Design and Selection of Single Use Technology for a Commercial Biologic
A Case Study

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Program Background
Tech Transfer of a Commercial Scale Biologic

- Existing process/facility
  - Mostly stainless equipment
  - Single Use in place
    - Bags and filter for intermediate storage
    - Some tubing
- New facility
  - Single product
  - Shell/structure already in place
  - Defined footprint
Program Background

Goals

- Increase capacity / yearly output
- Balance capital cost with operating cost
  - Process
  - Utilities
- Successful filing and approval of transferred process

Where to Use Single Use Technology?

Understand The Process

- Mapped out our process / operations
  - Developed a manufacturing schedule, material balance, equipment utilization
- Evaluated three options using modeling software
  - All Stainless
  - Hybrid
  - All Single Use
- Model Outputs
  - Capital Cost
  - Operational Cost
  - Single Use Usage (Bags/yr)
  - Manpower requirements
- Review of Outputs by Team
Where to Use Single Use Technology?
Understand The Environment

- **Ensure the chosen approach worked for the facility**
  - Manufacturing footprint / buffer prep and hold space
  - Warehouse space for single use components
  - Utilities requirements, space needed for utilities generation

- **Ensure the chosen approach worked for the team**
  - Training / experience with single use in MFG
  - Do we have the right skill set to prepare for and implement the SUT?
    - Science (MSAT) and Engineering
    - Quality
    - Materials Management
    - Procurement

- What benefits are we gaining from implementing? Are we ready?

Where to Use Single Use Technology?
Understand The Quality Requirements

- **Expected to demonstrate and maintain control of our processes / product quality**
- **Single use introduces a new variability**
  - Extractables / Leachables
  - Product Stability
  - Supplier Management
    - QTA’s
    - Vendor Qualification/Auditing
    - Vendor Change Management
- Where are the gaps? How do we fill them?
Where to Use Single Use Technology
Final Outcome – Hybrid Approach

- **Capital Costs vs Operational Costs**
  - Use single use where it makes sense

- **Schedule / capacity requirements met**
  - Reduced turnaround times / increased equipment utilization

- **Utilities / Facility footprint**
  - Major reduction in utilities (CIP, WFI, steam)
  - Warehouse / Utilities space adequate

- **Company environment**
  - Comfortable with implementing bags, filters, tubing
    - Quality Systems in place
    - Manufacturing experience
    - Skill sets required readily available or easily obtained through training

What Single Use Technology to Use?
Setting up for Success

- **Developed User Requirement Specifications (URS’s) and understanding of needs**
  - Specifics of operation, potential dealbreakers
  - Space requirements
  - Ease of use
What Single Use Technology to Use?

Setting up for Success

- Gathered existing knowledge
  - What vendors did we already have a relationship with?
  - What vendors were we potentially looking to build a relationship with?
  - What single use equipment have we used successfully?
  - What single use equipment have we had issues with?

- Took stock of the options on the market
  - Reviewed existing technologies / vendors (not just those you are most familiar with)
  - Selected top 3-5 options
  - Brought vendors in for discussions, learned more
  - For key equipment, took it for a test drive

- Worked with procurement group

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What Single Use Technology to Use?

Example – Mixing System

- Selected 5 potential vendors / mixing systems
- Visited and tested out all mixing systems
  - MFG, MSAT, Engineering present
  - Tests with water / sodium phosphate performed to evaluate mixing
- Procurement solicited and received bids
- Example output (not actual results of our work)

<table>
<thead>
<tr>
<th>Mixing Capability</th>
<th>Vendor 1</th>
<th>Vendor 2</th>
<th>Vendor 3</th>
<th>Vendor 4</th>
<th>Vendor 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min / Max Volume and Volumes available</td>
<td>25/110L (100L Mixer) 40/220L (200L Mixer)</td>
<td>30/100L (100L Mixer) 60/200L (200L Mixer)</td>
<td>25/110L (100L Mixer) 40/220L (200L Mixer)</td>
<td>30/100L (100L Mixer) 60/200L (200L Mixer)</td>
<td>Doesn’t bracket range required for step x</td>
</tr>
<tr>
<td>Footprint</td>
<td>Smallest</td>
<td>Footprint too large for Rooms x,y</td>
<td>Acceptable</td>
<td>Acceptable, but on the higher side</td>
<td>Acceptable</td>
</tr>
<tr>
<td>MFG Ease of Use</td>
<td>Acceptable</td>
<td>Acceptable</td>
<td>Mixer install difficult</td>
<td>Acceptable</td>
<td>Acceptable</td>
</tr>
<tr>
<td>Other Feedback</td>
<td>Capital Cost</td>
<td>$</td>
<td>$</td>
<td>$</td>
<td>$</td>
</tr>
<tr>
<td></td>
<td>Operational Cost</td>
<td>$</td>
<td>$</td>
<td>$$$</td>
<td>$$$</td>
</tr>
</tbody>
</table>
What Single Use to Use
Reducing Risk – Multiple Sourcing

- Separated Mixers, Bags, and Tubing Assemblies as separate packages
- Evaluated potential dual sources for bags and tubing assemblies
  - Mixers were not considered since each vendor has its own mixing technology
  - Final decision was made based on bid packages and team discussion
- Selected two bag vendors
  - Vendor 1: Same as mixing system
  - Vendor 2: Affordable custom bag to same dimensions
  - Totes: Selected a manufacturer that could build a tote capable of using either bag
- Selected two tubing assembly vendors
  - Vendors 1 and 2: Vendors with open architecture, one of which su

Implementation
- Both vendors single use systems added to material specifications, batch records
- All materials (bag films, tubing) were evaluated for E/L
- Primary vendor was selected for each subset

Advantages
- Able to negotiate pricing with two vendors for future planning
- Backup vendor if there are issues with supplying components

Disadvantages
- More upfront work dealing with multiple vendors and components
  - E/L
  - Materials Management (Part Numbers)
  - Quality (more companies for QTA’s, audits)
- Maintaining documentation for two suppliers
- Overall more complex
Key Takeaways

- Understand your goals and needs
  - Company
  - Program
  - Facility
  - Process
- Understand the strengths and weaknesses of your company as they relate to single use
  - Quality
  - Material Handling
  - Employee Training / Experience
- Do your homework when selecting single use equipment
- Leverage procurement

Questions?
Please use the microphone indicated so our recording includes audio of your question
For further information, please contact
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