

Burnthrough Round Robin

Update

Presented to: IAMFTFM

By: Timothy Salter

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**Federal Aviation
Administration**

Introduction

- **New point of contact for Burnthrough**
 - Timothy Salter (myself)
- **Continuing study for Dr. Robert 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 Summary

- **8 out of 11 labs submitted results**
- **Data looked good**
 - ~7% Std Dev for PAN-8579 felt material
 - ~9% Std Dev for PAN-8611 felt material
 - Burnthrough blankets below 2.0 BTU/ft²s 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 7-5-15). The turbulator is placed on the end of the draft tube with the tab located at the six o'clock position (figure 7-5-16). The typical configuration positions the face of the stator approximately 2.6875 inches (68.263 mm) from the exit plane of the turbulator (figure 7-5-17). Refer to the Preparation of Apparatus section of this supplement for the exact positioning of the stator and turbulator.



Figure 7-5-15. Location of the Stator on the Fuel Tube



Figure 7-5-16. 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 \pm 0.5 mm) from the exit plane of the turbulator (figure 7-5-28). This stator translational position is also 2.3 inches (63.5 mm) from the tip of the fuel nozzle.

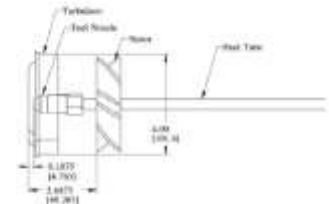


Figure 7-5-28. Fuel Nozzle and Stator Locations

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 7-5-29)

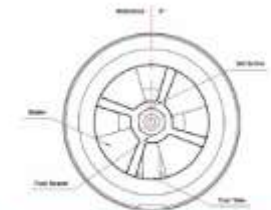
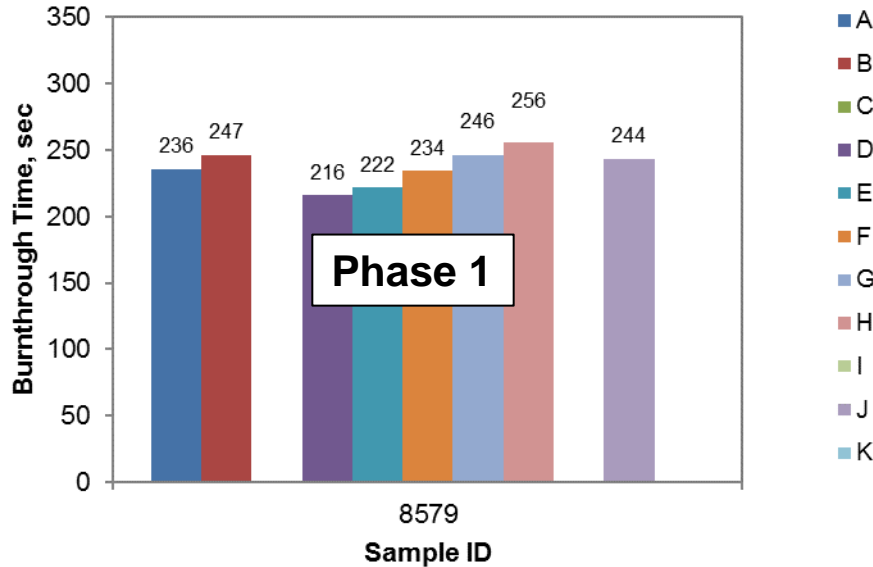


Figure 7-5-29. Stator Axial Position (looking into draft tube)



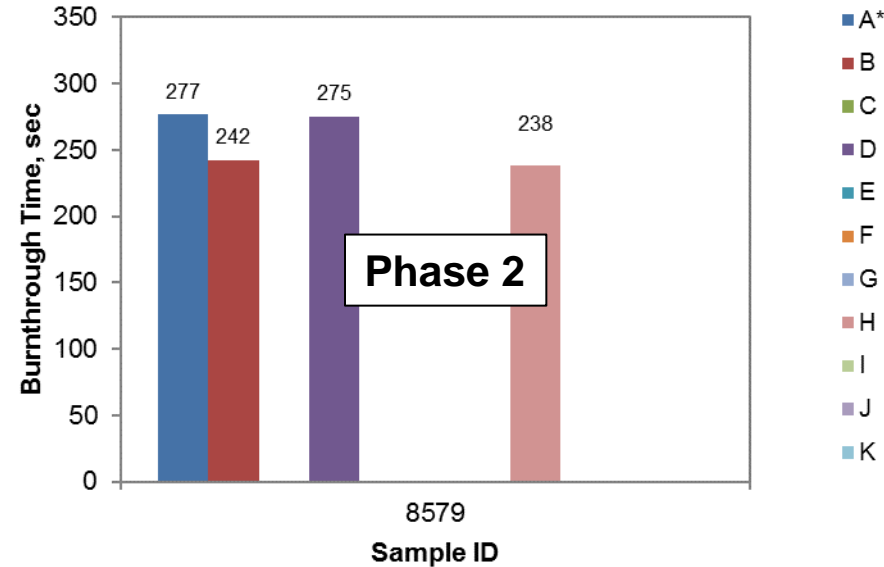
Phase 1 & 2 Comparison - 8579

8579 Average Burnthrough Times



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

8579 Average Burnthrough Times

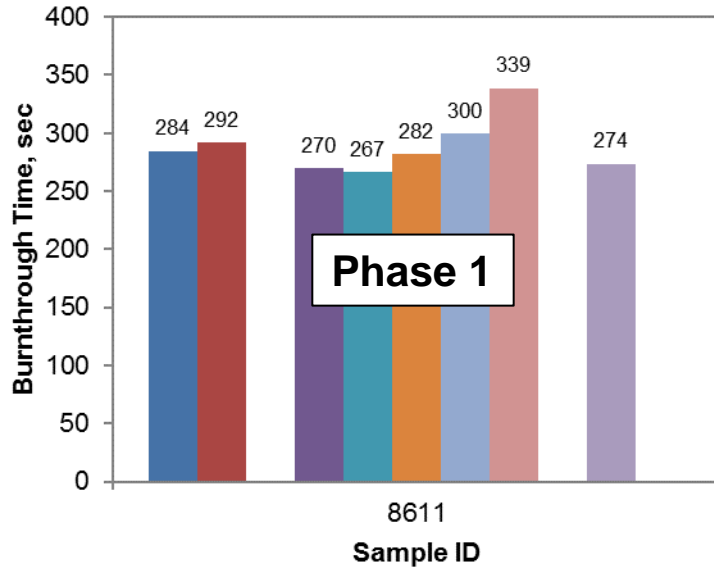


Overall Average BT: 256.2 s
Std Dev: 20.1 s
% Std Dev: 7.8%



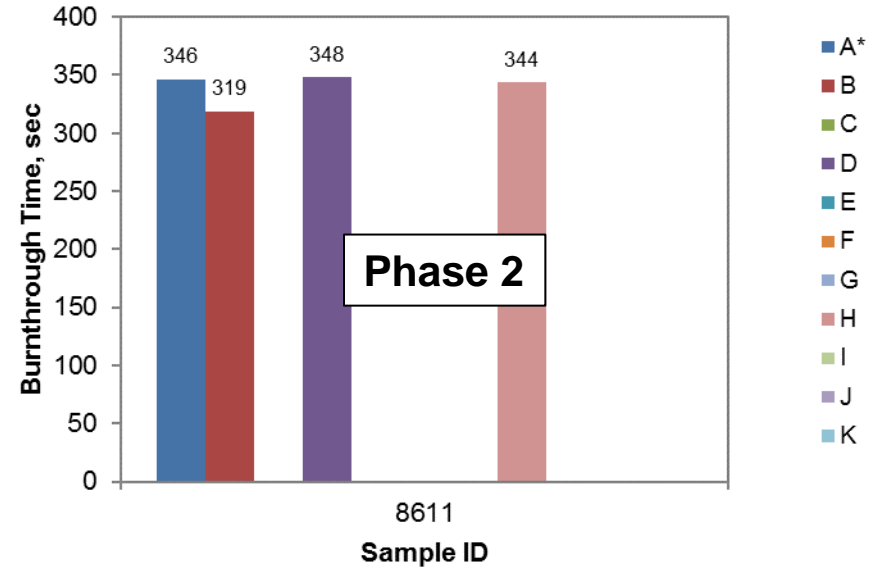
Phase 1 & 2 Comparison - 8611

8611 Average Burnthrough Times



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

8611 Average Burnthrough Times



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

Phase 2 Summary

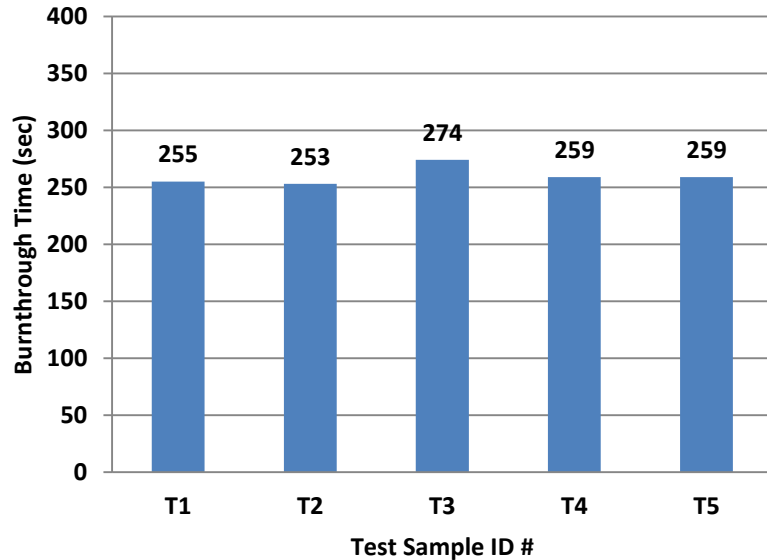
- **4 out of 11 labs submitted results**
- **Data showed mixed results**
 - ~8% Std Dev for PAN-8579 felt material
 - 1% increase from Phase 1
 - ~6% Std Dev for PAN-8611 felt material
 - 3% decrease from Phase 1
- **Longer burnthrough times compared to Phase 1**
 - ~20 seconds more for PAN-8579
 - ~50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

Purpose of Phase 3

- **Standardize Fuel Nozzle**
 - Monarch fuel nozzles commonly used in burnthrough testing
 - Quality control is lacking
 - Actual vs. rated flow rate
 - Fuel spray pattern
 - Delevan nozzles found to be much more consistent
 - Used in all other burner tests
 - Improved test result repeatability with Delevan over Monarch
- **Conduct comparative fuel nozzle testing at FAA T.C.**
 - COMPLETED
- **Adjust igniterless burner settings to achieve BT times similar to original burner configuration**
 - COMPLETED
- **Conduct “Phase 3” of study using Delevan nozzles and new burner settings**
 - Currently in progress

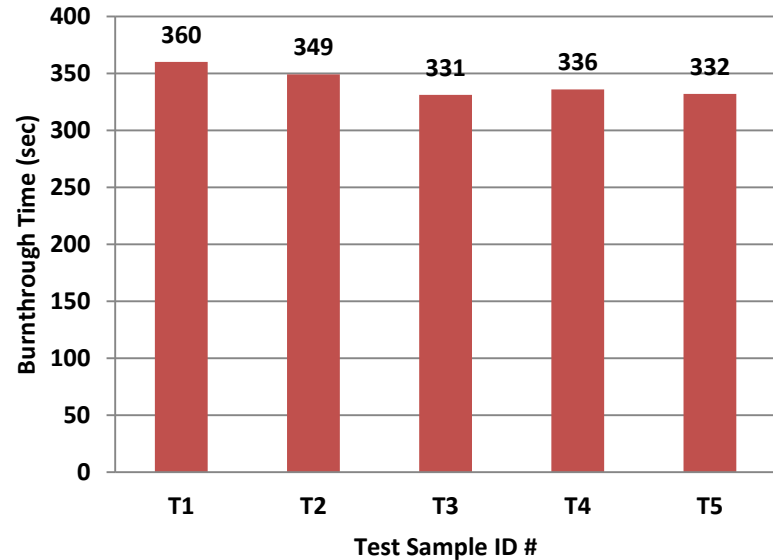
Phase 3: FAATC Test Results

PAN 8579 Burnthrough Times



Overall Average BT: 260.0 s
Std Dev: 8.3 s
% Std Dev: 3.2%

PAN 8611 Burnthrough Times



Overall Average BT: 341.6 s
Std Dev: 12.5 s
% Std Dev: 3.7%



Phase 3: FAATC Test Results

- **Lower Std Dev compared to Phase 2**
 - ~3.2% Std Dev for PAN-8579 felt material
 - ~4.8% decrease from Phase 2
 - ~3.7% Std Dev for PAN-8611 felt material
 - 2.33% decrease from Phase 2
- **Similar burnthrough times compared to Phase 2**
 - ~4 seconds more for PAN-8579
 - ~4 seconds more for PAN-8611

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
- **Phase 3 is the same as Phase 2 in all other manners:**
 - Stator position and air pressure
 - Only PAN materials are tested
 - 5 PAN-8579 light felt material
 - 5 PAN-8611 heavy felt material
- **Phase 3 status**
 - Delevan fuel nozzles, PAN test samples, and detailed instructions are provided
 - 5 labs currently involved
 - Need more participants!
- **Delevan nozzles are available to all burnthrough test labs**
 - Including non-participating labs

Final Notes

- **Chapter 24 of the Fire Test Handbook**
 - Recently updated to match other chapter formats
 - Now includes the Sonic burner
 - New round robin settings for Sonic burner added
 - Take a look if you haven't already
- **Seeking round robin participants**
 - Signup in Burnthrough task group
 - Or email me
- **Phase 3 update next meeting**
 - Need test data from participants

Questions?

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