Lubricant Solutions for the Aerospace Industry
We concentrate solely on high-quality lubricants and related specialties.

We develop innovative and holistic solutions for a wide variety of applications.

We value the high level of commitment of our employees and their trusting interaction with one another.
Facts and figures

**Company:** FUCHS SCHMIERSTOFFE GMBH, a company of the FUCHS Group

**Headquarters:** Mannheim

**Product range:** A full range of more than 2,000 products and 6,000 articles

**Certifications:** ISO/TS 16949, ISO 14001, BS OHSAS 18001, ISO 50001

**References:** Leading lubricant OEM for the German automotive industry

FUCHS has developed, produced and sold high-quality lubricants and related specialties for more than 85 years – for virtually all areas of application and sectors. With over 100,000 customers and 57 companies worldwide, the FUCHS Group is the leading independent supplier of lubricants.

A team of more than 800 specialists across Germany works to guarantee the satisfaction of our customers. Whatever their requirements, we have the ideal lubricant for their specific applications and processes. In our technology center we link interdisciplinary expertise in a quick and efficient way – and work on innovative lubricant solutions to meet the demands of today and tomorrow every single day.

FUCHS lubricants stand for performance and sustainability, for safety and reliability, for efficiency and cost savings. They represent a promise: technology that pays off.
Quality precision machining of aerospace components requires high performance specialist coolants. At FUCHS, we understand the unique challenges of aerospace machining and dedicate our expertise to ensuring our cutting fluids deliver competitive advantage to your production.

We research, develop and manufacture bespoke machining fluids – technology that is approved for use by leading manufacturers and available globally via the FUCHS organisation.
**Structures**

Materials used in the manufacture of ribs, stringers, spars and bulkheads are becoming more exotic. Utilised for their strength to weight ratio, these materials create unique demands on the cutting fluids, which FUCHS’ technology addresses head on.

FUCHS is able to offer specialist cutting fluid solutions providing optimum efficiency, from the initial bulk metal removal through to the high speed machining of thin wall components.

**Engines**

Aerospace engine machining requires unsurpassed accuracy, precision and quality. Through many years of partnership with leading global engine producers, we are able to supply innovative coolant solutions for all key components and substrates in the modern jet engine.

Turbine blade grinding, blisk milling and super-finishing are just some of the applications for which FUCHS can provide specialist coolant technology.

**Landing gear**

Modern landing gear uses high strength sophisticated materials (such as Ti 5-5-5-3) in its manufacture. These are increasingly difficult to machine and create unique demands on the coolant.

Only by working with OEM manufacturers, machine tool builders and tooling suppliers is FUCHS able to understand the full parameters of the operation and to develop build coolants capable of matching the production demands of the customer.

**Composite materials**

In the aerospace industry the use of composites is becoming ever more important, with a large number of secondary structures in aircraft airframes made of composites. The latest progression in the industry is in developing new aircraft in which a large structural percentage is built out of these materials.

Durability and maintainability are key advantages, and composites often outperform their metal counterparts. The demand for coolant is limited, but compatibility with materials and resins, tool life and accuracy/repeatability are just some of the key factors addressed by FUCHS’ technology.
INNOVATION AND TECHNOLOGICAL LEADERSHIP FOR LUBRICANTS

We engage in application-oriented development directly at and in cooperation with the customer with the aim of adapting lubricants optimally to the process and machine-related requirements. In addition, great emphasis is placed on basis research in the FUCHS Group.

Our ultra-modern Technology Center at the headquarters in Mannheim coordinates the international network of experts, brings together expertise and supports knowledge transfer on global requirements.
Super difficult metals
Technology designed to assist with high metal removal rate whilst maximising tool life. Specifically designed for titanium and nickel based alloys.

High pressure coolants
Technology designed to withstand the pressures of high velocity coolant delivery. Designed to offer maximum tool life, suitable chip evacuation and machining accuracy on a wide range of difficult-to-machine substrates.

Features of our products

<table>
<thead>
<tr>
<th>Product</th>
<th>Boron</th>
<th>Formaldehyde release Biocide</th>
<th>Emulsion / synthetic</th>
<th>Nickel based- and titanium alloys</th>
<th>Aluminium alloys</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECOCOOL TN 2525 HP-BFH</td>
<td>free</td>
<td>free</td>
<td>Emulsion</td>
<td>+++</td>
<td>++</td>
</tr>
<tr>
<td>ECOCOOL R-TN 2525 HP-RR</td>
<td>yes</td>
<td>free</td>
<td>Emulsion</td>
<td>+++</td>
<td>++</td>
</tr>
<tr>
<td>ECOCOOL S-AERO G</td>
<td>free</td>
<td>free</td>
<td>Synthetic</td>
<td>++</td>
<td>+++</td>
</tr>
<tr>
<td>ECOCOOL PHH-AL</td>
<td>free</td>
<td>free</td>
<td>Emulsion</td>
<td>++</td>
<td>+++</td>
</tr>
<tr>
<td>ECOCOOL S 761 B</td>
<td>yes</td>
<td>free</td>
<td>Emulsion</td>
<td>+++</td>
<td>++</td>
</tr>
<tr>
<td>ECOCOOL GLOBAL 10 PLUS</td>
<td>free</td>
<td>free</td>
<td>Emulsion</td>
<td>+++</td>
<td>+++</td>
</tr>
</tbody>
</table>

+ suitable  ++ good suitable +++ especially recommended

OEM approved
FUCHS’ coolant technology is approved by leading manufacturers globally including Boeing, Airbus, Rolls Royce and Pratt & Whitney, providing subcontractors with reassurance of quality and validity.

MQL
FUCHS’ product range includes minimum quantity lubricants for spray systems. Approved by aero manufacturers and equipment manufacturers.
OUR LUBRICANT SOLUTIONS TO THE SPECIFIC REQUIREMENTS OF AEROSPACE MANUFACTURING

Structural solutions: wing rib, engine mount, flap track, wing spar
Engine solutions: front case, engine case, blisk, hub
Landing gear solutions: slider, truck beam, links and braces
## Structural solutions

<table>
<thead>
<tr>
<th>Wing rib</th>
<th>Flap track</th>
<th>Engine mount</th>
<th>Wing spar</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Material</strong></td>
<td>7010 aluminium alloy</td>
<td>Titanium alloy</td>
<td>7010 aluminium alloy</td>
</tr>
<tr>
<td><strong>Operation</strong></td>
<td>Rough milling with solid carbide endmill</td>
<td>Helical side milling, roughing</td>
<td>Drilling</td>
</tr>
<tr>
<td><strong>Criterion</strong></td>
<td>Surface finish, metal removal rate</td>
<td>Metal removal rate</td>
<td>Application security and productivity</td>
</tr>
<tr>
<td><strong>Concentration</strong></td>
<td>5–10%</td>
<td>5–10%</td>
<td>5–10%</td>
</tr>
<tr>
<td><strong>Expected results</strong></td>
<td>Non-staining, increased tool life</td>
<td>Reduced cycle time, improved tool life</td>
<td>Reduced cycle time, improved tool life</td>
</tr>
</tbody>
</table>
### Engine solutions

<table>
<thead>
<tr>
<th>Engine case</th>
<th>Material</th>
<th>Operation</th>
<th>Criterion</th>
<th>Recommendations</th>
<th>Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Front case</td>
<td>Inconel 718, Waspaloy</td>
<td>Rough turning and finish top profile</td>
<td>Surface finish and dimensions</td>
<td>ECOCOOL TN 2525 HP-BFH ECOCOOL R-TN 2525 HP-RR ECOCOOL GLOBAL 10 PLUS</td>
<td>5–10%</td>
</tr>
<tr>
<td>Engine case</td>
<td>Ti 6Al/4V</td>
<td>Rough milling</td>
<td>Metal removal</td>
<td>ECOCOOL TN 2525 HP-BFH ECOCOOL R-TN 2525 HP-RR ECOCOOL S 761 B ECOCOOL GLOBAL 10 PLUS</td>
<td>5–10%</td>
</tr>
<tr>
<td>Blisk</td>
<td>Inconel 718 aged and hardened 48 HRc</td>
<td>End milling, slotting</td>
<td>Surface finish</td>
<td>ECOCOOL TN 2525 HP-BFH ECOCOOL R-TN 2525 HP-RR ECOCOOL GLOBAL 10 PLUS</td>
<td>5–10%</td>
</tr>
<tr>
<td>Hub</td>
<td>Inconel 718 forged</td>
<td>Rough turn internal features</td>
<td>Reduce cycle time</td>
<td>ECOCOOL TN 2525 HP-BFH ECOCOOL R-TN 2525 HP-RR ECOCOOL GLOBAL 10 PLUS</td>
<td>5–10%</td>
</tr>
</tbody>
</table>

Expected results:
- Fine finish, increased tool life
- Increased tool life
- Non-staining, increased tool life
- Reduced cycle time, improved tool life
## Landing gear solutions

<table>
<thead>
<tr>
<th>Slide</th>
<th>Truck beam</th>
<th>Links &amp; braces</th>
<th>Links &amp; braces</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Material</strong></td>
<td>Ti 6Al 4V (Ti 6-4)</td>
<td>Ti 5Al 5Mo 5Cr (Ti 5-5-5-3)</td>
<td>Ti 6Al 4V (Ti 6-4)</td>
</tr>
<tr>
<td><strong>Operation</strong></td>
<td>Slotting</td>
<td>Rough milling by plunge contouring</td>
<td>3D milling, roughing</td>
</tr>
<tr>
<td><strong>Criterion</strong></td>
<td>Metal removal rate, tool life</td>
<td>Metal removal rate, tool life</td>
<td>Metal removal rate, tool life</td>
</tr>
<tr>
<td><strong>Concentration</strong></td>
<td>5 – 10%</td>
<td>5 – 10%</td>
<td>5 – 10%</td>
</tr>
<tr>
<td><strong>Expected results</strong></td>
<td>Increased metal removal rate vs tool life</td>
<td>Increased metal removal rate vs tool life</td>
<td>Increased metal removal rate vs tool life</td>
</tr>
</tbody>
</table>
Global team
Research and development, as well as product knowledge, are shared amongst our dedicated aerospace specialists across the FUCHS network. Customers, regardless of location, can be reassured by access to a global knowledge and resource base. You will also benefit from the support of expert engineers and metallurgists in the field of aerospace machining to ensure accurate product recommendations.

Coolant technology needs to adapt to the demands of the global industry. Our specialist team ensure that FUCHS’ technology is functional, with modern machining techniques and processes, whilst being accepted and approved by leading OEMs.

FUCHS range
The FUCHS range of aerospace cutting fluids has expanded rapidly to encompass the technologies needed for efficient and cost effective aerospace machining. The key to aerospace machining is the optimisation of cutting-edge geometry and coolant technology to the substrate being machined.

Our local engineers are trained to offer expert advice on coolant technology – helping to reduce cycle times, minimise negative outputs and maximise tool life and process efficiency.

Advanced manufacturing research centre (AMRC)
The University of Sheffield Advanced Manufacturing Research Centre (AMRC) with Boeing is a world class centre for advanced machining and materials research for the aerospace industry. FUCHS is a proud partner of this facility and supports advanced machining initiatives, with research and development into the optimisation of the coolant performance in new and extreme machining conditions.

FUCHS uses such research to help customers ensure that all possibilities are explored and that the most practical and advantageous formulations are brought to market immediately.

Machining innovations network (MIN)
Top priority of the Machining Innovation Network is to support its members with the initiation of joint development projects and to sharpen the competitive edge by offering additional services. The partners of the Machining Innovations Network work together to realize innovative products and methods.

The first leading topics have already been defined. These are to be expanded with additional issues and substantiated with new projects in the working groups of the association. FUCHS is member of this Aerospace network, too.
Our support tools

Research and development are key factors in the success
Over 400 FUCHS engineers and scientists engaged in
research and development around the globe develop
new products and help our customers solve their problems.
They guarantee our technical advantage.

The most important facility for R&D is the new Technology
Centre in Mannheim, Germany. Opened in 2012, it provides
state-of-the-art test rigs, lab equipment and test machines.
The laboratory facilities secure the measurements of over
350,000 samples per year. With this Technology Centre and
the worldwide FUCHS R&D network we are in the position
to guarantee the latest technical trends and perfect techni-
cal support for tailor-made solutions.

Service
We have an experienced team of support engineers who
can provide expert assistance in fluid equipment manage-
ment. We can offer advice on all types of fluid handling
including storage, distribution, collection, recycling and
waste disposal.

We can supply “off the shelf” solutions to basic fluid hand-
ling projects but, through the FUCHS knowledge base, we
can also design, manufacture and install turnkey solutions
to each customer’s specific requirement.

Chemical Process Management (CPM)
To obtain maximum efficiency from coolant technology, it is essential to ensure the fluid remains in good health. FUCHS’ Chemical
Process Management service is a complete lubricant management programme encompassing coolant “health checks”. Regular
condition monitoring, sampling and maintenance advice are provided to customers to ensure maximum productivity. This service tool
is currently utilised by many leading aerospace manufacturers.
HOLISTIC SOLUTIONS TO THE AEROSPACE INDUSTRIES

Premium quality water miscible coolant solutions are just part of the FUCHS portfolio. FUCHS offers customers a full line supply service for all coolant and lubricant demands.

Included within our metalworking fluid portfolio are innovative solutions to meet the highly sophisticated demands of the aerospace industry, designed with the expertise of our aerospace group and approved by leading manufacturers. To support this, FUCHS carries a full range of lubricants suitable for aerospace applications.
Minimum quantity lubrication (MQL)
MQL was developed by the American aerospace industry and is the process of applying very small quantities of high lubricity oil, mixed with air, at the point of precise contact between the tool and the workpiece. The benefits of such technology can be extensive, especially with a fluid optimised for the operation. The FUCHS range of MQL products, including the aerospace approved ECOCUT MIKRO PLUS 20, can help to deliver the advantages of minimal fluid usage, minimal waste creation, dry swarf for recycling and reduced cycle times.

Electro-discharge machining (EDM)
Used predominantly in engine manufacture, this technique is often applied for fine finishing applications. FUCHS has a range of approved fluids for such applications, designed to offer users assurances over safety in production and accurate machining results.

Full line supplier
According to the Institution of Mechanical Engineers, 80% of all machine lubrication failures are due to incorrect lubrication. FUCHS, through expert lubrication and application knowledge as well as an unsurpassed range of machine lubricants and ancillary products, is able to provide assurances of reliability and performance for your company’s primary assets.

Broaching
The Broaching process of aerospace materials creates high demand from the performance of the cutting fluid. In addition, the correct selection of EP additives is important to achieve the necessary surface finish and required tool life. The use of a suitable cutting oil is particularly important for the very difficult-to-machine such as Inconel, Hastelloy and high-alloy steels which are used in the aerospace industry.
Innovative lubricants need experienced application engineers

Every lubricant change should be preceded by expert consultation on the application in question. Only then the best lubricant system can be selected. Experienced FUCHS engineers will be glad to advise on products for the application in question and also on our full range of lubricants.

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