Water & Process Solutions

Achieving Lower Operating Costs and Better Water Quality with More Advanced Ion Exchange System Designs

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Dow Water & Process Solutions

Outline

- Make-up Demin Overview Map
- Various Ion Exchange System Designs
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  - Reverse-Flow Regeneration
  - Packed Bed
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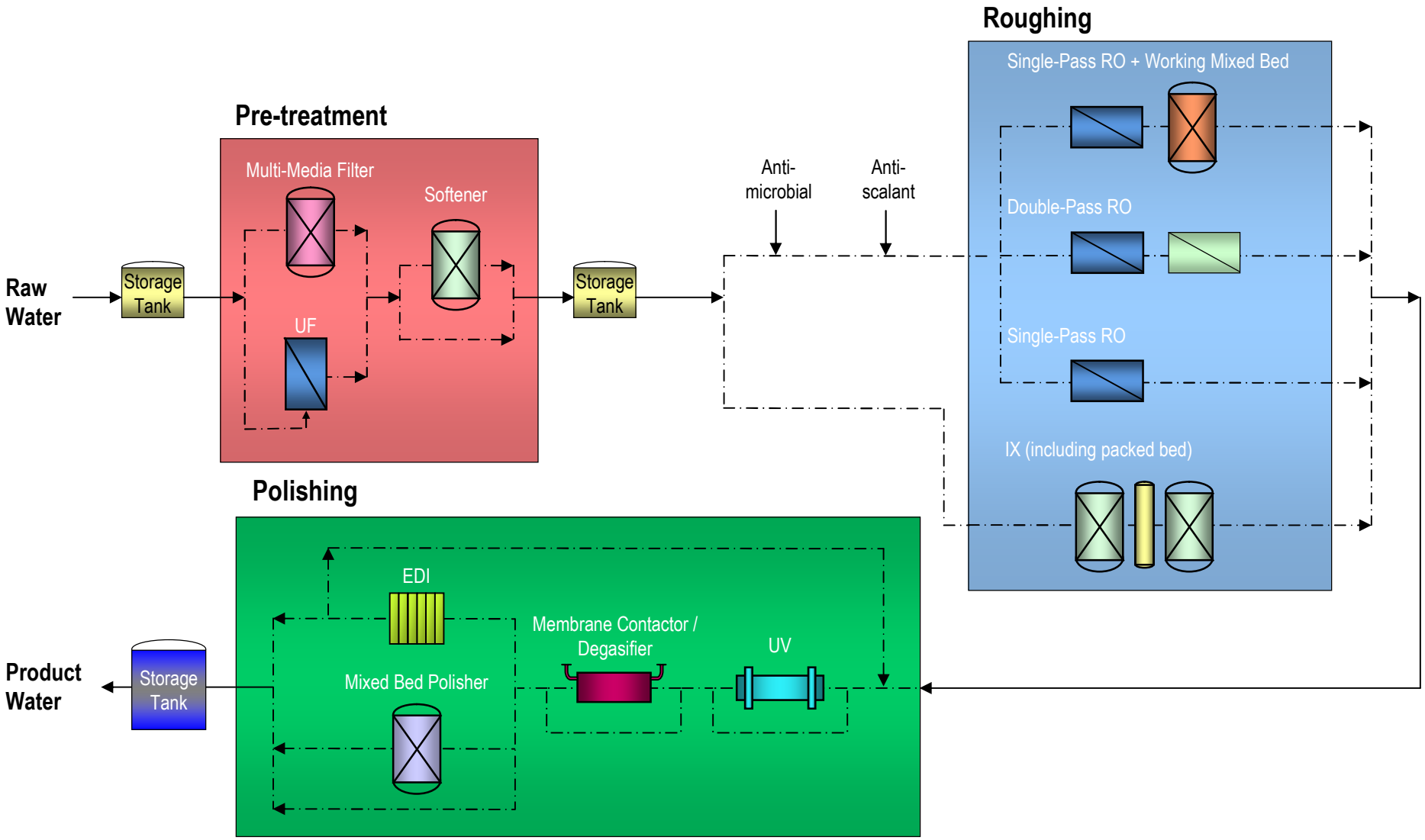
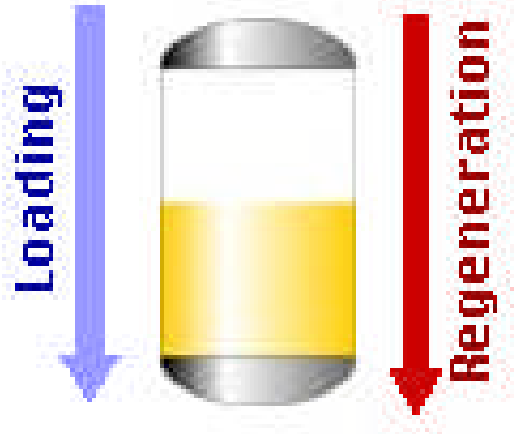
- Summary Table
  - Effluent quality: conductivity, silica
  - Efficiency: regeneration ratio, yield

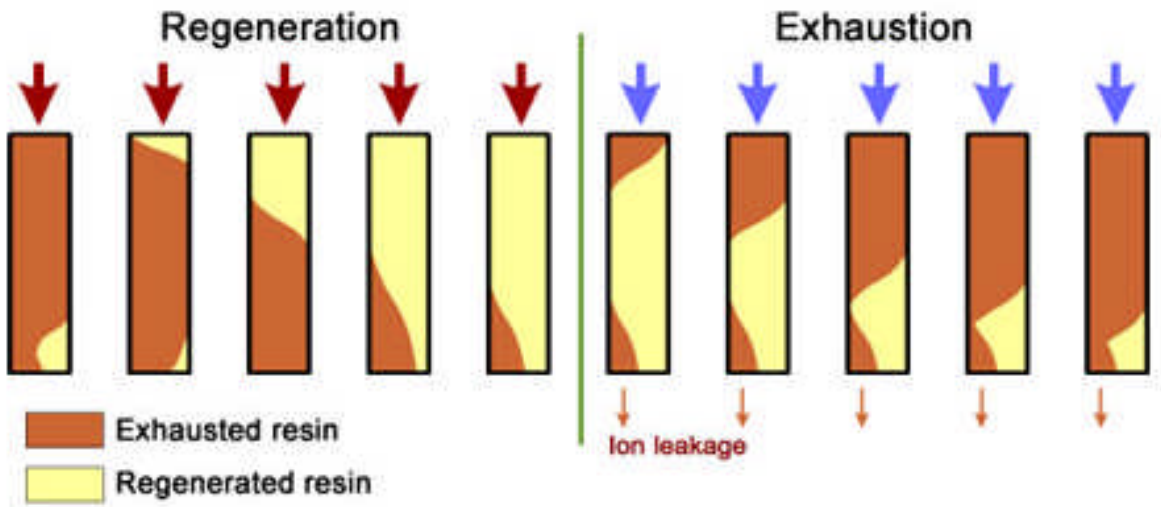
Make-up Demin Overview



Co-Flow Regeneration

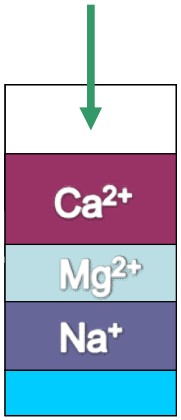


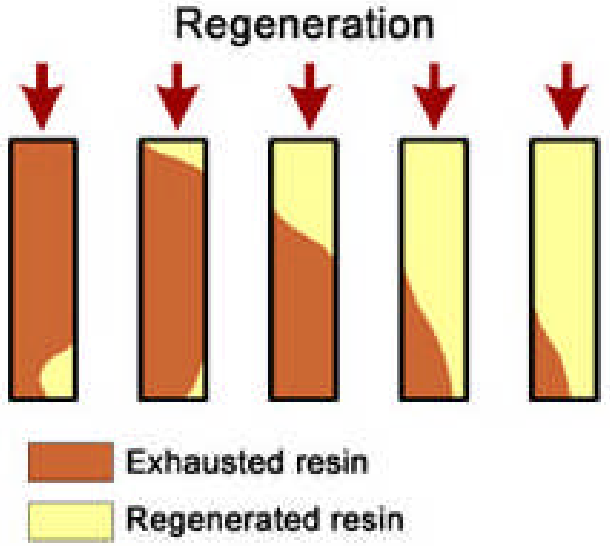
Conductivity: 3-30 µS/cm
SiO_2: 30-200 µg/L
Regen. ratio: 180-400%
Yield: 90%



Selectivity Coefficients

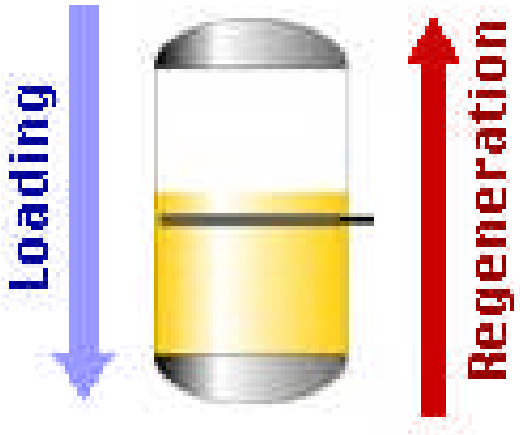
Counter-Ion	Selectivity (gel cation resin, 8% DVB cross-linking)
H^+	1.00
Na^+	1.56
Mg^{2+}	2.59
Ca^{2+}	4.06



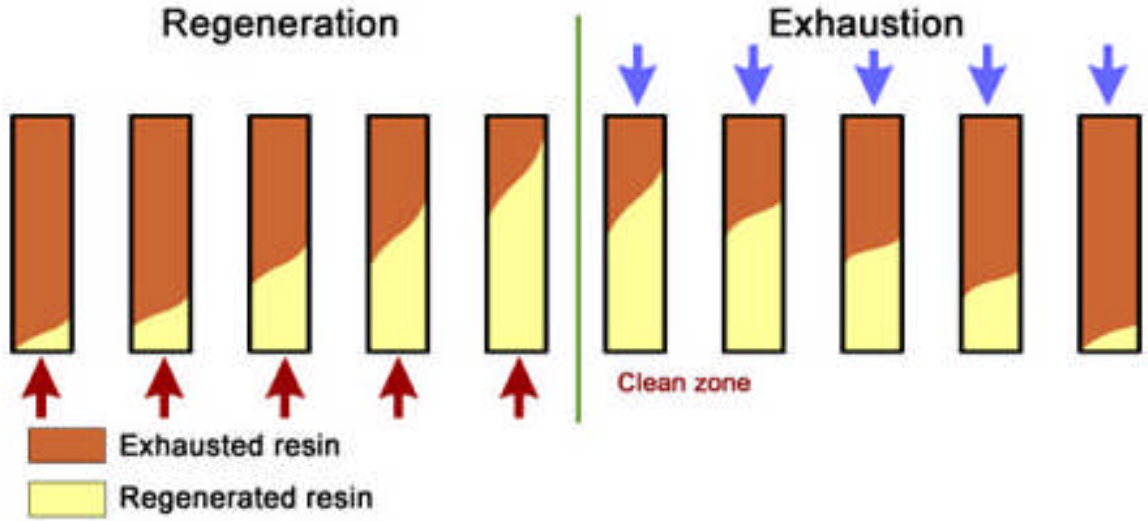


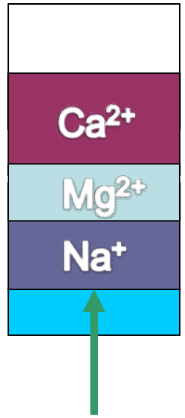
Reverse-Flow Regeneration

with compaction due to air or water blocking

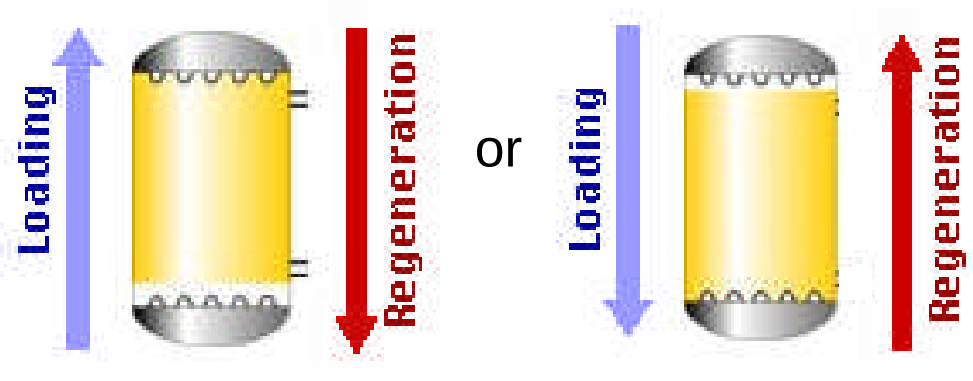


Conductivity: 1-3 µS/cm
SiO_2: 20-40 µg/L
Regen. ratio: 130-180%
Yield: 90-95%





Packed Bed

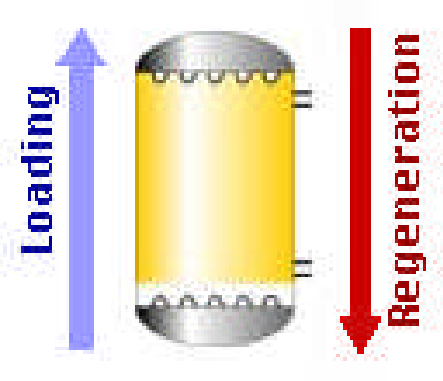


Conductivity: 0.1-1 µS/cm
SiO_2: 5-20 µg/L
Regen. ratio: 105-150%
Yield: 94-98%

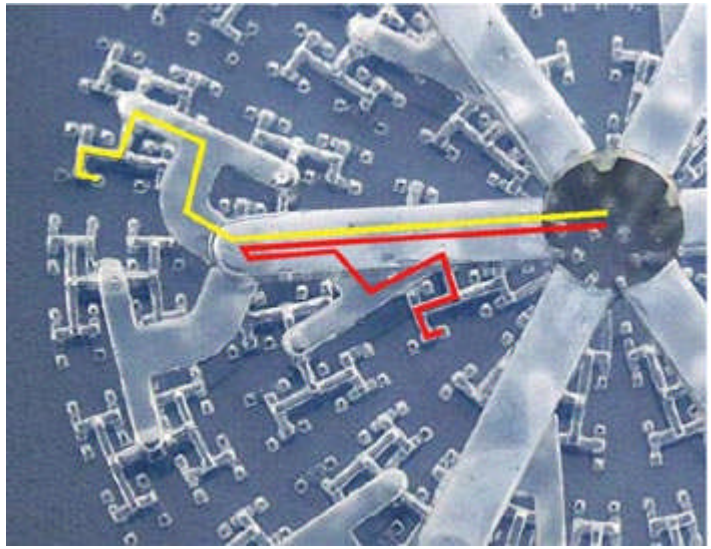
Packed Bed Benefits:

- Very simple
- Very compact
- No inert (for upflow service)
- Low investment cost
- Low pressure drop
- Best water quality
- Backwashable (external tank for upflow service)

Advanced Packed Bed



Conductivity: 0.1-1 µS/cm
SiO_2: 5-20 µg/L
Regen. ratio: 115-150%
Yield: 98%



Summary – Effluent Quality & Efficiency

	Co-Flow Regeneration	Reverse-Flow Regeneration	Packed Bed (AMBERPACK™, UPCORE™)	Advanced Packed Bed (ADVANCED AMBERPACK™)
Conductivity (µS/cm)	3 - 30	1 - 3	0.1 - 1	0.1 - 1
SiO_2 (ppb)	30 - 200	20 - 40	5 - 20	5 - 20
Regeneration ratio (%)	180 - 400	130 - 180	105 - 150	105 - 150
Yield (%)	90	90 - 95	94 – 98	98