**Spargers for pH Control in Chemical Treatment Plants**

**Application:** The customer needed the pH level adjusted in a chemical treatment tank. They wanted to eliminate use of sulphuric acid by using CO\textsubscript{2} instead. There was a restriction on the diameter and length of the sparger to be used.

**Mott Product/Solution:** After data collection, a sparger was sized based on the pH level, liquid flow rate, and the target time provided by the customer. The Industrial Sparger was chosen to be most efficient for this application. Per customer’s specification, a flange-mounted sparger was developed.

**Sparger Features/Benefits:**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sintered Metal</td>
<td>Rugged Construction, Reliable in Service</td>
</tr>
<tr>
<td>Many Configurations Available</td>
<td>Meet Specific Application Requirements</td>
</tr>
<tr>
<td>Available in Wide Variety of Metals &amp; Alloys</td>
<td>Corrosion Resistance (Chemical Compatibility), Temperature Resistance</td>
</tr>
<tr>
<td>Large Gas-Liquid Contact Area</td>
<td>More Complete and Rapid Mass Transfer</td>
</tr>
<tr>
<td>Precise Control of Bubble Point, Permeability And Uniformity of Permeability</td>
<td>Consistent &amp; Repeatable Performance</td>
</tr>
</tbody>
</table>

**Competition:**

- Drilled Pipe
  - Poorly Dispersed Gas
  - Large Bubbles
  - Low Surface Area
Competition (continued):

- Mott Sparger
  - Evenly Dispersed Gas
  - Millions of Tiny Bubbles
  - High Surface Area

High efficiency sparging is achieved by fine bubble propagation. The fine bubble propagation will provide maximum surface area for effective “mass transfer”.

Note: In addition to the pore size of the media, there are several factors that influence bubble size. These factors are: gas exit velocity – the lower the velocity the smaller the bubbles; and liquid surface tension – the lower the surface tension the smaller the bubbles.

Sizing Procedure for In-Tank or Vessel Sparging:

1. Determine gas flow required in standard cubic feet per minute (SCFM).

2. Determine the liquid pressure at the sparger, in psig (P).
   - 2.1 For open or vented tanks:
     \[
     P \text{ (psig)} = \text{liquid head (feet)} \times 0.433 \times \text{specific gravity of liquid}
     \]
     (Specific Gravity of water = 1.0)
   - 2.2 For closed tanks or vessels with a pressurized head space:
     \[
     P \text{ (psig)} = \text{Head Space Pressure (psig)} + \text{Liquid Head Pressure (psig)}
     \]

3. Determine liquid temperature, °F (T).

4. Determine ACFM, from SCFM using standard gas formula:
   \[
   \text{ACFM} = \frac{\text{SCFM} \times 14.7}{[14.7 + P]} \times (460 + T)
   \]

5. Select Gas Exit Velocity, FPM, using chart:

<table>
<thead>
<tr>
<th>In-Tank, not agitated:</th>
<th>In-Tank, agitated:</th>
</tr>
</thead>
<tbody>
<tr>
<td>5-10 FPM Design</td>
<td>1-5 FPS*</td>
</tr>
<tr>
<td>25 FPM</td>
<td>25 FPM Design</td>
</tr>
<tr>
<td>Maximum</td>
<td>50 FPM Maximum</td>
</tr>
<tr>
<td>5-10 FPS*</td>
<td>25 FPM Design</td>
</tr>
<tr>
<td></td>
<td>100 FPM Maximum</td>
</tr>
<tr>
<td>&gt; 10 FPS*</td>
<td>50 FPM Design</td>
</tr>
<tr>
<td></td>
<td>150 FPM Maximum</td>
</tr>
</tbody>
</table>

*Calculate agitator tip speed:
\[
\text{Agitator Diameter (in) x RPM} = \text{FPS}
\]

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Note: Lower exit velocities will produce smaller bubbles. Exit velocities may be less than the design values given.

6. Calculate sparger area required, ft², \( A \).
\[
A = \frac{ACFM}{FPM}
\]

7. Select appropriate Mott sparger element (or elements), and determine the best in-tank arrangement based on process requirements.

**VARIOUS CONFIGURATIONS**

Mott recommends the use of media grade 2 or general gas sparging.

The use of reinforced or supported elements is also highly recommended.
VARIous END FITTINGS

TYPE A HEX NIPPLE SPARGER ELEMENTS

TYPE G SPARGER ELEMENTS (FOR WELDING BY OTHERS)

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A

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