

Project Number: CF – ABH4

Automation of Pleated Cartridge Assembly

DESIGN AUTOMATION FOR MILLIPORE SIGMA

A Major Qualifying Project Report

Submitted to the Faculty

Of the

WORCESTER POLYTECHNIC INSTITUTE

In partial fulfillment of the requirements for the

Degree of Bachelor of Science

In Mechanical Engineering

By

Marissa Ford

Haruna Okada

Muhammad Ali Shah

Date: 4/26/2018

Professor C. Furlong, Major Advisor

Keywords:

1. Automation
2. Design Process
3. MilliporeSigma

Abstract

MilliporeSigma produces high grade filters used in the medical industry. One of the main components of the filters is a composite membrane that has complex elastic and mechanical properties, which demands manual, complex, and skillful processes for assembly of the filters. Therefore, assembly could benefit from automated solutions. In this project, we evaluated the current manual processes to identify automation points and formulated individual station designs. Multiple design solutions were evaluated with respect to functional specifications and experiments were conducted to approximate membrane properties. For each station, risk analyses and SWOT were used during an iterative design process to define two potential assembling solutions. These two solutions were detailed, which included identification of sensors and actuators together with animations that illustrate the assembly processes. Additionally, critical points of the designs were evaluated with kinematic analysis. It is shown that these designs hold the potential to be further analyzed and implemented by the sponsor.

Executive Summary

The work produced by Marissa Ford, Haruna Okada, and Muhammad Ali Shah has been deemed proprietary information by MilliporeSigma. The nature of the final results demands a level of confidentiality that does not permit a submission for public viewing. As such, a final paper cannot be submitted to Worcester Polytechnic Institute at this time. Alternatively, a final report will be submitted directly to MilliporeSigma. The report will be read and discussed by MilliporeSigma and any third party that MilliporeSigma deems appropriate.