

Duct/Duct Taped Specimen Fatigue Tester

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Background:

Engineers at our client company, which specializes in plastic and adhesive products, need to continuously improve their high performance tape. This duct tape currently meets the very challenging requirements of Underwriters Laboratory (UL181A) certification for the HVAC Industry. They are one of the few companies that produce a duct tape that meets these requirements. In order for them to remain competitive, it is necessary to research alternate designs and production methods to reduce the cost. However with each new design or process change, the duct tape must be re-tested and meet the requirements of UL181A to maintain its certification. This testing is very costly and time consuming. Therefore, it would be very valuable for them to have an understanding of how their design and process changes have affected the performance of duct tape prior to submitting a sample for certification.

Purpose:

The client has requested that the Department of Engineering, Mechanical Engineering Program at Western Kentucky University, assist them in the designing, building and commissioning (DBC) of a duct/duct taped specimen tester to demonstrate duct tape performance against the requirements of UL181A, Part I, Section 13 - Temperature/Pressure Cycling Test. With this air pressure fatigue tester, they will be able to have a way of knowing whether or not the design or process changes, have improved or adversely affected the ability of the tape to meet UL181A. The thought process being if the tape passes their in-house test, then they will know that the modified tape is ready to be subjected the UL181A test battery, but if it fails the in-house test, they save time and money by not submitting for certification. This effectively allows them to prescreen their product, and thereby, greatly reduce their cost of developing UL certified products.

Design/Method

In order to meet UL181A, the final system must pressurize and then depressurize the duct/duct tape specimen to prescribed levels, while being conditioned in various temperature and humidity conditions, much like blowing up a balloon and then letting the air out. This pressurization and depressurization cycle is repeated for thousands of cycles. While doing so, it must also monitor leakage rate and establish pass/fail criteria based on said standard leakage rate thresholds within a number of cycles. This tester is destined to be used in the process development laboratory at the client's location so it must be a turnkey solution requiring little to no interaction by plant or laboratory personnel except in the initial test setup process.

Results

At the time of abstract submission, the fatigue tester system has not been completed. Therefore, further details on this DBC project will be presented at the student conference poster session.

Conclusions

The goal of this project is to design, build and commission a duct/duct taped specimen fatigue tester. The tester must meet the test protocol as outlined in UL181A, Part I, Section 13 - Temperature/Pressure Cycling Test. This tester will allow our client to assess the impact of design and process changes on their duct tape performance.