Water is the most popular heat transfer agent in industrial heat transfer technology. It is easily available, cheap and overall not toxic. Up to 100°C it can be handled easily with any pump and shaft sealing. For higher temperatures the heat transfer systems must be pressurized in order to avoid vaporization. The vapor pressure rises rapidly, it is appr. 16 bar at 200°C, however already more than 40 bar at 250°C. Such high operating temperatures stress circulation pumps and sealing systems tremendously.

The company Dickow Pumpen offers a wide range of hot water pumps for temperatures up to 280°C and design pressures up to 80 bar. For temperatures up to 190°C and 22 bar pumps based on the chemical standard concept (medium duty pumps acc. to DIN) with ductile iron casings are sufficient. Up to 238°C and 45 bar are covered with the NHL series, specially designed for the high pressures of such plants. The casings are made of high temperature resistant carbon steel and optional centerline mounting is available.

Extended casing gasket surface and heat resistant expansion type casing bolts prevent leakage of the hot water. Extremely high temperatures of 280°C and system pressures up to 80 bar can be handled with the high pressure execution HPL / HPR (Fig 1). The casings of this type have been revised completely and have now better efficiencies and can generate higher differential pressures. The available casing sizes are now 6 instead of 4 with flows up to 280 m³/h and heads up to 62 m. The casings are also made of high temperature resistant carbon steel and centerline mounting is standard. The high suction pressures also require heavy duty ball bearings in order to reach sufficient bearing life time.

Due to high vapour pressures, standard mechanical seals can not be used for higher temperatures. The easiest and cheapest solution is a cooled mechanical seal. The required cooling water however consumes additional costs for water pipes and water treatment (max. operating temperature: 238°C). An alternative is a standard mechanical seal with a pumping device and an external air cooler (Fig 2). The cooler is a new development for this application, needs no cooling water and is selfventing (max. operating temperature: 210°C). For temperatures up to 280°C high pressure mechanical seals with external water cooled heat exchanger (API Plan 23) must be used (Fig 3).

Besides common sealed pumps, also sealless pumps with magnetic coupling can be used (Fig 4). The termination of the main wear part (the mechanical seal)
lead to considerably longer “mean time between failure” and therefore higher availability. Hot water spill through mechanical seal failures is also excluded. The design shown in Fig 4 is a close coupled execution where the motor is flanged directly to the pumps. This execution deletes the elastic coupling and its alignment procedure. The current operation limit for magnetic couplings in hot water applications is appr. 43 bar at 250°C.

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