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Lubricant additive packages remove the guesswork

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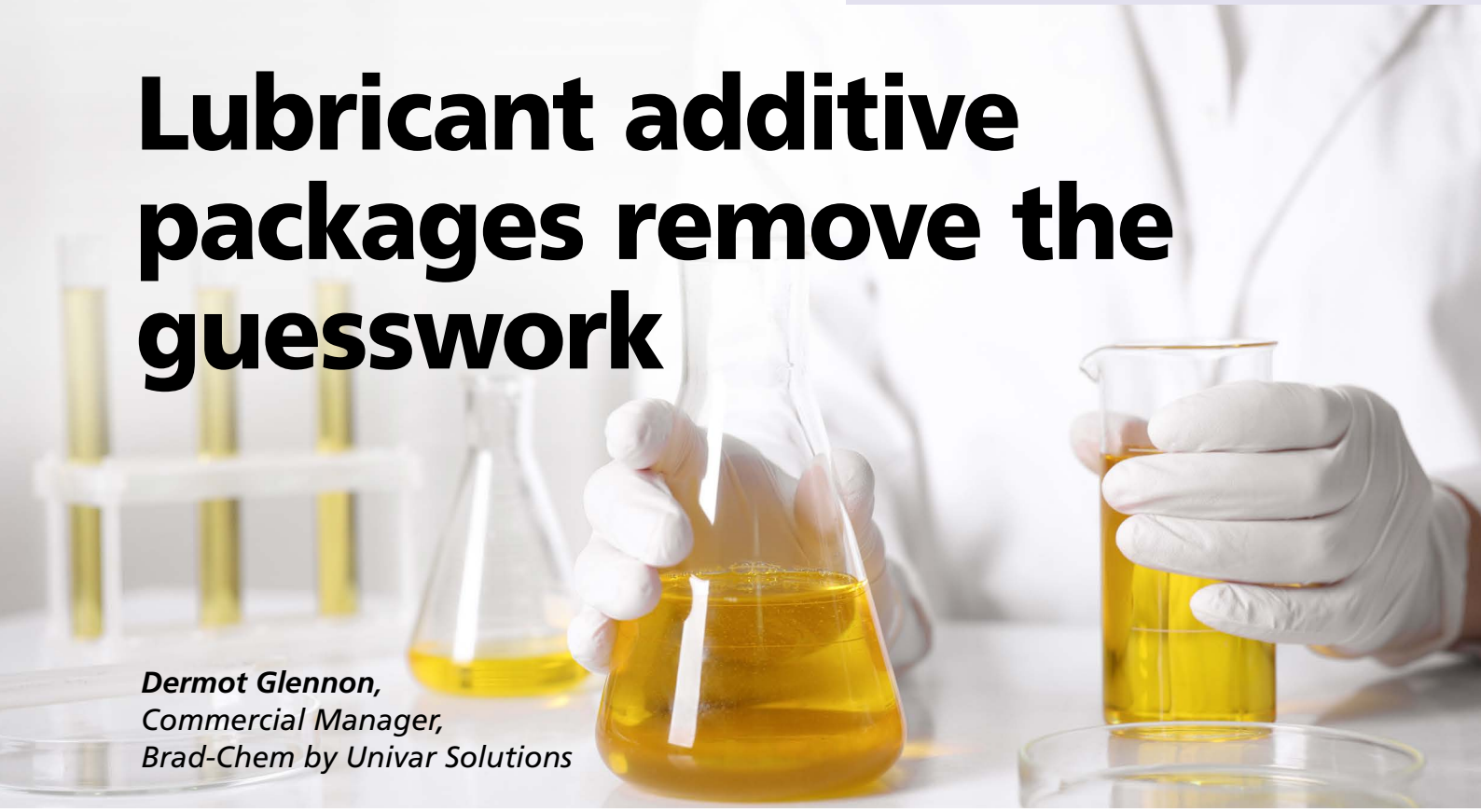
Lubricant additive packages remove the guesswork



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Over the last two decades the UK lubricant industry has evolved dramatically. Consolidation has reduced the number of active blenders, while performance expectations and regulatory requirements have become more complex and demanding across both automotive and industrial applications. As a result, formulation teams are now expected to meet a wider range of standards and certifications without sacrificing consistency or production efficiency.

As customer requirements have become more specialised, many UK blenders have diversified their product portfolios to cover both automotive and industrial segments. Today, a typical blender may supply both automotive and industrial markets, alongside complementary products such as engine coolants. Grease manufacturing remains largely the focus of dedicated specialists due to the equipment required, while metalworking fluids come from a mix of specialist producers and divisions within larger lubricant companies.

Automotive lubricants: Meeting standards efficiently

Automotive lubricants, such as engine oils, gear oils, and automatic transmission fluids, must comply with international standards and OEM specifications. Consider a modern engine oil; it may contain more than a dozen additives, each performing a critical role, from preventing wear in cold starts to resisting oxidation in high temperature highway driving. These may include requirements from Association des Constructeurs Européens d'Automobiles (ACEA), Society of Automotive Engineers (SAE), American Petroleum Institute (API), and major OEMs such as BMW, Mercedes-Benz, and VW.

Complete additive packages help simplify the process by allowing blenders to meet targeted performance levels using balanced formulations and provide a suite of industry approvals when used in combination with recommended base oils.

Automotive engine oil that is formulated from individual additives proves to be complex. Overall

performance can be affected by certain components in the formulation that interact or compete with others. Cascade additive packages can help manage additive interactions across a range of treat rates and targeted performance levels, while viscosity modifiers ensure compliance with SAE grades.

Antifreeze and engine coolant formulations must also meet standards such as ASTM D3306 or BS 6580. Super-concentrate additive packages offer a simplified approach by enabling compliance with multiple standards when blended with a suitable glycol.

Industrial lubricants: Application-driven requirements

Industrial lubricant requirements vary widely depending on application. For example, hydraulic fluids may require HL corrosion protection, HLP anti-wear performance, HVLP high viscosity index behaviour, or specialised options, such as HEES biodegradable formulations or HFDU fire-resistant fluids.

OEM specifications are generally less common in the industrial segment than in automotive and tend to be equipment specific where they exist. Certain applications require certifications including NSF H1, EU Ecolabel, Halal, or Kosher. Achieving NSF H1 certification, for instance, requires both compliant base oils and HX 1 approved additives blended in ratios that still deliver the intended performance.

Base oil choice also plays a major role. Mineral oils may achieve around 1,000 hours of compressor lubricant performance, while PAO-based formulations can exceed 8,000 hours, and synthetic esters may surpass 10,000 hours. Additives can behave quite differently in mineral versus synthetic base stocks, often requiring adjustments to treat rates. A well-designed additive package builds on the natural strengths of the selected base oil.

Additives such as extreme pressure agents, anti-wear components, and metal deactivators must be balanced thoughtfully so improving one property

Figure 1: *Kinematic viscosity characterisation of lubricants.*

doesn't compromise another. Metal deactivators not only protect yellow metals directly but also help stabilise the lubricant by reducing transition metal ions in solution.

Adapting to regulatory change

Recent regulatory changes in the UK, Europe, and parts of Asia continue to drive reformulation activity, particularly where longstanding additives face new restrictions. Blenders increasingly require new additive packages as food production standards improve and as existing additives acquire stronger hazard labelling.

To maintain product performance while reducing hazard classifications, formulators are increasingly seeking additive packages with the lowest feasible environmental and human health risk profiles. However, predicting which additives may face future restrictions remains challenging. This is prompting suppliers to develop multiple new package options to safeguard against unexpected regulatory outcomes.

Grease and metalworking fluids: Specialised needs

Grease manufacturers combine a blend of base oils, thickeners, and additives to achieve their desired performance characteristics. While non-soap thickeners are gaining traction in the industry globally, lithium and lithium complex greases remain a relevant technology for manufacturers. Additive compatibility varies widely between grease types; therefore, tailored additive packages can simplify development and help ensure reliable performance.

Metalworking fluid producers typically rely more heavily on individual components than on additive packages. Formulations must balance machining requirements, metallurgy, corrosion behaviour, pH management, and biostability considerations. As regulatory pressures increase on substances such as chlorinated paraffins and certain biocides, many formulators are turning to sulphur-based EP additives and alternative biostability solutions.

In practice, higher active sulphur levels tend to introduce new challenges, particularly around yellow metal corrosion, which requires additional copper passivation during reformulation. The need for more yellow metals corrosion protection is a consequence of changing to sulphur-based EP, and formulators will need to find ways to add more of the copper passivator/metal deactivator. Shifts toward more sustainable base stocks may also require reformulation due to reduced additive solubility.

Delivering on excellence and performance with chemistry

In the lubricants industry, product development is continuously being shaped by standards that are expanded and regulatory pressures, which in turn forces decisions around formulation to be determined earlier in the development cycle. Lubricant and grease formulations overall benefit from additive packages bringing consistency and efficiency to the formulator, however, metalworking fluids do remain as an exception to this. By simplifying formulation work, delivering balanced chemistry, and supporting reliable performance, these packages enable blenders to confidently meet the demands of modern applications and future industry challenges.

Behind every modern lubricant is a complex balance of formulation chemistry, testing, and performance validation. An effective additive package can enhance the inherent advantages of the selected base oil. For many blenders, the primary value of additive packages lies less in innovation alone and more in reducing formulation risk as performance requirements and regulations continue to tighten. As performance demands rise and regulations evolve, additive packages will remain essential tools, helping blenders innovate, adapt, and deliver lubricants that keep the industry moving forward.

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