

Burnthrough Round Robin

Phase 3 Update

Presented to: IAMFTFM

By: Timothy Salter

Date: June 18-19, 2019, Cologne, Germany



**Federal Aviation
Administration**

Introduction

- **Insulation burnthrough test method**
 - Evaluate Sonic burner configuration update in Chapter 24 of the Fire Test Handbook
- **Focus on:**
 - Repeatability
 - Within lab consistency
 - Reproducibility
 - Lab to lab consistency



Phases of Study

- **Phase 1**
 - Old stator design with igniters and ignition wires in draft tube
 - PAN material and insulation blankets tested
- **Phase 2**
 - Igniterless stator, eliminates igniters and ignition wires in draft tube, increase burner air pressure from 60 psi to 65 psi
 - PAN material tested only
- **Phase 3**
 - Igniterless stator, Delevan 6.0 gal/hr fuel nozzle, air pressure remains at 65 psi
 - PAN material tested only

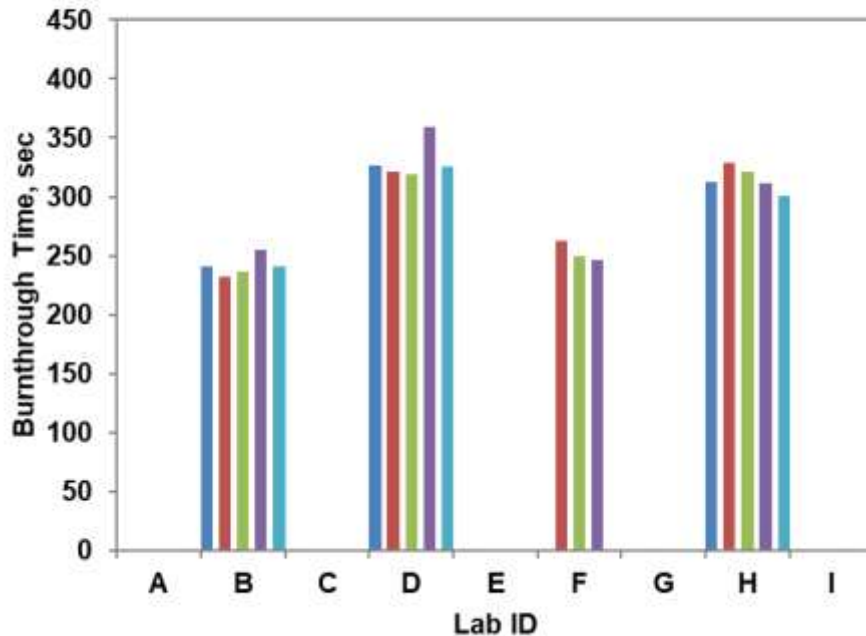
Phase 3 Current Status

- **Test items provided to labs:**
 - 5 PAN-8579 light felt material
 - 5 PAN-8611 heavy felt material
 - Delevan 6.0 gal/hr, type-B, 80-degree, solid spray pattern fuel nozzle
 - Detailed instructions

- **9 labs currently involved**
 - 4 labs have returned data so far

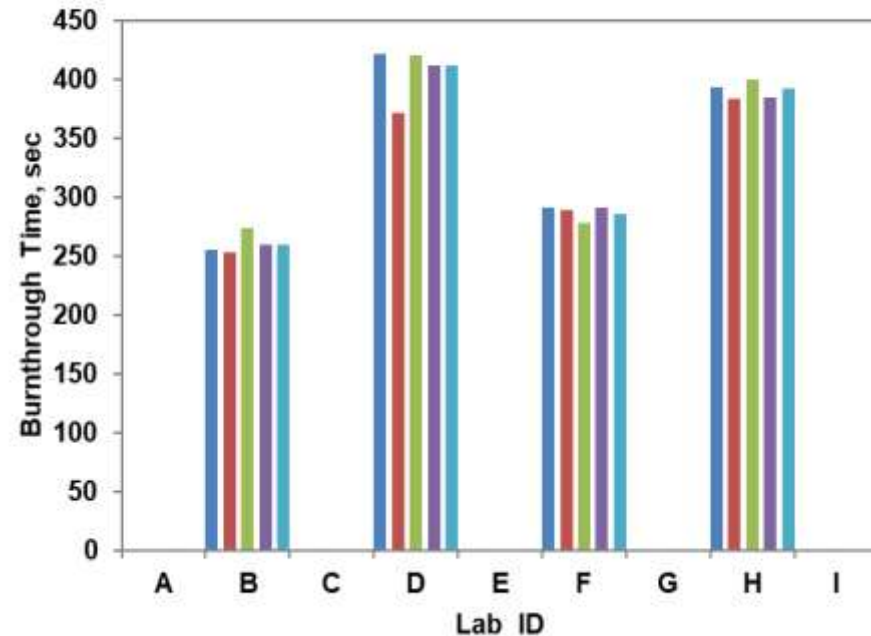
Phase 3: Test Results

8579 Burnthrough Times



Across All Test Labs
Average BT: 284.8 s
Std Dev: 10.9 s
% Std Dev: 3.8%

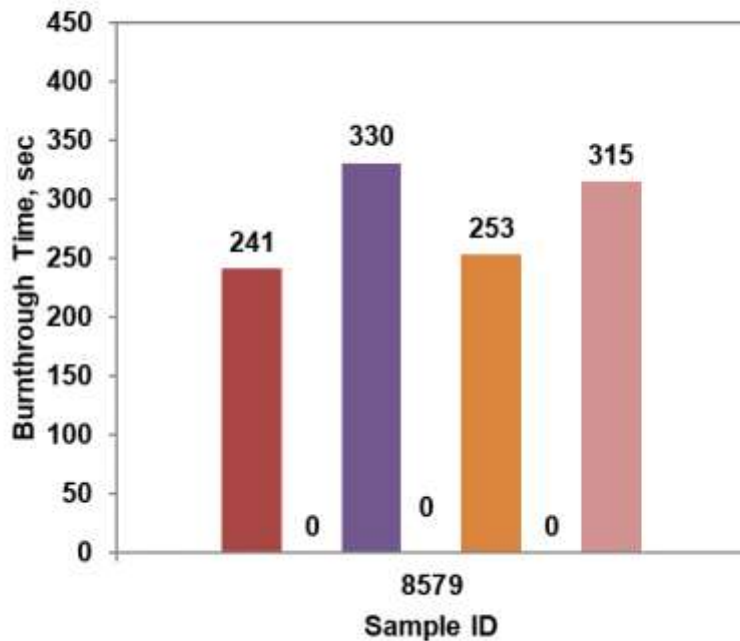
8611 Burnthrough Times



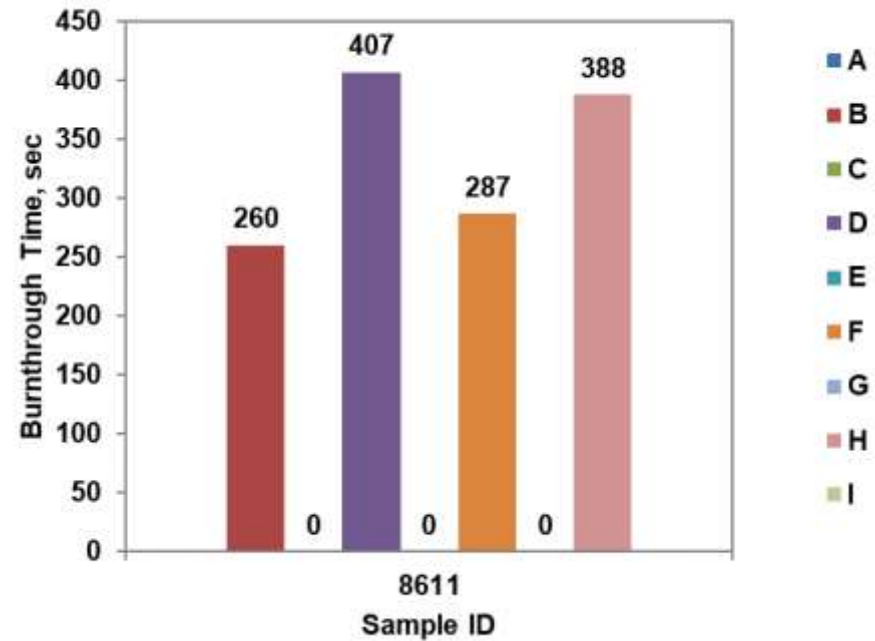
Across All Test Labs
Average BT: 335.5 s
Std Dev: 10.3 s
% Std Dev: 3.0%

Phase 3: Test Results

8579 Average Burnthrough Times

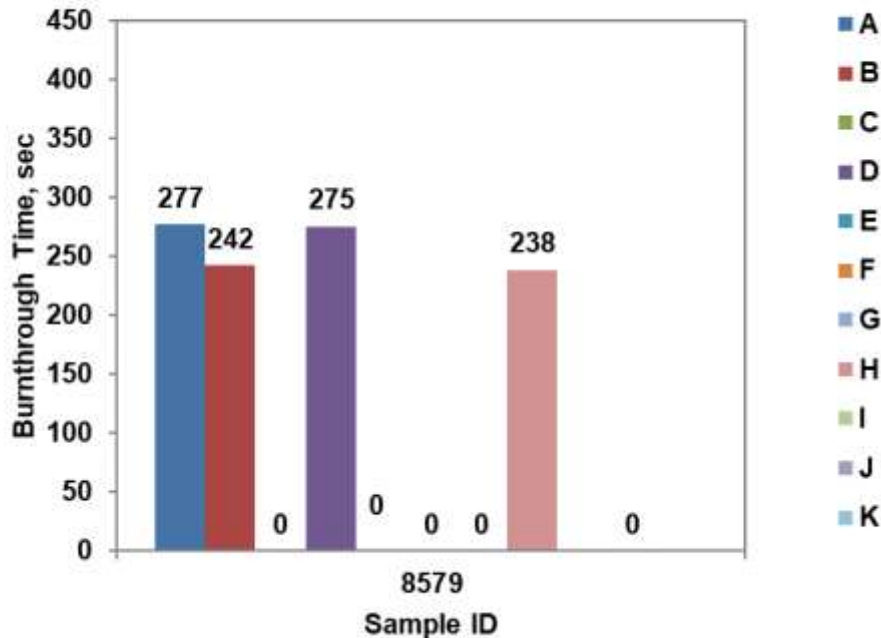


8611 Average Burnthrough Times



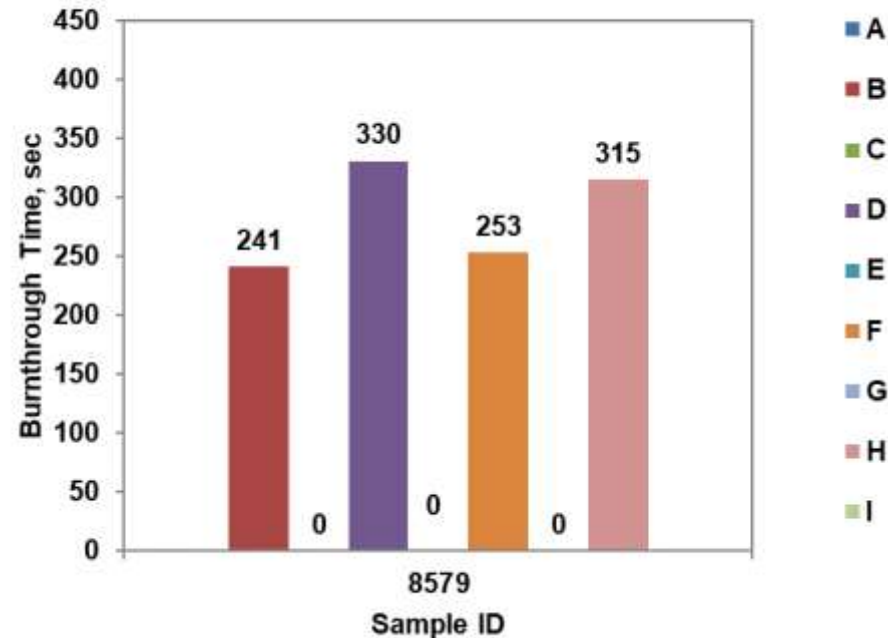
Phase 2 and 3 Comparison

8579 Average Burnthrough Times



Across All Test Labs
 Average BT: 256.2 s
 Std Dev: 20.1 s
 % Std Dev: 7.8%

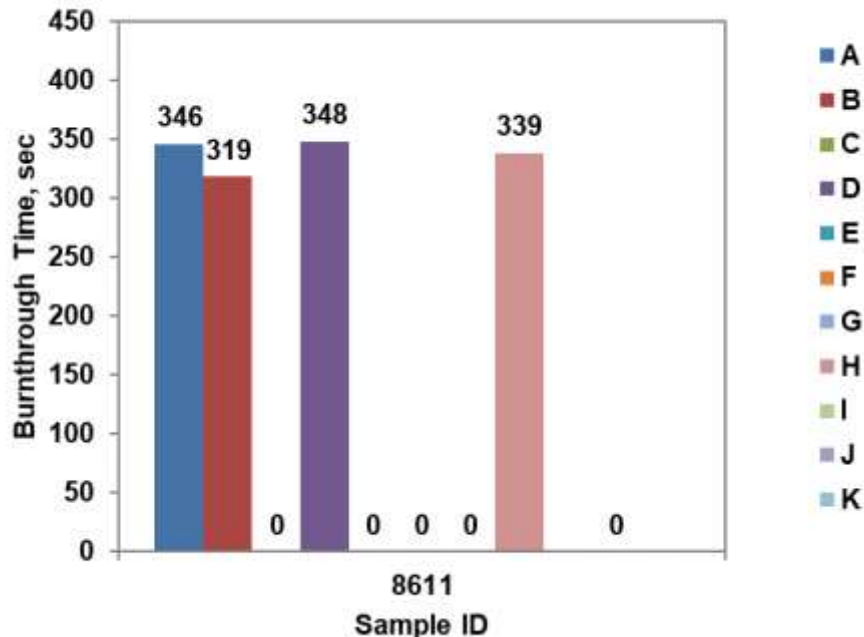
8579 Average Burnthrough Times



Across All Test Labs
 Average BT: 288.4 s
 Std Dev: 41.5 s
 % Std Dev: 14.4%

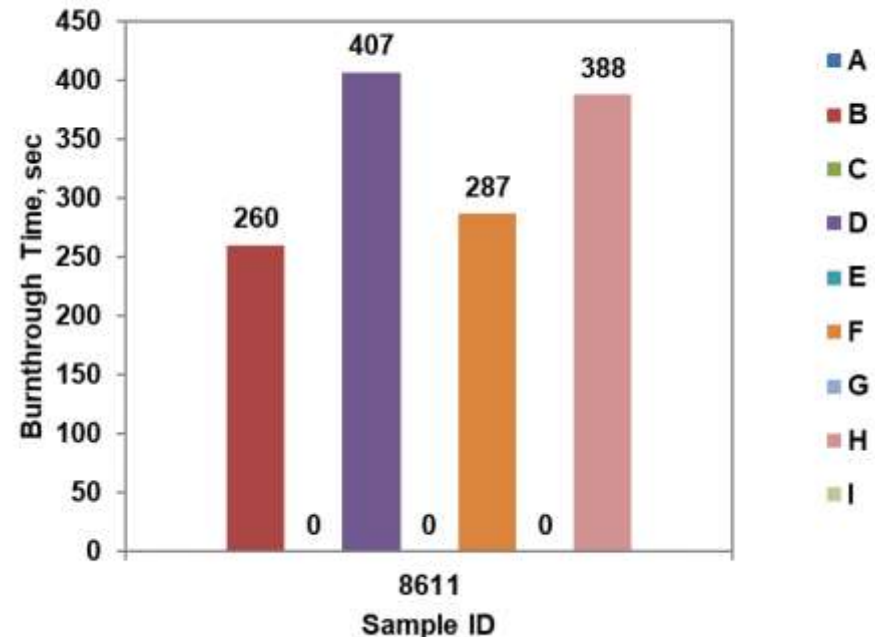
Phase 2 and 3 Comparison

8611 Average Burnthrough Times



Across All Test Labs
 Average BT: 337.8 s
 Std Dev: 18.8 s
 % Std Dev: 5.6%

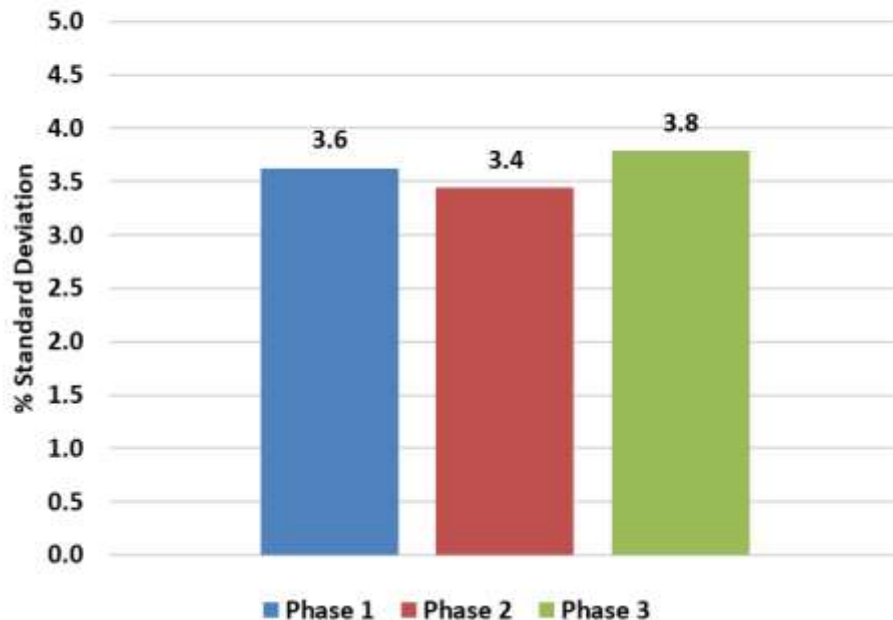
8611 Average Burnthrough Times



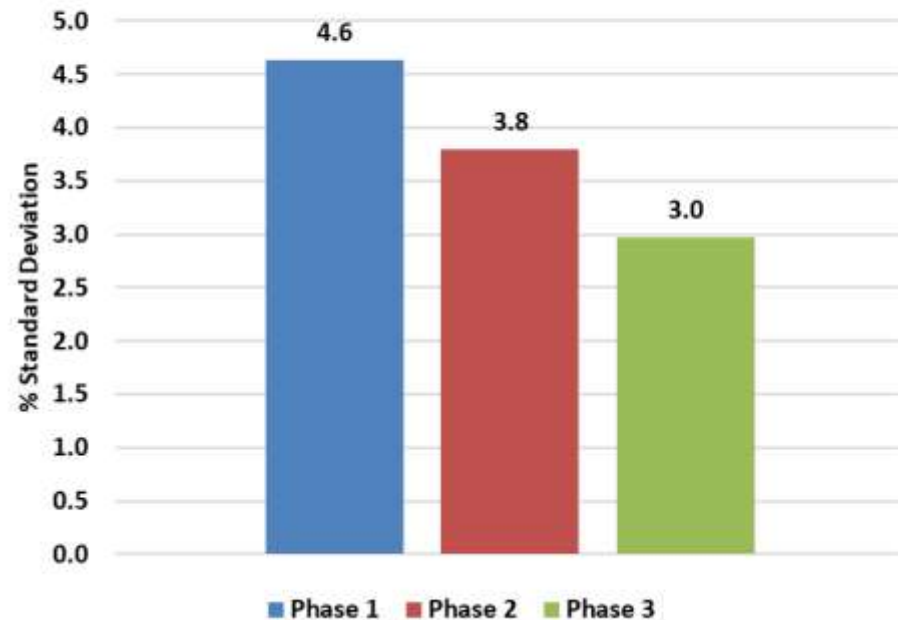
Across All Test Labs
 Average BT: 336.0 s
 Std Dev: 66.2 s
 % Std Dev: 19.7%

Within Lab Repeatability for Phase 1, 2, and 3

% Standard Deviation within Lab for each Test Phase for PAN 8579

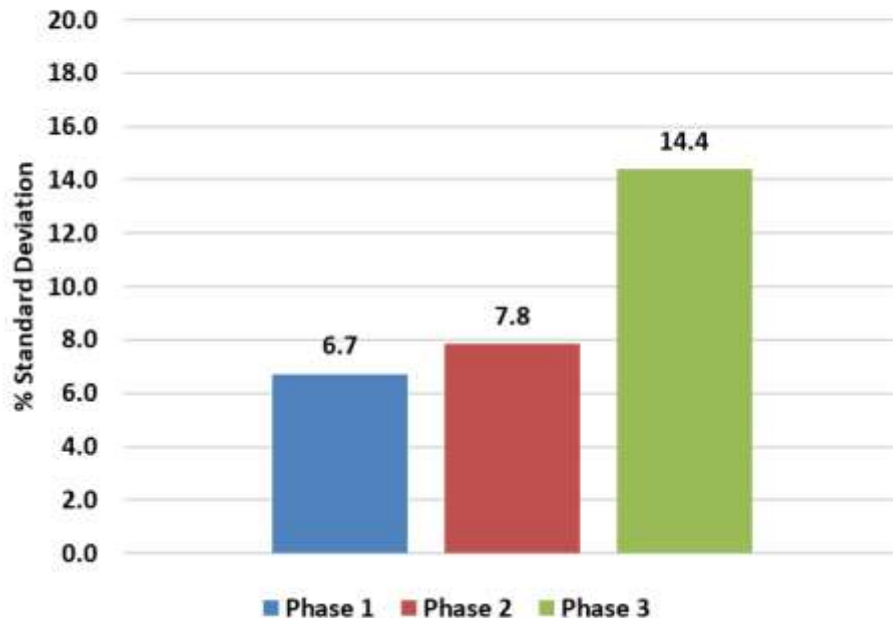


% Standard Deviation within Lab for each Test Phase for PAN 8611

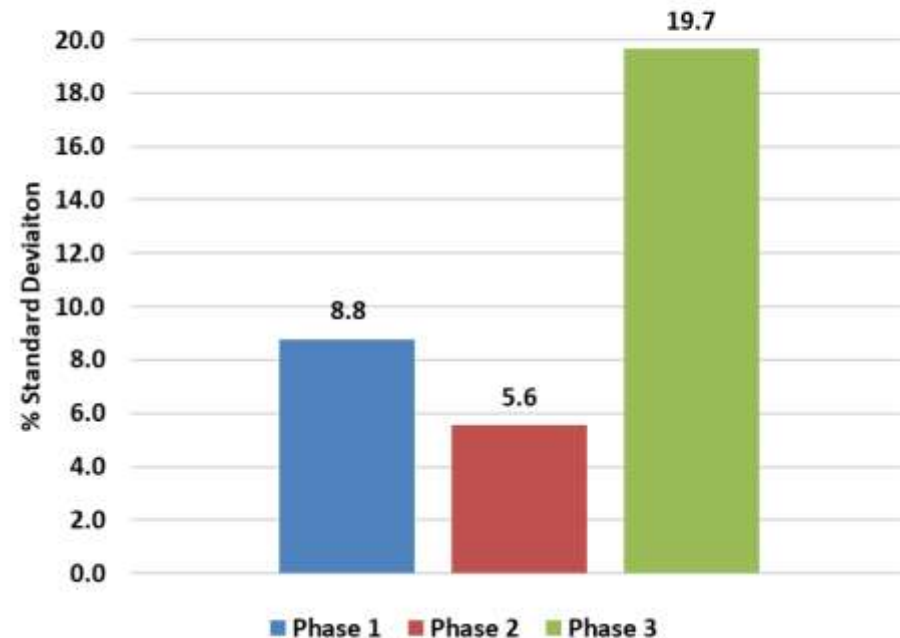


Lab to Lab Reproducibility for Phase 1, 2, and 3

% Standard Deviation Lab to Lab for each Test Phase for PAN 8579



% Standard Deviation Lab to Lab for each Test Phase for PAN 8611



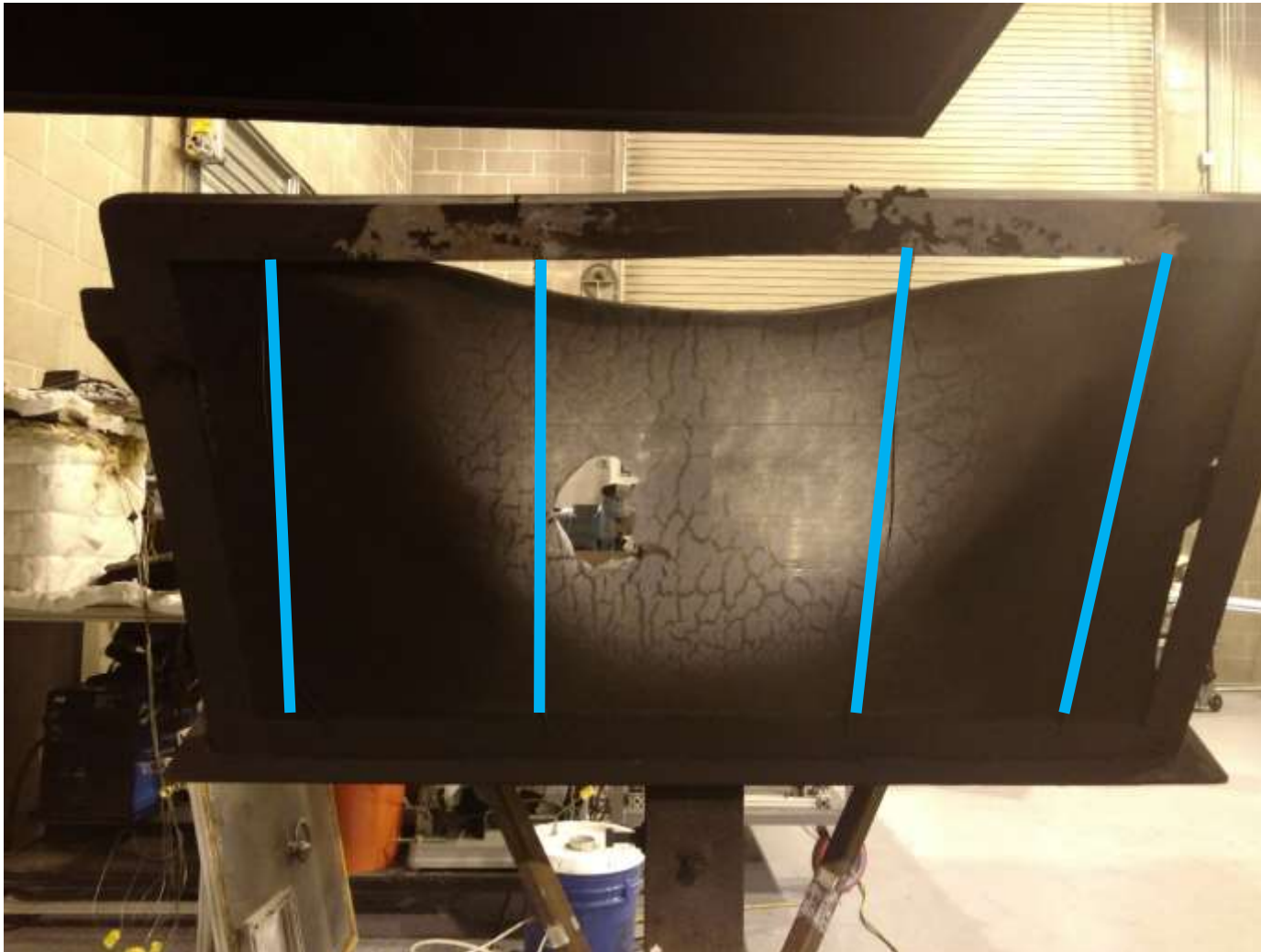
Phase 3: FAATC Test Results

- **Good repeatability within each lab**
 - ~3.8% Std Dev for PAN-8579 felt material
 - ~3.0% Std Dev for PAN-8611 felt material
- **Reproducibility among labs has improved as more data is returned**
 - ~14.4% Std Dev for PAN-8579 felt material
 - ~19.7% Std Dev for PAN-8611 felt material
- **Investigate reason for reproducibility issue**
 - Warped test frame?
 - Felt pulling out of frame?
 - Loose wires on test frame?

Sample Pulling Away from Frame



Loose Test Frame Wires



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Questions?

Timothy Salter

timothy.salter@faa.gov

609-485-6952



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International Aircraft Materials Fire Test Forum Meeting

Sonic Oil Burner Testing & Sonic Burner Video Update

Presented to: International Aircraft Materials
Fire Test Forum

By: Tim Salter, FAA Technical Center

Date: June 18-19, 2019, Cologne, Germany



Sonic Burner Cargo Liner Test: Air Shroud Round Robin Update



Purpose of Round Robin Study

- **Conduct cargo liner air shroud round robin to determine if it is an effective means of reducing the influence of airflow around the sample and improving test result repeatability and reproducibility**
- **The air shroud may be incorporated into Chapter 8 of the Fire Test Handbook should the study results prove it is effective**



Shroud Design

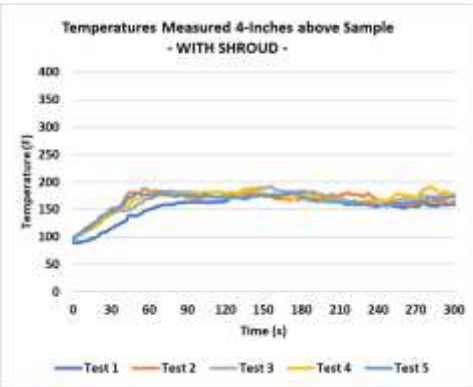
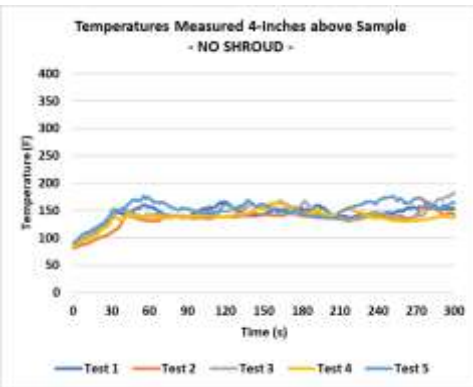
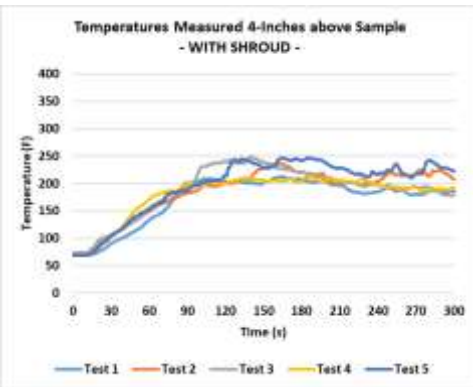
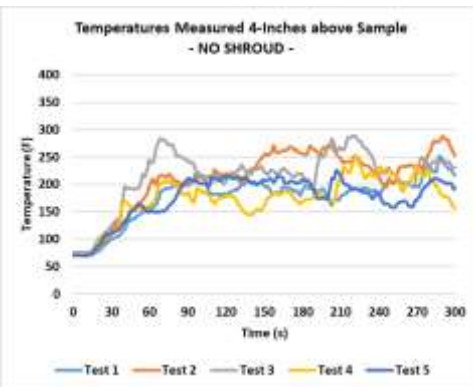
- **Design**
 - 18-gage perforated aluminum
 - Mounted with threaded rod on top of sample frame
 - No frame modifications
- **FAA TC Results**
 - Reduced temperature fluctuations
 - Measured peak temperatures equivalent to unshrouded tests



Shroud Round Robin

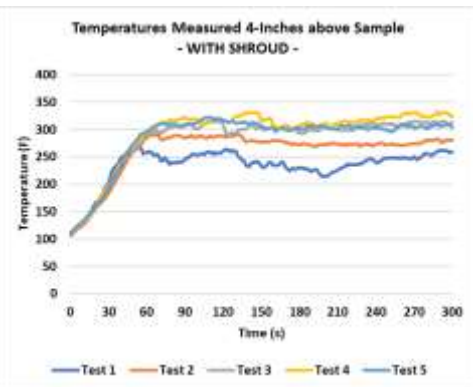
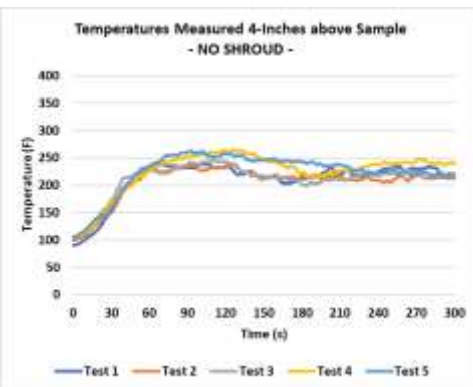
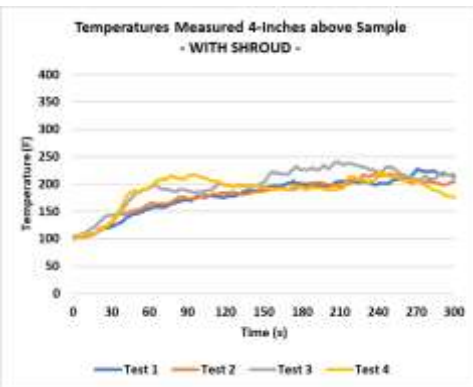
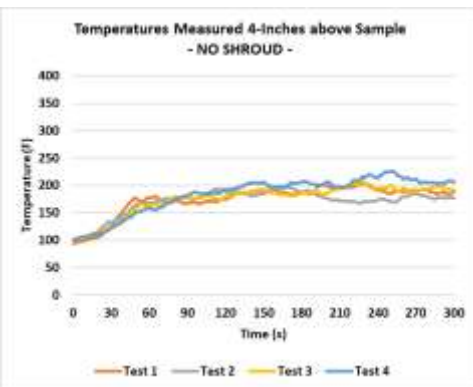
- **Test items provided to labs:**
 - 10 liner samples
 - 5 samples to be tested **with** the shroud
 - 5 samples to be tested **without** the shroud
 - Two liner types being tested
 - Polyester infused woven fiberglass (4 labs)
 - Tedlar surfaced woven fiberglass/epoxy (5 labs)
 - Fire resistant board used in place of wall panel
 - Sample tested in ceiling panel position only
 - Detailed instructions
- **8 labs currently involved**
 - 4 labs have produced data
 - Working to get test materials shipped to 2 labs

Test Results



Lab A

Lab B

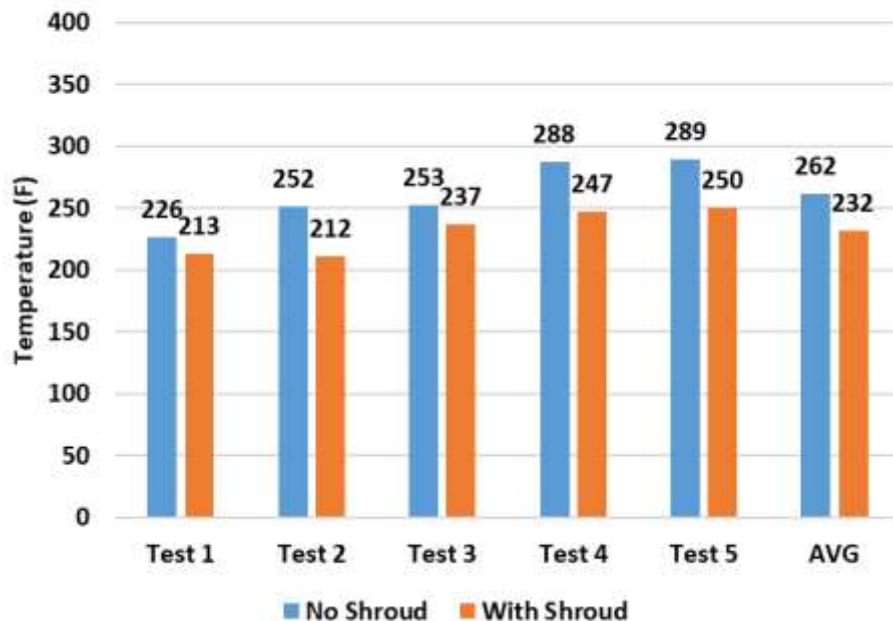


Lab D

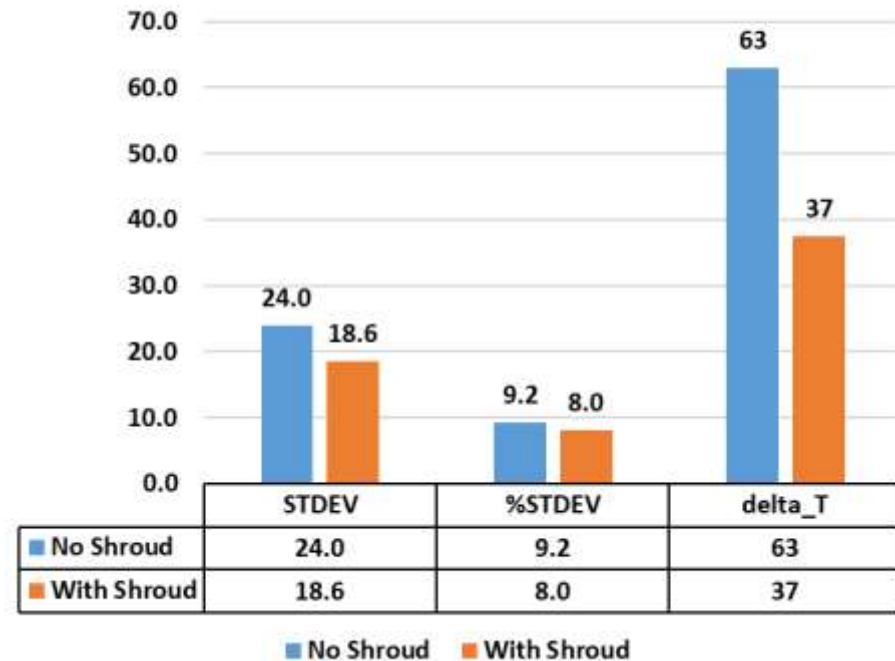
Lab E

Test Results – Lab A

Peak Temperatures Measured for each Cargo Liner Sample Test

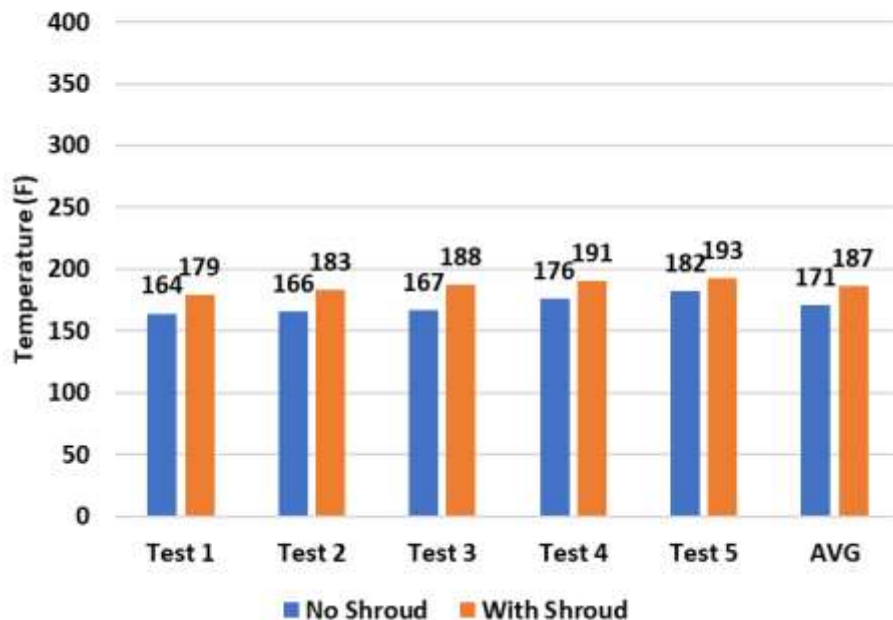


Peak Temperature Data Results

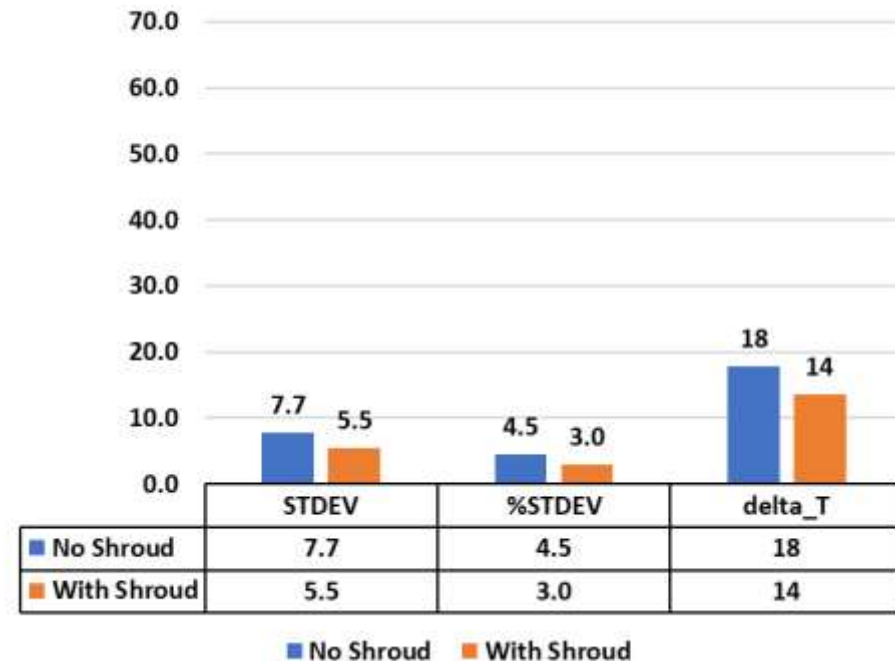


Test Results – Lab B

Peak Temperatures Measured for each Cargo Liner Sample Test

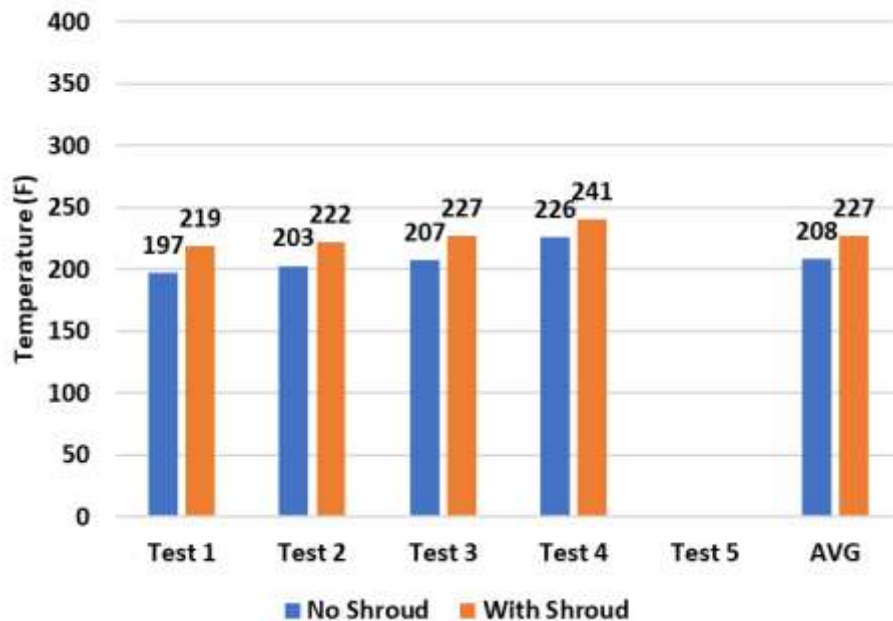


Peak Temperature Data Results

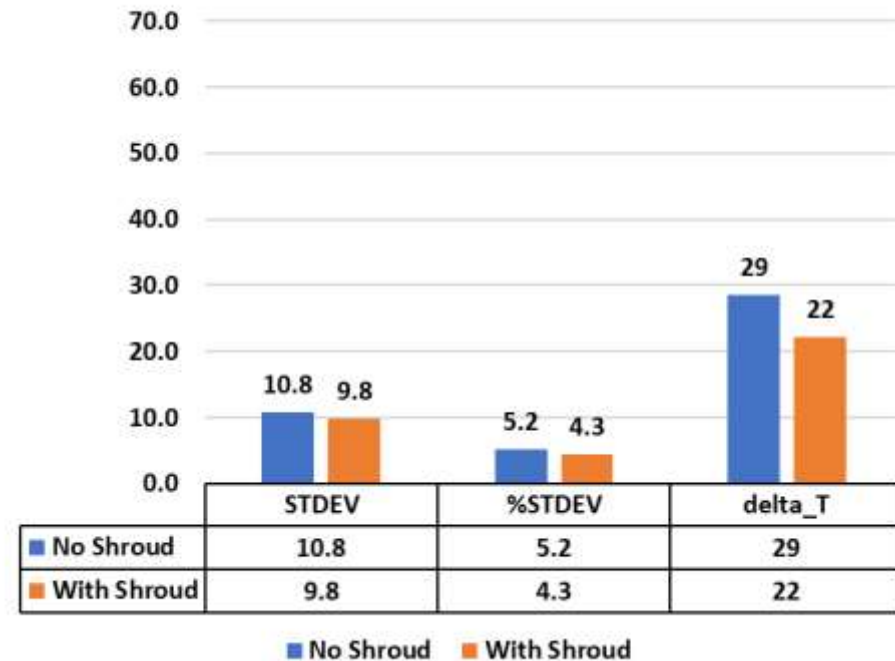


Test Results – Lab D

Peak Temperatures Measured for each Cargo Liner Sample Test

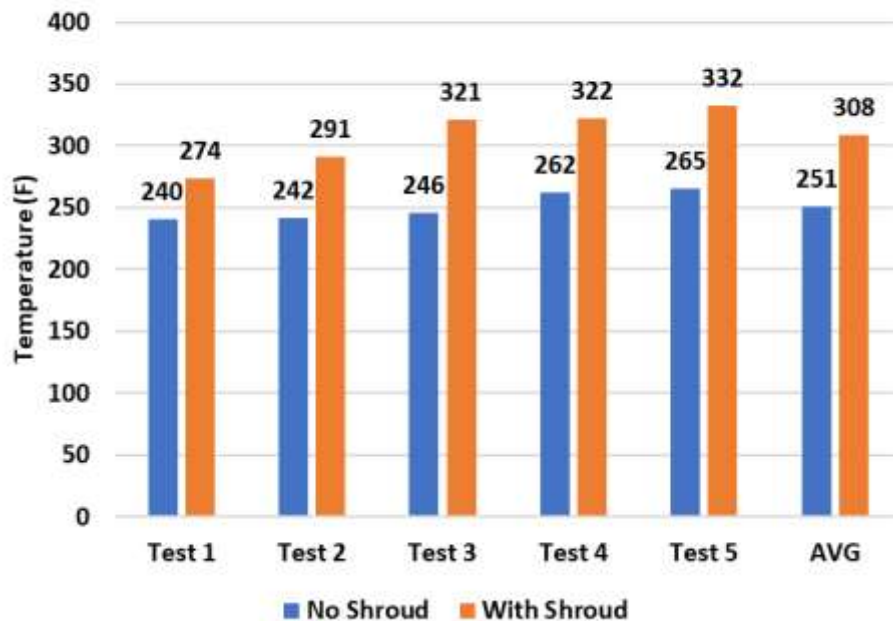


Peak Temperature Data Results

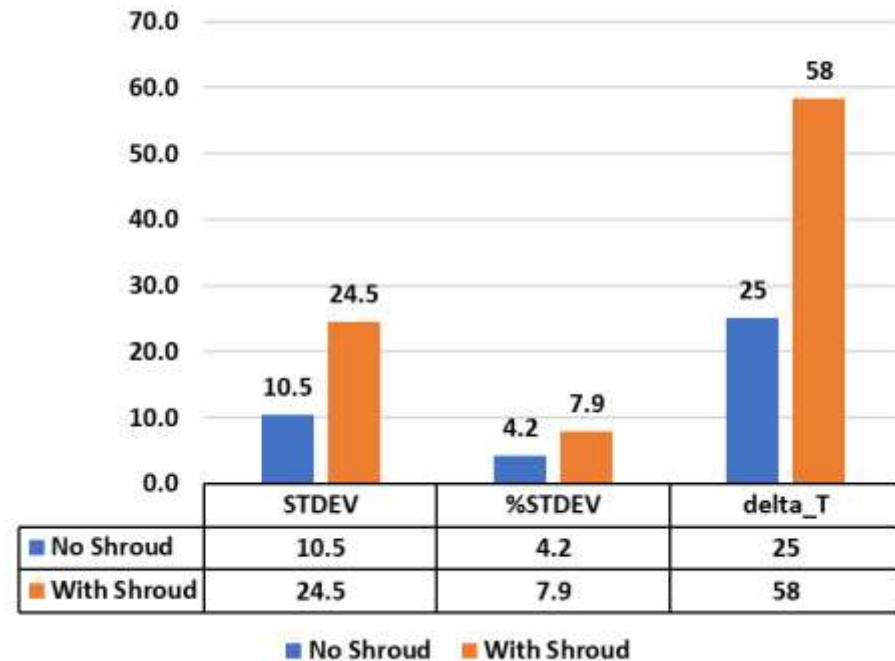


Test Results – Lab E

Peak Temperatures Measured for each Cargo Liner Sample Test



Peak Temperature Data Results



Summary

- **Lab A**
 - **Increased** repeatability, **less** temperature fluctuation, and slightly **lower** peak temperatures with shroud
- **Lab B**
 - **Increased** repeatability, **less** temperature fluctuation, and slightly **elevated** peak temperatures with shroud
- **Lab D**
 - **Slightly increased** repeatability, **equal** temperature fluctuation, and **slightly lower** peak temperatures with shroud
- **Lab E**
 - **Decreased** repeatability, **more** temperature fluctuation, and **significantly elevated** peak temperatures with shroud
- **Mixed data results**
 - Need more data to support effectiveness of shroud

Sonic Burner Seat Cushion Test: Air Shroud Development and Round Robin Study



Seat Cushion Shroud

- **Same purpose as cargo shroud**
 - Reduce influence of airflow at sample
 - Can significantly effect sample burning
- **Modified cargo shroud design**
 - Perforated aluminum
 - Open on flame side
 - Does not interfere with sample mounting
- **Seat shroud round robin**
 - Awaiting shipment of test samples
 - Looking for labs to participate



Sonic Burner Assembly and Operation Instructional Video



Sonic Burner Instructional Video

- **Focused on Sonic burner assembly and operation**
 - Information not found in current documentation
 - Applies to any Sonic burner test method
- **Viewing planned for seat task group**
 - Other task groups if time allows
- **Final video will be posted on Fire Safety website**

<https://www.fire.tc.faa.gov>

Insulation Burnthrough Video

- **Currently working on instructional video for the insulation burnthrough test method**
- **Script is based on chapter 24 of the FTH**
- **Will focus on testing with the Sonic burner**



Questions?

timothy.salter@faa.gov

(1)-609-485-6952

