Summary
Clothes Cleaning Studies for Long Duration Manned Missions

Imagine how much could be saved in just 5 years if the garments that are sent to space are reduced by half. My project consisted in analyzing the efficiency of steam cleaning with and without pretreatment of selected garments.

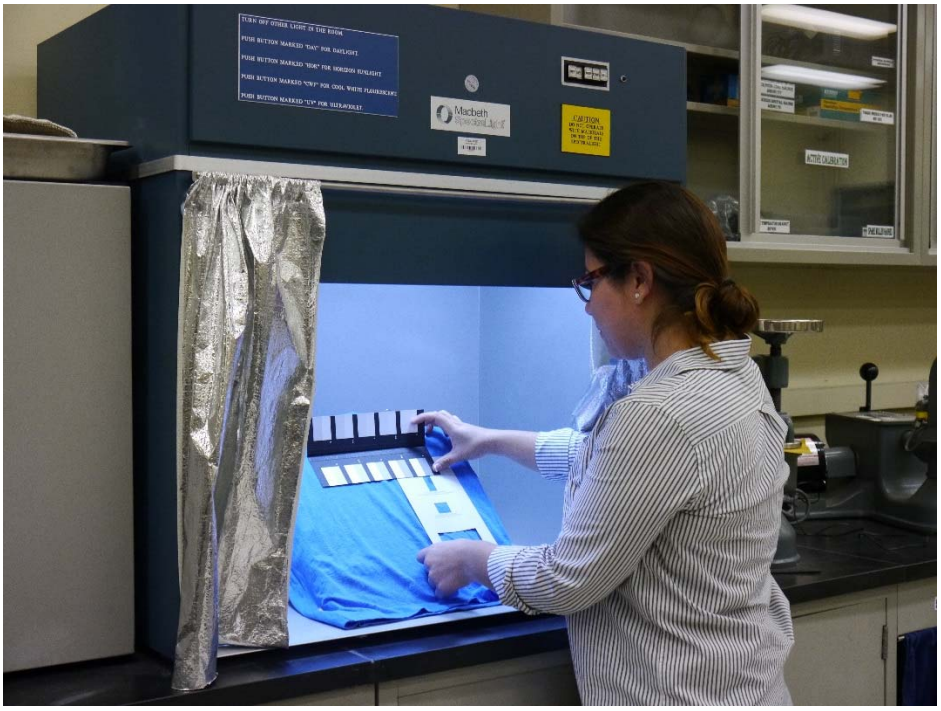
Crewmembers wear clothes for a certain period of time, and then these garments are discarded. Having crewmembers wearing their clothes for longer time while giving them the opportunity of reusing the garments (which at the moment is not possible) will reduce costs considerably. More importantly, it will build the path for sustaining human presence in deep space. In addition, reusing cleaned clothes will help crewmembers be in a more hygienic environment because the amount of trash will be reduced. By limiting the amount of garments that are sent, volume and mass will be reduced. As a result, there will be more space to pack other necessary goods.

The main duties within the project were to develop a pre wash procedure that will be used for all of the fabrics (4 different fabrics were included in the experiment), to establish a time for the process of cleaning the garments with steam, to know the amount of oil and salt solution necessary to soil the fabric and that will be completely absorbed by the fabric, to determine the amount of chemical agent to use for removing the stains, to create a matrix with the SAS software that will have all the possible combinations to carry out during the experiment when soiling the shirts, to measure the stains before and after the steam process, to measure the cleanliness of the fabric before and after with the use of the Gray Scale for Staining, and to find out whether or not the observations are valid and useful.

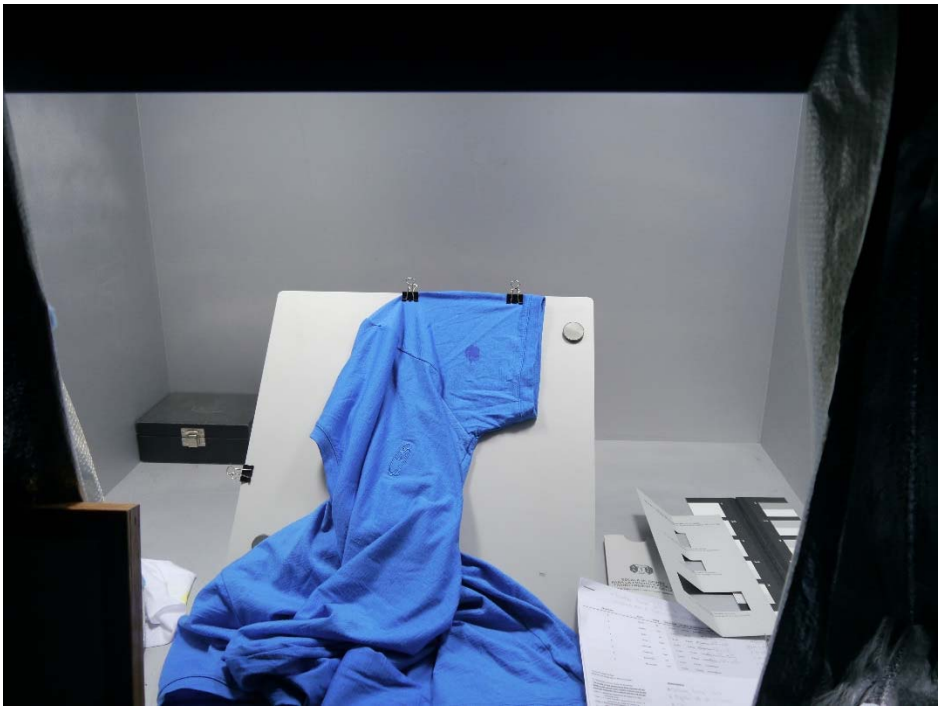
One of the major goals was to know if applying just steam without the use of chemical agents could clean the soiled shirts. In addition, reducing water and energy when cleaning the stains with the use of steam was another important goal. Up to this moment, the study has not finished and other methods to clean clothes for long duration manned missions will be experimented.

My learning experience was broad. I could observe how a big organization is managed and how its departments support each other with the purpose of achieving one common goal. My people skills broaden, and this was a very important accomplishment for me. Another interesting experience was to install the software that I was going to use in this project, which was critical to perform the experiment. I asked for help from the IT department. We worked together, and we could install the program successfully. Having the software installed allowed me to understand how SAS works. With the help of one of my mentors, I understood how factorial designs are created in SAS. Another important aspect was to create a plan to lay out the main tasks of the project that were subsequently divided in small ones. This was very helpful for tracking the tasks and overall managing the project.

After this experience, I can confirm that I selected the right major: Industrial Engineering. Once I finish my undergraduate degree (Spring 2016), I will continue my graduate studies in engineering at the University of Akron in Ohio. Since this internship at NASA Johnson Space Center has been an extraordinary experience, I will apply again to the program.



Picture 1. Working with the Gray Scale for Staining



Picture 2. Stained shirt before pretreatment

Picture 3. Shirt after pretreatment