AQUATENSID BW-FF

WATERBASED POLYMER CONCENTRATE FOR INDUCTION HARDENING AND TANK QUENCHING OF STEEL AND CAST IRON WITH QUENCHING CHARACTERISTIC BETWEEN WATER AND OIL

PETROFER
industrial oils and chemicals

DESCRIPTION

AQUATENSID BW-FF is a water dilutable polymer formulation to be used for the quenching of steels and alloys in various processes as detailed below. AQUATENSID BW-FF solutions are totally non-combustible and do not produce any flames or hazardous fumes during the quenching process. AQUATENSID BW-FF does not contain boron, formaldehyde and phenols, it also uses an isothiazole-free biocide, and so is extremely safe in use.

AQUATENSID BW-FF is supplied as a viscous green fluid. It does not contain any mineral-oil, nitrite or any other harmful substances. It readily mixes in water to form a stable green fluid solution and provides a long tank life without loss of performance.

The concentrate is diluted with water and forms a stable chemical solution (not emulsion) for the quenching application. Depending on the dilution ratio, quenching rates faster than oil but slower than water can be obtained.
The insulating polymer film created, reduces the speed of heat flow from the work-piece surface to the surrounding fluid while in the martensitic transformation temperature range, which reduces stresses and thereby the risk of cracks and distortion.
The short vapour phase guarantees a homogenous cooling at the beginning of the quenching process, which is necessary to reduce stresses in this temperature range, and to achieve uniform hardness.

BENEFITS

- totally non-combustible and do not produce any flames or hazardous fumes
- easy adjustment of the quenching properties by concentration
- NO Boron
- NO Formaldehyde
- NO Phenols
- NO Isothiazole based biocide
- the solutions reach a long term stable pH-value and a long lifetime by modern amine-corrosion components, combined with a low maintenance
- Skin compatibility: NO toxic - irritative reactions => dermatologically tested

Plain carbon and low alloyed steels require fast and uniform cooling, which only a quenchant with an extremely short vapour phase such as AQUATENSID BW-FF will guarantee, even at low concentrations. In induction hardening processes, polymer quenchants which work on the basis of inverse solubility are the most widely applied products, and Aquatensid BW-FF is excellent for this process.

PHYSICAL DATA

Appearance	viscous, green fluid
Density/20 °C (DIN 51757)	approx. 1.09 g/cm³
Viscosity/20 °C (DIN 51562/1)	approx. 700 mm²/s
pH level, 5-20 % (DIN 51369)	approx. 8.8 – 9.4

FACTORS FOR THE DETERMINATION OF CONCENTRATION

Refractometer: 1.9

USUAL APPLICATION CONCENTRATIONS

5 - 30 % see below

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GENERAL PROPERTIES

Polymers which are soluble in water at room temperature lose their solubility when the solution is heated above approx. 75°C, this being termed “reverse solubility”. As the surface of the workpiece has a significantly higher temperature when cooling from the “austenizing temperature”, the polymer forms a blanket around the component. Once the surface temperature drops below the reverse solubility temperature range, the polymers become soluble in the water again, leaving the component clean and reducing polymer drag out from the system. This process is repeatable continually and due to the polymer quality used by Petrofer, the quench will remain stable providing outstanding bath life.

Alloyed steels are, due to their good hardenability, sensitive to cracking when being water-quenched. Because it is almost impossible to apply quenching oils in induction hardening machines for spray-quenching, only polymers can be used. Consequently, the use of AQUATENSID BW-FF in a higher concentration is highly recommended and reduces the quenching speed in order to avoid distortion and cracks.

Due to the outstanding reproducibility of the quenching curves of AQUATENSID BW-FF it is also widely used for tank (immersion) quenching, e.g. for forged pieces. It can also be used for direct quenching from forging temperature, such as for hand tools, agricultural equipment etc.
Due to the stable performance of Aquatensid BW-FF, high quality, repetition processes can be established and maintained, which are necessary in the mass production industries such as automotive and component supply industries.

QUENCHING HEAT TREATABLE ALUMINIUM – ALLOYS

Products of the AQUATENSID family have been used for decades for quenching heat treatable Al-alloys after solution annealing. Their use minimizes and avoids distortion of sheet, profiles, forged and cast parts in the aerospace, automotive and other industries.
The aerospace industry has specific requirements for the properties of the quenchants used in their processes. AQUATENSID D-FF is qualified in accordance to Aerospace Material Specification SAE - AMS 3025 E - Type 1.
Al-alloys have to be cooled fast and uniformly – usually in the temperature range from approx. 500°C - 200°C - to achieve the required metallurgical and mechanical properties. AQUATENSID guarantees both characteristics.
When quenching in AQUATENSID solutions the vapour blanket breaks down quickly and uniformly (short vapour phase), and so the formation of vapour pockets is avoided. This together with the lower final quenching speed, compared to water, produces very low thermal stresses in the quenched pieces. This reduces distortion significantly.

WORKING FLUID TEMPERATURE

The optimum operating temperature for tank quenching should be between 20 and 35 °C and should never exceed 45 °C.
On induction hardening machines, temperature should be kept preferably between 20 and 35 °C.

The quenching properties of water-based quenchants are much more influenced by the bath-temperature than those of oils. The variation of the cooling speed with the variation of the temperature is a continuous process. Therefore, the temperature does not only have to be controlled, but also to be maintained in a narrow range (10 °C) to guarantee constant cooling properties with best quenching results.
It has to be considered, that min. 80 % of the quenchant are water and water starts to evaporate at 100 °C. The closer the bath temperature comes to the boiling temperature, the easier a longer vapour phase is formed. Furtheron, it is recommended to control the pressure of the fluid as well as the flow volume.
For the application-engineering and control & maintenance see further information.

Always consult a Petrofer Technical Sales Engineer to determine which polymer, concentration and application is best for the customer process parameters.

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CONCENTRATIONS RECOMMENDED FOR USE

The following are recommendations for suitable concentrations for tank quenching. Normally spray quenching, such as on induction hardening machines, requires only half to two thirds of these concentration values.

Material	recommended concentration
low and unalloyed steels: carbon content 0,30 - 0,50 % (C 35, C 45, Ck 35, Ck 45, 34 Cr 4, 37 MnSi 5, 40 Mn 4)	5 - 8 %
carbon content 0,50 - 0,70 % (chromium steels up to 1%, spring steels) Cf 53, C 60, C 70, 41 Cr 4, 55 Si 7, 100 Cr 6	10 - 15 %
alloyed steels: carbon content 0,30 - 0,50 % (alloyed with chromium, molybdenum or vanadium)	10 - 25 %
austenitic steel plates, pipes and profiles	5 - 10 %
heat treatable Aluminium - alloys after solution annealing	10 - 30 %

RECOMMENDED BIOCIDES AND SYSTEMCLEANER

When using the product, make sure that there is NO mixing with formaldehyde- containing products, preservatives or system cleaners. Ingredients from the product react with formaldehyde and fall out.

Recommended bactericide/fungicide: 0.05 – 0.1 % FEROSEPT LB

Against fungi/yeast – repeated addition is necessary (regarding biofilms).

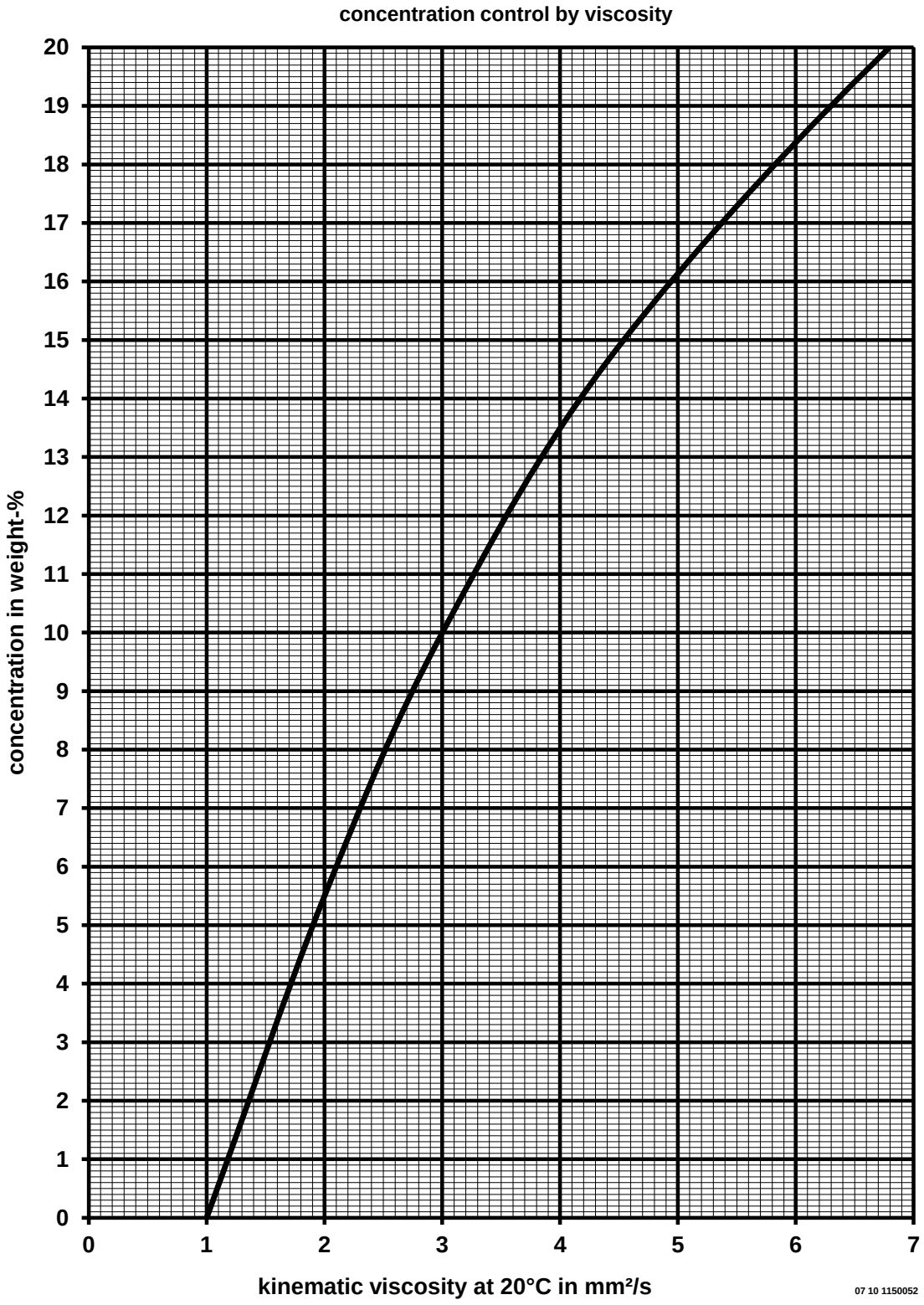
Recommended systemcleaner: 0.5 % FEROSEPT LB

HANDLING AND STORAGE

The storage temperature should ideally be between 5 - 25 °C, frost should be avoided.
Always observe the recommended use by date on the container.

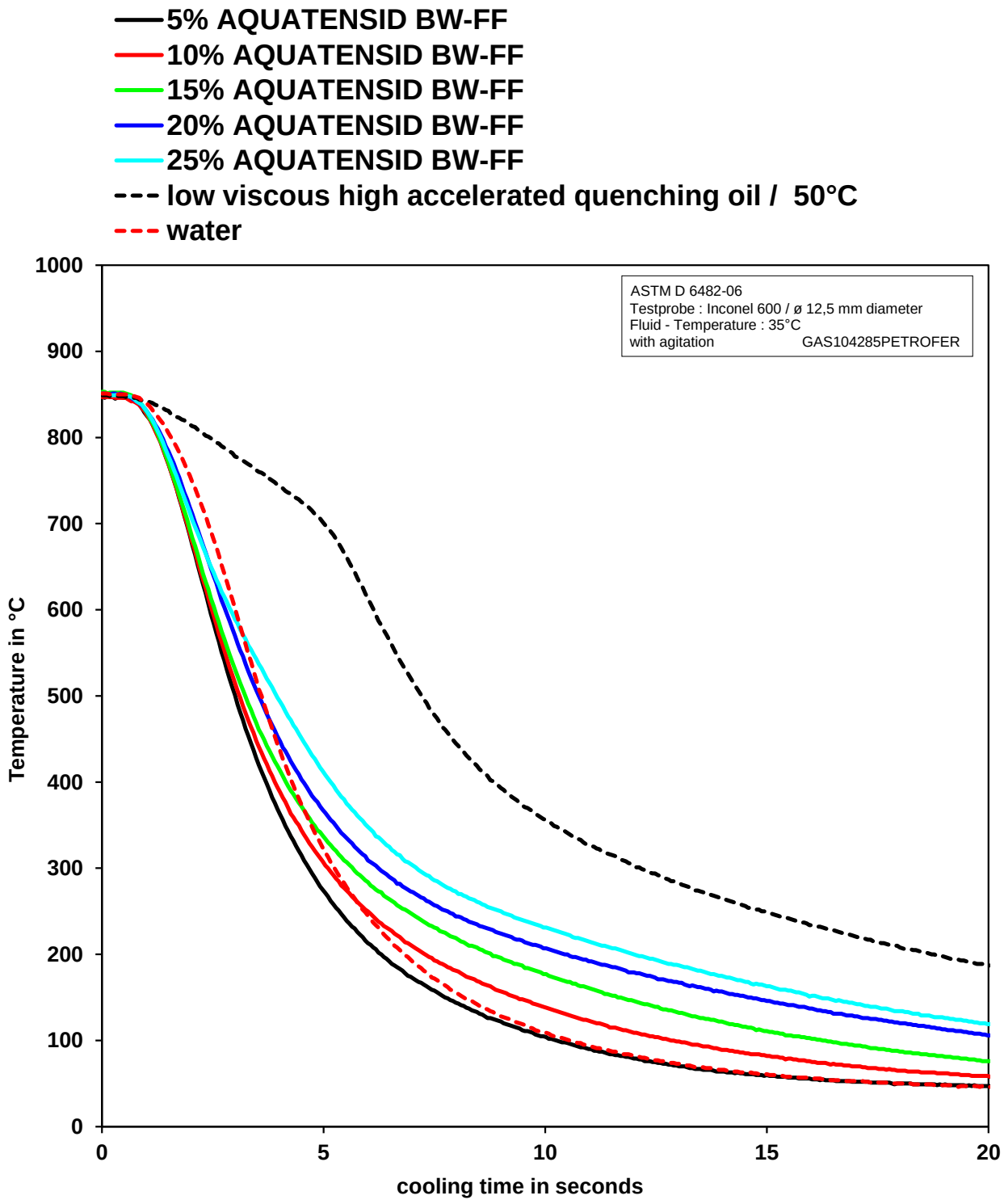
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Quenching properties



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