



# How To Reduce Chemical Costs in De-ashing Processes with DOWEX™ MONOSPHERE™ Resins

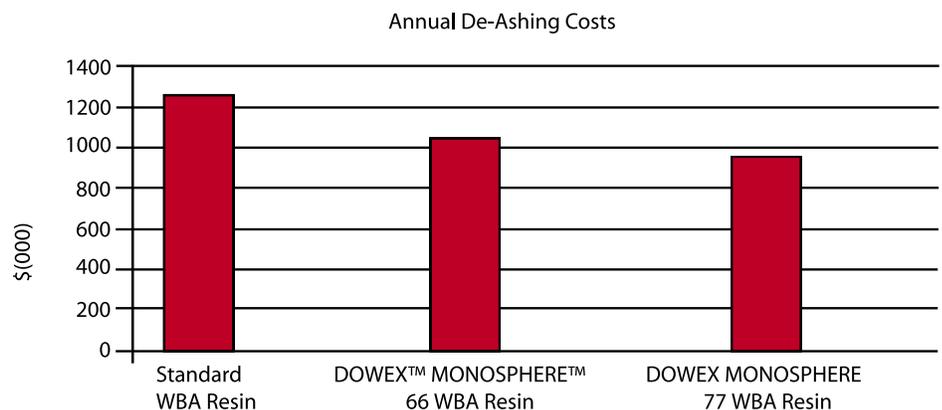
Longer Operating Cycle Times Could Save You As Much As 25%

## The Challenge – The High and Rising Cost of Regenerant Chemicals

With chemical and energy costs on the rise, it has never been more important to maximize the efficiency of your corn wet milling operation.

The single largest impact on profit in de-ashing applications is the cost of regenerant chemicals – typically 60 percent to 85 percent of total operating cost. The more often you have to regenerate your resins, the more regenerant chemicals you will use, increasing your costs. Although each regeneration recharges the resin for the next cycle, each regeneration also damages the resin. Thus, with frequent regeneration, resin life will be reduced, adding even more to your costs over the long term.

The key to minimizing your treatment cost is achieving the highest syrup operating capacity possible. By increasing the length of your service cycles (that is, reducing the frequency of your resin regeneration), you could save up to 25 percent of your regenerant costs.



For breakdown of costs, see Figure 10.

## The Solution – DOWEX™ MONOSPHERE™ Resins Can Increase Service Cycle Length, Reducing Regenerant Costs

### The Resin Makes the Difference

The key to increasing service time is using the highest performing resins. For many years, DOWEX™ 88 strong acid cation resin and DOWEX 66 weak base anion resin were the industry standard for de-ashing processes. Then, more efficient resins became available from Dow – DOWEX MONOSPHERE™ 88 cation resins and DOWEX MONOSPHERE 66 anion resins – which offered unique advantages due to their uniform particle size (UPS). Now a second, even more efficient, UPS weak base anion resin is available – DOWEX MONOSPHERE 77 resin.

### About DOWEX™ MONOSPHERE™ 77 Resin

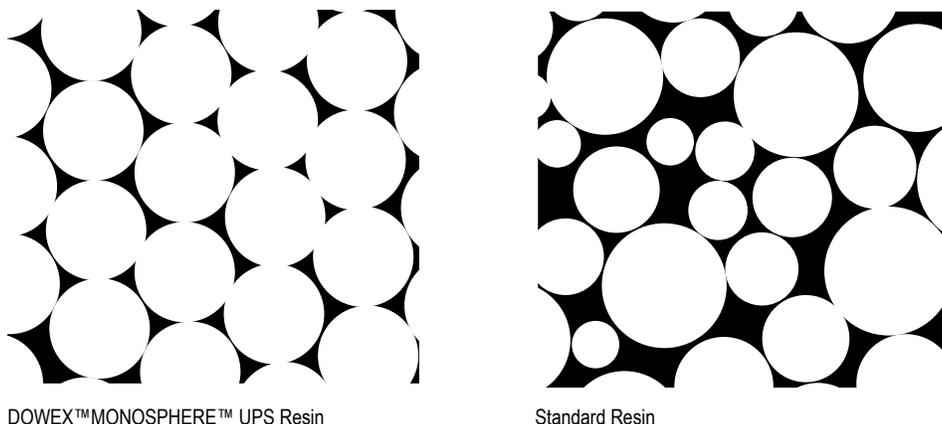
DOWEX MONOSPHERE 77 weak base anion resin is a high-capacity de-ashing resin designed for sweetener applications, which provides greater ion exchange efficiency, increased syrup service time and other performance advantages. When used with DOWEX MONOSPHERE 88 cation resin, it offers the highest operating capacity possible for de-ashing operations.

**Figure 1. Typical Properties of DOWEX™ MONOSPHERE™ 77 Resin**

Property	Unit	FB(Free Base) Form
Total Exchange Capacity, min.	eq/l	1.7
Weak Base Capacity, min	eq/l	1.5
Water Retention Capacity	%	40 - 50
Whole Uncracked Beads	%	95 min.
Particle Size Distribution		
Volume Median Diameter	µm	475 - 600
Total Swelling (FB→HCl), approx.	%	22
Particle Density, approx.	g/ml	1.04
Shipping Weight, approx.	g/l	640
Shipping Weight, approx.	lbs/ft <sup>3</sup>	40

Like all DOWEX MONOSPHERE resins, DOWEX MONOSPHERE 77 resin is made using a process, patented by Dow, that produces resin beads with a uniform particle size (see Figures 2 and 3). Uniform Particle Size (UPS) leads to tighter bead size distribution than standard resins, resulting in improved kinetics, increased strength and better flow. That means that DOWEX MONOSPHERE resins are more resistant to fouling, have longer resin life, and will provide longer service cycles between regenerations and increased operating capacity over the long-term (see Figure 4).

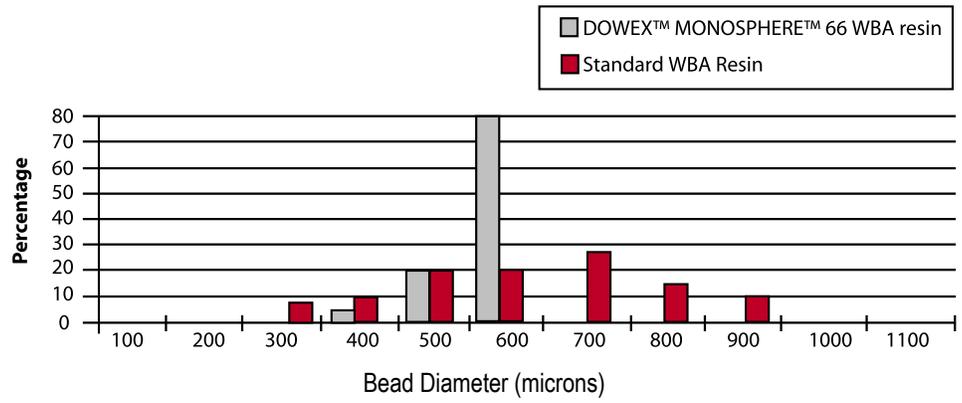
**Figure 2. Tighter Bead Size Distribution of UPS Resins**



DOWEX™ MONOSPHERE™ UPS Resin

Standard Resin

**Figure 3. Particle Size Distribution Comparison**



**Figure 4. Operating Capacity of Anion Resins**

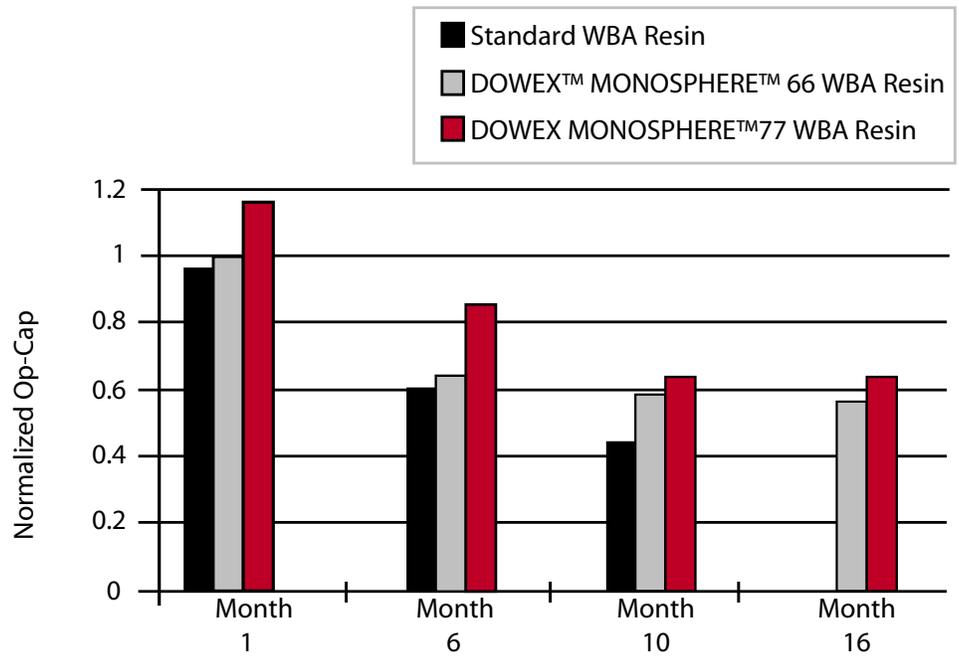
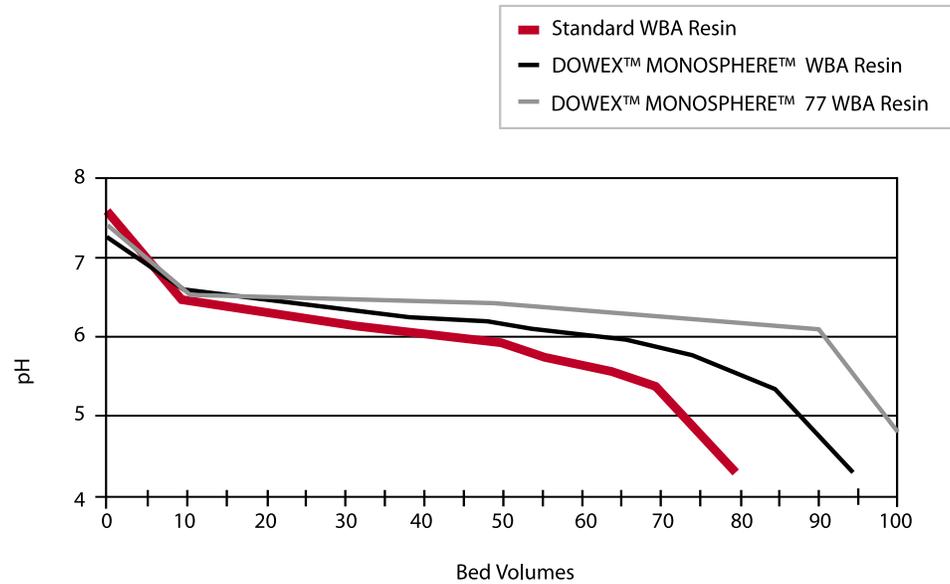
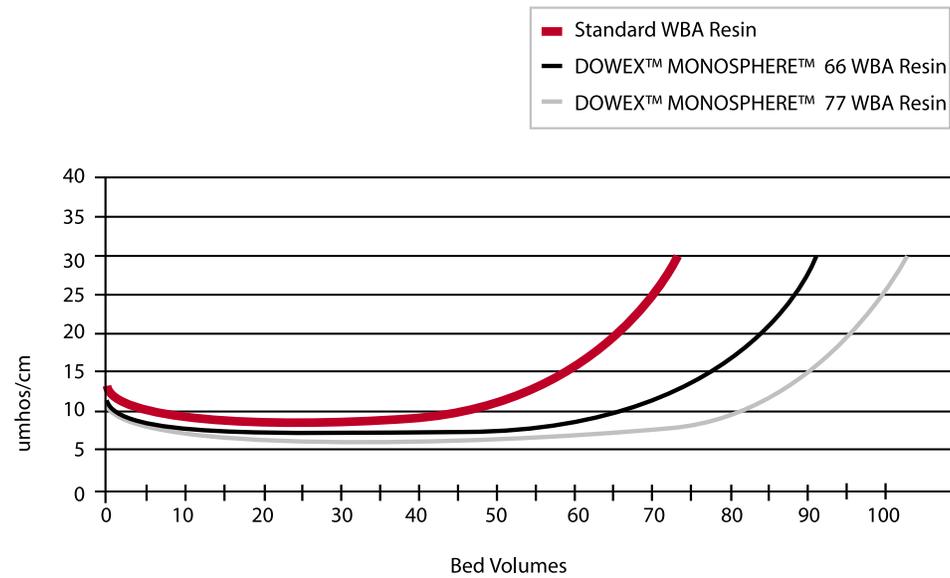


Figure 5 shows the primary dextrose anion pH profile of DOWEX™ MONOSPHERE™ resins, compared to standard resins. DOWEX MONOSPHERE resins also maintain a more consistent conductivity at higher bed volumes, as seen in Figure 6, leading to extended cycle times for DOWEX MONOSPHERE resins.

**Figure 5. Primary Dextrose Anion pH Profile**

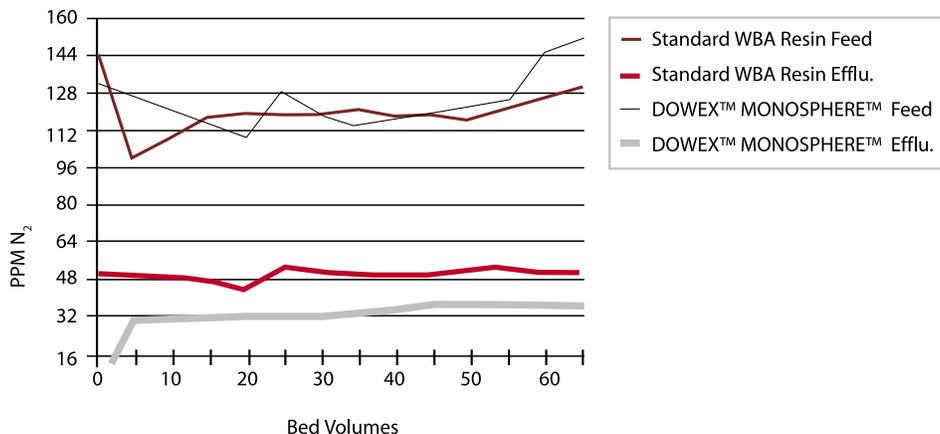


**Figure 6. Primary Dextrose Anion Conductivity Profile**



DOWEX MONOSPHERE resins also provide increased protein and organic acid removal for better storage stability, lower heat-treated color and lower total titratable acidity (see Figure 7) than standard resins, and they produce less sweetwater (30 percent to 40 percent) and less wastewater each cycle (see Figure 8).

**Figure 7. Dextrose Primary Nitrogen Profile**



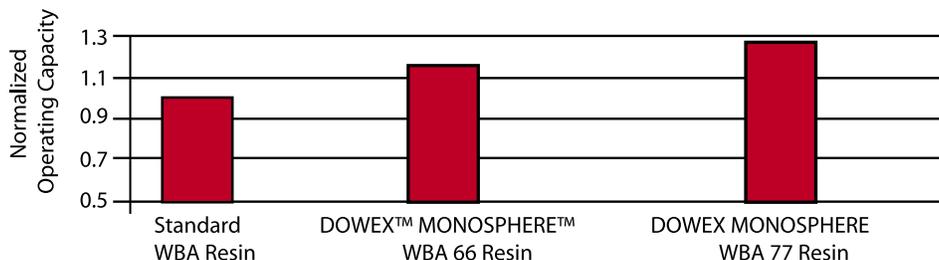
**Figure 8. Evaporation Water Balance  
What Does This Mean for Your De-Ashing Operation?**

	DOWEX™ MONOSPHERE™ Resin	Standard Resin
Gallons Water	4,250	6,870
Lbs Water	37,516	57,021
Delta Lbs		+19,505
Delta %	-34	

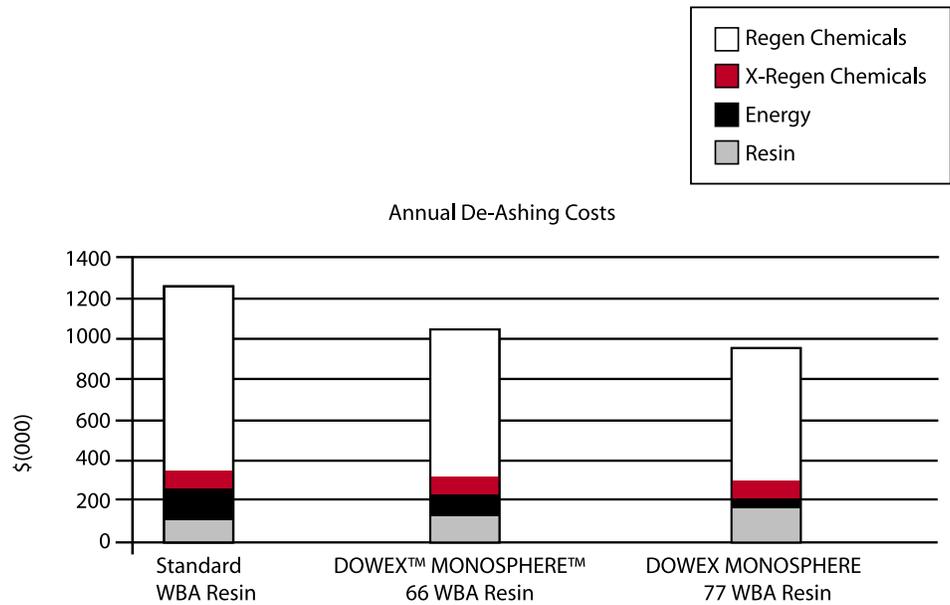
If you are using standard weak base anion resins or even DOWEX™ MONOSPHERE™ 66 resins, you may be able to increase your operating capacity by switching to DOWEX MONOSPHERE 77 resins. As seen in Figure 9, normalized operating capacity when using DOWEX MONOSPHERE 77 anion resins is almost 28 percent greater than when using standard anion resins, and approximately 13 percent greater than when using DOWEX MONOSPHERE 66 resins.

**Figure 9. Operating Capacity Comparison**

This increased operating capacity translates into a reduced need for regenerant chemicals, which may reduce your overall operating de-ashing costs by as much as hundreds of thousands of dollars, as shown in Figure 10.



**Figure 10. Annual De-Ashing Costs**



With this kind of savings, it may make economic sense to replace your weak base anion resins now with high efficiency DOWEX MONOSPHERE 77 resins, even if their useful life is not fully depleted. For the same amount of regenerant chemicals, you can extend your service cycle by up to 28 percent, saving you up to 25 percent in regenerant chemicals over the life of your resins.

### **Backed by Decades of Separations Expertise**

DOWEX™ MONOSPHERE™ resins are made by Dow, which has been an industry leader in separations technology since 1940. Dow provides a wide variety of resins designed specifically for corn wet milling applications. To find out more about DOWEX MONOSPHERE resins for your application, please contact us.

### **Appendix**

Note: For the purposes of this discussion, operating costs are based on the following parameters:

- Dextrose de-ashing
- Double-pass operation
- Caustic regeneration
- Resin cost differentials included
- Anion limited
- Projected resin lives
- Cost factors included:
  - Resin depreciation
  - Regenerant cost
  - Cross-regeneration cost
  - Evaporation cost (to concentrate sweetwater)
- Not included:
  - Wastewater treatment
  - Labor for regenerations

**DOWEX™ Resins**

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