Technical Report No. 66

Application of Single-Use Systems in Pharmaceutical Manufacturing

## Authors

<table>
<thead>
<tr>
<th>Author</th>
<th>Organization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Robert Repetto, MS, MBA</td>
<td>Team Co-Chair, Pfizer</td>
</tr>
<tr>
<td>Morten Munk, Team Co-Chair</td>
<td>CMC Biologics</td>
</tr>
<tr>
<td>Stephen Brown, Ph.D.</td>
<td>BE Vaccines</td>
</tr>
<tr>
<td>Jeffrey Carter, Ph.D.</td>
<td>GE Healthcare</td>
</tr>
<tr>
<td>Niels Guldager, NNE Pharmaplan</td>
<td></td>
</tr>
<tr>
<td>Christian Julien, MS</td>
<td>Meissner Filtration Products, Inc.</td>
</tr>
<tr>
<td>Duncan Low, Ph.D.</td>
<td>Amgen</td>
</tr>
<tr>
<td>Ingrid Markovic, Ph.D.</td>
<td>Food and Drug Administration</td>
</tr>
<tr>
<td>Jerold Martin, MS</td>
<td>Pall Life Sciences</td>
</tr>
<tr>
<td>Paul Priebe, Sartorius Stedim Biotech</td>
<td></td>
</tr>
<tr>
<td>Christopher J. Smalley, Ph.D.</td>
<td>Merck &amp; Co</td>
</tr>
<tr>
<td>Russell Wong, Ph.D.</td>
<td>Bayer HealthCare</td>
</tr>
</tbody>
</table>

## Contributors

<table>
<thead>
<tr>
<th>Contributor</th>
<th>Organization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Robin Alonso, Genentech</td>
<td></td>
</tr>
<tr>
<td>Eberhard Bill, Ph.D.</td>
<td>Boehringer Ingelheim</td>
</tr>
<tr>
<td>Oki Dzivenu, GE Healthcare</td>
<td></td>
</tr>
<tr>
<td>Bill Hartzel, Catalent Pharma Solutions</td>
<td></td>
</tr>
<tr>
<td>Eric Isberg, ATMI</td>
<td></td>
</tr>
<tr>
<td>Maik Jornitz, G-Con</td>
<td></td>
</tr>
<tr>
<td>Michael Kraich, Ph.D.</td>
<td>Boehringer Ingelheim</td>
</tr>
<tr>
<td>James Robinson, Lachman Consultants</td>
<td></td>
</tr>
<tr>
<td>Hillary Russak, Genentech</td>
<td></td>
</tr>
<tr>
<td>Robert Shaw, Finvector—FVT Ltd</td>
<td></td>
</tr>
<tr>
<td>Ken Baker, NewAge Industries Inc.</td>
<td></td>
</tr>
<tr>
<td>Sally Kline, Ph.D.</td>
<td>Amgen</td>
</tr>
<tr>
<td>Mani Krishnan, EMD Millipore</td>
<td></td>
</tr>
<tr>
<td>Jessica Frantz, Sartorius Stedim Biotech</td>
<td></td>
</tr>
</tbody>
</table>

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# Table of Contents

## 1.0 INTRODUCTION

## 2.0 GLOSSARY OF TERMS

2.1 Acronyms

## 3.0 POINTS TO CONSIDER FOR SINGLE-USE SYSTEM MANUFACTURING STRATEGY

3.1 Single-Use Technologies
3.2 Business Drivers for the Adoption of Single-Use Systems
3.3 Qualification and Verification of Suppliers, Materials, Components, and Completed Assemblies
3.3.1 Product Risk
3.4 Process Control Strategy Considerations
3.5 Implementation of a Single-Use System
3.5.1 Stakeholder Management
3.5.2 Risk Management
3.5.3 Process Validation and Verification (PVV)
3.5.4 Scoping
3.5.5 Project Execution Plan (PEP)
3.5.6 Supplier and Responsibilities
3.5.7 Testing and Documentation
3.5.8 Supplier Management
3.5.9 Logistics Control Requirements
3.5.9.1 Inventory and Supply Chain Management
3.5.9.2 Waste
3.5.9.3 Transportation
3.5.9.4 Single Suppliers
3.5.9.5 Change notifications
3.5.9.6 Technical Diligence
3.6 Implementation Summary

## 4.0 SINGLE-USE TECHNOLOGIES AND SYSTEM INTEGRATION

4.1 Introduction
4.2 Comparison of MUS and SUS
4.3 SU Components and Assembly
4.4 Technical Feasibility and Risk Assessment Framework
4.5 Factors Affecting SUS Design
4.5.1 Process Compatibility
4.6 Facility Impact for SUS Setup and Deployment
4.6.1 Operational Requirements
4.7 Applications and Technology
4.7.1 Process Connections
4.7.1.1 Technological Examples
4.8 Materials of Construction
4.8.1 Fluid Management
4.8.1.1 Technological Examples
4.8.2 Mixing
4.8.2.1 Technological Examples
4.8.3 Fermenters and Bioreactors
4.8.3.1 Technological Examples
4.9 Storage
4.9.1 Technological Examples
4.10 Freezing
4.10.1 Technological Examples
4.11 Filtration
4.11.1 Technological Examples
4.12 Centrifugation
4.13 Chromatography
4.13.1 Technological Examples
4.14 Drug Product Final Filling
4.14.1 Technological Examples
4.15 Isolators
4.16 Sampling and Laboratory Analysis
4.16.1 Technological Examples
4.17 Transportation
4.17.1 Technological Examples
4.18 Sensors
4.18.1 Technological Examples
4.19 System Integration
4.20 Supply Chain Integration
4.20.1 Factors Which Affect the Quality of Supply Chain

## 5.0 QUALIFICATION AND VERIFICATION OF SUPPLIERS, MATERIALS, COMPONENTS, AND COMPLETED ASSEMBLIES

5.1 Introduction
5.2 Risks Associated with Using Single-Use Systems
5.3 Single-Use System Assembly
5.4 Supplier Qualification of Single-use Systems
5.4.1 Supplier Audits and Technical Diligence
5.4.2 Supplier Quality Agreements and Responsibilities
5.5 Qualification of Alternative Suppliers
5.5.1 Qualification of Alternative Sources
5.5.2 Interchangeability
5.5.3 Using Supplier Quality Documentation
5.6 Extractables and Leachables (E&L)
5.6.1 Material and Supplier Qualification
5.6.2 Toxicity of E&L
6.0 BUSINESS DRIVERS FOR THE ADOPTION OF SINGLE-USE SYSTEMS

6.1 Evaluation of Business Drivers
6.2 Lifecycle Approach
6.3 Opportunity Cost
6.4 Cost of Quality
6.5 Quantitative Evaluation of Business Drivers
6.6 Operational Model
6.6.1 Single- or Multiple-Product Facility
6.7 Total Cost Model
6.7.1 Shortcut Cost Model Based on Cost of Goods
6.7.2 Example of a Shortcut Cost Model
6.7.3 Comprehensive Cost-of-Goods Model
6.8 Investment Costs
6.8.1 Process Equipment
6.8.2 Utility Equipment
6.8.3 Indirect Equipment Costs
6.8.4 Facility
6.8.5 Materials
6.8.6 Consumables
6.8.7 Utilities
6.8.8 Waste
6.9 QC/QA and Cost of Quality
6.10 Fixed Operating Costs
6.10.1 Cost of Capital
6.10.2 Depreciation
6.10.3 Staff
6.11 Project Duration, Time, and Productivity
6.11.1 Overall Project Duration
6.11.2 Process Operation Time
6.11.3 Time Constraints
6.11.4 Speed of Process Development
6.11.5 Equipment and Process Validation
6.11.6 Construction Time
6.11.7 Self-Assembly
6.12 Logistics
6.12.1 Supply
6.12.2 Storage
6.12.3 Transportation
6.12.4 Waste
6.13 Disposal of an SUS
6.14 Sustainability
6.15 The Value Added
6.15.1 Value-Added Analysis

7.0 IMPLEMENTATION OF A SINGLE-USE SYSTEM

7.1 Implementation Road Map
7.2 Implementation Themes
7.2.1 Stakeholder Management
7.2.2 Risk Management
7.2.3 Process Validation and Verification (PVV)
7.3 Implementation S3: Scoping
7.3.1 SUS Strategy
7.3.2 Business Drivers
7.3.3 Operating Scenarios and Standardization
7.3.4 Process Validation Stage
7.3.5 Operating Volumes and Storage Requirements
7.3.6 Hybrid Systems
7.3.7 Connection Principles
7.3.8 Campaigning
7.3.9 Future Deployment
7.3.10 Sourcing
7.3.11 Testing Strategy
7.3.12 Materials
7.3.13 Shelf-Life Policy
7.3.14 Procurement
7.3.15 Storage
7.3.16 Waste Treatment
7.3.17 Non-GxP Issues
This is a preview of "PDA TR 66-2014". Click here to purchase the full version from the ANSI store.
FIGURES AND TABLES INDEX

Figure 3.0-1  Key Decision Areas for an SUS Manufacturing Strategy ......................... 4
Figure 3.0-2  Proposed SUS Decision Pathway .......... 6
Figure 3.0-3  Technical Report Structure Overview.... 6
Table 4.2-1  Comparison of MU and SU Systems .. 15
Figure 4.3-1  Anatomy of an SUS ......................... 16
Figure 4.4-1  Implementation of an SUS and the Assessment of Drug Process and Product Risk .................................................. 17
Table 4.5.1-1  Assessment of Process Compatibility 19
Table 4.6-1  Assessment of SUS Facility Setup and Deployment ........................................ 20
Table 4.6.1-1  Assessment of Operational Requirements ........................................... 21
Table 4.7.1.1-1  Functional Categories of Connectors .. 22
Table 4.7.1.1-2  Specific Considerations for Connectors ........................................... 23
Table 4.8-1  Plastics Commonly Used in SUS ......... 24
Table 4.8.1.1-1  Specific Considerations for Fluid Management ..................................... 28
Table 4.8.2.1-1  Specific Considerations for Mixing ..... 29
Table 4.8.3.1-1  Specific Considerations for Fermenters or Bioreactors ......................... 30
Table 4.9.1-1  Specific Considerations for the Storage of Process Intermediates .............. 31
Table 4.10.1-1  Specific Considerations for Freezing ... 32
Table 4.11.1-1  Specific Considerations for Filtration .. 33
Table 4.13.1-1  Specific Considerations for Chromatography .................................... 34
Table 4.14.1-1  Specific Considerations for Drug Product Final Filling ......................... 35
Table 4.15-1  Specific Considerations for Isolators .. 36
Table 4.16.1-1  Specific Considerations for Sampling and Laboratory Analysis ............... 37
Table 4.17.1-1  Specific Considerations for Transportation ........................................... 38
Table 4.18.1-1  Specific Considerations for Sensors ... 39
Figure 4.19-1  System Integration ................................. 39
Figure 5.2-1  Example of an Ishikawa Diagram for Determining Risk Sources ................. 41
Table 5.2-1  Risk Complexities of SUS Items and Applications ................................ 42
Table 5.5.2-1  Component Interchangeability Evaluation ........................................... 46
Table 5.5.3-1  Example Supplier Testing and Reference Standards .................................. 47
Table 5.6.1-2  Example—Quantitation of Extractables from SU Components after 50 kGy Irradiation ........................................... 50
Table 5.6.1-3  Identified Extractables from Membrane Filter Cartridges from Several Manufacturers ........................................... 51
Table 5.6.1-4  Identification of Extractables from Polyethylene Biocontainers with Ethyl Vinyl Alcohol Interlayer ..................................... 51
Figure 5.11.2-1  Investigation of a Bioprocess Container for Leaks ..................................... 58
Figure 5.11.2-2  Identifying the Location of Leaks on a Bioprocessing Container ............... 59
Figure 6.5-1  Cost Comparison Studies Reference Model ........................................... 63
Table 6.5-1  Factors That Affect the Process Model .. 63
Table 6.6-1  Factors That Affect the Operational Model ............................................ 64
Table 6.7-1  Comparative Evaluation of a New Versus Retrofitted Facility During SUS Implementation ........................................... 64
Table 6.8.1-1  Contributory Factors to Investment Costs ........................................... 66
Table 6.8.4-1  Main Variable Operating Costs .......... 67
Table 6.10-1  Main Fixed Operating Costs .......... 69
Table 6.13-1  Treating and Discarding Waste from SUSs ........................................... 74
Table 6.15.1-1  Comparison of Value-Added Activities .. 75
Figure 7.1-1  SUS Implementation Road Map ........... 78
Table 7.1-1  Focus and Output for Each SUS Implementation Stage .................................. 79
Figure 7.2.1-1  An Example of a Stakeholder Power Grid ........................................... 81
Table 7.2.3-1  Guidelines for the Application of Risk Management During SUS Implementation ........................................... 82
Table 7.2.3-2  Directional Risk Profile of SUS Items and Applications........................................83
Table 7.2.3-3  Risk Management and Mitigation in Current and Future SUS Implementation........................................83
Figure 7.2.3-1  SUS Implementation and the Validation Lifecycle .................................................................84
Table 7.4.1-1  Typical Contents of the SUS Project Execution Plan ..............................................................89
Figure 7.4.5-1  SUS Process and Facility Integration ......................................................................................90
Figure 7.4.6-1  Process and Facility Considerations for SUS Implementation ..............................................91

Table 7.4.6-1  Example of a Regulatory Assessment Table.................................................................92
Figure 7.5.3-1  Example of SUS Installation Scope Drawing .................................................................97
Table 7.7.3-1  Principle Differences Between a Quality Audit and a Technical Diligence Assessment.................................104
Table 7.7.3-2  Some Pertinent Factors for a Technical Diligence Assessment Checklist .......105
Table 7.7.3-3  An Interpretation of the SUS Implementation Process ......................................................106
Table 8.4.3.1-1  Sample Room Classifications ..............117
1.0 Introduction

Single-use technology, often described as single-use systems (SUSs) or single-use equipment, has the potential to transform pharmaceutical manufacturing by offering tremendous opportunities to reduce cost, improve flexibility or cycle time, and shorten the time needed to build a manufacturing process for new, lifesaving drugs. This success, however, is very much dependent on how effectively the industry approaches the development and implementation of single-use technology. Ultimately, a new drug can only be successful if it is effective, safe, and available. Traditionally, only a comprehensive understanding of the drug product and manufacturing process can achieve these goals. This remains true as SUS is introduced in place of traditional reusable equipment. Encouraging an open science- and risk-based dialogue during supplier audits and evaluation of SUS supply chains significantly improves an SUS implementation.

This document is intended to provide the reader with critical concepts or points to consider when implementing an SUS strategy in a pharmaceutical manufacturing process. These concepts are intended to be valid both for chemically synthesized small molecules and for bioprocesses that produce large-molecule biopharmaceutical products. However, to be truly effective, many of these critical concepts must start with the design, supply chain, manufacturing, and distribution of SUSs themselves, as many inherent quality attributes can impact either the product molecule or its production process. Pharmaceutical manufacturers and single-use technology suppliers have become partners whose success is dependent on the control strategies implemented.

This document discusses SUSs that are in either direct or indirect contact with the raw materials, intermediates, and pharmaceutical drug substances or drug products. The document does not intend to discuss disposable items related to laboratory activities, final delivery system to the patient, transfusion bags, packaging, or medical devices.

Successful SUS implementation needs a comprehensive approach balancing the product and process goals achieved by using single-use technology. Section 3, Manufacturing Strategy, of this technical report is intended to present an approach that ties together key considerations when evaluating single-use technology. A well-designed manufacturing strategy will address technical, quality, business, and implementation considerations. Each topic has a dedicated section in this technical report, providing a detailed discussion of the associated considerations.

Determining the optimal manufacturing strategy involves concepts from many disciplines. An effective evaluation will have a balanced viewpoint, with input from engineering, regulatory, quality, project management, and accounting. Balancing risks and rewards of an SUS over a multiple-use system (MUS) will help determine the most appropriate manufacturing strategy. Thus, a structured science- and risk-based approach is recommended and should be consistent with principles described in ICH Guidelines Q6, Q7, Q8, Q9, Q10, and Q11. Primary goals, when developing any manufacturing strategy, should focus on controlling impacts to patient safety, product availability, and product and process understanding (1–6).

Only a formal partnership with an SUS supplier can ensure that quality is as good as or better than what is achieved with traditional systems (e.g., a purchase order is not a partnership). SUS suppliers provide equipment that includes the outsourced, value-added activities that the end user no longer performs. These value-added activities are important for the success of both organizations, and a winning control strategy for SUS has elements in both the supplier’s and the end user’s quality systems.

The concepts and recommendations presented in this technical report were developed over several years of discussion within the task force, at PDA workshops, and at other industry meetings. The authors of this technical report recognize that the conversation regarding how best to implement SUSs is just beginning. Ultimately the success of these systems will be determined by the decisions suppliers and end users make during implementation, and the hope is that this report provides a foundation for the industry to build on.