

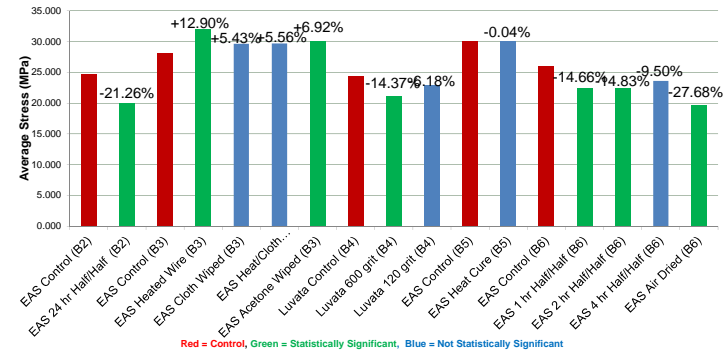
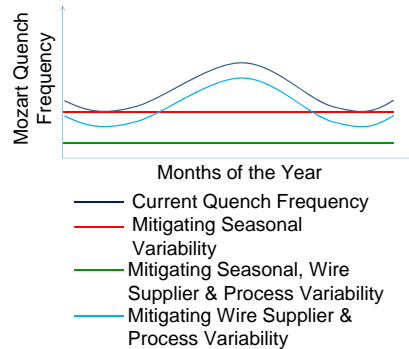
Quench Variability

Purpose:

- Evaluate the reason(s) for increased quenching from June to September and provide suggestions/solutions to reduce/eliminate magnet quenching

Background

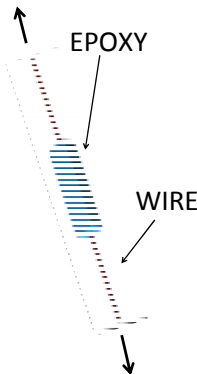
- MRI Superconducting magnet cooled with liquid helium to 4K
- Quenching is a massive helium boil off
- Caused by small increase in temperature
- Slips in wire-epoxy create frictional heat
- More common during humid summer
- Quenching costs time and money



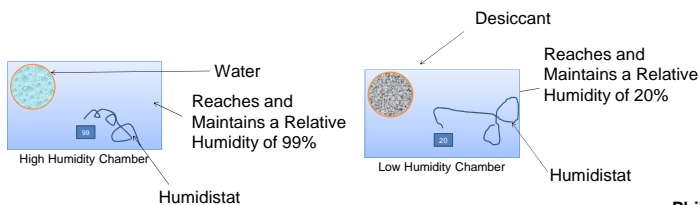
Slip Test Underway

Semester Accomplishments

- Statistically supported hypotheses for quench variability
- Determined how the surface finish of the wire correlates to slippage
- Analyzed how environmental humidity affects the wire-to-epoxy bond strength
- Measured moisture build up within the epoxy and test how this affects bonding capabilities



New sample design for Tensile Test



Philips Core During Manufacturing

Technical Results

- Humidity is absorbed into epoxy and DMD
- Humidity reduces wire-epoxy bond strength, determined by slip testing
- Wire suppliers have chemically similar surfaces, determined by spectroscopy
- Supplier with roughest wire provided highest bond strength, determined by microscopy

Recommendations

- Reduce local humidity around cured/curing magnet
- Finish winding magnet in one session
- Switch to wire supplier with roughest surface
- Blow heat on wire to remove adsorbed water