

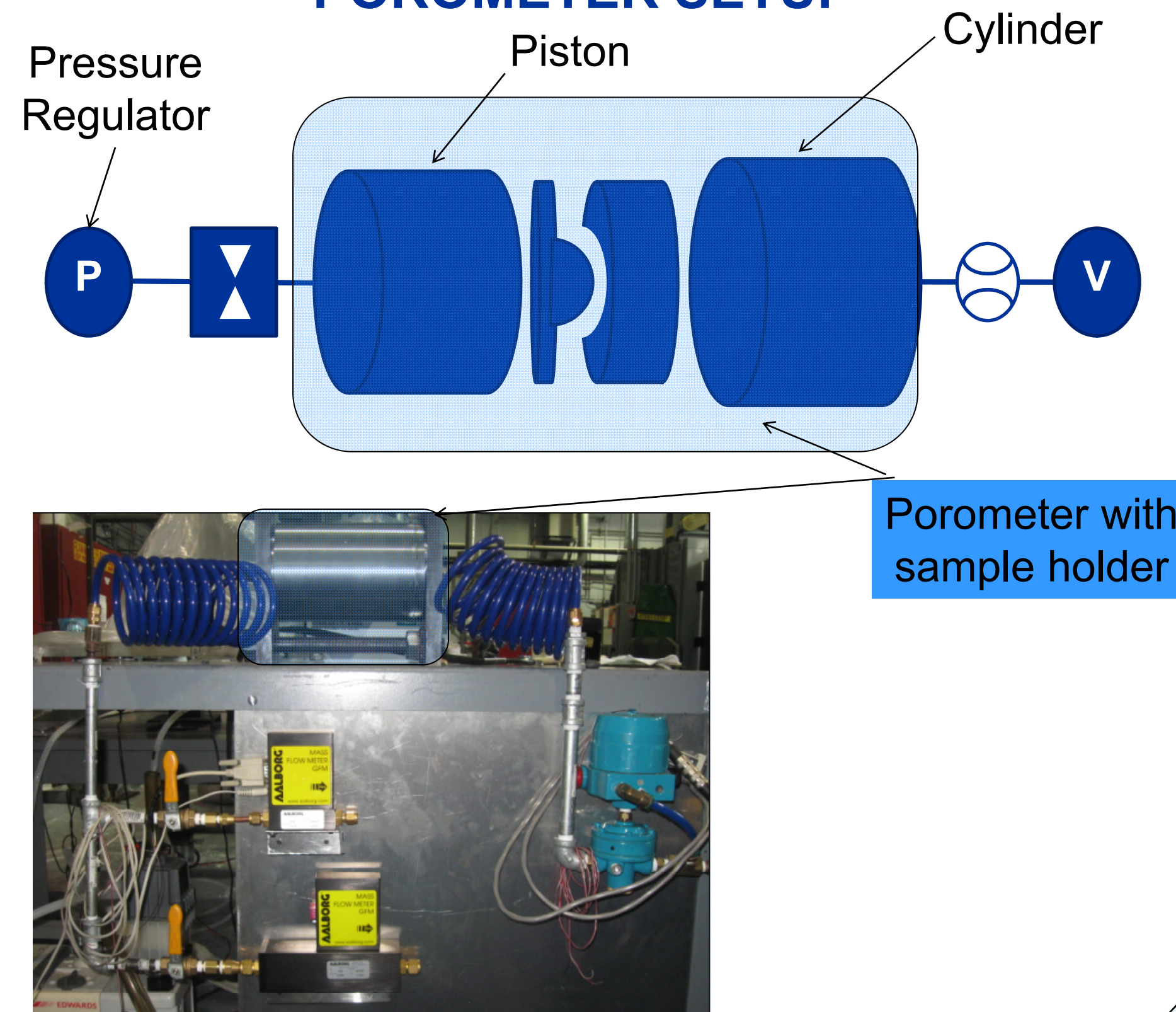
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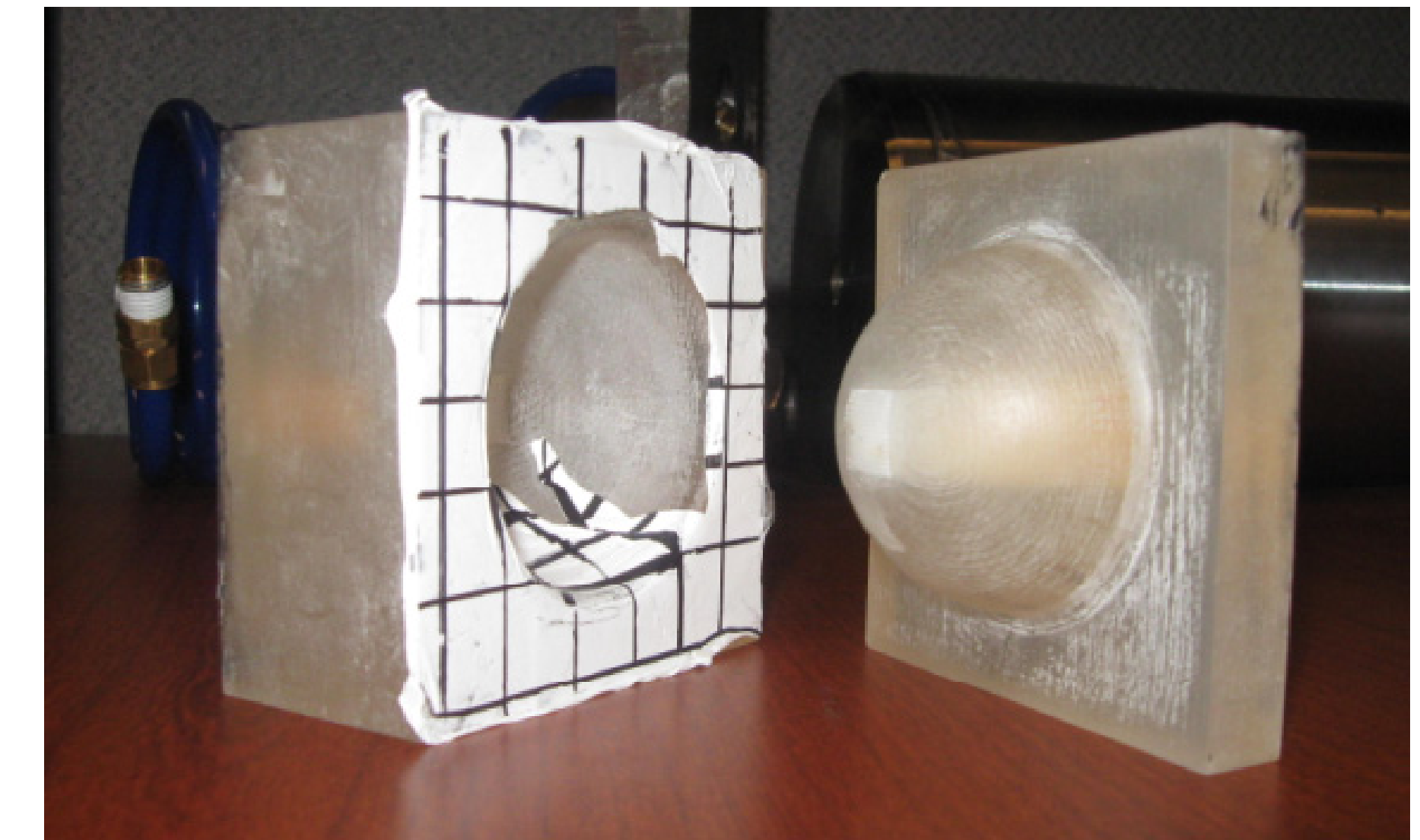
INTRODUCTION

- Porometers are used to measure pore size distribution and permeability in membranes.
- Draping in composite manufacturing introduces stretching of fabric/membrane material.
- **GOAL**
- Design a porometer capable of controlled stretching of membrane/fabric material while measuring the pore size distribution changes
- **IMPLEMENTATION**
- New design includes high-precision measurement of through-thickness flow and pressure across sample
- Unique sample holder is developed allowing stretching of sample during testing

POROMETER SETUP

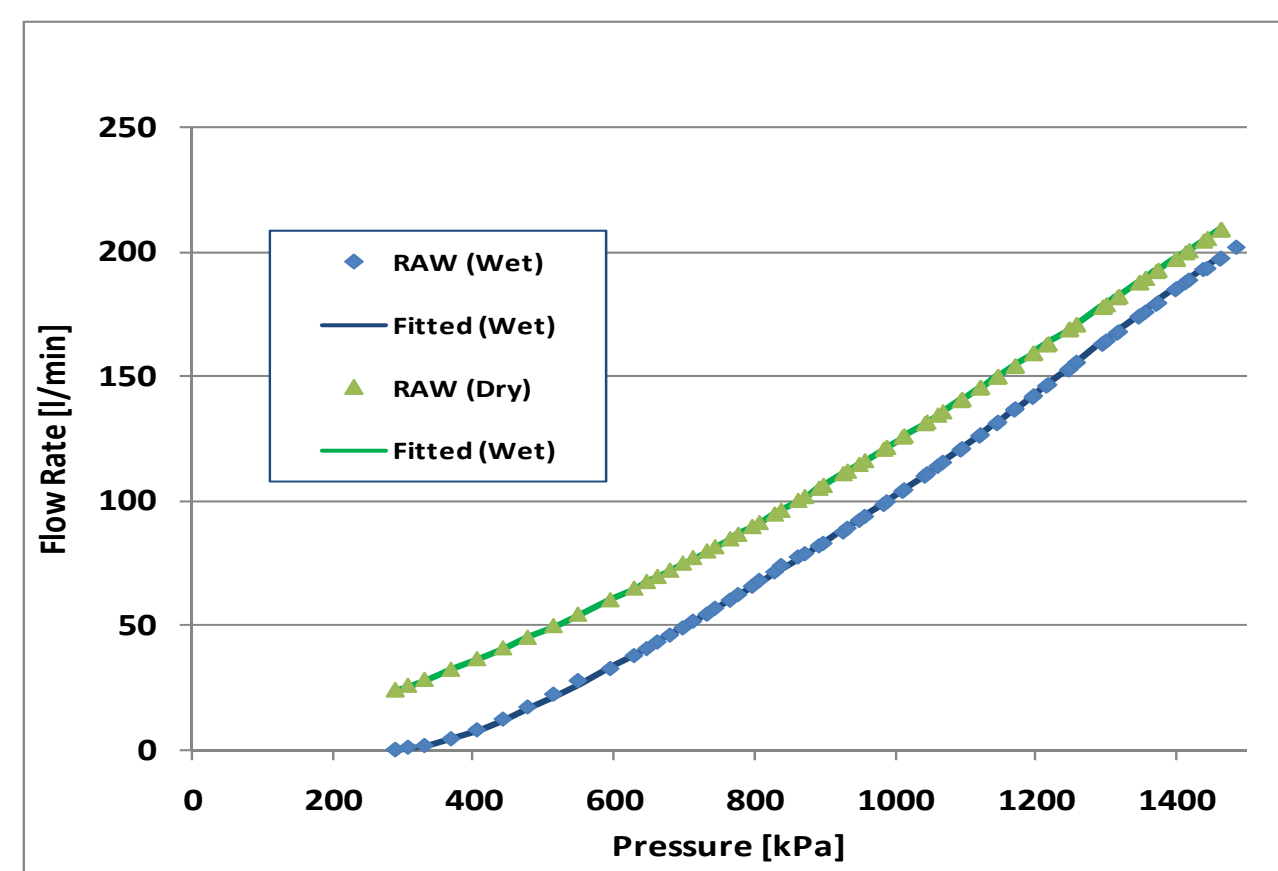


SAMPLE HOLDER



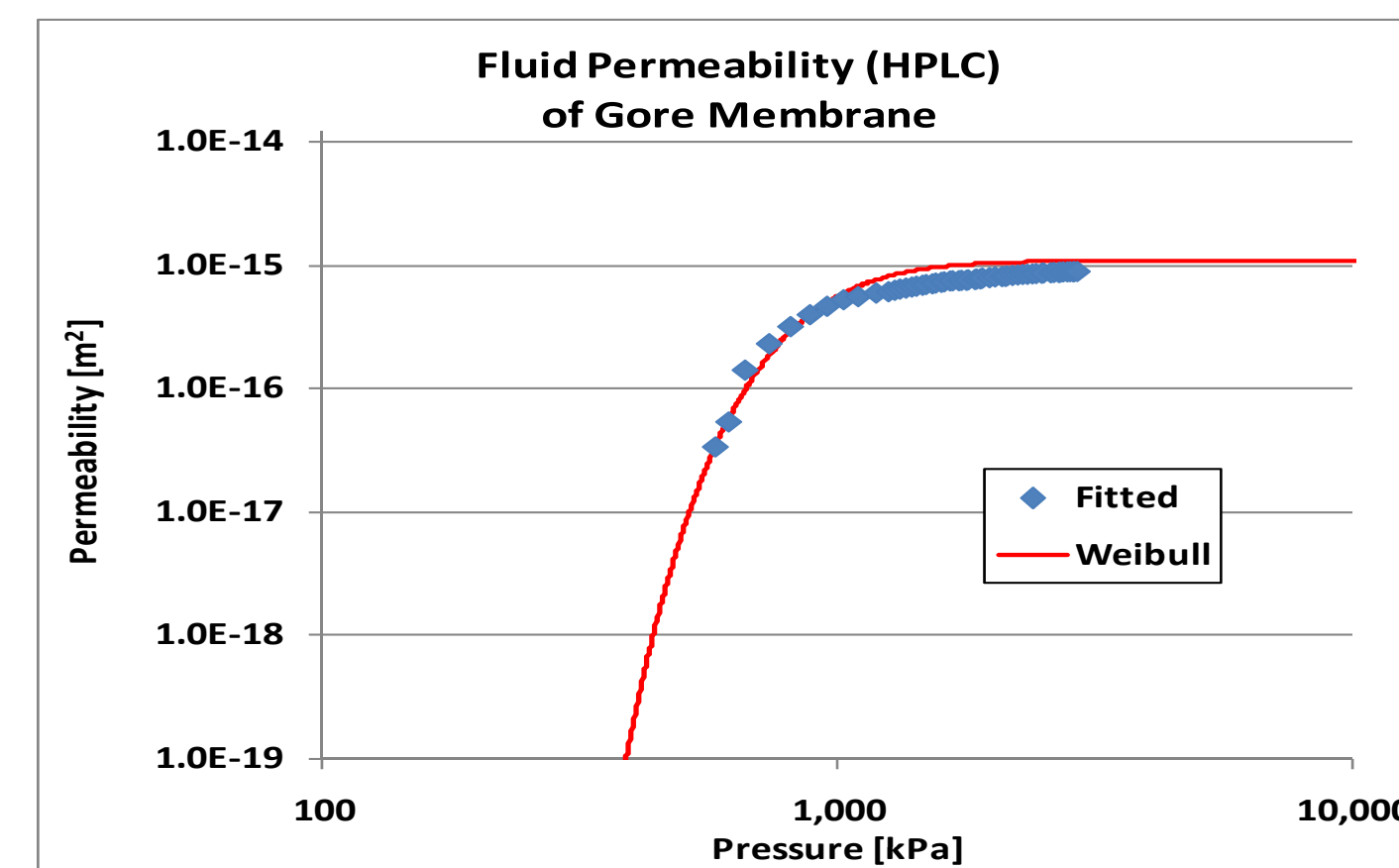
- Applying load on sample induces known geometry changes of sample leading to fixed stretching/strain in membrane/fabric
- Transparent mold allows measurement of strain
- Active measurement area is center area of membrane

FLOW RATE OF WET AND DRY MEMBRANES



$$f_n = \frac{1}{d_n^4} \left[\left(\frac{Q_{wet,n+1}}{Q_{dry,n+1}} \right) - \left(\frac{Q_{wet,n}}{Q_{dry,n}} \right) \right]$$

PORE SIZE DISTRIBUTION OF A TYPICAL MEMBRANE



$$\Rightarrow \frac{f_n}{\sum f_n} = \frac{N_n}{\sum N_n} = p_n$$

SUMMARY AND FUTURE WORK

- Design of Porometer for stretched samples has been developed.
 - Accurate measurement of Q and ΔP is currently being validated
 - Different sampleholder shapes allow variation in stretching factors
- Data reductions has been implemented to obtain pore size distribution from sensor feedback .
- Future work will execute system for various materials and stress levels.

ACKNOWLEDGEMENTS

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