



Residue Analysis of Oils and Fuels

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Residue analysis has become a real buzzword with petrochemical products. The Fuel Technology Centre of the SGS Group, as a certified and accredited service partner, has also recently begun offering microscope-based residue analysis for investigating just how clean oils and components are – all within the framework of neutral and independent quality analysis of oils and fuels.

The SGS Group

Inspecting, testing and certifying – the SGS Group is a global leader as a provider of inspection, verification, analysis and certification services. SGS conducts global fuel studies in the Fuel Technology Center based in Speyer, Germany. "Our lab services cover the entire spectrum of petroleum and petrochemical product analyses", explains Stefan Heppes, responsible for the Special Analysis area. All SGS Labs (www.sgs.de.com) focus on maintaining neutrality and independence. Heppes adds: "SGS inspects and certifies only. We do not produce any products ourselves. To guarantee high standards qualitatively, our petrochemicals labs are accredited according to the DIN EN ISO/IEC 17025 standard by DASTMIN, the German accreditation agency for the petrochemical sector".



Figure 1: The analySIS Filter Inspector provides fully automatic standards-compliant and reproducible optical analysis, classification and documentation of residues on circular filters. SGS positions this microscope-based system-solution on a vibration-free stage and under a laminar flow hood.

Prevention instead of recall

In the automobile sector, customer expectations (long-lasting products, performance, fuel efficiency, etc.) lead to increasing component complexity and networking. This, in turn, generates more extensive inspection and analysis requirements. Anyone saving at the wrong end here risks expensive recall campaigns and damage to their reputation. The important thing is to follow the motto "Prevention instead of recall".

Mr. Heppes of SGS has this to say about it: "All solid surfaces are contaminated by flat anorganic or organic substances and with particles to a greater or lesser extent during their processing and usage lifespan; this is referred to as residual contamination". Contamination affects wetability performance, friction properties, electrical conductivity, corrosion potential and the optical properties of material surfaces. "And the consequences are devastating", continued Heppes, "because changing these parameters causes interference to subsequent production steps or can contribute to product failure later on in the field". For the suppliers in the petrochemicals industry and refineries

this means ensuring that oils and fuels do not cause any subsequent contamination. Analysis of fresh and used oil samples regarding suitability and/or reusability with an insurance-related and legally recognized certification regarding the physical-chemical properties thus takes on a much greater significance. It's no surprise then that international standards define the parameters for investigating the cleanliness of oils and components. Heppes stated: "The cleanliness of all contaminant-sensitive components, including oils, is specified according to international and national standards". The standards ISO 4406 and ISO 4407 are particularly applicable in the hydraulics fluids and fuels sector. "The ISO 4406 defines the numeric key for the degree of contamination by solid particles. The ISO 4407, however, defines the degree of solid contamination based on the microscopic counting method", noted Heppes. The analysis of the cleanliness of components in fluid circuits is described in detail by the ISO 16232 standard and the VDA 19 directive as well.



Figure 2: SGS uses a special multi-filter holder insert which can have up to 9 filters mounted on it simultaneously. The analysis is then conducted and evaluated automatically providing considerable time savings compared with filter analysis using just one filter holder.

Isolating, analysing and classifying

Exact information on the nature of the contamination such as number of particles, particle size distribution and particle composition are of decisive significance for the lifespan of parts and components. Counting, analysis and classification of the often microscopically tiny contaminant and foreign particles has grown enormously important for all processes: development, manufacturing and production and on to quality control of the final product.

Stefan Heppes' choice for doing so was the analySIS Particle Inspector. "The microscope-based system solution of Olympus offers fully-automatic, standards-compliant and reproducible optical classification and documentation of residues on filter media. What really persuaded us were the short analysis times even at high resolution, the intuitive usability, the high degree of flexibility, the option of multiple-filter analysis along with the normal particle included".

After the filtration of the medium being investigated (oil, fuel, flushing liquid) the filter is fixated in a filter holder and placed on the motor stage of the microscope. Now the system takes over the work from here. And the system software guides the user step-by-step through the entire analysis. What is particularly helpful for Heppes is that "the system distinguishes between metallic and non-metallic particles and can analyze them specifically afterwards".

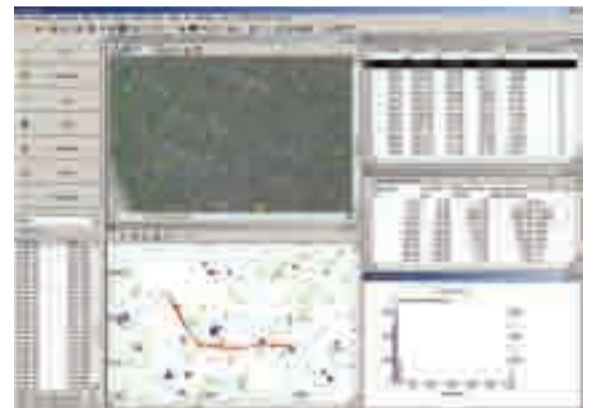


Figure 3: The user-friendly system software guides the user through the entire analysis process – and it's standards-compliant.

No end to miniaturization in sight

Heppes is confident that his team will be increasingly dependent on microscope-based residual contamination analysis in order to fulfill his customers' new requirements in future. This is why SGS has currently had the system accredited because, "we see it as a real gain for our customers' reputation if they have the opportunity to have their samples investigated by a certified and accredited lab". And it is also an investment in the future because "the higher the components' functions density, the smaller the size of foreign substances that can contribute to wear and failure." Miniaturization shows no sign of letting up. This is why Heppes agree that it is "good to appropriately position oneself in the market early on".



Figure 4: Standard-compliant reports are generated by the system software at the press of a button.