The Pall Magnetic Mixer 3000 system is a scalable single-use mixing system optimized for the growing number of processes operating at volumes greater than 2000 L. The heart of this system is a mixing biocontainer incorporating an innovative bottom-mounted, magnetically-driven impeller capable of providing efficient, high speed, high-torque mixing in powder-liquid and liquid-liquid applications.

Introduction

Liquid-liquid mixing, whether for maintaining homogeneity, for chemical treatment, or for formulation steps, is a common requirement in biopharmaceutical processing. In this experiment, a Pall Magnetic Mixer 3000 system was used to perform pH adjustments at various impeller speeds.

Experimental

A 3000 L Pall Magnetic Mixer biocontainer was installed in a 3000 L Pall Magnetic Mixer cubical tank and filled with ~3000 L of room-temperature water. A pair of pH sensors were positioned at the top and bottom of the biocontainer, and then mixing was initiated with an impeller speed of 60 rpm.

After allowing the pH sensors to equilibrate for 10 minutes, an aliquot of 0.5 M HCl aqueous solution was added via a liquid inlet port at the top of the biocontainer, and the time for mixing to be complete (i.e. when the top and bottom sensor readings plateaued and agreed within 5% of the mean pH value) was recorded. The water was then neutralized with 0.5 M NaOH aqueous solution, and the sequence repeated at impeller speeds of 90, 120, 150, 180, 210, 300 and 490 rpm.
Results

Table 1 shows the mixing times at each impeller speed value.

Table 1
Mixing times at various impeller speeds

<table>
<thead>
<tr>
<th>Impeller Speed (rpm)</th>
<th>Mixing Time (minutes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>60</td>
<td>21</td>
</tr>
<tr>
<td>90</td>
<td>7</td>
</tr>
<tr>
<td>120</td>
<td>4.5</td>
</tr>
<tr>
<td>150</td>
<td>5</td>
</tr>
<tr>
<td>180</td>
<td>4.5</td>
</tr>
<tr>
<td>210</td>
<td>4.5</td>
</tr>
<tr>
<td>300</td>
<td>4.5</td>
</tr>
<tr>
<td>490 *</td>
<td>3</td>
</tr>
</tbody>
</table>

* High-speed impeller required

Conclusions

The high-speed mixing action of the Pall Magnetic Mixer 3000 system facilitates rapid liquid-liquid mixing at scales up to 3000 L. Under the conditions evaluated, mixing was completed within between 3 minutes and 21 minutes depending on impeller speed. The ability to mix effectively at a wide range of impeller speeds provides end-users with considerable flexibility in selecting the optimal mixing conditions to meet their process needs.

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