REINVENTED ASEPTIC FILL-FINISH PROCESSING TECHNOLOGIES

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Agenda

• Industry Trends & General Requirements
• Traditional Aseptic Processing Overview
• Flexible Aseptic Processing Overview
• Comparison Between Tradition and Flexible Approaches
• Cost & Savings
• Conclusions
Trends & General Requirements

• Small scale, high value, patient focused
• Fast turnaround time and clinic responsiveness becoming more critical
• New products are highly potent at the filling stage
• Leaner, modular, simpler
• Superior flexibility – multi-format, multi-product, multiple dosing options
Traditional Aseptic Processing

CNC

Vials
Comp Prep

Cartridge
Comp Prep

Syringes
Comp Prep

CNC/Grade D

Wash
Comp Prep

Wash
Comp Prep

Depyro
Comp Prep

Tub Decon
Comp Prep

Grade C

Fill
Lid/Liner Removal

Stopper
Capping

Insert Plunger
Capping

Insert Plunger
Capping

CNC

Capping

INTERPHEX
Traditional Aseptic Processing

• Dedicated fill-finish capabilities for a specific container type or “format”
• Adding additional container filling capabilities is a significant investment in facilities, time and equipment
• Processing challenges include glass on glass contact, machine jams, broken containers, etc.
• Very efficient for high volume dedicated products where flexibility is not necessary and the line is rarely “changed over”
Flexible Aseptic Processing

- Integrates best in industry technologies
- Simplifies the manufacturing process
- Ability to fill multiple container formats & sizes
- Common facility with reduced floor space and utilities
- Increased asset utilization

*Flexibility is the antidote to uncertainty*

Courtesy of AST

Courtesy of Bausch + Stroebel

Courtesy of VanRx

INTERPHEX
Enabling Technologies

• Ready-To-Fill Containers
  • Vials, Syringes, Cartridges and Infusion Bags
  • WFI Washed, <1 EU/Container, EtO Sterilized
  • Cartridges have line seal & crimp cap placed, and oriented like a pre-filled syringe
  • No glass on glass contact

• Ready-To-Use Components
Single-use Technology Evolution

From here to fully integrated systems

1. Reservoir / Bag
2. Sterile Connector
3. Sterile In-Line Filter
4. Bag Assembly / RTP Port
5. Surge Bag
6. Tubing Extension
7. Pump Tubing Assemblies

INTERPHEX
Enabling Technologies

Isolator Barrier Technology + Robotics

- Provides full separation between the operator and the process
- Compatible with VHP bio-decontamination
- Recipe driven operation
- Maximum flexibility and functionality
- Negligible particle generation

“Automation of other process steps, including the use of technologies such as robotics, can further reduce risk to the product.”

Guidance for Industry: Sterile Drug Products Produced by Aseptic Processing — Current Good Manufacturing Practice (Pg.10)
Flexible Aseptic Processing

- Consolidated manufacturing process that allows multiple container formats to be filled and finished on a single system.
- Interchangeable robot tooling specific to container
Cost & Savings

- **Facility Size**
  - Reduce operating areas by 30-40%

- **Facility Cost**
  - Reduced engineering / design & construction costs
  - Reduced construction / constructability challenges
  - Reduced capital equipment investment

- **Equipment Operations**
  - Eliminate washing and depyrogenation operations
  - Increase equipment utilization
  - Single fill line has the ability to process multiple container formats
  - Eliminates some of the most common routine interventions
  - Reduced set-ups, operations, and maintenance
Modularity: Proof of Value

- Modularity, along with Standardization, are of significant value in biomanufacturing capital investment programs for the following reasons:
  - Drives cost control and a rapid delivery
  - Holistic solution
  - Risk mitigated (financial, human)
  - Efficient execution strategy
  - ‘Bolt on’ capacity, as needed, when needed
  - Drives efficiency and repeatability
  - Higher predictability of a successful outcome
The Cost of Modularity

• Modular components on an isolated unit price basis, may cost more than a stickframe solution

• On an overall CAPEX basis (including all direct and indirect costs), this added cost translates to about 2-5% additional cost

• This added cost is offset by a more efficient construction execution approach afforded by modularity, reducing indirect and management costs

• The quality of modular systems is typically better than stickframe construction, since the quality is controlled in a factory, by a single source of responsibility
Flexible, Multi-Format Facility
Modular Delivery Options

Modular System Vendors
The available options vary greatly. Here are a few examples:

Modular Solutions Spectrum

- Modular Room Enclosure Systems
  - Daldrop
  - AES
  - Plascore

- Modular Room Enclosures with Utility Systems
  - G-Con
  - SmartFit

- Building Modules with Utility Systems
  - Pharmadule
  - Morimatsu

- Building Modules with Process Systems
  - GEHC KUBio

House-in-House

Team with 3rd Party to Provide Product Processing Systems
The Modular Execution Approach

Modular Component Fabrication

- Equipment Skids
- Podular Enclosures
- Modular Infrastruct.
- Modular HVAC
- Prefab Piping Racks
- Building Shell + Core
- C+Q Templates

Site Implementation

- Tested + Delivered
- Fab + Delivered
- Fab + Delivered
- Fab + Delivered
- Fab + Delivered
- Built Onsite
- Edit + Issue

- Systems Specialists + Local Labor
- System Specialist + Local Labor
- System Specialist + Local Labor
- System Specialist + Local Labor
- System Specialist + Local Labor
- C+Q Specialist + Local Labor

Delivered Globally

- Local Labor
- Local Labor
- Local Labor
- Local Labor
- Local Labor
- Local Labor
Schedule Optimization

Success is predicated on a comprehensive execution plan aimed at an efficient, parallel execution toward operational readiness:

Typical Conventional Project Schedule – 24 to 28 months
- Design: 4 Months
- Permit: 1 Mo
- Procurement: 2 Mo
- Construction: 12 Months
- C+Q
- Operationally Ready: 4 Months

Modular Schedule Scenario – 9 to 14 months
- Design: 2-3 Months
- Procurement: 1 Mo
- Permit: 1 Mo
- Fabrication + Installation: 6 Months
- Construction: 6-7 Months
- C+Q
- Operationally Ready: 4 Months
“Cloning” - cookie cutter

Benefits:
• Known entity/process
• Known qualification/validation
• Known headaches
Conclusions

Flexible aseptic processing:

• Simplifies the traditional aseptic manufacturing process, and

• Leverages the strengths of best in class technologies to:
  
  • Focus on core aseptic manufacturing processes
  • Provide an adaptable platform capable of multi-container format filling
  • Minimize routine operator interventions
  • Reduce facility size, utilities, cost, and validation
  • Increase operational efficiency
  • Increase speed to market
Conclusions (continued)

• Current facility design are becoming obsolete and do not meet pressing industry requirements
• Multi-product/ multi-purpose facilities are requested
• Enabling technologies include:
  • Single-use process systems,
  • RU and RS components,
  • Robotics
  • Isolator or RABS for critical processing
  • Autonomous cleanroom spaces
  • Modular cleanroom and facility designs
  • Deployable designs for global markets e.g. ‘in-country/for country’
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It's just ONE THING, and it's in our corporate DNA. At the heart of everything we do at Genesis is one guiding principle...

“How can we help our clients?”