

INTRODUCTION

On the International Space Station (ISS), the wastewater processing tank currently experiences biofilm growth produced by bacteria. Biofilm formation is produced through microorganisms adhering to surfaces and creating an extracellular polymeric matrix.¹ Biofilm causes clogging issues downstream from the tank, impacting equipment reliability and life. To target biofilm remediation more accurately, biofilm floc samples from the wastewater tank must be collected for further ground sampling efforts. SHIEPP intends to leverage existing ISS sampling hardware to complete this task. The SHIEPP test stand will determine if the custom-built filter bags can adequately handle the potential pressure a sampling line may produce and assist in deployment testing.

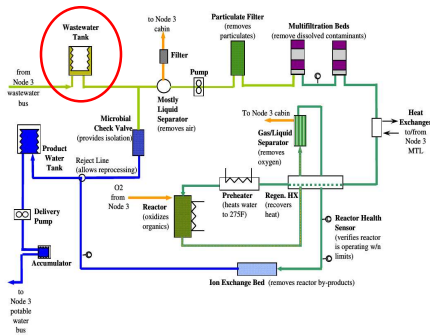


Figure 1: Location of the Wastewater Tank in the Wastewater Processing Assembly



Figure 2: Biofilm accumulation in piping²



Figure 3: Biofilm Floc

OBJECTIVES

Through Jacobs innovation grant funding, this project seeks to build a filter bag that can be used inside existing sample hardware in order to separate out the flocs from the sampling stream. The filter bag will need to:

- Be able to survive the flow rate and pressure coming off the sample line on the ISS
- Adequately separate out the flocks of biofilm
- Not provide significant back pressure to the system
- Deploy from a folded position into the Potable Water Collection Packet

Design of the SHIEPP

- Nylon tubing and the folded bag is small and collapsible enough for insertion through the small Luer lock fittings into the existing sample hardware
- Nylon filters of 10 microns will provide adequate separation for the flocs from the rest of the sample line fluid
- The nylon filters will be bag sealed together enabling it to withstand the pressures and flowrates of the sample line



Figure 4: SHIEPP Bag Prototype

Progress

- A SHIEPP filter bag prototype has been constructed.
- A test stand has been assembled to ensure that the custom built bag will be able to withstand the potential pressures and flow rates of the ISS sample line and give data about back pressure conditions.
- Bag deployment will be tested once it is determined the bag design can handle ISS sample line conditions.

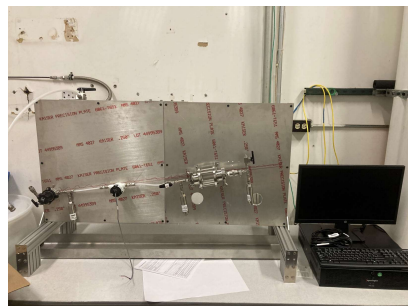


Figure 5: SHIEPP ISS conditions test stand.

Deployment in ISS Sampling Technology

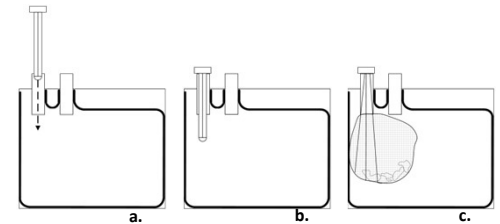


Figure 6: SHIEPP Deployment Plan

SHIEPP seeks to leverage existing flight sampling hardware currently on the ISS by inserting the floc capture bag within the existing Potable Water Collection packet (SVO-ZV). Figure 6 shows the planned sequence.

- 6a. SHIEPP is inserted into the Potable Water Collection packet (SVO-ZV)
- 6b. Folded SHIEPP is then introduced to pressure through flow, and expansion bars (may be omitted) provide back up to help deployment.
- 6c. Bag filter at 10 um is deployed to collect biofilm floc. The Potable Water Collection packet is then sealed and returned for analysis.

CONCLUSION

SHIEPP will attempt to utilize the Potable Water Collection packet to allow for floc samples from the ISS wastewater tank to be returned on the ground. Floc sample return will allow for targeted biofilm mitigation strategies to be employed. Through the current test stand build and later testing, we will determine if the custom-built filter bags can successfully survive ISS line conditions and effectively deploy and capture flocs in the Potable Water Collection packet.

REFERENCES

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