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Tap water

Why the water quality is so important for the functionality of the coolant

Water quality can have a profound influence on the functionality of coolants in the application state. After all, in emulsions the water content is as high as **90%**, while in solutions, the water content is **95%**. For this reason, certain minimum requirements with respect to tap water must be met.

Minimum requirements for tap water

Water components	Metal machining	Metal forming
pH value	Approx. 7	Approx. 7
Conductivity (µS/cm)	Max. 1000—1500	Max. 50—75
Total hardness (°d)	5—20	Max.
Nitrite (ppm)	Max. 5	Max. 5
Nitrate (ppm)	Max. 50	Max. 50
Chloride (ppm)	Max. 250	Max. 50
Germ number (cfu/ml)	Max. 10^2	Max. 10^2

The pH value and total hardness are of particular importance. A pH value of 7 is optimal. In this case, the tap water will act as neutral. pH values of up to 9 are still permissible as long as there are no other reasons not to use this tap water.

Tap water with a pH value < 6 is unacceptable. Water with such a low pH could lower the pH value of the coolant emulsion when freshly applied. This results in reduced corrosion protection.

The pH value is not the only important factor for attaining optimal tap water. The total hardness is also important and is one of the most important application technology parameters.

If the water is too hard, this may cause the hardness components it contains to react with anionic emulsifiers to form poorly soluble compounds — known as lime soaps. This can result in clogged filters and deposits on workpieces and tools.

Tap water that is too weak also has adverse consequences for emulsions, as it promotes the formation of foam.

If your tap water is very soft, we have a range of special products available to use. In the case of extremely low water hardnesses of < 5°d, the addition of a harder mains water, if available, may help. It is possible to induce a change in the alkaline earth content of the tap water by adding a hardener containing Ca2+.

This type of manipulation is only required with fresh applications, as the total hardness of emulsions increases during use. Conversely, we recommend replenishing the volume losses with deionised water when using tap waters with a relatively high total hardness.

As a rule:

The optimum hardness range for tap water is around 5 to 20°d

Nitrite/nitrate and chloride in used emulsions

For used emulsions, the values determined by the German Institute for Occupational Safety and Health (Berufsgenossenschaftlichen Institut für Arbeitssicherheit or BIA) and accepted by the employers' liability insurance association and TRGS 611 apply as follows:

Nitrite = 20 ppm and nitrate = 50 ppm

The basic principle that nitrite and nitrate concentrations should be as low as possible applies for tap water. Drinking water quality meets these demands. According to EC directives, drinking water should be free of nitrite and nitrate content < 5 ppm.

In addition, we recommend that you ensure a low chloride content in tap water. Too high a value has a negative impact on the corrosion protection behaviour of water-miscible coolants.

Germs are harmful, as is too high an electrolyte content

There should be no microbial loads in tap water. The requirements can be equated to those that apply to the quality of drinking water.

An appropriate value is a maximum of 99 colony-forming units per millilitre (cfu/ml).

We also recommend that you check the electrical conductivity of the tap water. This provides information on the electrolyte content of the tap water. This is important, because too high a value has a destabilising effect on emulsions. Even if no exact limit value can be set due to different influences, the following approximate maximum values form a good benchmark:

— In metal machining applications: < 1000 to 1500 µs/cm

— In metal forming applications: < 50 to 75 µS/cm

An easy way to determine the quality of tap water

The composition of the tap water is an important criterion when selecting a water-miscible coolant. As mains water is often used to mix the coolant concentrates, the exact values can be obtained from the relevant local water supplier.

The most important parameters can be measured with sufficient accuracy using a test strip. Anyone using a pocket potentiometer can also determine the pH value and conductivity of the tap water with almost laboratory accuracy.

The following table lists the characteristic water components and the (on-site) processing methods selected as examples.

Water component	Detection method (e.g.)
pH value	Via potentiometer
Conductivity [µS/cm]	Via potentiometer
Total hardness [°d]	Merckoquant 10046
Nitrite [ppm]	Merckoquant 10007
Nitrate [ppm]	Merckoquant 1.10020
Chloride [ppm]	Laboratory procedures (ion-selective electrode)
Germ counts [cfu/ml]	Laboratory procedures (“dip slides”)

When is it useful to take advantage of the assistance offered by a laboratory?

This is a question we are often asked. Our answer is that any potential microbial load of the tap water should always be checked in the laboratory to make absolutely certain. The same applies for the quantitative detection of existing chloride ions.

If you have any questions, please talk to our experts in application technology. They will be happy to help you on the topic of tap water.

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