EXPLORING THE BRINE ENVELOPE

MARYLAND GROUND WATER SYMPOSIUM
SEPTEMBER, 2009
THE BRINE ENVELOPE

POUNDS OF SALT PER CUFT RESIN

CAPACITY RESULT (PERCENT)
WHY?

WEST COAST WATER AND TDS CONCERNS

EAST COAST ON-SITE BRINE CONCERNS

WATERSENSE PROGRAM
STRATEGY SELECTION

BRINE    WATER

PER CAPACITY
DECREASE SALT DOSE:

INCREASE EFFICIENCY (CAPACITY PER SALT)

DECREASE CAPACITY PER REGENERATION
INCREASE FREQUENCY OF REGENERATION (WATER USE)

RECLAIM SALT:

REUSE SELECTED PORTION OF BRINE DRAIN

INCREASE HARDNESS IN BRINE
DECREASE CAPACITY PER REGENERATION
INCREASE FREQUENCY OF REGENERATION (WATER USE)
WATER SENSE EFFICIENCY STANDARDS FOR WATER SOFTENERS

• DEMAND (METER) INITIATED

• SALT EFFICIENCY: NOT LESS THAN 3350 GRAINS CAPACITY PER POUND OF SALT

• WATER EFFICIENCY: NOT MORE THAN 5 GALLONS OF WATER PER 1000 GRAINS OF CAPACITY.
VARIABLES:

RESIN TYPE

DISTRIBUTOR TYPE (KINETICS)

UPFLOW / DOWNFLOW BRINING

SALTING LEVEL (POUNDS PER CUFT)

INJECTOR RATES (KINETICS)

RECLAIM POTENTIAL

RAW WATER CHARACTER
WATER SOFTENER

UNTREATED WATER → MULTIPORT VALVE → TREATED WATER

SODIUM CHLORIDE OR POTASSIUM CHLORIDE

DRAIN

CATION EXCHANGE RESIN
SERVICE CYCLE

UNTREATED WATER ➔ MULTIPORT VALVE ➔ TREATED WATER

REGENERANT ➔ MEDIA ➔ DRAIN
BACKWASH CYCLE

UNTREATED WATER → MULTIPORT VALVE

TREATED WATER

WASTE TO DRAIN

REGENERANT

MEDIA
REGENERATION CYCLE

UNTREATED WATER ➔ MULTIPORT VALVE ➔ TREATED WATER

UNTREATED WATER ➔ REGENERATION CYCLE ➔ TREATED WATER

WASTE TO DRAIN

BRINE

MEDIA

BRINE AND RINSE
TANK DISTRIBUTOR
TYPICAL SAVINGS* WITH VORTECH: 1800 GALLONS OF WATER PER YEAR

*FAMILY OF 3 AND MEDIA FILTER
BRINING FLOW
UP OR DOWN
STANDARD CO-CURRENT BRINE AND RINSE CYCLE

CONTAMINANTS PUSHED THROUGH ENTIRE BED
COUNTER-CURRENT BRINE AND RINSE CYCLE

CONTAMINANTS LIFTED FROM BED
COUNTERCURRENT CAUTION!

KINETICS

FLUIDIZING THE BED
TOTAL SALT USED
DEGREE OF REGENERATION

BASED ON AMOUNT OF SALT PER CUBIC FOOT OR RESIN

CAPACITY RESULT (PERCENT)

POUNDS OF SALT USED

NO REGENERATION

NORMAL RANGE OF USE

20
DEGREE OF REGENERATION

BASED ON AMOUNT OF SALT PER CUBIC FOOT OR RESIN

Region of Highest Efficiency
SWEET SPOT

NORMAL RANGE OF USE

NO REGENERATION

POUNDS OF SALT USED

CAPACITY RESULT

(PERCENT)
BRINING (INJECTOR) FLOW RATE
BRINE AND RINSE

UNTREATED WATER

BRINE (26%)

AIR CHECK

BLFC

INJECTOR

50/50 MIX

10 – 13 % BRINE

RESIN

ONE CYCLE
DRAW BRINE FOR 20% OF TIME
--------------AIR CHECK--------------
REMAINDER IS BRINE RINSE

DLFC

DRAIN
INJECTOR SIZING

BRINE FLOW PER SQFT

0.5 TO 0.63 GPM / SQFT FOR **UPFLOW** (Pentaire 7/23/08)
BRINE DRAW FOR 15 to 30 MINUTES (Osmonics)
BRINE DRAW FOR > 20 MINUTES (ResinTech)

BRINE FLOW PER CUFT

0.5 GPM / CUFT (Osmonics)
1 GPM / CUFT (Bruner)
0.5 TO 1.5 GPM / CUFT (ResinTech)
0.25 TO 0.9 GPM / CUFT (Purolite)
0.5 GPM / CUFT (Sybron)
RESIN CAPACITY
COMBINED ELECTRONIC AND VORTECH
NSF Standard 44 Tested

- MECHANICAL
- ELECTRONIC
- ELECTRONIC AND VORTECH
WATER USAGE (3-5 lbs/cuft)
COMBINED ELECTRONIC AND VORTECH
NSF Standard 44 Tested

WATER USED (GAL) PER 1000 GR CAPACITY

- MECHANICAL ELECTRICAL: 79 14.4K
- ELECTRONIC: 48 15.5K
- ELECTRONIC AND VORTECH: 31 18.8K
BRINE RECLAIM
“NORMAL” BRINE ELUTION CURVE

SALT CONCENTRATION

RAW TDS

TIME

20
40
THEORY

VORTECH BRINE ELUTION CURVE
RECLAIM/REUSE POTENTIAL

SALT CONCENTRATION

10%

5%

RAW TDS

TIME

20

40

RECLAIM AREA

HIGH Ca

HIGH Na
TESTING PROTOCOL
3 CUFT RESIN W/VORTECH DISTRIBUTOR

TEST #1 DECEMBER 2008:
15 LBS SALT/CUFT
STANDARD INJECTOR

TEST #2 MARCH, 2009
15 LBS SALT/CUFT
YELLOW INJECTOR

TEST #3 JULY, 2009
15 LBS SALT/CUFT
YELLOW INJECTOR
TESTING DECEMBER, 2008
(GREEN) 15 LBS SALT/CUFT RESIN

VORTECH BRINE ELUTION CURVE
RECLAIM/REUSE POTENTIAL

SALT CONCENTRATION (PERCENT)

HARDNESS CONCENTRATION (GPG)

TIME

CLAIM #1
CLAIM #2
CLAIM #3

RINSE

60 GPG
30 GPG
9.5 GAL
44 GAL
10 GAL
TESTING MARCH, 2009
(YELLOW) 15 LBS SALT/CUFT RESIN

VORTECH BRINE ELUTION CURVE

SALT CONCENTRATION (PERCENT)

HARDNESS CONCENTRATION (GPG)

CLAIM #1 10.4 GAL
6.9 LBS

RINSE

10% 60 GPG

5% 30 GPG

20 40 60 TIME

10.4 GAL
6.9 LBS
TESTING JULY, 2009
(YELLOW) 15 LBS SALT/CUFT RESIN

VORTECH BRINE ELUTION CURVE

SALT CONCENTRATION (PERCENT)

HARDNESS CONCENTRATION (GPG)

CLAIM #1

10.4 GAL
6.9 LBS
## RECLAIM POTENTIAL

<table>
<thead>
<tr>
<th>TEST AREA</th>
<th>GALLONS RECLAIM</th>
<th>POUNDS NaCl REUSED</th>
<th>PPM HARDNESS CARRIED</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>9.48</td>
<td>5.78</td>
<td>68</td>
</tr>
<tr>
<td>2</td>
<td>10.1</td>
<td>6.6</td>
<td>24</td>
</tr>
<tr>
<td>3</td>
<td>10.4</td>
<td>6.9</td>
<td>10</td>
</tr>
</tbody>
</table>

**TOTAL BRINE: 15 GALLONS**
RAW WATER CHARACTER

IRON       Higher Salt Dose Needed

TDS        Less Capacity Achieved
EFFECT OF TDS UPON CAPACITY

TOTAL DISSOLVED SOLIDS (ppm)

CAPACITY (KGr)

15 POUNDS SALT

6 POUNDS SALT