The Fermentation Facility is designed to help researchers develop new fermentation technologies and products and to provide benchtop- and pilot-scale fermentation equipment. The facility has equipment for scaling up the production of industrially important chemicals, chemical feedstocks, genetically modified organisms, and enzymes.

The Fermentation Facility works jointly with the Iowa State University BioCentury Research Farm. Additional fermentation capabilities are available in the Biomass Processing Facility.

**MAIN SERVICES**

» Controlled growth of microorganisms from benchtop (1- to 7-liter) to pilot scale (15- to 1,000-liter) working volume capacities

» Analysis of cells and metabolites

» Simultaneous and long-term fermentations

» Parallel benchtop scale fermentations

» Continuous and batch fermentations

» Downstream processing including centrifugation, ultrafiltration, and freeze-drying

» Training for industry personnel
LAB AND PILOT PLANT EQUIPMENT

Published fees are for cost estimation purposes only. Fees are subject to change based on specific circumstances. Fermentor prices include labor for a standard fermentation. Operating and safety training is required for equipment operation by clients.

<table>
<thead>
<tr>
<th><strong>Staff Assistance</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Per Hour ..................</td>
<td>$135</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Benchtop Fermentors</strong>*</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>5-Liter</td>
<td></td>
</tr>
<tr>
<td>Set-up/Cleaning ............</td>
<td>$100</td>
</tr>
<tr>
<td>Daily ................................</td>
<td>50</td>
</tr>
<tr>
<td>Note: Free if customers use the fermentors to prepare seed culture for larger fermentor cultures.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Sterilizable-in-place Fermentors</strong>*</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>15-Liter</td>
<td></td>
</tr>
<tr>
<td>Set-up/Cleaning ..................</td>
<td>$500</td>
</tr>
<tr>
<td>Daily ......................................</td>
<td>160</td>
</tr>
<tr>
<td>50-Liter</td>
<td></td>
</tr>
<tr>
<td>Set-up/Cleaning ..................</td>
<td>$750</td>
</tr>
<tr>
<td>Daily ......................................</td>
<td>270</td>
</tr>
<tr>
<td>120-Liter</td>
<td></td>
</tr>
<tr>
<td>Set-up/Cleaning ..................</td>
<td>$1,200</td>
</tr>
<tr>
<td>Daily ......................................</td>
<td>450</td>
</tr>
<tr>
<td>500-Liter .........................</td>
<td>Call for quote</td>
</tr>
<tr>
<td>1,000-Liter .........................</td>
<td>Call for quote</td>
</tr>
<tr>
<td>Note: Free if customers use the fermentors to prepare seed culture for larger fermentor cultures.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Cell Harvesting</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>CEPA Z-41 Semi-continuous Centrifuge</td>
<td></td>
</tr>
<tr>
<td>Set-up/Cleaning ..........</td>
<td>$200</td>
</tr>
<tr>
<td>Hourly .........................</td>
<td>50</td>
</tr>
</tbody>
</table>

| Sharples A-26 Continuous Centrifuge |  |
| Set-up/Cleaning .................. | $240 |
| Hourly ................................ | 70 |

| **Centrisys Three-phase, Continuous Horizontal Decanter** |  |
| Set-up/Cleaning .................. | $700 |
| Hourly ................................ | 100 |

| **Membrane-filtration Unit (10-Liter)** |  |
| Set-up ................................ | $240 |
| Hourly ................................ | 50 |

| **Membrane-filtration Unit (200-Liter)** |  |
| Set-up/Cleaning .................. | $600 |
| Hourly ................................ | 100 |

<table>
<thead>
<tr>
<th><strong>Cell Homogenization</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>French Pressure Cell Press (40-ml cell)</td>
<td></td>
</tr>
<tr>
<td>Per Use .....................</td>
<td>$70</td>
</tr>
</tbody>
</table>

| **Emulsifier Flex-D 20B** |  |
| Set-up/Cleaning .......... | $500 |
| Hourly ...................... | 100 |

<table>
<thead>
<tr>
<th><strong>Spray Drying</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Spinning Disk Otomized</td>
<td></td>
</tr>
<tr>
<td>Set-up/Cleaning ..........</td>
<td>$500</td>
</tr>
<tr>
<td>Hourly ......................</td>
<td>100</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Drum Drying</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Mini Drum Dryer</td>
<td></td>
</tr>
<tr>
<td>Set-up/Cleaning ..........</td>
<td>$150</td>
</tr>
<tr>
<td>Hourly ......................</td>
<td>50</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Tray Drying</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Tray Dryer VWR</td>
<td></td>
</tr>
<tr>
<td>Set-up/Cleaning ..........</td>
<td>$80</td>
</tr>
<tr>
<td>Daily ......................</td>
<td>40</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Freeze Drying</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Virtis Ultra-35 Freeze Dryer: Bulk Drying</td>
<td></td>
</tr>
<tr>
<td>Set-up/Cleaning ..........</td>
<td>$200</td>
</tr>
<tr>
<td>Daily ......................</td>
<td>250</td>
</tr>
</tbody>
</table>

| **Virtis Unitrap II Freeze Dryer** |  |
| Set-up/Cleaning .......... | $200 |
| Daily ...................... | 100 |

| **Dry Grind Corn Ethanol Production*** |  |
| 500-Liter / 1,000-Liter Fermentors .......... | Call for Quote |
| Distillation Tower .......... | $1,680 |
| Falling Film Evaporator .......... | 1,200 |
| Sharples Horizontal Decanter Centrifuge .......... | 600 |
| Membrane-filtration Unit, MPMC .......... | 600 |
| Rotary Steam Tube Drying System for DDGS .......... | 1,136 |
| *Per batch base |  |