TEXAS SPACE GRANT CONSORTIUM
DESIGN CHALLENGE

TOPIC # - TDC - 94 - S24

IV FLUID GENERATION (IVGEN) MINI pH CORRECTION

BACKGROUND

Intravenous (IV) fluids are an important treatment modality for multiple medical conditions that have the potential to occur during Mars missions and that may lead to adverse crew health and mission outcomes without appropriate treatment. However, carrying sufficient volumes of IV fluids with adequate shelf life to support such missions is currently not feasible due to anticipated mass and volume constraints of future vehicles and the relatively short shelf-life of terrestrial IV fluids. The goal of the IntraVenous Fluid GENeration Mini (IVGEN Mini) project is to develop a low mass and volume IV fluid generation device that can produce IV fluids in situ and that reduces the need to launch and store large quantities of IV fluids. It builds on the original IVGEN system developed by the Human Research Program Exploration Medical Capability Element that successfully demonstrated the capability to produce in situ IV fluids aboard the ISS in 2010 using an ISS potable water source. Flight demonstration objectives for this system included purification via packed bed, bubble removal, sterilization, microgravity mixing, and United States Pharmacopeia (USP) tested compliance.

PROBLEM DESCRIPTION

IV fluids produced by IVGEN Mini are required to meet United States Pharmacopeia (USP) standards. One of the USP standards for IV fluids is pH, which must be between 4.5 and 7.0. However, the IVGEN Mini is to use ISS potable water which can have a pH between 4.5 and 8.5. Furthermore, for exploration missions, the planned pH ranges for potable water are based on EPA standards and are expected to be between 6.5 and 8.5. In both cases, there exists the potential for exceeding the USP pH limits for concentrated saline. There is therefore a need to measure and buffer the pH of the input potable water to meet USP standards.

PROJECT SCOPE

The scope of the project is to design and build an engineering prototype that enables inline measurement and correction of pH of potable water, that is optimized for mass and volume, and that can buffer a minimum of 20L of ISS potable water in one batch. Consideration should also be given to operation of the device in microgravity. The prototype does not need to include capabilities to pump, collect, or filter potable water or include the corresponding tubing. The NASA team is available for questions and meetings concerning input water characteristics, spaceflight constraints, medical constraints, etc. The schedule and deadlines are based on the overall TSGC & NASA Spark challenge deadlines.

DELIVERABLES: A standalone prototype of a small mass/volume device that can measure and correct pH of at least 20 L of input water similar to ISS potable water composition to between a pH of 4.5 and 7.0. This includes engineering drawings, BOM, requirements or description of use, concept of operations and maintenance, and a summary of results from testing and any lessons learned.

DESIGN TEAM PROFILE

NASA MENTOR:	Courtney Schkurko
LEVEL:	All levels
MAJOR / DISCIPLINES:	AE, ME, ChemE, BiomedE or similar
TEAMS:	Mentor may accept more than one team
DURATION:	Two-Semester Project