A VACUUM DEGASSER IS NECESSARY TO MEET VDI STANDARD

Spirotech recommends following the VDI 4708 and VDI 2035-2 guidelines. In order to achieve the best possible degassing performance in heating and cooling installations, a separate vacuum degasser is necessary in addition to often used deaeration function in pressurization systems'.

The maximum amount of gas in heating installations, which is predominantly nitrogen and oxygen, is specified in VDI 4708 (design guideline for degassing and deaeration, August 2019) and VDI 2035-2 (guideline for the prevention of damage in water heating installations) respectively.

Maximum value for oxygen, the maximum value for oxygen in heating water is max 0.1 mg/l (low saline) and 0.02 mg/l (saline). These values are theoretical values that depend more on system design and corrosion processes than the degassing process. Furthermore, the values specified by VDI 2035-2 are only achievable in oxygen-sealed water heating installations (an installation that is impossible for oxygen to penetrate). While the stated values may not be achievable in a practical system, the closer you get the better.

Nitrogen gas concentration, on the other hand, has a more direct correlation with the degassing process. This means that in order to absorb gas (nitrogen) from the system and fully degas it, the maximum partial gas pressure in the degasser should be lower than the lowest partial gas pressure in the system. The VDI 4708 guideline indicates therefore that the value for dissolved nitrogen in heating water should be between 10 and 15 mg/l (depending on the temperature of the system).

When selecting a degassing solution, figure 1 can be used (see also VDI 4708, figure 23) to ensure compliance with the VDI guidelines. It contains the **applicable ranges for the different degassing techniques** as well as the reference values for the gas concentration.

On the right hand side of figure 1, it can be seen that a vacuum degasser can reach a very low concentration of dissolved oxygen. However, the chosen vacuum degasser must be able to reach oxygen pressures of 0.01 bara (0.02 mg/l O_2) or lower to comply with VDI2035-2.

When an atmospheric degasser is used, the VDI 2035-2 values are far from achievable. However, in an oxygen-sealed water heating installations that consists largely of

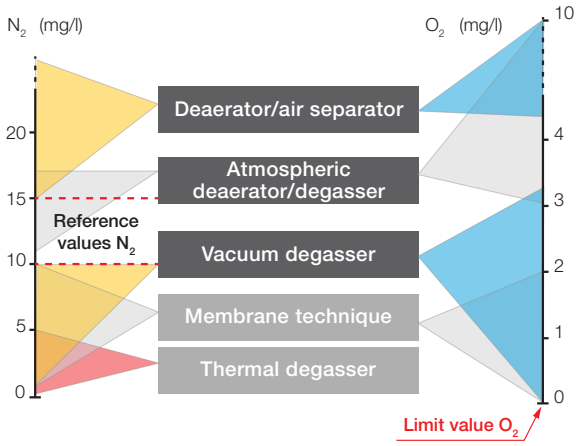

Figure 1. Simplified representation of the applicable ranges of deaerators, atmospheric degassers, vacuum degassers and other degassing techniques for oxygen and nitrogen.

steel part (majority of the systems), the dissolved oxygen will be consumed very quickly by corrosion processes to levels mentioned by VDI2035-2. In case the system is not oxygen-sealed, corrosion will continue indefinitely due to newly introduced oxygen.

Regarding Nitrogen, figure 1 shows that the minimum nitrogen concentration of 10 mg/l, which corresponds to a nitrogen gas pressure of approximately 1 bara, can be reached with a vacuum degasser and not with an atmospheric degasser. The reason for this is that a gas pressure of 1 bara (10 mg/l N_2) is difficult to achieve with atmospheric degassers, since the minimum degassing pressure is typically above 1 bara.

The degassing function available with many pressurization systems, will reduce air related issues in closed water circuits, but they cannot guarantee to reach a gas pressure which is lower than the lowest pressure in the system (gas absorption condition). This means a vacuum degasser such as the Spirotech Superior is necessary to meet the VDI guidelines for degassing and deaeration, and for prevention of damage in water heating installations.

DIFFERENT TYPES OF DEAERATORS

SPIROEVENT®

(MICROBUBBLE) DEAERATOR

An air separator removes (already liberated) micro air bubbles at practically the same pressure as the system pressure. Microbubble separation can only occur when the correct environment is created. The deaerator should include a coalescing medium in the vessel to provide a large surface area. This is necessary to be able to remove all free and entrained air, even the smallest microbubbles.

SPIROEXPAND®

DEGASSER FUNCTION (of a pressurization solution)

With atmospheric degassing, part of the system fluid is temporarily subjected to (maintained at) a lower pressure compared to that of the system: generally atmospheric pressure with 0.5 bar being the maximum pressure. Due to the lowering of the pressure, the stored volume of water will start to liberate dissolved gases. These liberated gases will rise through the liquid and disperse (release) into the atmosphere above.

SPIROVENT® SUPERIOR

VACUUM DEGASSER

Vacuum degassing is the most effective degassing technique applied in HVAC systems. Vacuum degasser differs from atmospheric degassing, because part of the system fluid is temporarily subjected to a vacuum (below atmospheric) which results in nearly all dissolved gasses to be extracted from the fluid.

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