PROJECT SUMMARY

The purpose of the High Efficiency, High Output Plastic Melt Waste Compactor (HEHO-PMWC) SBIR Phase I effort is to provide additional data and analysis on the current PMWC system as well as alternative designs. The current PMWC is a device where trash is side-loaded and compressed with an eight-inch piston. During compression, heat is applied to remove water from the trash and simultaneously melt plastic contained within the trash. By melting the plastic, the PMWC can achieve extremely high density levels reducing the overall volume of trash.

A few concerns/issues going forward with the current design are that it has been optimized for hypogravity (a point of emphasis now that microgravity has come back into focus with NASA's new direction of utilizing ISS more fully), that it is a side-loading design (which increases maintenance), that it is very thermally inefficient, and that its throughput is quite low for the amount of processing required on a daily basis.

ORBITEC's intent is to conduct analyses and trades to mitigate these issues/concerns to bridge the current technology with the requirements for NASA's new direction. ORBITEC's HEHO-PMWC effort will build on and complement ongoing work being done at Ames Research Center on the PMWC. ORBITEC's focus during the Phase I effort is to conduct flow and thermal analyses to optimize the system design for microgravity, to conduct bench-top testing to analyze various piston designs, and to conduct trade studies to determine the optimal capacity and capability of the HEHO-PMWC. All of these analyses and tests will be used to influence the next phase of design and to create a conceptual design for the next-generation HEHO-PMWC.

Through testing and analysis, ORBITEC conceptually designed a heat melt compaction system that would be suitable for long-duration application, such as on the ISS. From analysis and trade studies of several variables, it was determined that an optimal compaction chamber size of 16" square would be the most efficient solution. From testing of surface treatments it was determined that a Tufram series surface treatment would provide the best solution due to its release and wear resistance properties.

With the knowledge gained during the Phase I effort and the work conducted on the conceptual design for a long-duration application on the ISS, we feel that by the end of the Phase II effort, a near-brassboard version of a HEHO-PMWC for ISS application could be fabricated and tested. Accelerating the development of the HEHO-PMWC in this manner would greatly increase the technology readiness level of the system and advance the system in a very short timeframe.