Whitepaper

THREE BUILDING BLOCKS OF SUSTAINABLE AND PRODUCTIVE METALWORKING OPERATIONS

IT'S MORE THAN JUST OIL. IT'S LIQUID ENGINEERING.®

Castrol®

HOW CAN METALWORKING MANUFACTURERS INCREASE THEIR PRODUCTIVITY WHILE SIMULTANEOUSLY REDUCING ENERGY CONSUMPTION AND SAVING RESOURCES

New generation products and equipment solutions can make a valuable difference including long lasting, bio stable cutting fluids, recyclable parts cleaning fluids and real-time metalworking fluid condition monitoring. With these three building blocks, metalworking manufactures can work more productively and in a more environmentally friendly and cost-effective manner.

> In the drive to optimize production in metalworking operations, output and efficiency have long been the key focus areas.

INTRODUCTION

Metalworking is one of the key operations for many of the manufacturing industries, that have traditionally played a major role in the economy of Europe. These include the automotive, aviation and machine manufacturing industries. Manufacturing plays an important role in industrial value creation. This includes the specialist suppliers for tools and operating materials, such as lubricants and cutting fluids.

EVER FASTER, EVER MORE EFFICIENT

In the drive to optimize production in metalworking operations, output and efficiency have long been the key focus areas. Machine outputs have risen, through the reduction of downtime (e.g., for tool and lubricant changes), the adoption of processes such as high-speed cutting (HSC) to reduced cycle times and automation (handling, feeding, post-processing) is rigorously applied wherever possible.

Whilst these areas remain important today, the context in which metalworking companies operate, is fundamentally changing and they are also facing new customer requirements and challenges.

> Companies are taking more responsibility for the protection of the environment through measures such as reducing emissions and resource consumption.

DIGITALIZATION TREND

Digitalization is significantly changing the future of production. With the tools of Industry 4.0, small-scale production batches can be produced far more economically. A “digital twin” accompanies manufactured components throughout their entire production cycle. End-to-end, IT-supported information now flows from order management, to production planning, production machines and plant management, bring greater transparency and efficiency to the processes. Also, the step change in the methods of condition monitoring and predictive maintenance has enable more effective maintenance and a reduction in machine downtime. The use of artificial intelligence will continue to grow and will significantly amplify the impact of digitalization in the metalworking sector.

INCREASED FOCUS ON SUSTAINABILITY

Metalworking manufacturers are placing a far greater focus on sustainability. The main drivers behind this are:

- Companies are taking more responsibility for the protection of the environment through measures such as reducing emissions and resource consumption.
- Legislators are supporting this trend through stricter emissions limits and the banning of substances that are harmful to human health and the environment.

The reduction of energy and resource consumption also saves costs and enhances a company’s competitiveness. This also applies to the reduction of operating material waste, such as cutting and cleaner fluids.

THE CHALLENGE: STRIKING A BALANCE

From the perspective of metalworking manufacturers, usually medium-sized companies with limited resources, it is already a challenge to optimize manufacturing processes to be more sustainable. In addition, some of the other challenges they face are:

- Increasingly fierce international competition and the associated pressure to continuously reduce costs.
- Major changes in important target markets, particularly in the automotive industry were the move away from the combustion engine has reduced the demand for many machined components[1].

Metalworking manufactures are under pressure from numerous fronts and must master these challenges to stay viable in the future.

[1] Effect of vehicle electrification on the German mechanical engineering sector. Study by Porsche Consulting, 2019 (link can be provided if desired)

THE ROLE OF LUBRICANT PRODUCERS

Manufacturing companies cannot overcome all these challenges entirely on their own. Suppliers and partners must be involved in the effort. Castrol, as a leading manufacturer of metalworking and component cleaning fluids, has developed several innovative solutions, to help address some of these challenges.

A key objective at the forefront of these solutions, is to reduce the resource consumption of machining, without compromising productivity, product quality and cost-efficiency. Solutions are also ideal when they simultaneously address several company objectives like increased productivity, reduced costs, reduced resource consumption and reduced waste volumes.

Castrol has developed three innovative solutions that are introduced here.

SUSTAINABLE CUTTING FLUIDS: CASTROL ALUSOL AND HYSOL XBB

Castrol HYSOL XBB

Castrol ALUSOL XBB

Cutting fluids are a key process medium across the entire metalworking industry. Their main function is to dissipate the heat generated during the machining process. This task is becoming increasingly important as there is pressure to reduce cycle times, resulting in higher cutting speeds and heavier machining processes. Without effective heat dissipation, component quality and tool life are adversely affected.

In view of these demanding requirements, Castrol has developed the innovative, technologically advanced soluble XBB cutting fluid range, available for both aluminum machining (Alusol XBB) and cast-iron and steel machining (Hysol XBB).

> The longer the service life of a cutting fluid, the lower the volume of fluid that needs to be disposed of and replaced.

DEVELOPMENT OBJECTIVE: SUSTAINABLE SOLUTION

The key motivator for this new development was to create a truly sustainable solution. One of the main factors is the service life of the cutting fluid. The longer the service life of a cutting fluid, the lower the volume of fluid that needs to be disposed of and replaced. This not only protects the environment by reducing waste volumes but also conserves resources. This reduces costs and enhances the competitiveness of the metalworking operation.

How is this achieved? In practice, microbial activity leads to the reduced effectiveness of the cutting fluid. The formulation of the XBB technology was selected to ensure that the pH value remains stable over a longer time. Alusol and Hysol XBB can also neutralize more acidic components than standard cutting fluids, so they can be used effectively for longer.

The more stable pH value also enables the end user to reduce the use of high-cost additives, in particular biocides, resulting in long-term cost and HSSE benefits. Machine operators and maintenance technicians also benefit from greater health protection and the potential exposure to harmful biocides. All the cutting fluids - in the XBB range, comply with all applicable regulations and are free of boron and formaldehyde.

UP TO 45% LOWER REPLENISHMENT VOLUMES

Experience has shown that the use of the technologically advanced Castrol Alusol and Hysol XBB products, enables coolant replenishment rates to be reduced by up to 45%. This is achieved because the machining fluid condition and pH levels remaining stable over a longer period, compared with conventional products. Machining output remains consistently high for longer and the coolant also effectively protects against corrosion because of its stable pH, reducing maintenance costs for the machine tools.

INDUSTRIAL PROCESS CLEANER FOR THE CIRCULAR ECONOMY: CASTROL TECHNICLEAN XBC

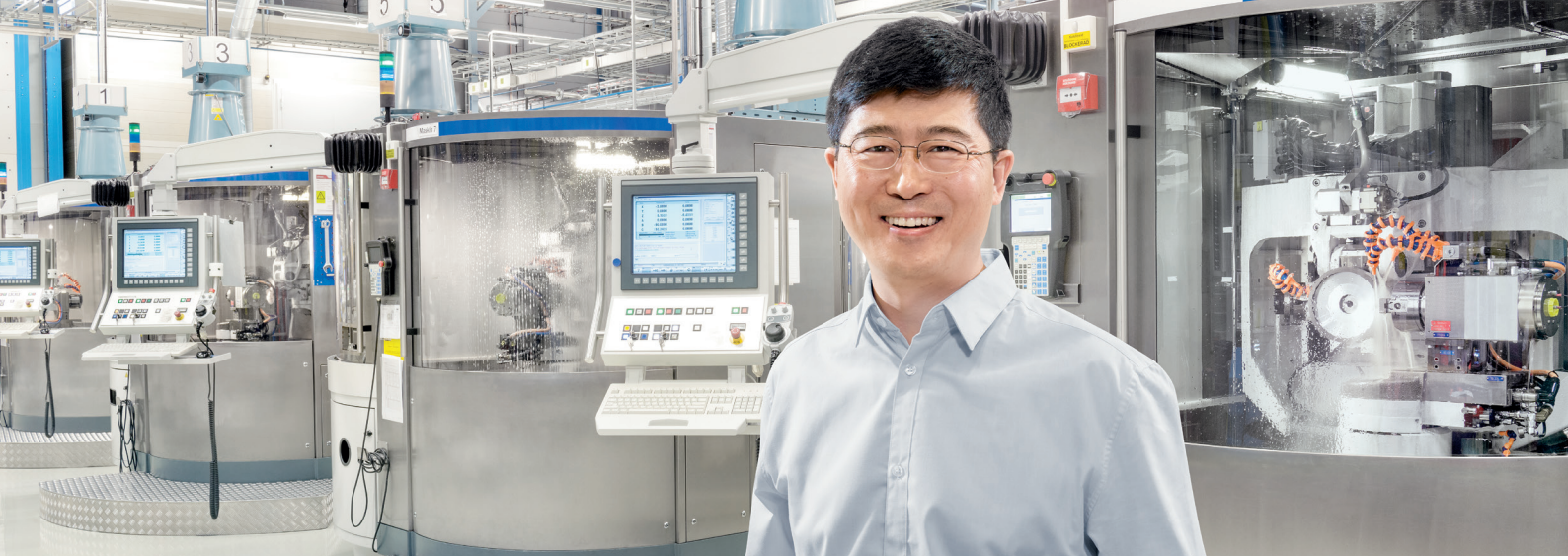
Castrol has also recently introduced the new Techniclean XBC product range of industrial cleaners. In addition to offering a long bath life these cleaners can also be recycled, further contributing to the circular economy.

HOLISTIC APPROACH: THE USED CLEANER IS RECYCLED INTO THE CUTTING FLUID

Through the use of innovative, compatible chemistry, used Techniclean XBC can be recycled back into Castrol's XBB cutting fluids, without compromising machining performance.

This holistic approach of recycling the used cleaner solution into a compatible cutting fluid enables a significant reduction in water consumption. What would normally have been waste, turns into a reusable resource. This increases not only the sustainability but also lowers the operating costs of both metalworking and component cleaning processes.

The Techniclean XBC product range also enables effective cleaning at lower temperatures, significantly reducing the energy consumption of the cleaning process.



Castrol SMARTCONTROL

EVERYTHING UNDER CONTROL – WITH SMARTCONTROL

The effective digitization of an industrial production process relies on monitoring an increasing number of parameters in order to document and ideally, to take immediate and increasingly automated (e.g. use of AI) corrective actions.

This trend primarily impacts the main production processes, but also applies to auxiliary processes, such as lubricant management. Castrol's SmartControl lubricant monitoring and SmartBlend dosing systems, shows how it's done.

AUTOMATIC LUBRICANT MONITORING OFFERS MANY BENEFITS

These systems enable metalworking fluid central systems to be automatically and consistently monitored and controlled. This ensures that the optimum coolant concentrations are tightly maintained, resulting in a more stable machining process. The benefits include:

- A more consistent & efficient machining process
- Improved product quality consistency
- Reduced coolant consumption
- Reduced human intervention & improved safety

> These systems enable metalworking fluid central systems to be automatically and consistently monitored and controlled.

The key parameters of the metalworking fluid continuously monitored are concentration, pH value, conductivity, temperature and nitrite content (optional). These are captured in real time and displayed on a large TFT display. The data is also recorded and can be transmitted to external control rooms or other locations as needed. The user can also define control limit values for each parameter and receive an alert (via email, text, etc.) if the control values are reached. This ensures that all relevant parameters are always maintained.

FLAWLESS PROCESSES IN 24/7 OPERATION

The SmartControl system is available in two versions: with real-time condition monitoring (Castrol SmartControl) only or additionally with a controller (Castrol SmartBlend) for automating fluid management.

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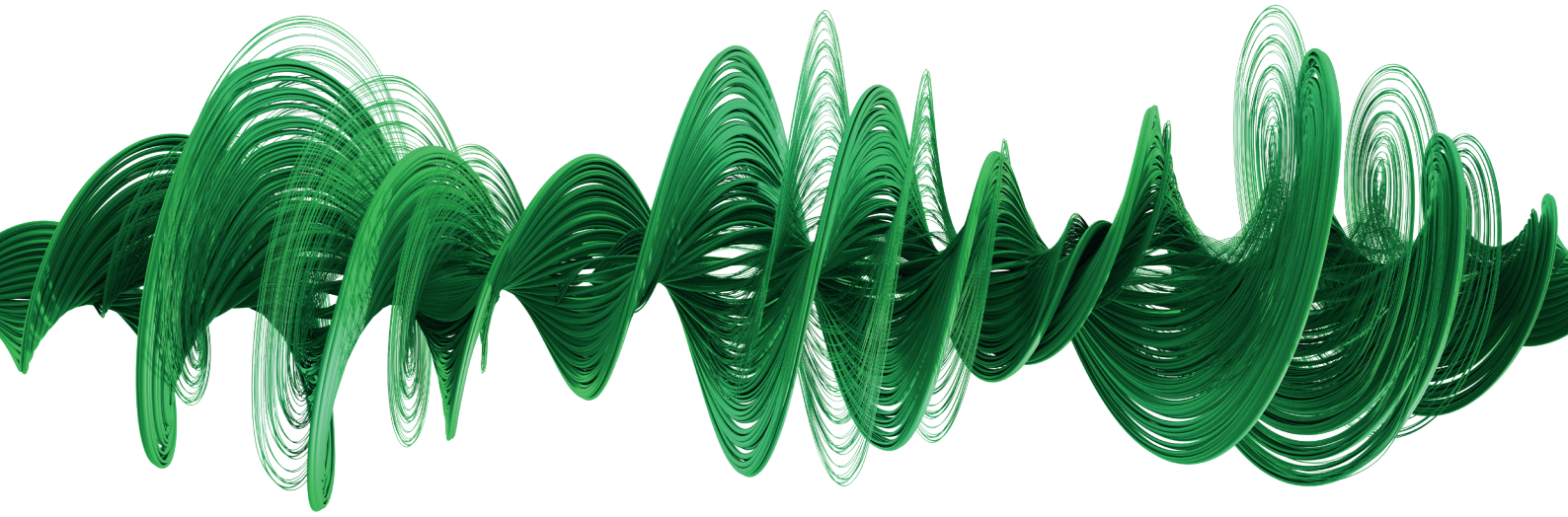

CONCLUSION: THREE BUILDING BLOCKS FOR EFFICIENT AND SUSTAINABLE METALWORKING PROCESSES

With these three building blocks, Castrol offers metalworking manufacturers valuable aids to optimize their production processes. Impacting not only performance parameters, such as output, cycle times, productivity, and process costs but also critical environmental factors, such as resource conservation, waste reduction and recycling. These benefits span the use of cutting fluids, recyclable media used in component cleaning and the continuous monitoring of lubricant quality.

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