Choosing an Isolator or BSC for Aseptic Applications

Abstract

Choosing an appropriate aseptic processing environment for various aseptic applications has become an increasingly hot topic in the world of pharmaceuticals and advanced therapy medicinal products (ATMPs). Isolators and biosafety cabinets (BSCs) can each provide a Grade A environment for aseptic processing. However, for processes that require enhanced product integrity, product safety, and personnel safety, isolators are rapidly replacing biosafety cabinets as the "gold standard" for sterility assurance and safety.

Why choose an isolator over a biosafety cabinet? Besides noteworthy operational and facility cost savings, isolators are also the most effective form of protection for your product. Recent innovations and engineered solutions for material logistics, isolator material and liquid transfers, and new designs of isolator process flow are key for the high-quality manufacture of medicinal products and related sterility testing. Additionally, isolators provide the highest form of personnel protection when working with potentially hazardous materials.

Isolators are more operationally cost-effective

If a company chooses to perform aseptic processing within an isolator, significant savings associated with facility and operational costs will be observed. Isolators require a lower cleanroom classification compared to the required biosafety cabinet cleanroom classification. Aseptic processing within an isolator requires a maximum of a Grade C cleanroom classification (ISO 7 at rest, ISO 8 in operation). Sterility testing within an isolator allows for a controlled-unclassified cleanroom classification. Equivalent processing, manufacturing, or testing within a biosafety cabinet requires a minimum Grade B cleanroom classification (ISO 5 at rest, ISO 7 in operation).

Increased facility and operational costs for supporting a BSC within a manufacturing or sterility testing space arise from:

- Larger facility size, typically by 20-33% (more airlocks, larger cleanrooms)
- Higher utility and HVAC demand with facility size and cleanroom classification upgrades
- Additional labor, materials, and supply costs for increased cleaning & disinfection, environmental monitoring, and gowning

Clear capital and operational cost savings are associated with reduced cleanroom classification. Additionally, there are significant labor time savings and productivity enhancements that accompany lower cleanroom classifications due to the time saved with less gowning. Perhaps, the greatest "savings" of all is the increased quality of life observed across the workforce. Less gowning allows for increased physical freedom and added ease of facility entrance and exit, resulting in higher operator satisfaction and productivity.

SKANFOG Pure²

Cost-effective transition product from BSCs to isolators

Cellana-M

Modular customized isolator with integrated equipment

Cellana-L

Modular, expandable, scalable isolator with maximum flexibility

Regulatory preference within Eudralex (EU) Annex 1

The recent update of the European Union's Eudralex Volume 4 Annex 1 "*Manufacture of Sterile Medicinal Products*" has created a noteworthy pivot in the world of biopharmaceuticals and therapies with emphasis on contamination prevention and associated design controls. Specifically, Section 2.1.i of the updated Annex 1 regulation provides a distinguished focus on new technologies.

"*Facility, equipment, and process should be appropriately designed, qualified and/or validated and where applicable, subject to ongoing verification according to the relevant sections of the Good Manufacturing Practices (GMP) guidelines. The use of appropriate technologies (e.g., Restricted Access Barriers Systems (RABS), isolators, robotic systems, rapid/alternative methods, and continuous monitoring systems) should be considered to increase the protection of the product from potential extraneous sources of endotoxin/pyrogen, particulate, and microbial contamination such as personnel, materials, and the surrounding environment, and assist in the rapid detection of potential contaminants in the environment and the product.*"

Additional benefit comparison between an isolator and BSC

The argument between choosing an isolator or biosafety cabinet depends on various factors that are related to a company's manufacturing process, facility setup, and strategic facility planning. As well, regulatory guidance (such as Eudralex Volume 4 Annex 2A *Manufacture of Biological Active Substances and Medicinal Products for Human* Use) may suggest key points to consider when it comes to choosing between an isolator or biosafety cabinet.

Operation Considerations	BSCs	Isolators
Sterility Assurance Level (SAL)	10^{-3} SAL (3-log Reduction)	10^{-6} SAL (6-log Reduction)
Annex 1 Compliance	Transfer Challenges	Validatable Compliance
Disinfection	Manual Wipe-Down	Automated / Validatable Decon
Data Management	Manual Data Logging	Automated GMP Data
Equipment Integration	Basic / Benchtop	Fully Integrated
Facility Operating Costs	Higher	Lower
Equipment Capital Cost	Lower Per Unit Cost	Higher Per Unit Cost

Why choose SKAN?

SKAN, founded in 1968, has evolved beyond isolator manufacturing, offering global services, a renowned training academy, and in-house process specialists. SKAN supports customers with process designs and validations for success. Aseptic Technologies, a SKAN group company, also stands as a leader in aseptic fill & finish solutions with a focus on the ATMP market. SKAN provides aseptic process isolator solutions worldwide, ensuring the highest sterility standards.

Choose the high-quality cGMP solution for the highest-quality product.

What if there is more?