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During hemodialysis, blood from the dialysis patient flows through one compartment of an artificial kidney (dialyser), while an isotonic salt solution (dialysate) flows in a counter current manner through another compartment. A thin semi-permeable membrane separates the two compartments, allowing metabolic waste products in the patient's blood to diffuse across the membrane into the dialysate. One of the critical requirements for haemodialysis machines is pure water. And a dialysis patient can require up to 30,000 litres of dialysis water per year.

A dialysis water treatment system would include pretreatment, reverse osmosis, ultrafiltration, storage and distribution to points of use. *~Duplexing~*TM, a tried and tested option, is where critical item of the water treatment plant is duplicated, to provide duty and stand by. An example system for renal dialysis would consist of pre-treatment of the mains water using duplex softeners. The softened water is pumped through carbon filters to ensure that the water is free from chlorine, which could damage the downstream equipment, and chloramines which could harm the patient. The water would then supply a Reverse Osmosis purification system - two twin-pass reverse osmosis plants, each consisting of two membrane units in series. Each stream is capable of meeting the full flow demand to ensure security of supply during cleaning and maintenance.

Reverse osmosis operates by using pressure to drive water through a semi-permeable membrane that removes, typically, around 95-98% of dissolved salts and more than 99% of bacteria and organic molecules. The reverse osmosis units operate duty/standby to prevent stagnation and the resulting possibility of microbiological growth.

Two streams of RO Water then feed two heat sanitisable ultrafiltration units, each fitted with a high integrity 12,000Da molecular weight cut off membrane. This membrane rejects both bacteria and endotoxins to ensure compliance with the water quality specifications before the water is distributed to points of use.

Heat sanitisation is a proven process to prevent bacterial growth within the dialysis water distribution system and can be independently validated by measuring the pipe temperature with non-intrusive thermocouple sensors. Ultrafiltration units are constructed in hygienic stainless steel and incorporate a water tank with a heater in combination with a complete system control interface.

This allows sanitisation to be achieved by circulating 90Â°C hot water through the ultrafiltration unit and round the entire ring main plus the dialysis connection hose including the inlet area of the dialysis unit. This provides a closed hygienic system that gives a significant improvement in microbiological control and reduction of biofilm formation. The distribution pipework should be fully lagged around its length to contain the heat during the automatic heat sanitisation cycles.

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