Burnthrough Round Robin

Update

Presented to: IAMFTWG

By: Timothy Salter

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Introduction

- **New point of contact for Burnthrough**
  - Timothy Salter (myself)
- **Continuing study for Dr. Rob Ochs**
- **Insulation burnthrough test method evaluation within lab and lab to lab consistency**
  - Sonic burner
    - 2 stator configurations tested
  - PAN felt material test samples used
    - Good repeatability for burnthrough time

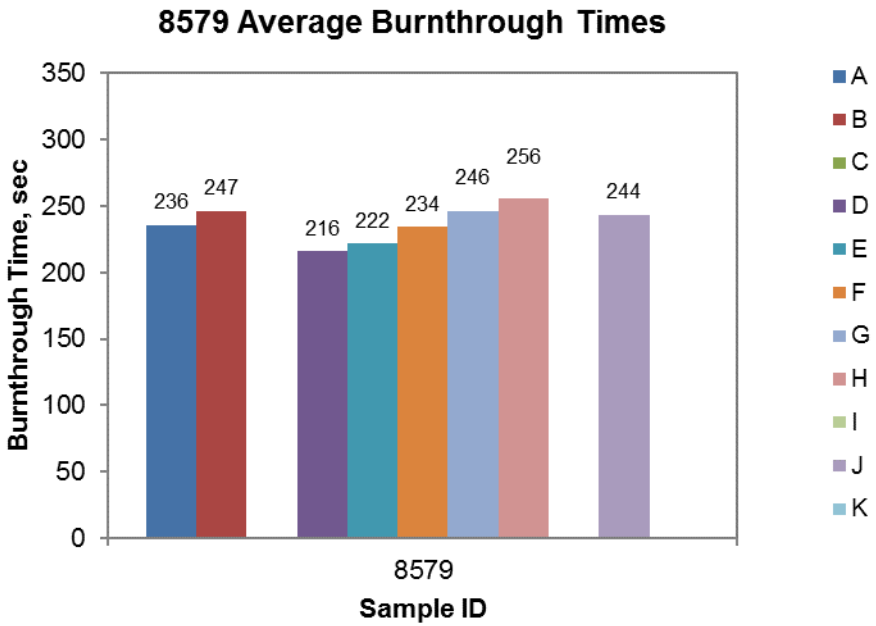
2017 Comparative Test Series: Completed

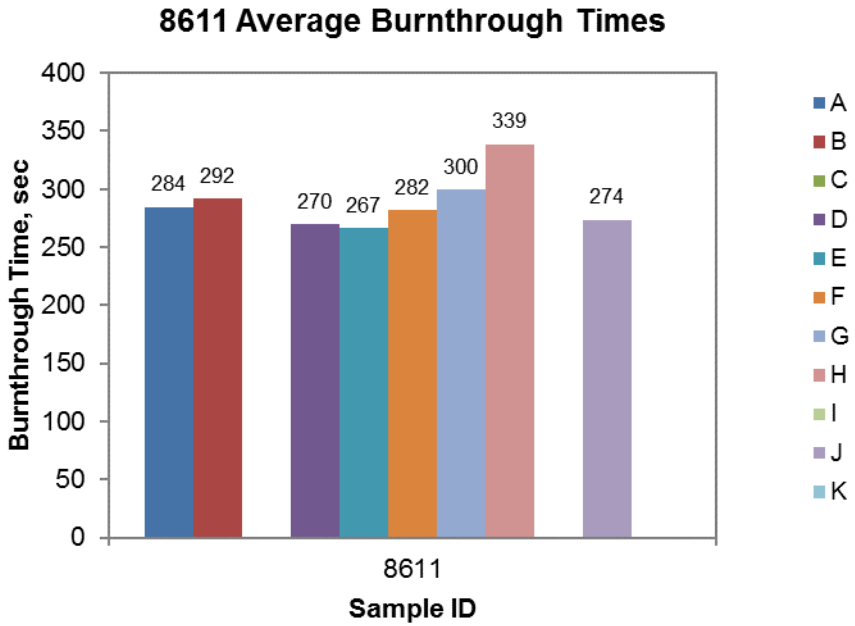
- **Participation by 11 labs across 3 continents**

1. Accufleet – USA
2. Airbus – Germany
3. Boeing – USA
4. DGA – France
5. Embraer – Brazil
6. FAATC – USA
7. Govmark – USA
8. Jehier – France
9. Rescoll – France
10. Resonate – N. Ireland
11. Triumph – USA

- **Labs shipped samples for two-part test series**
- **Test with original stator (igniters and wires)**
  - **5 PAN-8579 light felt material**
  - **5 PAN-8611 heavy felt material**
  - **6 thermal acoustic insulation blankets**
- **Test with new stator (no igniters or wires)**
  - **5 PAN-8579 light felt material**
  - **5 PAN-8611 heavy felt material**
- **Test instructions e-mailed to each lab**

Phase 1 Results – 8 of 11 Labs Reported





Note: Lab H results 325, 325, n/a, 318, 386

Phase 1 Summary

- **8 out of 11 labs submitted results**
- **Data looks good**
  - ~7% Std Dev for PAN-8579 felt material
  - ~9% Std Dev for PAN-8611 felt material
  - Burnthrough blankets below 2.0 BTU/ft^{2}s during 4-minute test at nearly every lab
    - Some labs modified blankets with slits

Phase 2

- **Phase 2 differed from Phase 1 in the following manner:**
  - Igniterless stator used in place of the original stator
  - Inlet air pressure increased from 60 psig to 65 psig
  - Only PAN materials are tested (no full-sized blanket tests)
    - 5 PAN-8579
    - 5 PAN-8611

Stator and Turbulator Configuration

The stator slides onto the fuel rail, is oriented in the proper direction, and is locked into place with a set screw located at the twelve o'clock position (figure 7-S-15). The turbulator is placed on the end of the draft tube with the tab located at the six o'clock position (figure 7-S-16). The typical configuration positions the face of the stator approximately 2.6875 inches (68.263 mm) from the exit plane of the turbulator (figure 7-S-17). Refer to the Preparation of Apparatus section of this supplement for the exact positioning of the stator and turbulator.

Figure 7-S-15. Location of the Stator on the Fuel Tube

Figure 7-S-16. Position of Turbulator at the end of the Draft Tube

Stator Translational Position

The front face of the stator must be located 2.6875 ± 0.020 inches (68.263 ± 0.5 mm) from the exit plane of the turbulator (figure 7-S-28). This stator translational position is also 2.5 inches (63.5 mm) from the tip of the fuel nozzle.

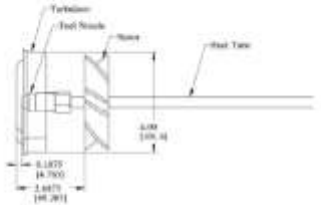


Figure 7-S-28 Fuel Nozzle and Stator Locations

Stator Axial Position

The line running through the set screw and geometric center of stator will be used as a reference for properly orienting the rotational position of the stator. The stator must be positioned so the reference line angle is 0 degrees (12 o'clock) from the zero position when looking into the burner draft tube. (figure 7-S-29)

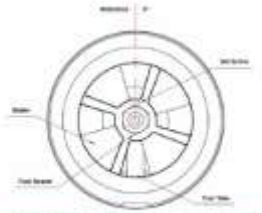
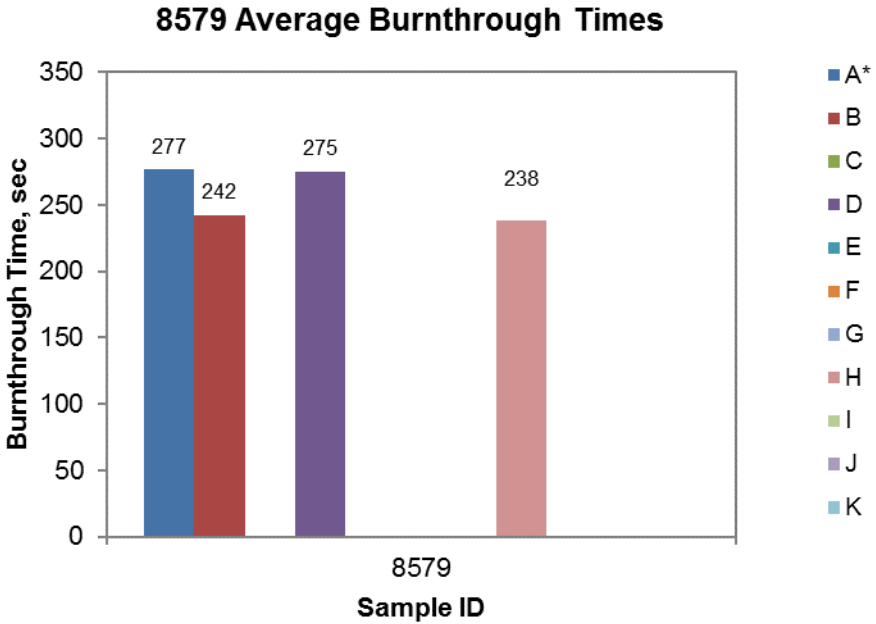
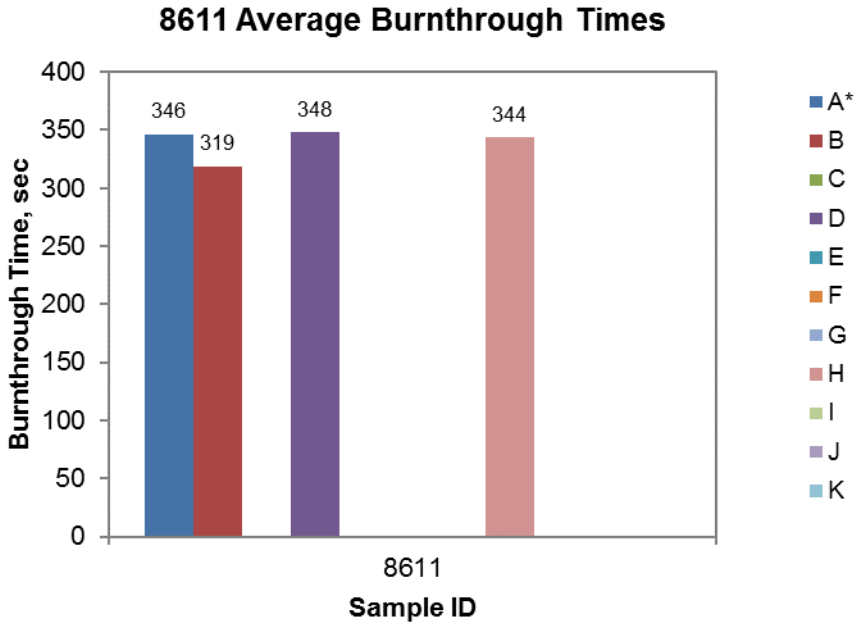


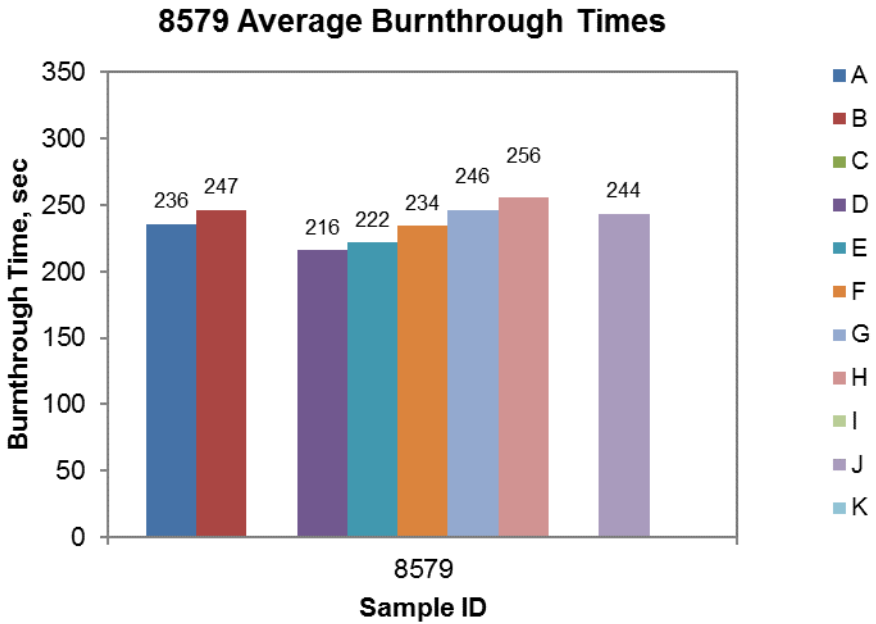
Figure 7-S-29 Stator Axial Position (looking into draft tube)

Phase 2 Results

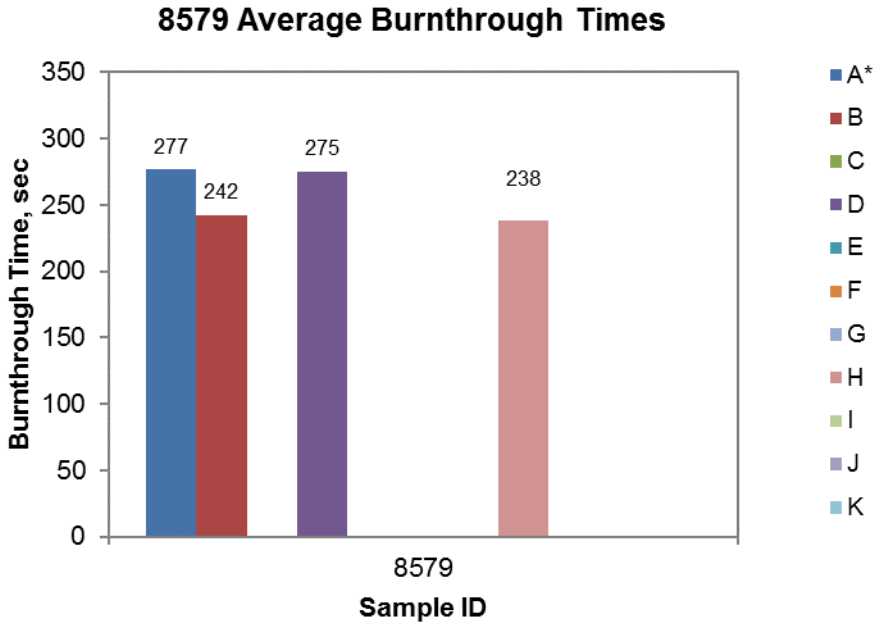




Phase 1 & 2 Comparison - 8579

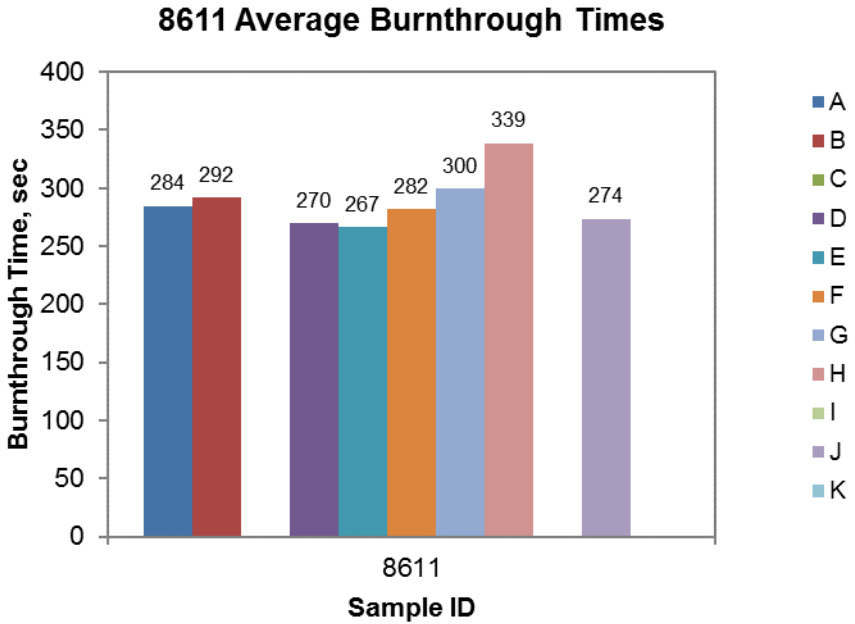


Overall Average BT: 237.5 s
Std Dev: 15.9 s
% Std Dev: 6.7%

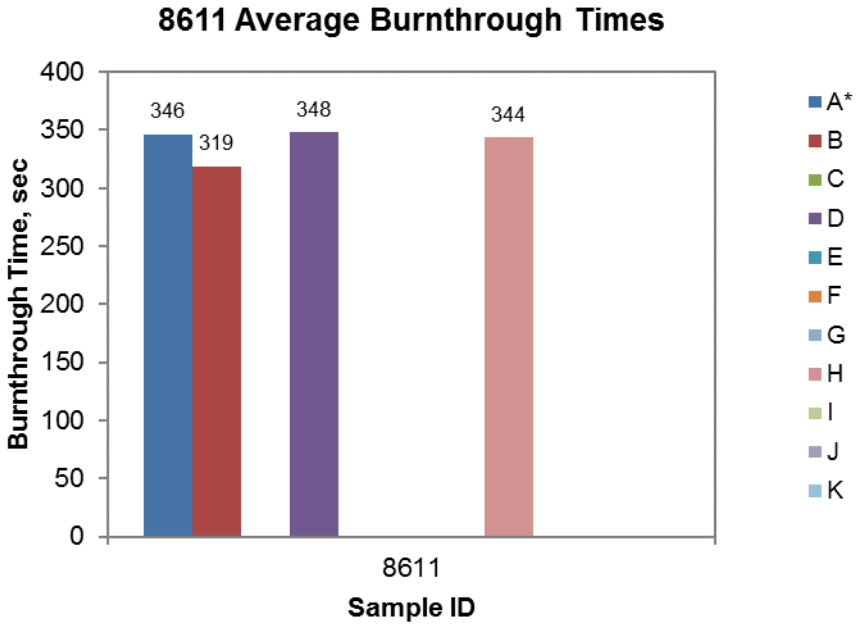


Overall Average BT: 256.2 s
Std Dev: 20.1 s
% Std Dev: 7.8%

Phase 1 & 2 Comparison - 8611



Overall Average BT: 287 s
Std Dev: 25.2 s
% Std Dev: 8.8%



Overall Average BT: 337.8 s
Std Dev: 18.8 s
% Std Dev: 5.6%

Phase 2 Summary

- **4 out of 11 labs submitted results**
- **Data showed mixed results**
  - ~8% Std Dev for PAN-8579 felt material
    - 1% increase from Phase 1
  - ~6% Std Dev for PAN-8611 felt material
    - 3% decrease from Phase 1
- **Longer burnthrough times compared to Phase 1**
  - ~20 seconds more for PAN-8579
  - ~50 seconds more for PAN-8611

Plans for Phase 3

- **Standardizing Fuel Nozzle type for Burnthrough Test**
  - Most labs are still using original Monarch type fuel nozzles
  - Actual flow rate compared to rated flow rate better with Delevan brand fuel nozzles
  - Other oil burner tests use Delevan type fuel nozzles
  - Improved test result repeatability using Delevan compared to Monarch
- **Conduct comparative burnthrough testing at FAA T.C.**
  - Test using Monarch and Delevan fuel nozzles
- **Adjust burner settings to bring Igniterless stator BT times closer to BT times obtained using original stator setup**
- **Conduct “Phase 3” of study using Delevan nozzles and new burner settings**

Phase 3

- **Phase 3 differs from Phase 2 in the following manner:**
  - Delevan 6.0 gal/hr, 80-degree, solid spray fuel nozzles will be used by all labs
  - Stator position and inlet air pressure (based on FAA T.C. tests)
- **Phase 3 is the same as Phase 2 in all other manners:**
  - Only PAN materials are tested
    - 5 PAN-8579 light felt material
    - 5 PAN-8611 heavy felt material

- **Phase 3 of Burnthrough Study**
  - All labs which returned test results for Phase 2 are invited to participate in Phase 3 of study
  - Delevan fuel nozzles, PAN test samples, and detailed instructions will be provided to labs
- **Delevan nozzles will be made available to all other labs with burnthrough test rigs**
  - Non-participating labs

Questions?

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