HU22091701

Checklist for Water Conditioning for Temperature Control Units

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| **Company details** | | | | | | |
| Company |  |  |  | Phone |  |  |
| Name |  |  |  | E-Mail |  |  |
| Fct./Dept. |  |  |  | Web |  |  |
| Street |  |  |  |  |  |  |
| ZIP/City |  |  |  | Project |  |  |
| Country |  |  |  | Date |  |  |
|  |  |  |  |  |  |  |
| **Introduction** | | | | | | |

Thanks to its good thermal transmission properties water is the most frequently used heat transfer medium in temperature control units, as well in the cooling water circuit as in the temperature control circuit.

Water exists in various compositions and in all but a very few cases it is not suitable for use in closed temperature control and cooling circuits without first having been subjected to special treatment. Impurities and contaminants in circuits or corrosion in moulds result in a reduced heat transfer and thus a reduction in performance. Completely blocked circuits render temperature control simply impossible.

Causes include:

* Dissolved minerals turn into solid particles e.g. into lime scale
* Oxygen in the water increases its aggressiveness and leads to corrosion, especially in moulds
* Oxygen in the water can have a negative effect on the chemicals added for water conditioning (e.g., flocculation)
* Operating temperatures below 60 °C promote the growth of algae.

Various measures are required to deal with problems in closed water circuits. Mechanical treatment through filtering alone is not sufficient in most cases. Design measures need to be included in the system engineering in addition to chemical treatment of the water.

Water treatment should ensure that:

* no corrosion and scaling can occur any longer,
* the formation of algae and sludge is prevented,
* particles eroded from encrustations and accumulations of sludge are filtered out.

In the plant itself, make sure that the circuits are thoroughly deaerated and to prolong service life any further contact with air and/or oxygen is avoided. This means taking into consideration all components and appliances involved in the circuit, such as moulds, conditioning plant and temperature control unit.

**Guideline values for water quality when working with untreated water**

When the untreated water used in the temperature control circuit complies with the following guideline values, in normal cases it can be used without any special treatment. To protect the plant equipment, it is recommended that these values are complied with and checked periodically.

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| Hydrological data |  | Guideline value |
| pH value | 7,5–9 |  |
| Conductivity | to 110 °C: 110–180 °C: above 180 °C: | <150 mS/m <50 mS/m <3 mS/m |
| Total hardness | to 140 °C: above 140 °C: | <2,7 mol/m3 (<15 °dH) <0,02 mol/m3 (<0,11 °dH) |
| Carbonate hardness | to 140 °C: above 140 °C: | <2,7 mol/m3 (<15 °dH) <0,02 mol/m3 (<0,11 °dH) |
| Chloride ions Cl - | to 110 °C: 110–180 °C: above 180 °C: | <50 mg/L <30 mg/L <5 mg/L |
| Sulfate SO4 2- |  | <150 mg/L |
| Ammonium NH4 + |  | <1 mg/L |
| Iron Fe |  | <0,2 mg/L |
| Manganese Mn |  | <0,1 mg/L |
| Particle size | <200 | μm |

Note: The values given for conductivity and hardness in the upper temperature ranges can usually only be achieved with prior water softening or desalination.

In operating temperatures below 60 °C the bacterial count must be monitored. When values go above 1 000 CFU/mL (colony forming units) a biocide must be used.

The water should be free of solids.

Aluminium must be prevented in water circuits, otherwise special treatment is necessary.

The water in the temperature control circuit should be replaced regularly. The frequency of water replacement is determined by the conditions of use and depends on the water quality, the filter technology, the materials used and the frequency of mould changes. HB-Therm units offer a cyclic system water replacement option.

Water treatment

If the values listed in the above table cannot be maintained, then appropriate water treatment is necessary. To be observed here:

* For working temperatures above 110 °C it is recommended that the water be softened.
* Desalination is recommended above 180 °C. Since there is no buffering in salt-free water the water must be appropriately conditioned to stabilise the pH value.
* When using treated water, the values can differ from those for untreated water. They are determined by the specifications of the conditioner.
* If the water is treated then the threshold values for the filling and makeup water are determined by the specifications of the conditioner, as well as the frequency of checking.
* When treating water care must be taken to ensure that the agents used are suitable for operation with maximum unit temperatures.
* Setup and operation of circulation systems with treated water is usually handled by the user or a contractual partner. Both necessitate appropriate clarifications in advance as well as conscientious performance. The following checklists (plant, chemical treatment and mould) are intended to help for this.

# Plant

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| **No.** | | **Checkpoint** |  | | **Answer** | |
|  | **Planning with the chemicals supplier**  Has the chemicals supplier been contacted at an early stage in the planning of the installation?  *For isolated applications HB-Therm offers water treatment units and provides advice for the procurement of the preffered agents.* | | |  | | Yes  No  Comments: |
|  | **Separating cooling water and system water**  For high operating temperatures there are economic and ecological advantages to deliberately treating the system water separately from the cooling water.  *HB-Therm temperature control units with indirect cooling are easy to modify for separate supply of system water.* | | |  | | Yes  No  Comments: |
|  | **Deaeration**  Are the water circuits adequately deaerated?  *HB-Therm temperature control units have an automatic deaeration system* | | |  | | Yes  No  Comments: |
|  | **Air contact**  Is contact with air avoided over a large surface area?  *HB-Therm temperature control units are closed systems without oxygen contact and with automatic deaeration.* | | |  | | Yes  No  Comments: |
|  | **Filtering cooling water and system water**  Is filtration available to separate solid particles from the cooling water and system water and is this inspected regularly?  On central water conditioning plants, the filtration process is normally carried out continuously in the bypass process (partial flow filter). In so doing, it is possible to use fine filters with mesh sizes of 100 μm to  10 μm to enable the removal of the minutest dirt particles.  On plants where water conditioning is introduced as a new operation, an increase in particles detaching themselves from existing furring etc. may be expected in the beginning.  *HB-Therm temperature control units have a cooling water filter as a standard feature.* | | |  | | Yes  No  Comments: |
|  | **Filtering heat transfer circuit**  Is a dirt-catcher installed in the return line of the unit in order to filter out larger dirt particles (e.g., swarf from new moulds) and is this inspected regularly?  *HB-Therm temperature control units can exchange the system water cyclically. Where dirt particles are <1 mm a filtration device on the unit can be omitted.* | | |  | | Yes  No  Comments: |
|  | **Pressure conditions**  The difference in pressure between the cooling water inlet and outlet must be between 2–5 bar if it is to ensure adequate cooling and sufficient deaeration. The drain pressure must not exceed 3 bar.  Do pressure conditions remain stable when other consumer units, e.g. machine coolers, are added?  *Must be taken into account while dimensioning the supply lines.* | | |  | | Yes  No  Comments: |

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|  | **Cross-sections of pipes**  Are the cross-sections of the pipes adapted to the expected flow rate?  The max. cooling water quantity can be found in the technical specifications of the unit.  *HB-Therm temperature control units operate with a proportional valve for cooling. This regulates the cold water without wear and tear and prevents pressure surges.* |  | Yes  No  Comments: |
|  | **Mould evacuation**  For easy handling when changing moulds.  Possible disadvantages are risk of corrosion for moulds and air or oxygen may get into the heat transfer circuit.  Therefore, mould evacuation with compressed air is not recommended.  Experience shows that water additives can provide protection against corrosion for many months even with evacuated or partially evacuated tools.  *On HB-Therm temperature control units mould evacuation is by default effected by reversing the pump.* |  | Yes  No  Comments: |
|  | **Pipes**  When selecting material, is the fact taken into account that the drain can reach temperatures equivalent to those of the main line? |  | Yes  No  Comments: |

# Chemical treatment

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| **No.** | | **Checkpoint** |  | | **Answer** | |
|  | **Planning**  Is a specialist company employed for determining the chemicals and are the particular features of the plant considered?  *For isolated applications HB-Therm offers water treatment units and provides advice for the procurement of the preferred agents.* | | |  | | Yes  No  Comments: |
|  | **Guideline values**  Are the recommended guideline values respected with regard to the water quality?  *→ Refer to information on page 1* | | |  | | Yes  No  Comments: |
|  | **Material compatibility**  Is care taken to ensure that the conditioned water cannot destroy the materials that it comes into contact with in the entire circuit?  Attention must also be paid to materials used in the consumer circuit (e.g. moulds).  *Attention: Typically, galvanized components are unsuitable!*  *The water-circuit of HB-Therm temperature control units consists of corrosion-resistant materials. These are: copper, brass, bronze, nickel, chromium steel, titanium, NBR, FPM (Viton®), PTFE (Teflon), FFKM,  MQ (Silicon), PEEK and ceramic (Al2O3).* | | |  | | Yes  No  Comments: |

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|  | | **Temperature stability**  Are the water conditioning additives used stable at least to the main line temperature reached?  In specific cases the cooling water may even evaporate in the cooler of the temperature control units.  HB-Therm temperature control units use a proportional valve for cooling, *vaporisation-free and with cooler temperature below 60 °C.*  *That means: without lime scale.* |  | Yes  No  Comments: |
|  | | **Stability with air or oxygen**  Are the functioning and service life of the conditioning additive unimpaired by the possible presence oxygen in the water?  *HB-Therm temperature control units are closed systems without any oxygen contact and with automatic deaeration.* |  | Yes  No  Comments: |
|  | | **Dosage**  Are the dosages recommended by the chemicals supplier followed and checked?  Attention: If minimum level of concentration is less than it should be, this could increase the rate of corrosion!  On tempering circuits on which the heat transfer medium is not replaced regularly, the concentration may change over the course of time and must therefore be checked periodically.  Suitable testing materials are needed to check the dosage, usually available from the chemicals supplier.  *HB-Therm temperature control units can replace the system water cyclically.* |  | Yes  No  Comments: |
|  | **Changeover**  When making a changeover, are the circuits cleaned sufficiently beforehand (e.g. etching out with pickling inhibitor)?  Are the circuits filtered adequately after changeover?  Are the sealed points checked to ensure that they are leakproof after changeover?  Because of their reduced surface tension, water additives as a rule have a cleansing effect in that they penetrate and release deposits. Yet this property has the potential for rendering formerly tight areas leaky.  *For cleaning mould circuits HB-Therm offers cleaning units and provides advice for the procurement of the preferred agents.* |  | Yes  No  Comments: | |

# Mould

| **No.** | | **Checkpoint** |  | | **Answer** |
| --- | --- | --- | --- | --- | --- |
|  | **Mould construction**  Is care taken to avoid blind holes in the cooling channels? | | |  | Yes  No  Comments: |
|  | **Operation**  Are the channels cleaned (of swarf, dirt, lubricant) before a new mould is put into operation?  Temperature control circuits of moulds and consumer units should be periodically inspected and cleaned as necessary. A simple pressure-loss measurement indicates whether channels are constricted or blocked. | | |  | Yes  No  Comments: |
|  | **Storage**  Are the moulds stored with the channels filled and are the connections hermetically sealed?  If the moulds are stored with emptied channels they must be treated with a preservative and dried, which is virtually impossible if there are blind holes.  Experience shows that water additives can provide protection against corrosion for many months even with evacuated or partially evacuated tools. | | |  | Yes  No  Comments: |