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# Synthetic coolants and corrosion – physics or chemistry?

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There are two clear trends in the machining industry: high-pressure applications and smaller tank sizes. This is a challenge for oil-based metalworking fluids, as their emulsifiers, which ensure that oil and water form a stable emulsion, tend to create foam under high pressure – foam that can't degrade in time due to the smaller tank size.

Synthetic coolants seem to be the perfect solution for this issue, as the concentrate dissolves in water, meaning that they don't need emulsifiers. However, especially in Europe, the machining industry is sceptical about this type of coolant, as it is said to cause corrosion and residues. Blaser Swisslube also offers synthetic coolants – Synergy 915 and 735 – two crystal-clear high-performance fluids with zero foam. As chemical experts, we thought that we could prevent residues and corrosion with the right chemical formulation, but also we were faced with some rare instances of corrosion. We therefore took our chemist coat off and looked at the physico-chemical process of oxidation within the machine in detail.

Oxidation is a conversion of metal into metal oxide through an electrolyte such as water. There are only two options to prevent this from happening naturally: with a barrier such as oil or paint, or with chemicals that reduce the reactivity of the surface. But why do we have corrosion in certain machines but not in others? For this, we need to look at the machine in total. There are rotating parts and motors as well as friction along hoses and coated machine parts, which generate static charges and potential differences between machine and ground. This imbalance needs to be equalized, either through proper grounding of the machine, or through the water of the coolant. If the latter happens, then corrosion is the natural consequence.

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