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Evaluation of engine oils: 'suitable for use' versus OEM-approved standards – Analysing quality, validation processes, and reliability

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Introduction

Engine oils are the lifeblood of modern engines and ensuring their quality is critical for reliability and longevity. In the lubricant industry, a distinction has emerged between engine oils that are "Suitable for Use" (SFU), typically meaning the product claims to meet certain specifications without formal approvals and those that carry explicit European Automobile Manufacturers' Association (ACEA) or Original Equipment Manufacturer (OEM) approvals.

***Figure 1:** Is engine oil testing and OEM approval necessary? The image illustrates a comparison between pistons from an engine test conducted at Lubrizol's test facility. The piston on the left was tested with an SFU engine oil, which failed at 23 hours, while the piston on the right used an OEM-approved engine oil, successfully completing the full test at 96 hours. This image is owned and protected by Lubrizol.*

As indicated in Table 1, the terms 'Recommended For,' 'Meets Requirements Of,' and 'Suitable For Use' do not fully guarantee that the engine oil has undergone testing to a specific approval level, potentially posing performance risks. These terms vary, necessitating the oil marketer to assess the performance of their formulations. In contrast, OEM-approved oils have their performance validated by the OEM.

Suitable For Use	Recommended For	Meets Requirements Of	OEM Approved
May include data which complies with an **older version of the specification**		May include all required data, **but not applied for OEM approval**	Formulation and testing has been reviewed and **confirmed by the OEM**
May not include engine test data to support the claim!	**Specification may be obsolete** so an OEM approval can't be obtained		
The **oil marketer** has made a judgement about their formulation's performance			The **OEM** has validated the formulation's performance
Investment →			

***Table 1:** Understanding the terminology used within the industry for engine oils.*

Lubrizol has examined some of the European landscape for SFU lubricants versus OEM-approved lubricants, reviewing the potential performance gap between the two product standards. Whilst work remains ongoing,

Lubrizol's aim is to deliver a factual, engineering-focused review of how self-certified oils compare to formally approved ones, and most importantly, what is being done to safeguard lubricant quality.

The rising prevalence of SFU Oils in Europe

Across Europe, most engine oil brands seek to meet the performance requirements set by the industry and OEMs. However, there is a significant presence of products on the market that rely on self-declared compliance. Often marketed as "Suitable for Use" in applications calling for certain specifications or standards rather than holding an official OEM approval. Some lubricant marketers adopt SFU labelling to avoid the cost and time of formal approval processes. These SFU oils typically claim to meet standards (such as ACEA sequences or OEM standards) based on in-house or additive supplier data. This practice has rightfully raised some concerns in the industry, as it relies heavily on the integrity and testing diligence of the oil marketer and their additive suppliers.

The extent of SFU oils in the market is highlighted by the work of industry watchdogs. For example, the UK's Verification of Lubricant Specifications (VLS), an independent body under the UK Lubricants Association, has investigated over 120 lubricant cases since its formation in 2013. The vast majority of these cases involve passenger vehicle engine oils, reflecting how prevalent and important this segment is. Significantly, in its findings, VLS reports that "non-compliance with stated specifications remains the most frequent cause of complaint", indicating that many oils were found not actually meeting the claims on their labels. In 2024 alone, half of the cases opened by VLS related to conflicting or unevidenced OEM specification claims, i.e. oils marketed as approved or meeting OEM specs without proof. This statistic underscores the level of growing concern that the engine oil market is becoming populated by SFU products whose performance credentials may not be fully verified.

Such findings reveal a compliance gap in the marketplace. While most mainstream oils sold by established companies are indeed tested and conformant, there are some products where claims might be exaggerated or unsupported. The Chairman of the VLS Technical Review Panel noted that although awareness of compliance is growing, "the significant rise in cases over the past 12 - 18 months, demonstrates that there is still work to do to ensure an open and fair marketplace that end users can have confidence in" [*VLS Managing Conformance and Assuring Compliance, A Case Review 2013 – 2024*]. In other words, despite progress, sub-standard formulations occasionally slip through, with some products being sold as meeting the latest specifications but failing to perform effectively. This is the context in which certain SFU oils have proliferated: while the product might be to the highest standard, the lack of approval means the self-certification environment relies on trust and technical honesty.

Validation frameworks: ACEA sequences, ATIEL code, EELQMS, and OEM approvals

Ensuring an engine oil truly meets required performance standards involves a complex framework of industry specifications and testing protocols. In Europe, the backbone of performance definition comes from the ACEA Oil Sequences, the specifications published by the European Automobile Manufacturers Association (ACEA) for various classes of engines (e.g. ACEA A/B for passenger gasoline/diesel, ACEA C for catalyst-compatible oils, ACEA E and ACEA F, for heavy-duty diesel). These sequences define minimum performance requirements in standardised engine tests and lab tests. Noteworthy is that ACEA does not itself certify or license oils. Oil companies are responsible for testing their products and self-declaring compliance. There is currently no official ACEA stamp on a bottle, unlike the API's trademark "donut", and no central registry of ACEA-compliant oils maintained by ACEA. The system relies on manufacturers to act diligently.

To promote reliability in this self-certification system, the European oil industry relies on the European Engine Lubricant Quality Management System (EELQMS). EELQMS is a voluntary quality framework developed jointly by ACEA, ATIEL (the Technical Association of the European Lubricants Industry) and the Additive Manufacturers Technical Committee (ATC). Under EELQMS, lubricant marketers are expected to adhere to the ATIEL Code of Practice; a detailed guideline that standardises how oils are developed and tested for ACEA claims. Marketers who follow the ATIEL Code of Practice sign a Letter of Conformance and register it with ATIEL's administrative arm, SAIL (Services to Associations and Industry in the Lubricants sector). By signing and registering this Letter of Conformance, companies publicly declare their participation in EELQMS and commitment to abide by the industry's quality standards. ACEA now requires that any marketer making ACEA performance claims must submit such a Letter of Conformance via ATIEL/SAIL, effectively tying ACEA claims to adherence to the CoP. This process doesn't pre-approve the oil but creates accountability. A list of all lubricant companies who have signed the compliance letter is published by SAIL, and those companies agree to make test data available and to undergo audits if required and requested.

In practice, oil marketers do rigorously follow EELQMS: they invest in running the battery of engine tests defined in the ACEA sequences (often in collaboration with additive suppliers who have testing "packs" of data) and they maintain internal quality systems to ensure that every claimed formulation is covered by valid test results. However, nothing strictly stops an oil marketer from skipping tests, overstating results or not holding a technology supplier accountable for appropriate test data, since there is no official licensing. This is where bodies like ATIEL and VLS step in with compliance monitoring. Since 2014, ATIEL has operated a compliance program that performs random or targeted testing of oils off the market to verify their claims and this was reinforced with a new policy in 2017. SAIL, on behalf of ATIEL, conducts independent monitoring of engine oil quality, checking that products sold as ACEA-compliant do indeed meet the requirements. Over the years, ATIEL's program has found several non-compliant products globally, including cases of incompatible specification claims (e.g. claiming mutually exclusive ACEA categories on one label) and oils failing certain chemical and physical limits. Documented failures have included out-of-range values for Total Base Number (TBN), sulphated ash, phosphorus content, Noack volatility or viscosity parameters, where the tested sample did not meet the claimed specification limits. When such discrepancies are found, ATIEL can pressure the company to correct or withdraw claims and industry groups like VLS may be alerted for further action.

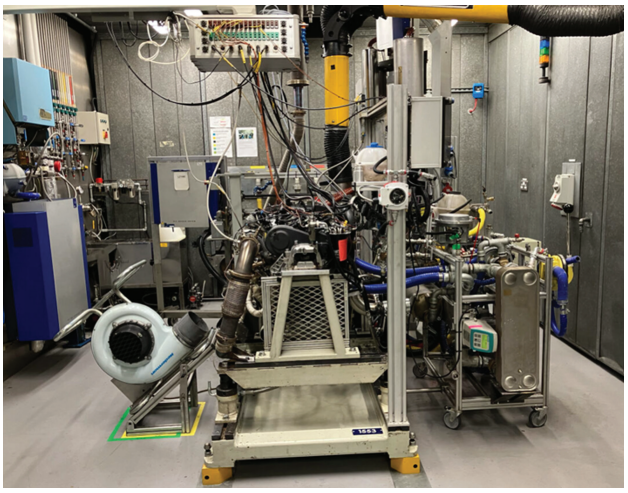

Figure 2: *Lubrizol in-house engine test cell used to test the SFU oils. Image owned and protected by Lubrizol.*

While ACEA sequences provide a baseline, many vehicle manufacturers also have their own OEM-specific oil specifications that go beyond ACEA in certain aspects. Examples include Volkswagen's VW 50400 / 50700, Mercedes-Benz's MB 229.52 plus several others. Obtaining the right to claim an approval according to an OEM specification always involves a formal approval process: the oil formulation

must be tested (often at independent labs) according to the OEM's protocol (which incorporates ACEA tests and often additional more stringent requirements), and the results submitted to the OEM for review. If the oil meets all requirements, the OEM may issue an official approval letter or code, and the oil can be listed as approved for that specification. Unlike ACEA, many OEMs do maintain approved oil lists or databases, however, rarely are these lists published and in the public domain.

The technical rigour behind an OEM approved lubricant is generally higher or at least more assured. OEM specifications often include additional tests or tougher limits tailored to their engines (for instance, a proprietary turbocharger deposit test, an elastomer compatibility test with the manufacturer's seal materials, or extended duration engine tests for long-life drain intervals). For an oil to claim, "OEM Approved", it must satisfy those specific criteria and be reviewed by the OEM's engineers. By contrast, an oil labelled only with "meets X criteria" relies on the blender's word that it would pass the same tests. The difference in accountability is clear, and it has real consequences for engine reliability if a claim turns out to be false.

Technical performance comparison: How do SFU oils measure up?

Oxidation stability and thermal resistance

Engine oils must resist thickening and breakdown at high temperatures. Poor oxidation stability can cause viscosity increases, sludge and varnish formation. OEM approved oils pass rigorous engine tests like the DV6C and Volvo T-13, ensuring stable viscosity and minimal deposits. SFU oils, lacking formal validation, risk failing these critical tests due to formulation shortcuts, compromising engine performance over time.

Through our evaluation of the SFU oils tested, we utilised the CEC L-109 test method, which is a laboratory test designed to assess the oxidative stability of engine oils at high temperature (150°C) when used in conjunction with biodiesel fuels. There has been a shift towards higher concentrations on biodiesel, moving from levels such as B0 to B5 and B7, with variations occurring across different regions. This oxidation test aims to proactively safeguard against potential oxidative degradation of engine oils induced and accelerated by biodiesel. The test conditions are chosen to reflect significant fuel dilution (7%), often a consequence of the diverse engine operation characteristic of both passenger vehicles and commercial fleets. This ensures that the evaluation is comprehensive and applicable to a wide range of engine types and uses, providing a reliable measure of an engine oil's performance in biodiesel-inclusive environments. As illustrated in Figure 3, the oil under evaluation, which is marketed as suitable for use for in vehicles requiring the VW 50400 / 50700 specification, exhibited a significant increase in viscosity, far beyond the ACEA specification limit of <60%. Such a substantial change in viscosity will impact the oil's ability to circulate efficiently within the engine, consequently compromising its capacity to offer essential protection to engine components.

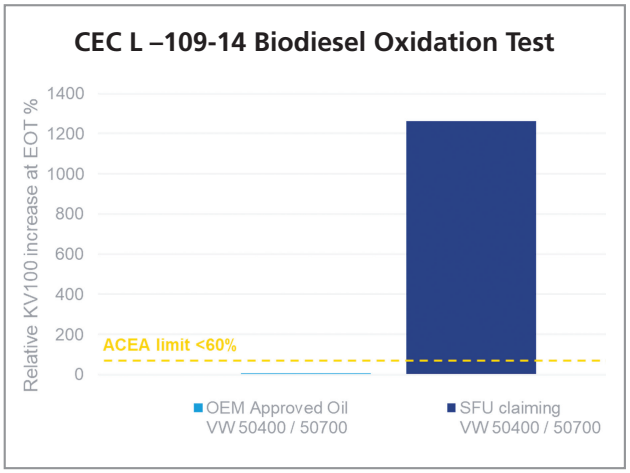

Figure 3: *CEC L-109-14 Biodiesel Oxidation Test results comparing an OEM approved oil vs SFU oil. The graph is owned and protected by Lubrizol.*

Wear protection

Engine oils contain anti-wear additives (e.g., ZDDP) and must pass strict wear tests such as the OM646LA Diesel test, Sequence IVB valvetrain test and Sequence X timing chain elongation test. Approved oils also meet High-Temperature High-Shear (HTHS) viscosity requirements, ensuring sufficient film strength under load. Some SFU oils may fail these criteria, as shown by VLS investigations revealing that some SFU oils exhibited significantly low HTHS viscosities, that may lead to increased or accelerated engine wear.[1]

Cold-start and low-temperature performance

Proper cold-start lubrication depends on meeting SAE J300 standards, including Cold Cranking Simulator (CCS) and Mini Rotary Viscometer (MRV) tests. Oils must not exhibit yield stress, indicating gelation risks. Some SFU oils may sometimes fail these tests, risking oil starvation during cold starts. Our testing revealed that SFU oils exhibited inadequate oil flow at low temperatures.

Sludge, varnish, and deposit control

Effective oils manage sludge and deposits, proven through rigorous testing (Sequence VH, M271 EVO Sludge Test, VW TDI3 and OEM In-House). OEM and ACEA-approved lubricants demonstrate consistent control, preventing piston ring sticking, blocked oil passages and engine failures. Some SFU oils which may lack formal validation, may risk insufficient performance leading to sludge buildup, particularly in extended drain interval scenarios, increasing the likelihood of serious engine damage.

Seals Compatibility

Oils must be compatible with engine elastomer seals, tested via ASTM D7216 or CEC L-112 standards to ensure appropriate swelling and hardness changes. OEM-approved oils are rigorously validated, while some SFU oils may assume compatibility without explicit testing, risking seals degradation, leaks and operational failures due to unexpected formulation incompatibilities.

The image below shows elastomers after performing CEC L-112 tests on an OEM approved oil compared to an oil claiming SFU for the same OEM specifications. It can be seen that the elastomers from the SFU oil are cracked, leading to reduced tensile strength. In an engine, this would result in break-down of the seals which would likely cause oil leaks.

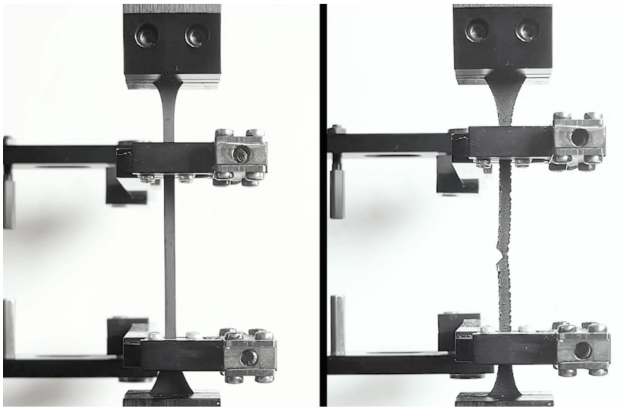

Figure 4: *This image demonstrates the results of seals testing conducted at Lubrizol's test facility, comparing OEM-approved engine oil (left) with a SFU engine oil (right). The image is owned and protected by Lubrizol.*

In summary, comparative performance of an SFU versus an approved oil can only be truly known by testing. A legitimately formulated SFU oil could perform just as well as an approved one, the trouble is distinguishing those from the sub-standard products. The evidence from some industry testing and Lubrizol's internal testing suggests a non-trivial number of SFU claims do not fully meet the performance requirements. Through the testing we have conducted, Lubrizol has seen cases of too high phosphorus (risking catalytic converters), too low TBN (risking corrosive wear), failing pumpability, and insufficient HTHS in oils that were on sale to

[1] *https://ukla-vls.org.uk/latest-news/#:~:text=Case%20010203%C2%A0%E2%80%93%20Anonymous,only%20and%20the%20batch%20date*

consumers. Each of those translates to a potential engine problem under the right (or wrong) conditions.

In extreme cases, Lubrizol have witnessed catastrophic engine failure as a direct result of low performance SFU oils. Lubrizol performed diesel sludge engine tests on both an OEM Approved and a SFU oil. This test is required for the OEM specifications claimed by both oils. The OEM approved oil had low sludge build-up, obtaining a passing result. The SFU oil failed to reach the full test duration, stopping approximately ¼ through the test. The SFU oil generated so much sludge that it blocked the oil ways, leading to oil-starvation. This resulted in catastrophic engine failure as the engine was insufficiently lubricated and cooled.

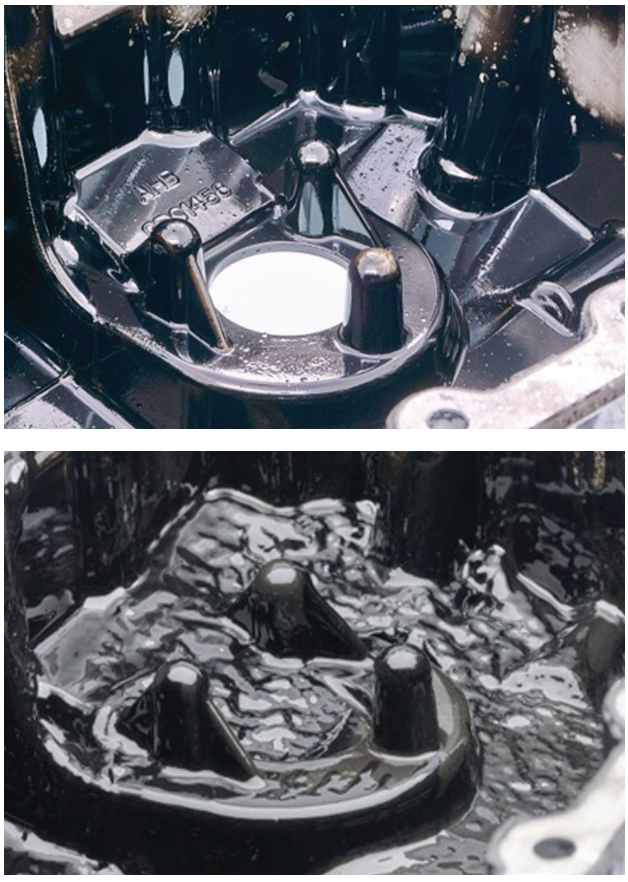

Figure 5: *Illustrates the oil sump condition following engine testing at Lubrizol's test facility. The top image displays the results with OEM-approved engine oil, while the bottom image shows the results with a SFU engine oil. This image is owned and protected by Lubrizol.*

Industry response: improving transparency and compliance

The lubricant industry, including trade associations and OEMs, has recognised the challenges posed by misleading or sub-par SFU claims. A number of initiatives and responses have been put in place or strengthened in recent years to protect the markets integrity:

ATIEL and ACEA compliance measures

ACEA and ATIEL have tightened ACEA sequence claims through mandatory Letters of Conformance [LoC] registered via SAIL. The 2021 ACEA updates include new test requirements, eliminating outdated claims without data validation. Since 2017, ATIEL has intensified random oil sampling and testing to identify lacking formal licensing, ATIEL leverages industry pressure and potential legal actions via bodies like VLS. ATIEL also now has the authority [granted by ACEA and SAIL] to remove LoC registrants from the system in the case of continued and intentional non-compliance.

Role of VLS (UK) and other national bodies

The UK's VLS independently addresses lubricant misrepresentation, testing products and publicly reporting results, driving voluntary compliance or product withdrawal. VLS collaborates closely through a statutory Primary Authority partnership with Bucks & Surrey Trading Standards agreed by the Secretary of State for Business & Trade, escalating severe non-compliance cases for legal enforcement. Similar frameworks are emerging in other European countries, supported by industry associations like UEIL, highlighting collaborative approaches to ensure fair lubricant marketing practices and OEM compliance.

OEM actions

Automakers actively clarify lubricant approvals, some occasionally publishing approved oil lists online (e.g. Mercedes-Benz via their BEVO web platform). Owner manuals explicitly advise using OEM recommended

oils and clearer OEM specification definitions (e.g. BMW Long life codes), is encouraging transparency and strengthening lubricant market integrity.

Additive companies' support

Major additive suppliers heavily invest in developing reliable additive packages meeting stringent tests. They provide comprehensive data packages to lubricant blenders, ensuring adherence to recommended formulations. Additive companies actively support VLS and enforce compliance through rigorous test assurance programs (ATC Codes of Practice, BOI/VGRA guidelines), collectively safeguarding lubricant quality and market credibility.

Overall, the trend is likely toward greater transparency rather than heavy-handed legislation. The industry generally prefers to police itself to avoid external regulation and through organisations like ATIEL, ATC, ACEA and national associations, we are collectively ramping up efforts. The "grey zone" where a dubious product could be sold is shrinking as information flows more freely, but there remains the critical piece of the puzzle: educating the users and the market to make more informed choices.

Educating lubricant users: bridging the knowledge gap

Even the best specifications and oversight mean little if the people choosing and changing oils are not aware of their significance. Education is key at multiple levels: from large fleet maintenance managers to the mechanic at the local garage and ultimately down to the individual consumer who might buy a litre of top-up oil at a service station. A technically knowledgeable audience may know the difference between a fully approved oil and an SFU claim, but many end users do not. Thus, a concerted effort is needed to convey why it matters.

For professional mechanics, wholesalers and service centres, training and information can be provided through industry channels. Many OEMs include oil selection as part of their certified training for dealership technicians. They emphasise using the specified oil grade and specification and warn of consequences of deviating. Independent workshops however more often do not have direct OEM guidance, so industry associations and oil suppliers step in: for example, the UKLA's VLS has produced guidance leaflets like "How to buy the right oil for your vehicle," decoding the letters on oil packs and highlighting the importance of correct oil choice. These materials help mechanics and consumers alike to understand that an ACEA code or OEM spec on a bottle is not just jargon but a quality indicator. VLS's consumer leaflet explains how their work ensures lubricant product claims are valid, so motorists can make an informed purchase. Similarly, major oil companies often print educational info on their websites or even on the product labels – explaining that "meets specification X" means the oil should only be used if it matches the car's requirements and urging users to check their owner's manual. The goal is to instil a habit: always use an oil that at least claims the specification your engine needs, and preferably one that is approved or from a reputable brand.

Figure 6: *The image illustrates a comparison between pistons from an engine testing conducted at Lubrizol's test facility. The front piston is from an engine tested with a SFU engine oil, which failed at 23 hours, while the rear piston is from an engine using an OEM-approved engine oil, successfully completing the full test at 96 hours. Image owned and protected by Lubrizol.*

The lubricant industries shared responsibility and the pathway forward in lubricant quality

The comparison between "Suitable for Use" and OEM approved engine oils ultimately highlights the importance of accountability and verification in lubricant quality. While an SFU oil and an approved oil might look identical on a shelf and even share similar labelled specifications, the difference lies in the evidence behind those claims. As we've seen, an OEM approved or officially compliant oil comes with the assurance that it has been through defined tests and checks, essentially a proven track record on a test bench, whereas an SFU oil asks the user for trust. In a critical machine like an engine, trust is good, but proof of performance is better.

Ensuring that every engine receives oil that truly meets its needs is a shared responsibility. OEMs must continue to define clear and relevant specifications, adapting them as technology evolves and make approval pathways accessible and transparent. Oil companies and additive manufacturers carry the responsibility to formulate correctly and validate their products rigorously and to honestly communicate what their oils can and cannot do. Industry organisations (ACEA, ATIEL, UKLA VLS, etc.) have the task of upholding the integrity of the market, through codes of practice, monitoring and if needed, calling out non-compliance. Regulators and legal bodies should support these efforts and be prepared to act against wilful violators, to create a deterrent for those who might cut corners. Finally, end-users (whether a professional mechanic or an everyday car owner) also play a role: by staying informed and choosing quality oils, they not only protect their own equipment but also send a market signal that there is no place for sub-standard products.

The good news is that the lubricant industry is largely on the right track. The fact that non-compliance is being detected and addressed is a positive sign; it shows the system, imperfect as it is, has checks and balances. Moving forward, we can expect even more robust validation processes, possibly blending industry self-regulation with smarter oversight. Clearer communication will be key: terms like "suitable for use" should either be backed by data or phased out in favour of precise language about approvals and performance levels. A truly collaborative approach, where OEMs, lubricant companies and independent experts work together, will ensure that lubricant quality keeps pace with engine innovation and environmental demands and above all consumer expectations.

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