



# DOWEX M-43 Ion Exchange Resin

## Corrosion Control with DOWEX M-43 Ion Exchange Resin

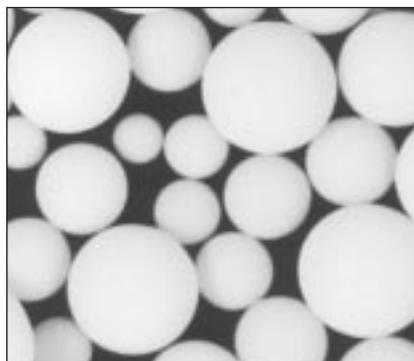
**Corrosion Cost** – Corrosion is a common concern in modern industrial facilities. Whether it is a brand new plant or an aging facility, making equipment last is a top priority. Computers and electronic systems are no less sensitive to corrosive acid vapors. The cost and expense of corrosion can come in many forms, from lost production to unneeded repairs and maintenance to premature replacement of equipment.

Many facilities deal with corrosion by neutralization with base. Precision neutralization is not always easy. The right amount of base must be added so as not to overshoot or undershoot the target. In addition, the neutralized salts stay in the process stream contributing to sludge and other disposal costs.

### **Can you remove acid from a process stream without changing the stream?**

DOWEX\* M-43 anion exchange resin acts like an acid absorber. This is because it is an immobilized base. The base is attached to a tough styrenic plastic bead (Figure 1) that is stable to concentrated acids and bases and insoluble in organic solvents. DOWEX M-43 works by completely removing the acid from the solution, neutralizing the acids. Nothing is released back into the solution that will make a sludge or change the process stream.

**Figure 1. DOWEX M-43 resin.**



### **Typical Properties of DOWEX M-43**

Structure	Macroporous styrenic plastic beads
Density	40 lbs/cubic foot (0.64 g/cc)
Temperature Limit	150°F Maximum
pH Range	0-14 Effective range
Capacity	1.55 equ/l (Minimum)
Moisture	40-50%

With an acid absorbing capacity of >1.55 equivalents of acid per liter of the resin, more than 8.8 lbs of HCl can be removed by 100 lbs of M-43.

DOWEX M-43 resin is a versatile acid absorber, removing both mineral and organic acids. Acids that are successfully removed include HCl, HBr, HF, HI, H<sub>2</sub>SO<sub>4</sub>, H<sub>3</sub>PO<sub>4</sub>, acetic, formic, propionic, and benzoic acid to name only a few.

DOWEX M-43 can be conveniently regenerated by washing the resin with a number of base solutions. The base neutralizes the absorbed acids, converting them to their acid salts to be washed out of the plastic matrix. Excess base is washed away in preparation for the next cycle of use. DOWEX M-43 has been used and regenerated over hundreds of operating cycles with good success.

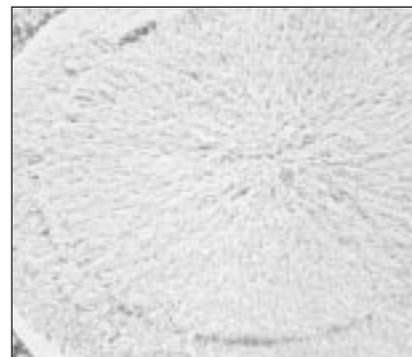
### **Examples**

**Mineral acids** – Corrosive acids such as hydrochloric and sulfuric acid can be removed from process water with DOWEX M-43 resin.

In some batch applications the resin is added directly to the process water and simply removed by filtration. Typically fixed beds are equipped with a 70 mesh screen to contain the beads. The process water is pumped through the resin at 5 to 10 bed volumes per hour until its acid removal capacity is exhausted.

DOWEX M-43 can be regenerated with a number of bases such as NaOH, NH<sub>4</sub>OH or Na<sub>2</sub>CO<sub>3</sub>. Excess base is washed off of the resin in preparation for the next cycle.

**Figure 2. Cross section of macroporous ion exchange resin.**



**Organic acids** – Formic acid can be removed from formaldehyde with DOWEX M-43. The resin is confined in a packed bed and the formaldehyde is passed through the resin at 4 to 6 bed volumes per hour until the acid removal capacity is exhausted. At this point, the resin is washed with water to remove the formaldehyde then regenerated with 3 to 5 lbs. of NaOH (2 to 4% concentration) per cubic foot of the resin. Excess base is washed from the resin with water in preparation for another operating cycle.

**Non-Aqueous Streams** – Organic acids and inorganic acids can also be removed from organic solvents. In this case, it may be desirable to dry the DOWEX M-43 to improve the interaction of the solvent with the plastic and eliminate the addition of water to the process stream. The resin can be dried with warm air or by washing with a dry, compatible solvent such as an alcohol or ketone. DOWEX M-43 functions in the same way to remove acids without leaving a counter ion to contaminate the product stream. The exhausted resin can be regenerated with base in a solvent such as methanol so that water is not needed in the process.

**Controlling Acid Vapor** – DOWEX M-43 resin is also effective in removing acids from air. It has a porous surface to allow complete use of all of the media (Figure 2). The beads can be incorporated into a

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# DOWEX

## Ion Exchange Resins

For more information about DOWEX resins, call Dow Liquid Separations business:

North America . . . . . 1-800-447-4369  
 Latin America . . . . . (+55) 11-5188-9277  
 Europe . . . . . (+31) 20-691-6268  
 Japan . . . . . (+81) 3-5460-2100  
 Australia . . . . . (+61) 2-9776-3226  
<http://www.dow.com/liquidseps>

filter, placed between two screens or held in an open tray. Because the adsorbent is made of tough, round plastic spheres, it can be used in a fluidized bed to remove acids from an air stream. Just like liquid applications, DOWEX M-43 can be regenerated with base and used over and over again.

### DOWEX M-43 Resin

- Tough plastic beads
- Insoluble in acid, base or solvent
- High capacity for acid removal
- Easily regenerated
- Removes corrosives from liquids or air
- Works on solvents or water
- Won't contribute to sludge build-up

### Drying DOWEX M-43

DOWEX M-43 can be dried by washing it with a sufficient volume of a dry, compatible solvent such as an alcohol or ketone. The dry solvent extracts the water and dehydrates the M-43 prior to use.

An alternative drying method is to place the M-43 in a vented oven at 100°C for a sufficient time to dry the M-43 to the level of moisture desired.

### Typical Operating Cycle

Service Flow Rates Operating - 36" deep bed (Based on column cross sectional area)	1.5 gpm/ft <sup>3</sup> Maximum 4.5 gpm/ft <sup>2</sup>
Rinse	Follow regenerant at same rate
Regenerant	0.5-1 gpm/ft <sup>3</sup>
Backwash - (50% expansion) Fully exhausted resin - 77°F for other temperatures [Flow = flow at 77°F (1 = 0.008 (T-77))]	Maximum of 3 gpm/ft <sup>2</sup>
Regenerant dosage suggested NaOH (as 2-4% NaOH) NH <sub>4</sub> OH (as 2-4% NH <sub>4</sub> OH) Na <sub>2</sub> CO <sub>3</sub> (as 2-4% Na <sub>2</sub> CO <sub>3</sub> )	3-5 lb/ft <sup>3</sup> 2.7-3.6 lb/ft <sup>3</sup> 4-5.3 lb/ft <sup>3</sup>

The M-43 will slightly deaminate at elevated temperatures with a noticeable odor. Since the nose is very sensitive to amines, a properly vented oven is needed.

Before use, it is often wise to verify the final moisture content of the resin by a Karl-Fisher titration or some similar test.

**Warning:** Oxidizing agents such as nitric acid attack organic ion exchange resins under certain conditions. This could lead to anything from slight resin degradation to a violent exothermic reaction (explosion). Before using strong oxidizing agents, consult sources knowledgeable in handling such materials.

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