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Large scale freeze-thaw bag system for protein bulk storage: prototypes development

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Freezing of large quantities of protein bulk has generally been handled using “freeze-thaw vessels”, which are essentially jacketed metal tanks with additional cooling surface provided by internal coil and fin assemblies. With the recent industry push towards using disposables, it is desirable to explore disposable technology alternatives to costly freeze-thaw vessels. In this presentation we discuss our approach at designing and testing of first and second generation prototypes for a large bag freezing system developed in-house. The system, which is compatible with our existing and commercially available freeze-thaw skids, can handle 300 L of bulk at a time. Our approach is based on the “tank liner” concept where disposable liners (bags) fit into cavities contained by a non-disposable jacketed stainless steel shell. We have explored several bag/cavity shapes to optimize for manufacturability and operational performance. Our results suggest that times required to freeze and thaw are typically slightly longer than the equivalent volume freeze-thaw vessel but exhibit large variability depending on bag placement. Overall, while technological feasibility has been demonstrated, many aspects of the system require further development to render it sufficiently robust to be implemented in actual production environment.