

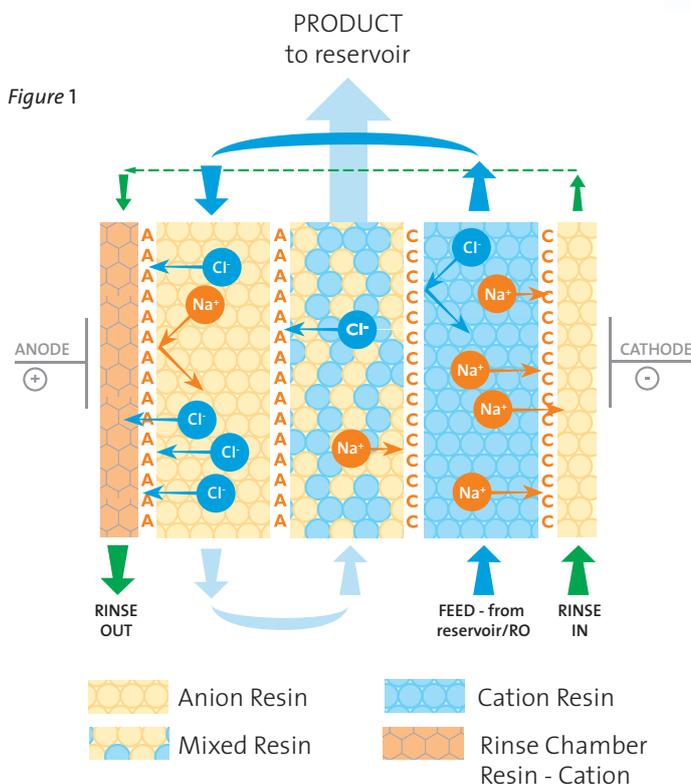
Bactericidal Effects of EDI Technology within the PURELAB Pulse

Electrodeionization (EDI) is an electrically-driven water purification process that involves the use of Ion Exchange (IX) resins and Ion Permeable Membranes, all held within a low-voltage electric field.

Water to be purified enters the EDI module and passes through a series of ion-exchange beds. Under an applied voltage, ions are moved across the resin beds and through the membranes and are collected into concentrate streams that can be put to drain or recycled. The product is deionized water.



Pulse Module (EDI purification)



- Ion-exchange resins act in several ways in relation to bacteria. Fresh resins are covered in H^+ or OH^- ions and so present extreme pH environments. These actively discourage bacterial growth. However, resin beds present high surface areas and, when part of the resin bed has exhausted (when H^+ & OH^- ions have been replaced by, for example, Na^+ & Cl^- ions), can provide areas for bacterial growth.
- Because of the intrinsic qualities of an EDI device, resins are continuously regenerated by the current, and are never fully exhausted. Also the resins are used for a number of years so avoiding the regular replacement of packs and the associated release of organic compounds when a new resin pack is fitted which will provide nutrients for bacteria.

TECHNOLOGY NOTE 22

Benefits Specific to the PURELAB Pulse

In addition to the benefits and features of the Pulse Module, the design, processes and technology of the PURELAB Pulse contribute to the bactericidal effectiveness of the Pulse Module.

- One of the resin beds inside the Pulse Module contain Anion resins only. As shown on table 1, this provides a better bactericidal performance compared with mixed bed resin beds which are used in some competitor systems.
 - Anion resin is highly bactericidal (>95% reduction) with or without the electric field.
 - Mixed anion and cation resins have very little bactericidal effect without an electric field but have significant effect (about 80% reduction) with an electrical current flowing.
 - Cation resin has negligible bacterial effect with or without the electrical field applied

- During normal operation mode, the water from the tank is re-circulated repeatedly through the Pulse Module. The unique location of the Pulse Module within the recirculation loop provides on-going bactericidal performance (an average of 93.4% reduction in total viable counts (TVC) across the stack over a period of 4 months) and also avoids the need for a deionization pack in the loop with its associated risks of contamination. The enhanced bacteria performance achieved is illustrated in Fig.1 showing the TVC of the product water from the PURELAB Pulse without a point-of-use (POU) filter over a 12 month period. See Technology Note 23.

Bactericidal effects of various resin beds

Resin	Current (amps)	Bacteria (CFU/ml)		% Reduction
		Feed	Product	
Cation	0	91.0	87.0	4.4
Cation	3	91.0	89.5	1.6
Cation	0	16.4	16.6	-1.2
Cation	3	16.4	16.6	-1.2
Anion	0	91.0	2.8	96.9
Anion	3	91.0	3.8	95.8
Anion	0	38.7	1.0	97.3
Anion	3	38.7	0.7	98.2
Mixed	0	107.0	103.0	3.7
Mixed	3	107.0	20.0	81.3
Mixed	0	34.5	32.5	5.8
Mixed	3	34.5	6.0	82.6

Table 1 - Bactericidal effects of various resin beds.

PURELAB Pulse bacterial levels (without POU filter)

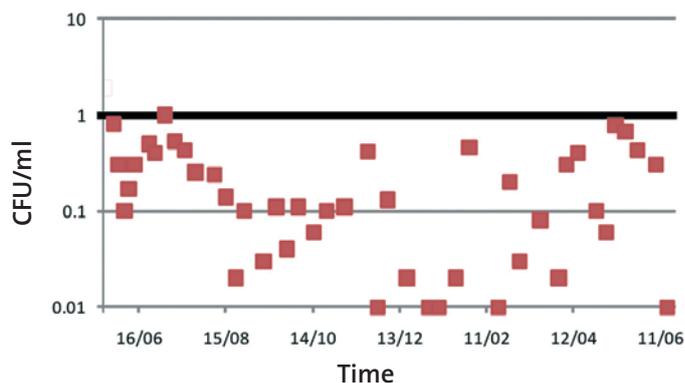


Fig.1 - TVC of the product water from the PURELAB Pulse without a point-of-use (POU) filter over a 14 month period.

ELGA LabWater

Tel: +44 (0) 1494 887500 Fax: +44 (0) 1494 887505 Email: info@elgalabwater.com Website: www.elgalabwater.com

ELGA® is the global laboratory water brand name of Veolia Water. VWS (UK) Ltd. Registered in England & Wales No. 327847 ©Copyright 2010 ELGA LabWater/VWS (UK) Ltd. All rights reserved. As part of our policy of continual improvement we reserve the right to alter the specifications given in this technology note.

Technology Note TN22