# 1.0 INTRODUCTION

## 1.1 General Equipment Description

The IWT Manual Industrial Mixed-Bed Deionizers are designed to remove mineral salts from an industrial feed stream. These deionizers are available in a wide range of sizes to handle different flow rates.

An Industrial Mixed-Bed Deionizer consists of one exchanger vessel, which is constructed of carbon steel, lined with 3/32" PVC, and rated for 100 psig non-code. With option 6, this pressure rating will be different - see the Option Page at the front of this manual.

The exchanger contains cation and anion exchange resins mixed together. These resins are separated in the vessel for the chemical regeneration sequence, then mixed back together for the next service cycle.

If your system does NOT have option 34A or 34B (see the Option Page at the front of the manual), it will also include two chemical day tanks made of polyethylene, complete with covers. One of these tanks will be for the 30% hydrochloric acid (HCl) used to regenerate the cation resin in the exchanger, and the other tank will be for the 20% sodium hydroxide (NaOH) used to regenerate the anion resin in the exchanger. After each regeneration, the day tanks must be refilled with the proper chemicals.

If your system has option 34A, the NaOH (caustic) tank has been replaced with a flexible draw line you can insert directly into a drum of 50% NaOH.

If your system has option 34B, the acid tank has been replaced with a flexible draw line you can insert directly into a drum of 30% HCl.

Manifold piping and valves are Schedule 40 socket-welded PVC.

An inlet water meter and outlet resistivity monitor are standard.

## 1.2 Equipment Specifications

The table below lists the major equipment specifications for a single Industrial Mixed-Bed Deionizer. Resin volumes are for resins as they are shipped, in the salt form (sodium form for cation, chloride form for anion). If your system has option 34 the chemical tank specifications may not be applicable (see the explanation above).

| | MB-865 | MB-875 | MB-885 | MB-895 |
|---|---|---|---|---|
| Service Flow (gpm) | 4 | 11 | 20 | 30 |
| Vessel Size (in) | 10 dia x 60 | 16 dia x 72 | 20 dia x 72 | 24 dia x 96 |
| Piping Size (in) | 1/2 | 3/4 | 1 | 1-1/4 |
| Acid Tank (in) | 11 dia x 14 | 11 dia x 14 | 14 dia x 27 | 14 dia x 27 |
| Caustic Tank (in) | 11 dia x 14 | 14 dia x 27 | 18 dia x 29 | 22 dia x 36 |
| Cation Resin C-361 | 0.6 cu. ft. | 1.8 cu. ft. | 2.9 cu. ft. | 5.0 cu. ft. |
| Anion Resin A-244 | 0.8 cu. ft. | 2.7 cu. ft. | 4.2 cu. ft. | 7.6 cu. ft. |

## 1.3 Process Stream and Utility Specifications

### 1.3.1 Required Feed Water Specifications

| | |
|---|---|
| Type | Raw water (or better) |
| Flow rate | Per table on page 1-1 |
| Pressure | 45-75 psig |
| Temperature | 50-95 degrees F |

Maximum Feed Water Impurities

$\leq$ 350 ppm TDS
$\geq$ 30% Alkalinity
$\leq$ 30% Chloride
$\leq$ 30% Sodium
< 10% Silica
< 5 Color (APHA units)
< 6 NTU turbidity
< .2 ppm $Cl_2$
< .3 ppm Fe, Mn
< 1 ppm organics by $O_2$ consumed

### 1.3.2 Treated Water Specifications

| | |
|---|---|
| Flow rate & Temperature | Same as feed |
| Pressure | 5-35 psig min |
| Volume & Quality | Dependent on feed quality |
| Silica Guarantee (option 33 only) | See the Option Page at the beginning of this manual |

### 1.3.3 Required Chemicals for Regeneration

| | |
|---|---|
| Cation Resin Regenerant: | 5% Hydrochloric acid (HCl) |
| Acid Dosage: | 20 lbs. of 30% HCl per $ft^3$ of cation resin |
| Acid Quality: | See HCl analysis on next page |
| Anion Resin Regenerant: | 4% Sodium hydroxide (NaOH) |
| NaOH (Caustic) Dosage: | 8 lbs. of 100% NaOH per $ft^3$ of anion resin |
| Caustic Quality: | See NaOH analyses on next page |
| Chemical Volumes: | See the table on page 1-4 |

### 1.3.4 Mixing Air

| | |
|---|---|
| Type: | Plant air |
| Pressure: | 10 psi |
| Quality: | Clean, dry, oil-free |
| Flow: | See the table on page 1-4 |

## HYDROCHLORIC (MURIATIC) ACID

Grade - Muriatic Acid, Technical (HCl)
Color - White to light yellow
Concentration - Minimum (18° Be') - 28% HCl
Sulfuric Acid, as $SO_3$ = 4,000 ppm maximum
Iron (Fe) = 100 ppm maximum
Freezing point = -40°F
Organic contaminants = 100 ppm $O_2$ consumed
Weight per gallon = 9.5 lbs.
NOTE: Acid should be free of turbidity, inhibitors and oxidants.

## SODIUM HYDROXIDE - LIQUID CAUSTIC SODA, MERCURY CELL GRADE

| Typical Analysis | Average |
|---|---|
| NaOH | 50.6% |
| $Na_2CO_3$ | 200 ppm |
| NaCl | 20 ppm |
| $NaClO_3$ | Less than 1 ppm |
| $Na_2SO_4$ | 10 ppm |
| $SiO_2$ | 10 ppm |
| $Al_2O_3$ | 3 ppm |
| CaO | 3 ppm |
| MgO | 0.6 ppm |
| Fe | 2 ppm |
| Ni | 0.6 ppm |
| Cu | 0.2 ppm |
| Mn | Less than 0.2 ppm |
| Hg | 1.0 ppm |
| Freezing point | 54° F |

## SODIUM HYDROXIDE - CAUSTIC SODA, RAYON GRADE FLAKE

| Typical Analysis | Average |
|---|---|
| NaOH | 98.25% |
| $Na_2O$ | 76.61% |
| $Na_2CO_3$ | 7,600 ppm |
| NaCl | 5,700 ppm |
| $NaClO_3$ | Less than 2 ppm |
| $Fe_2O_3$ | 10 ppm |
| $SiO_2$ | 39 ppm |
| $Al_2O_3$ | 10 ppm |
| CaO | 27 ppm |
| MgO | 38 ppm |
| Cu | 0.2 ppm |
| Mn | 0.5 ppm |
| Pb | 0.5 ppm |
| Ni | 0.9 ppm |
| $Na_2SO_4$ | 2,000 ppm |
| As | 0.01 ppm |

### 1.3.5 Waste Specifications

Type: Mineral salts and excess chemicals
Pressure: 5-30 psi min
Flow: See the regen flows in section 6.4
Volume: See the table below

| | MB-865 | MB-875 | MB-885 | MB-895 |
|---|---|---|---|---|
| HCl (gal 30%/regn) | 1.567 | 3.656 | 6.268 | 10.028 |
| NaOH (# 100%/regn) | 6.5 | 21.0 | 33.5 | 63.0 |
| (gal 50%/regn) | 1.02 | 3.30 | 5.26 | 9.90 |
| * (gal 20%/regn) | 3.19 | 10.32 | 16.46 | 30.96 |
| Air Flow (scfm) | 3.0 | 7.0 | 11.0 | 16.0 |
| Waste (gal/regn) | 180 | 574 | 913 | 1,641 |

* The volume of 20% NaOH will not be applicable to systems with option 34A - 50% NaOH is drawn directly from a drum

### 1.3.6 Electrical Power Requirements

The resistivity monitor and any optional electric actuators, flow switches, water meter totalizers, and pumps must be connected to a source of 110VAC, 60 Hz, single-phase power.