



**Federal Aviation
Administration**

International Aircraft Materials Fire Test Working Group Meeting

Seat Cushion Oil Burner Round Robin Update

Presented to: International Aircraft Materials Fire Test
Working Group

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Introduction

- **Previous interlab studies had shown the NexGen burner test results to be less repeatable than originally thought**
 - Within a single lab, as well as among multiple test labs
- **In the case of the Park burner, the stator and turbulator inside the burner draft tube could be adjusted to compensate for any irregularities in burner performance which might impact test results**
- **The NexGen burner was designed to be setup in a standardized configuration, meaning that there are no adjustments to be made in order to simplify NexGen burner test rig setup**
- **Flames coming from the NexGen burner cone were often bias to the left or right side, rather than exiting evenly from the cone**
- **It was thought that redesigning the internal components of the NexGen burner may help reduce flame bias and increase test repeatability**

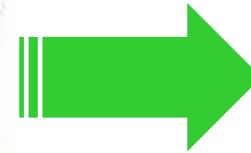
Old Vs. New Burner Internals

- The original concept was to retain the same internals from the Park burner for use in the NexGen burner in order to keep burner performance similar
- After trialing the igniterless stator design with no success, other options were considered
- Oil burners on the market today no longer use stators and turbulators to direct the flow of air through the burner
- Flame retentions heads (FRH) are now used in their place
 - Generate a more efficient and complete combustion
 - Simpler in design
 - Relatively easier to produce

Turbulator



Flame Retention Head



Stator



Static Plate

FRH vs. Stator and Turbulator

Flame Retention Head



Stator and Turbulator



NexGen Burner Settings for 2013 Seat Cushion Flammability Round Robin

- **Face of FRH to nozzle tip: 1-1/8”**
- **Fuel nozzle adapter to static plate: 2-3/8”**
- **Static Plate Angle: centerline of igniters at 0°**
 - Looking into the cone of the burner, the centerline between the igniters will be at 0° on the burner reference
- **Fuel pressure: 108 psi (+/- 4 psi)**
 - This pressure is to be used as a starting point when flow checking the fuel flow rate
- **Air pressure: 45 psi**
- **Air Temperature: 40-60°F**
- **Fuel Temperature: 32-52°F**

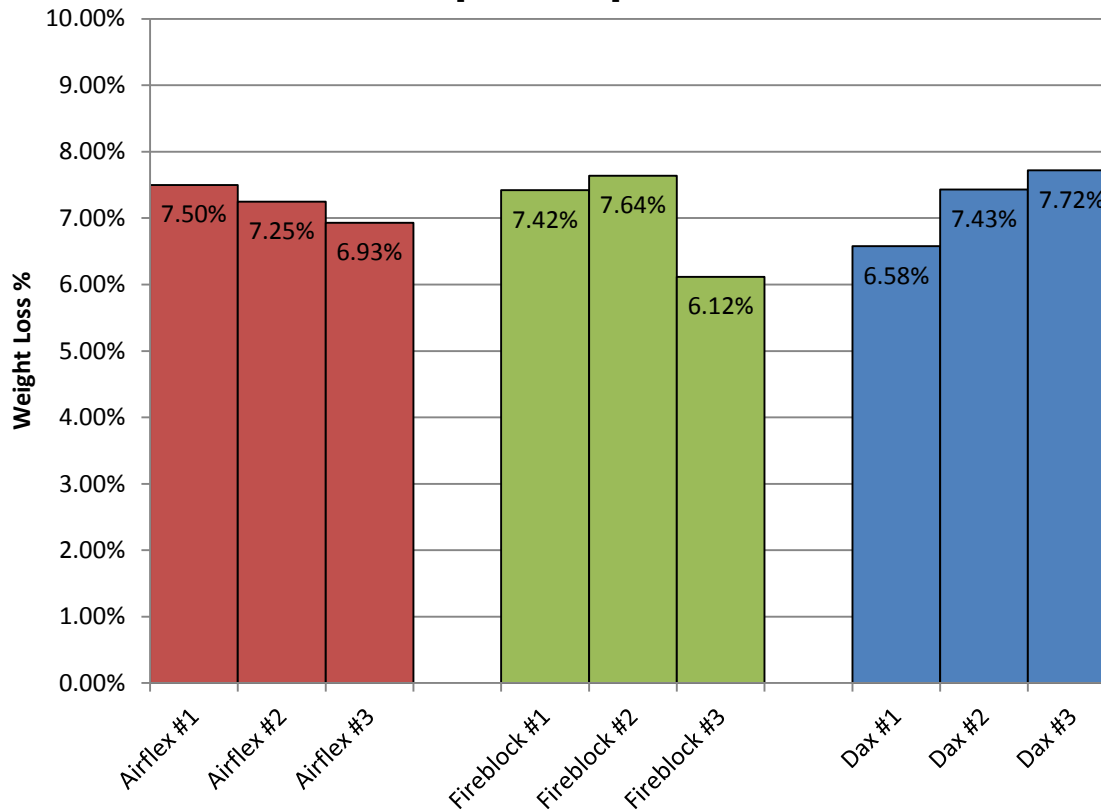


Test Materials

- **All participating labs will be provided with cushions for testing purposes**
- **3 different foam cushion types will be provided**
 - Airflex fire hardened foam
 - Dax fire hardened foam
 - Fire retarded polyurethane foam with a fire blocking layer
- **There will be 3 cushion sets of each cushion type provided**
 - 9 samples total
- **Testing should be performed as described in the Rule or Fire Test Handbook**

FAA Initial Test Results using the FRH with the NexGen Burner

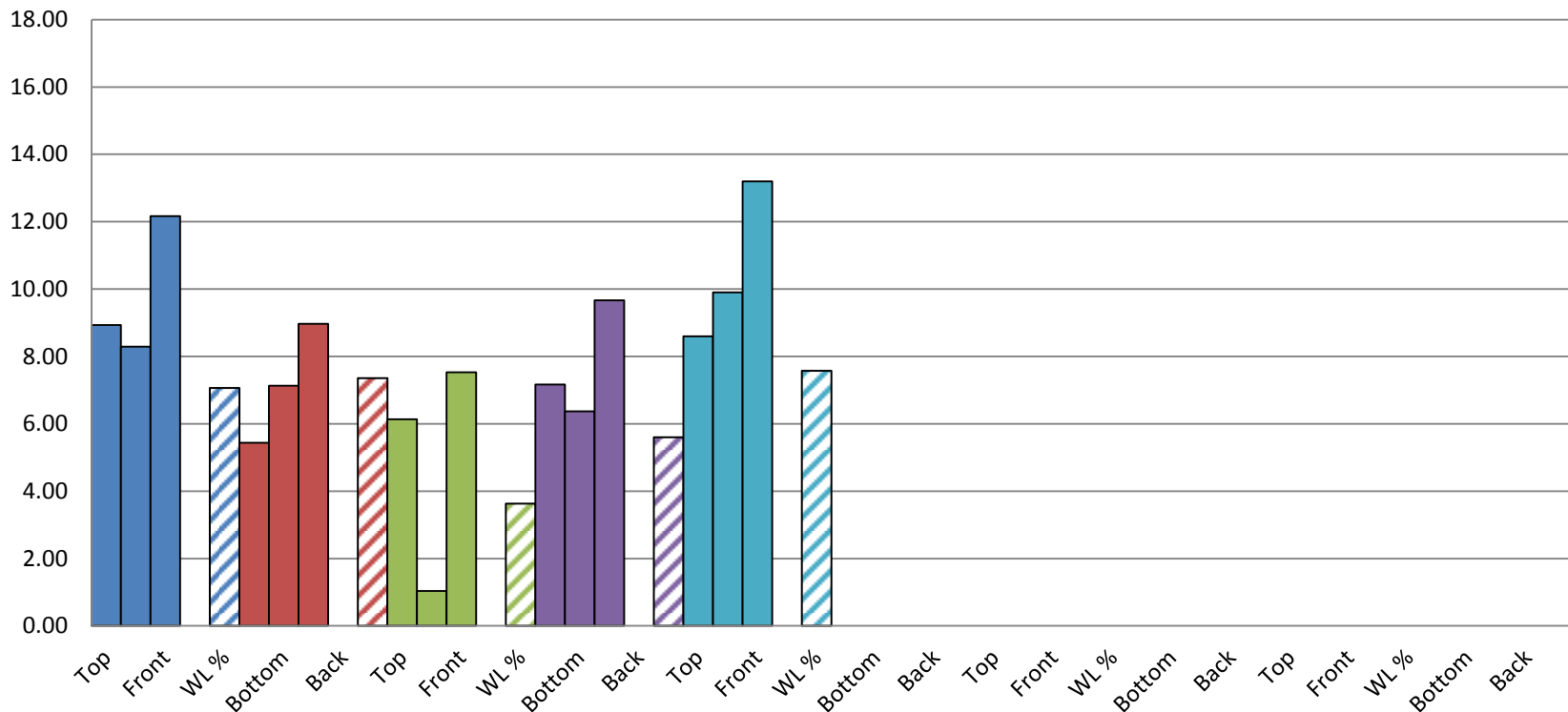
% Weight Loss for each Cushion Sample Set Tested using Delavan W nozzle and 45 psi air pressure



	Airflex	Fireblock	Dax
Sample #1	7.50%	7.42%	6.58%
Sample #2	7.25%	7.64%	7.43%
Sample #3	6.93%	6.12%	7.72%
Average	7.22%	7.06%	7.24%
Stdev	0.287	0.82	0.594
%Stdev	3.97	11.67	8.20

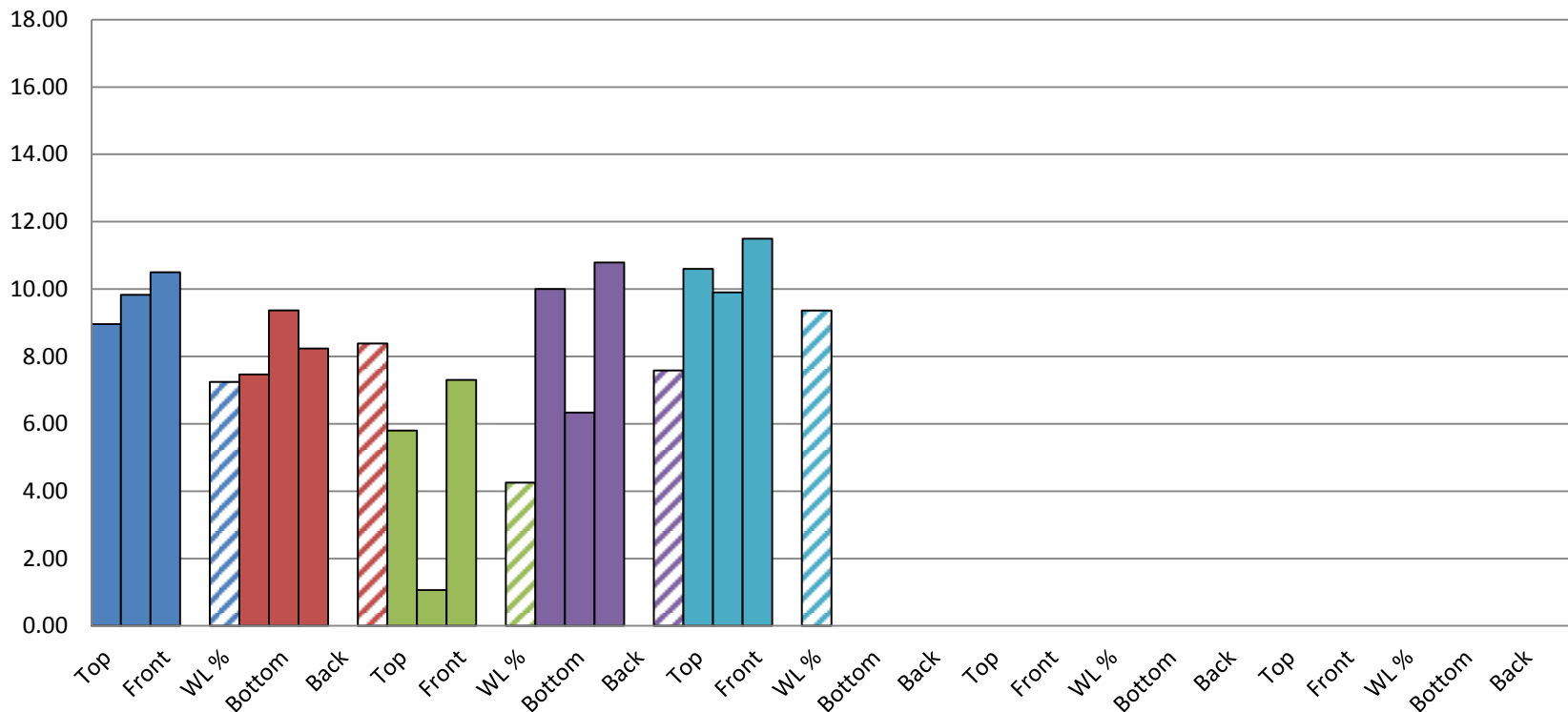
2013 Round Robin Test Results

Round Robin 2013 Average Weight Loss % and Burn Lengths for Fireblocked Cushions



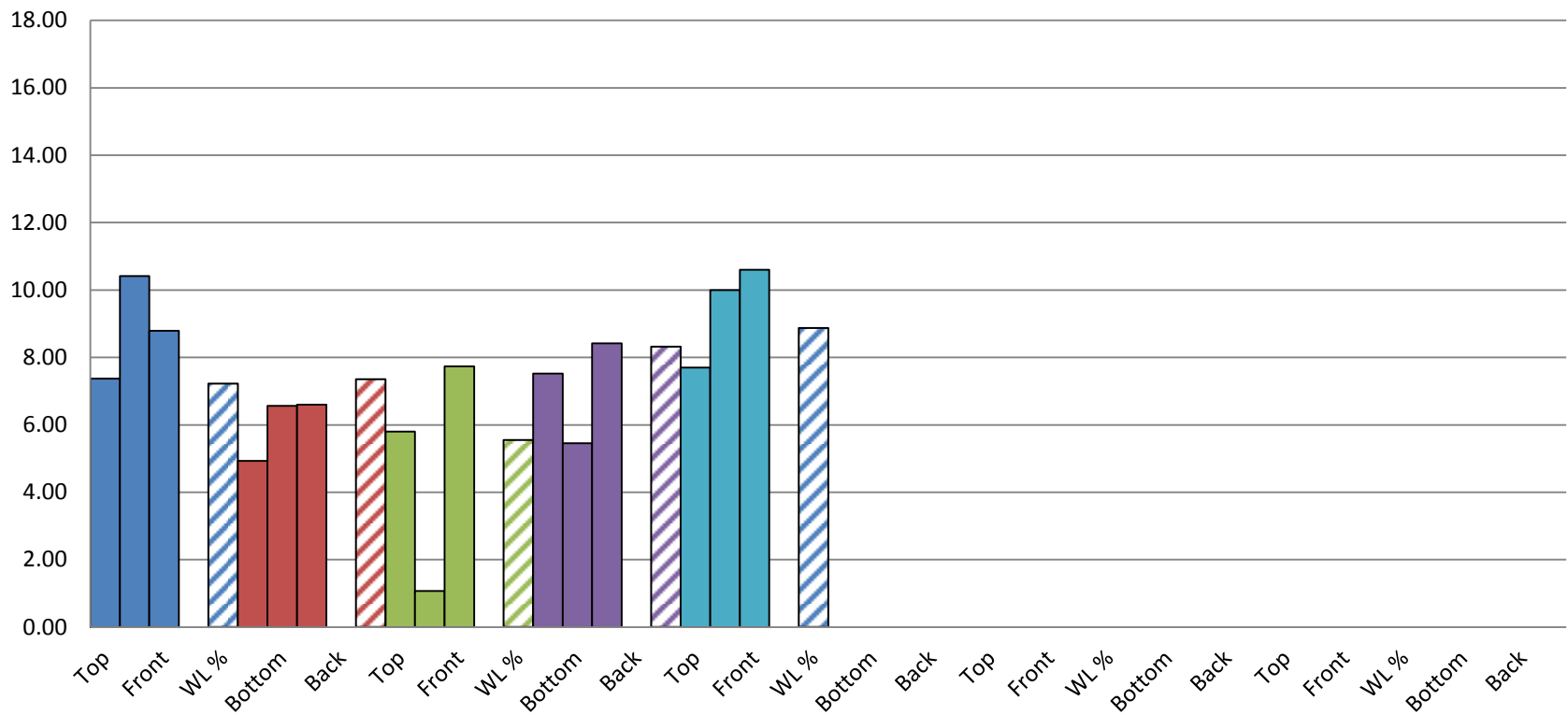
2013 Round Robin Test Results

Round Robin 2013 Average Weight Loss % and Burn Lengths for Dax Cushions



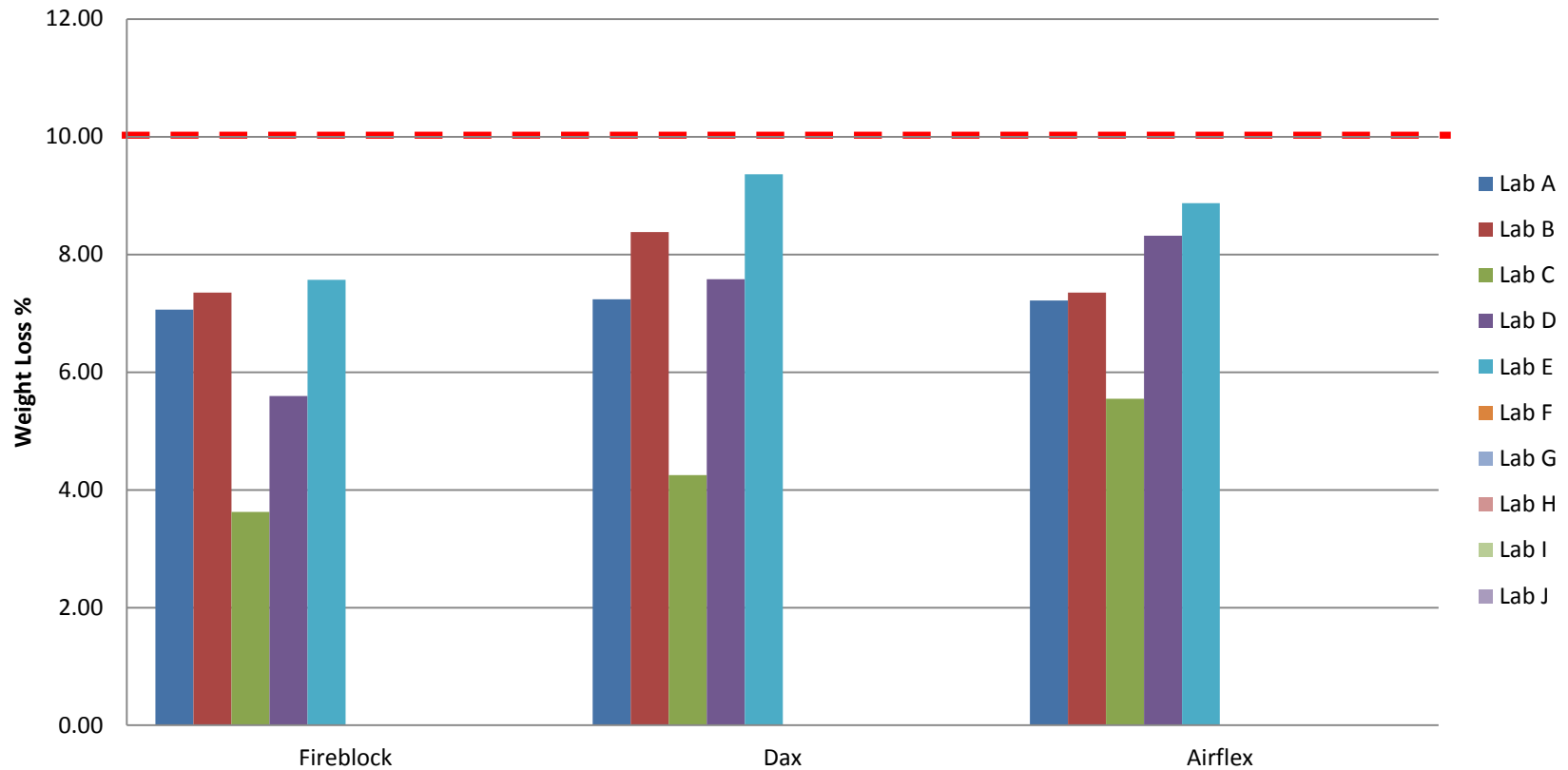
2013 Round Robin Test Results

Round Robin 2013 Average Weight Loss % and Burn Lengths for Airflex Cushions



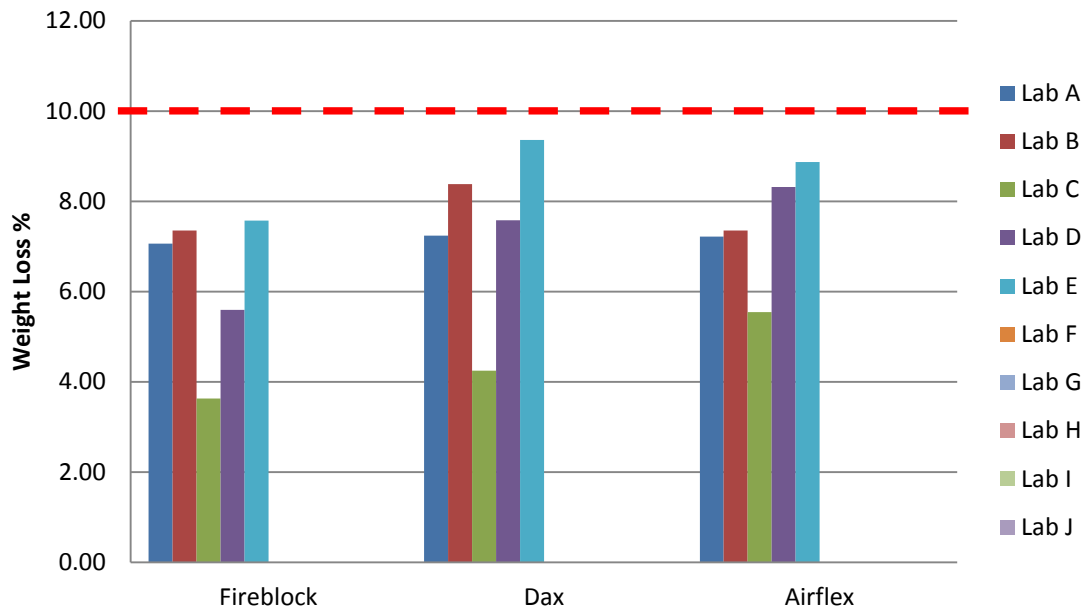
2013 Round Robin Test Results

Round Robin 2013 Average Weight Loss %



2013 Round Robin Test Results

Round Robin 2013 Average Weight Loss %



Average Weight Loss % Results

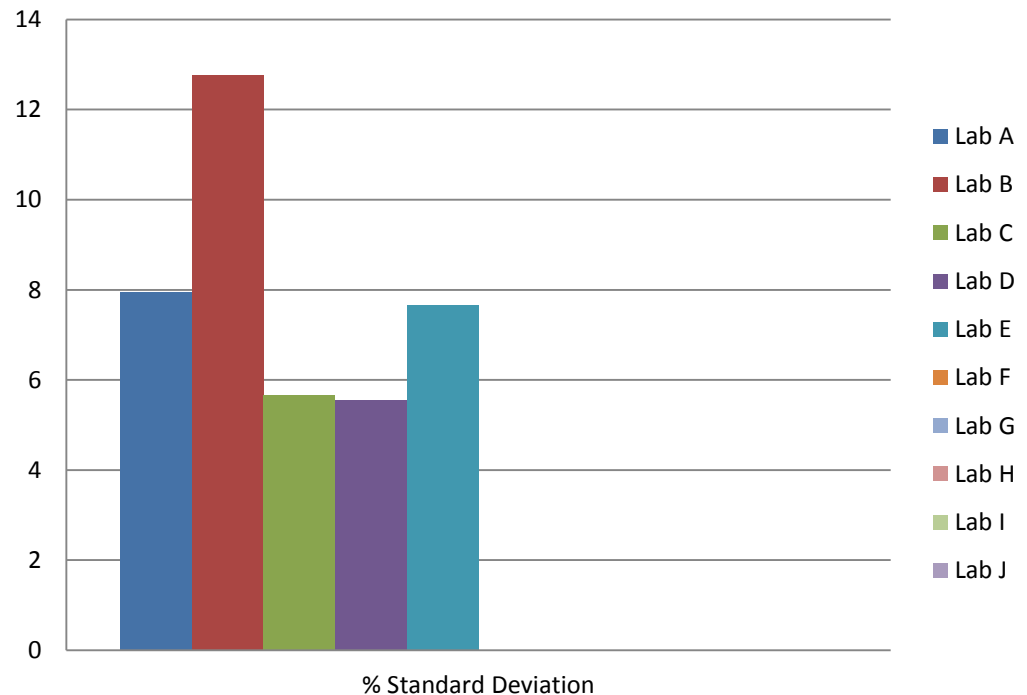
	Fireblock	Dax	Airflex
Lab A	7.06	7.24	7.22
Lab B	7.35	8.38	7.35
Lab C	3.63	4.25	5.55
Lab D	5.60	7.58	8.32
Lab E	7.57	9.36	8.87
Lab F			
Lab G			
Lab H			
Lab I			
Lab J			
Avg	6.24	7.36	7.46
Stdev	1.65	1.92	1.27
%Stdev	26.48	26.11	17.02

- No average weight loss % failures have been experienced in a lab for the 2013 round robin
- %Stdev results are above the preferred 10% limit when comparing all lab's results

2013 Round Robin Test Results

- The data on the previous slide shows the %Stdev among the participating labs to be elevated
- Possible cause is likely configuration/size of test lab, and not the NexGen burner
- Working to resolve these issues in the next Workbook
- However, when examining the results of one lab at a time, there appears to be much higher consistency
- The graph shown (right) shows the %Stdev for weight loss percent within each particular lab

Round Robin 2013 Total % Standard Deviation within Labs for All Cushion Types

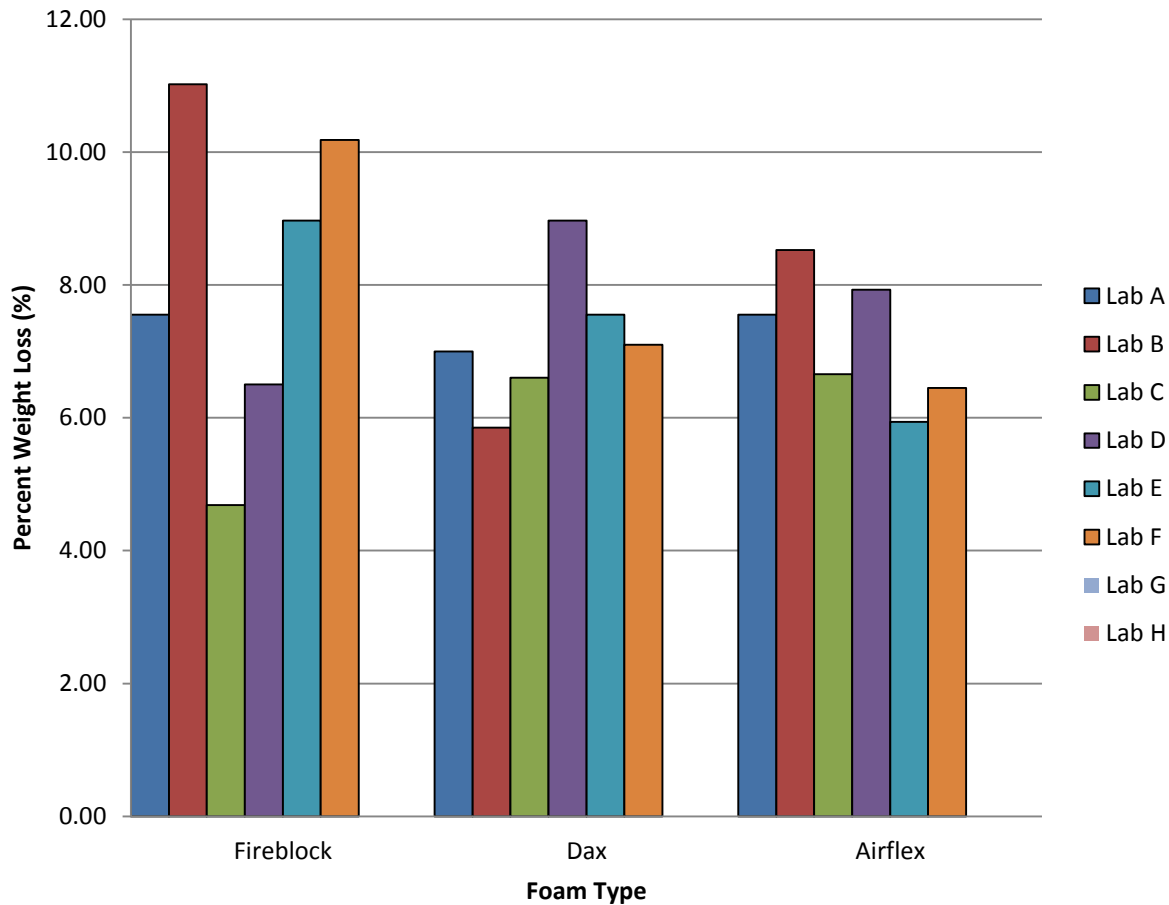


Questions?



2012 Round Robin Test Results

Round Robin 2012 Average Weight Loss Percent

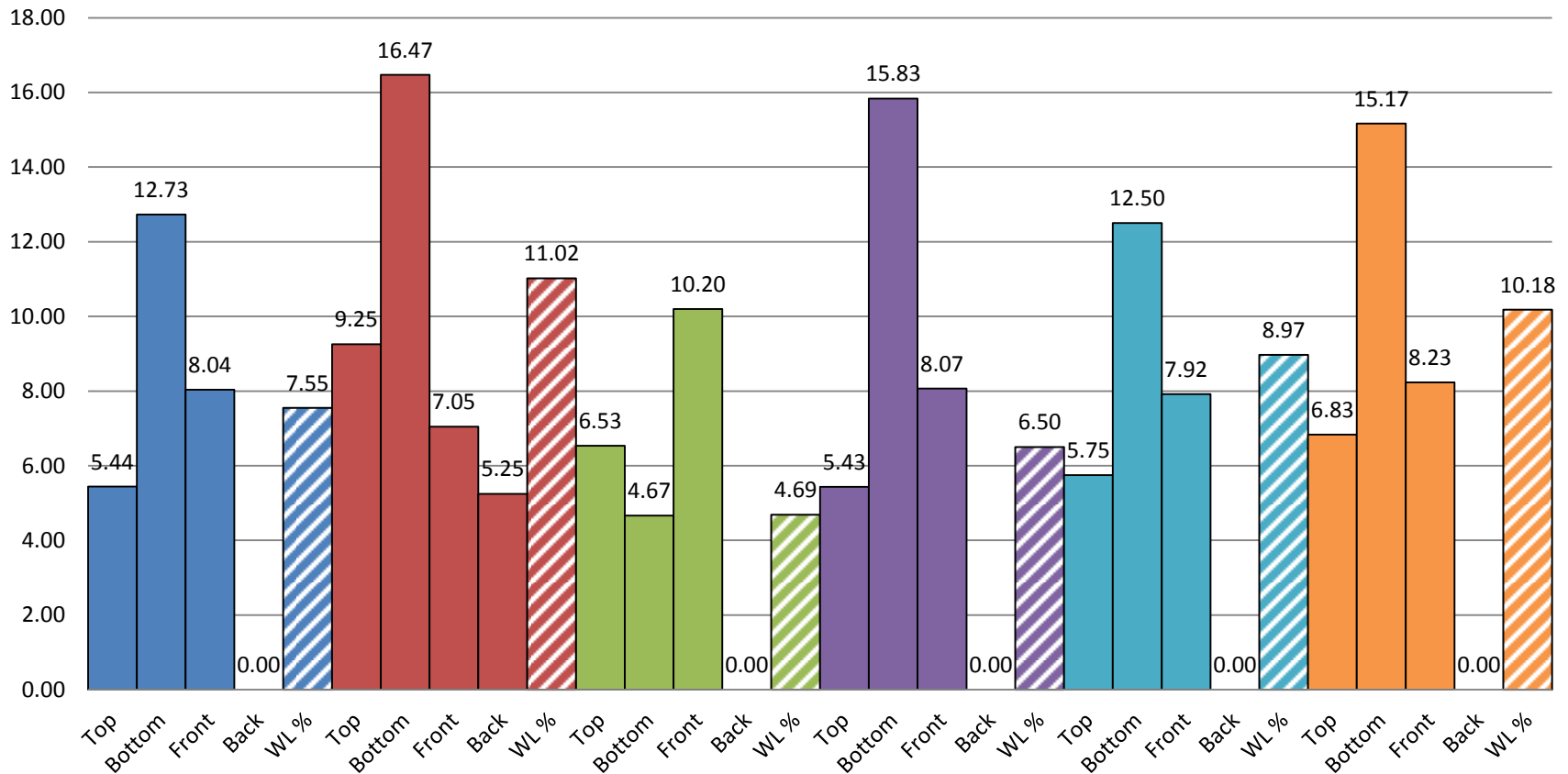


	Fireblock	Dax	Airflex
Lab A	7.55	7.00	7.55
Lab B	11.02	5.85	8.52
Lab C	4.69	6.60	6.66
Lab D	6.50	8.97	7.93
Lab E	8.97	7.55	5.94
Lab F	10.18	7.10	6.45
Lab G			
Lab H			
Avg	8.15	7.18	7.17
stdev	2.37	1.05	0.98
%stdev	29.09	14.57	13.72

•FAA is Lab A

2012 Round Robin Test Results

Fireblock Cushion Burn Lengths and Weight Loss Percent



- Lab at far left is FAA Technical Center