refining” which treats used oil to reclaim base oil. The procedure includes dewatering, cleansing, distillation, and solvent extraction. The raw distillates produced are processed in a fractionation system which produces the viscosity grades required for viscous base oils.

[1]From “Redefining rerefining“ brochure published by Avista Oil.

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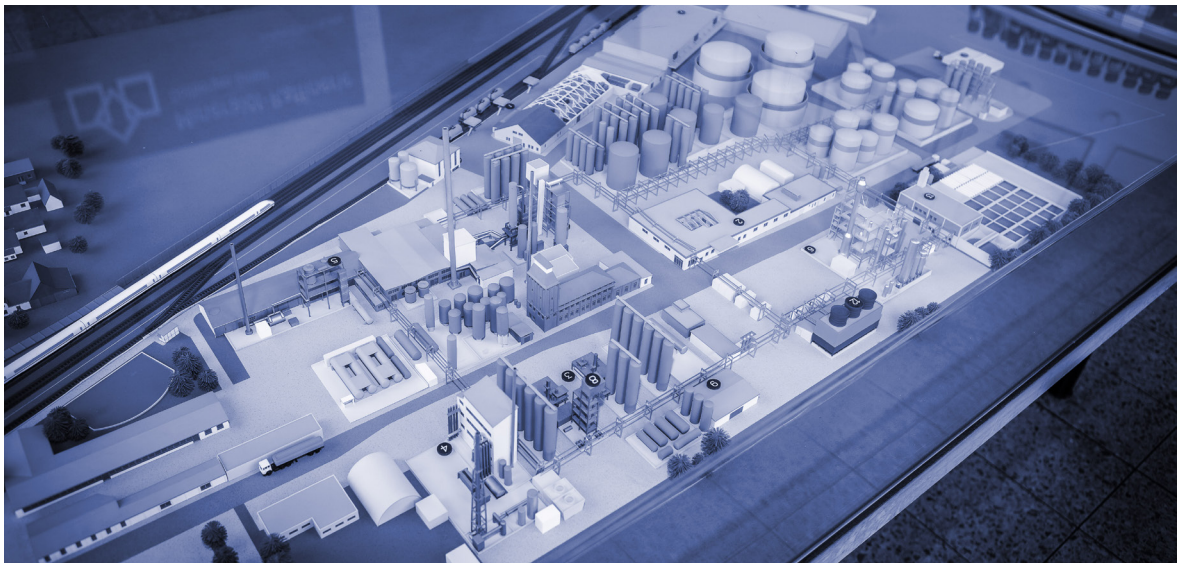
>
> *Dr. Jan Otto*



Model of the Avista Oil premises

To remove the undesirable components (e.g. PAHs) in the base oil starting fractions, these are first treated with the help of a solvent in a liquid-liquid extraction plant. A great benefit of Avista Oil's expanded selective refining process is that the base oil produced is free of impurities but the synthetic elements in the oil (XHVI, PAO) are preserved. The refined products obtained in this way are sold directly as high-quality base oil or processed further. As Dr. Jan Otto, head of the laboratory, explains: "We do everything here at the plant. Used oil is rerefined to make base oil and the base oil is then mixed with the appropriate additives to become engine oils, hydraulic oils, gear oils, and industrial lubricants."

After the rerefining process, the used solvent is recovered and the impurities distilled out so it can be used again in the extraction process. This almost waste-free production of high-quality base oil and the considerable savings in CO_2 emissions are attractive to companies striving to decrease their carbon footprint. Large customers of Avista Oil include leading German car manufacturers and several well-known supermarket chains in the U.S.

Analysis of core parameters

How much analysis does the upcycling of used oil require? Quite a lot, it seems. Measurements and analysis are required to check the individual production steps, assess the quality of the new oil mixtures, perform incoming inspections on purchased products, and evaluate the finished products. The rerefinery works around the clock, even on the weekend. To deliver the required analyses, the team in the Lubrication Laboratory works in two shifts and has a wide array of measuring apparatus at their disposal.

A density meter has been part of the well-equipped laboratory for many years. When the last model became so old that there was no more support for spare parts, Avista Oil replaced it with a DMA 4100 M from Anton Paar.

The DMA 4100 M plus Xsample 340 ready for samples

The decision to purchase from the Austrian measuring technology company was easy: the Lubrication Laboratory already uses a number of Anton Paar devices, including the Pensky-Martens flash point tester, Cleveland flash and fire point tester, and a Herschel emulsifier. The team in the production center uses the kinematic viscometer from Anton Paar. As the instruments are covered by one service agreement, purchasing another instrument from the same manufacturer saves the company money and reduces paperwork.

Density measurement: an integral part of the big picture

With many different parameters monitored in the busy laboratory, the density meter is a small cog in a large machine. Around five density measurements are performed each day. Density results are required, for example, to check the quality and concentration of purchased materials: the highly viscous additives, glycol, and two important liquids used in the production process: potassium hydroxide solution and sodium hydroxide solution.

The Anton Paar density meter works with a sample changer for single samples, which reduces the lab technicians' workload and ensures consistently good cleaning, even with the highly viscous additives.

The built-in camera and live view of the measuring cell on the screen are not generally used to monitor the filling, as Mr. Lenk relies on the meticulous work of his knowledgeable team and the internal checks on the density meter. To date the filling has always been flawless. As Mr. Lenk summarizes: “You connect the syringe with the sample, press ‘Start’, and the device measures and cleans. When it’s finished you can insert the next syringe. It’s as simple as that.”

Hidden champion

Sixty years of rerefining at the North German plant amounts to many millions of tonnes of used oil upcycled and given a second life in industry, and many tonnes of CO_2 emissions spared. Avista Oil’s leading-edge work has defined sustainable conditions for rerefining and laid the foundation for continued growth. With over three hundred and fifty employees working at the German sites, two hundred of these at the rerefinery in Lower Saxony, four in the Lubrication Laboratory, and a dense network of trucks collecting and delivering used oil from around Germany, Avista Oil is a true hidden champion and innovation pioneer. And in a quiet corner of the Lubrication Laboratory, the DMA 4100 M density meter is doing its part.

Right: Avista Oil tests a variety of substances; left: the plant at Dollbergen, near Hanover, Germany

Main points at a glance

SAMPLES Highly viscous additives, glycol, potassium hydroxide solution, sodium hydroxide solution

INSTRUMENT DMA 4100 M density meter, Xsample 340

ACCURACY 0.0001 g/cm³