

Aquatherm Technical Bulletin

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Integration of other systems or components with Aquatherm piping for pressure pipe applications

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When integrating Aquatherm piping systems with other systems or components not made of PP-R, RP(RCT)⁴ (e.g., components not made of PP-R, RP(RCT) like valves, pumps, other piping, check valves, strainers, etc.), care must be taken to ensure the operating parameters for PP-R, RP(RCT) won't damage the other materials or vice versa.

Be aware that even if the Aquatherm pipe is compatible with the fluid being transported, other materials in the system may not be. All parts of the system must be verified as compatible with the medium being carried before installing them. And, while Aquatherm pipe does not require treatment to protect it from corrosion, metals (ferrous and non-ferrous) in the system may be susceptible to corrosion.

Do not mix Aquatherm pipe with other piping systems in conditions that will cause the other system or components to fail.

Domestic hot water recirculation (DHWR)

The domestic Hot Water Recirculating System includes all portions of the DHW system where the water is being circulated, including supply and return piping and any components other than end-of-line fixtures.³

When there is copper piping used in conjunction with PP-R, RP(RCT) in a DHWR system, care should be taken to ensure the operating conditions will not cause degradation or erosion/corrosion of the copper. Aquatherm recommends following the Copper Development Association guidelines (CDA Publication A4015-14/16: The Copper Tube handbook – www.copper.org) for sizing, temperature and flow velocity in copper tubing. This will also help ensure that the copper levels in the water do not approach the regulatory action levels recommended by independent institutions (e.g. U.S. Environmental Protection Agency (EPA), World Health Organization (WHO), Federal Ministry of Justice and Consumer Protection of Germany). Sustained high levels of copper in DHWR piping can damage components within the system, even PP-R, RP(RCT). **Damage caused by copper in the water resulting from erosion/corrosion or other degradation of copper components in the DHWR system will void the Aquatherm warranty.**

Accordingly, and as mandated by various regulations and codes in DHWR systems, it is considered good design and operational practice to ensure that the maximum HW-temperature within any part of the system / loop does not exceed 60°C (140°F). Some regulations and codes further restrict the temperature

at any fixture to a maximum of 50°C (120°F). There are some exceptions to this such as the process of thermal disinfection in health care facilities where temperatures of 70°C (160°F) or higher can be applied for short periods of time throughout the pipe system.

Importantly, the maximum temperature used must not exceed the rating of the pipe for the operating pressure. (See Aquatherm green pipe catalogue – table: permissible working pressure potable/drinking water – Fluid transported: water acc. to DIN 2000)

According to some regulations and codes, flow rates in a DHWR system should not exceed 0.5 m/s (1.5 ft/sec) anywhere in the system, except in some special cases where velocities up to 1 m/s (3 ft/sec) are needed to achieve proper flow temperature. The CDA Publication A4015-14/16 - The Copper Tube handbook - limits the velocity in DHWR system to similar rates.

When re-piping an existing DHWR-system originally installed in copper tubing, ensure all possible copper is replaced. If some copper remains as part of the system, strictly follow the rules and guidelines of the Copper Development Association (CDA Publication A4015-14/16: The Copper Tube Handbook) regarding flow rates and water conditions. Small amounts of copper or brass in valves and other equipment will generally not cause an issue. If the copper fails, it may degrade O-rings, gaskets, PP-R, RP(RCT) and other components as well, shortening their service life.

When adding PP-R, RP(RCT) to an existing copper system in a DHWR-application, the level of copper in the water should be tested. These levels should not exceed 0.1 mg/L (ppm). Higher levels of total copper indicate that the copper pipe is corroding /eroding due to system and/or water conditions.

To hydraulically balance a DHWR-system and ensure the required flow rate for each area of the building, it is necessary to install hydraulic-balancing-valves in every circulating loop throughout the complete system. This also maintains the flow velocity in the smaller return piping at or below the manufacturer's or CDA's recommendations.

In addition to sizing the piping and pumps to the correct flow velocity, care must also be taken to avoid water hammer and excessive surge pressures. Pump systems operating with on/off cycling, or pumps over-sized for the piping, can create high pressure and fatigue the piping material. The pump total dynamic head (TDH) must also be matched to the flow requirements, piping layout, and operating conditions to avoid cavitation for all components throughout the system. Cavitation can lead to excessive system noise and more importantly, can result in the erosion and degradation of the pipe surface and other components. Properly sized variable-speed (VFD) constant pressure pumping systems and pressure-sustaining valves can alleviate these issues. The pumps should be sized to operate at maximum efficiency with the lowest energy usage for the required flow rate.

The issues described here are only of concern in DHWR-systems. For domestic cold water (DCW) and mechanical (heating-cooling)-systems no additional requirements or actions are necessary. In some situations, the DHWR system is also used to provide hot water to the mechanical heating system. Additional consideration and care must be given for this type of combined system, as the mechanical



components may not be compatible with the more aggressive water conditions and flow velocity limitations of DHWR systems, and these components may not be suitable for potable water contact.

Revisions:

1. 13 September 2013
2. 31 May 2017 - title change
3. 14 February 2018 - adding paragraph
4. 29 Oct 2021 – Added RP(RCT)