

# HEAT RELEASE RATE Updates

## Materials Working Group Mobile, AL

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March, 2020



Federal Aviation  
Administration



# Agenda

- BACKGROUND
- HR2 sonic choke research
  - Specifications
  - Installation
  - Calibration/Theoretical Data (Volume flow vs. Temp., Press.)
  - Task Group input



# HR2 Update

## BACKGROUND

- OSU Voltage Round Robin (March 2019 - Boeing)
- Implemented global voltage and current monitoring (April 2019)
- TRL 5 (Repeatability) – May 2019
- NPRM released and on our FAA web site (July 2019; Chapter A4 - Heat Release Rate Test)
- Conference Presentations (October 2019)
  - Detailed HR2 / OSU description of changes (M. Burns - FAATC)



# HR2 Update

## BACKGROUND (Continued)

- Summary of Airflow Effects on Material Heat Release Results using OSU Calorimeter (T. Spanos - Boeing)
- HR 2 Nominal Operating Parameters Range (Y. Agyei - Boeing)
- Current work (March 2020):
  - TRL 6 (Reproducibility) – In progress
  - R&D heater development – In progress
  - Investigation into MFC replacement with sonic choke – In progress



# HR2 Sonic Choke

- If inlet pressure and temperature to the sonic choke can be regulated accurately, the MFC can be replaced.
- Estimated uncertainty in mass flow rate of air approximately +/- 0.5% traceable to NIST
- FAATC acquired sonic choke / equipment (Fall 2019)
- Temperature control:
  - Thermal Transfer Products heat exchanger
  - Remcor Chiller/Heater
  - Type-K TC



# HR2 Sonic Choke

- Pressure control:
  - Pressure regulator
  - ✓ ControlAir #7100-EAE
  - ✓ ~ \$340 each



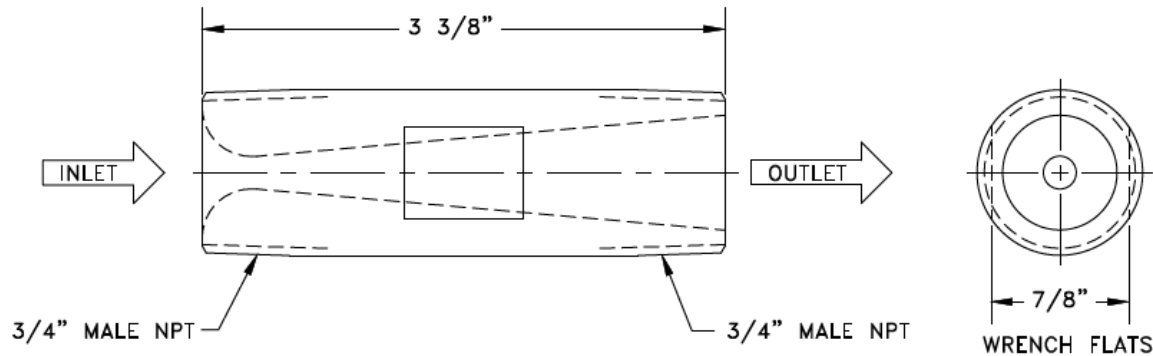
- High-accuracy pressure gauge
- ✓ PX309-050A10V
- ✓ ~ \$270 each



- Pressure tolerance  $34.7 \pm 0.7$  psia correlates to  $20.0 \pm 0.4$  SCFM.

# HR2 Sonic Choke

DO NOT SCALE DRAWING



## Testing & Certifications

The following are included with supply of this Venturi.

	YES	NO
Flow Calibration	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Hydrotest	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Weld Dye Pen.	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Weld Certs	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Radiograph 100%	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Cleaning Spec.	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Material Certs.	<input checked="" type="checkbox"/>	<input type="checkbox"/>

**Fox 3/4" Sonic Choke**

**Fox Part No. 625442**

**Fluid Media:** Air at 34.7 psia, 72.5° F

**Line Size:** 3/4" Sch 40 pipe

**Material:** 304 Stainless Steel

**Throat Dia:** Approx. Dt = 0.208"

**Design Flow Rate:** Approx. 0.0269 lbs/sec of Air at 34.7 psia


**Configuration:** 3/4" male NPT ends

### Calibration at CEESI:

**Description:** Air Flow Test at ambient temperature; "As Found" testing

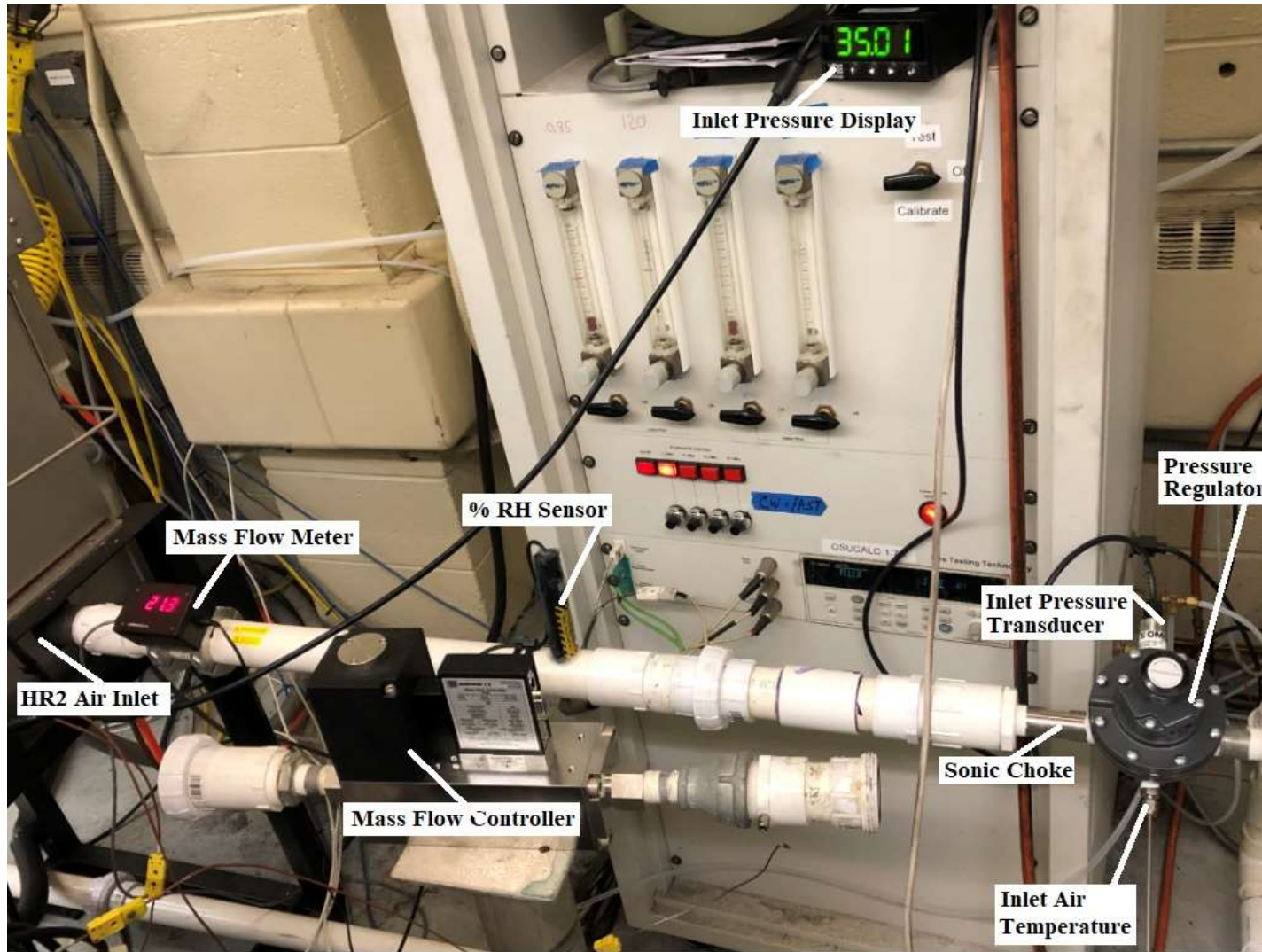
**Choked Flow:** Approximately (6-10) Data Points taken over an inlet pressure range of about 24.7 to 44.7 psia

**Accuracy:** Estimated uncertainty in mass flowrate of air approx. ± 0.5% traceable to NIST

CONTRACT NO.			<b>Fox Venturi Products</b>	
APPROVALS	DATE		Dover, NJ USA www.foxvalve.com	
DRAWN BY: EAN	07/18/19	<b>3/4" Sonic Choke, Male NPT</b> For Fire Safety R&D For: DOT/FAA Atlantic City, NJ		
APP. BY				
MATERIAL	SS 304	SIZE	REVISION	DRAWING NO
FINISH	32 RMS	<b>B</b>		<b>625442</b>
TOLERANCES UNLESS OTHERWISE SPECIFIED:		SCALE	SHEET# OF	
FRACTIONS: ± 1/8"				

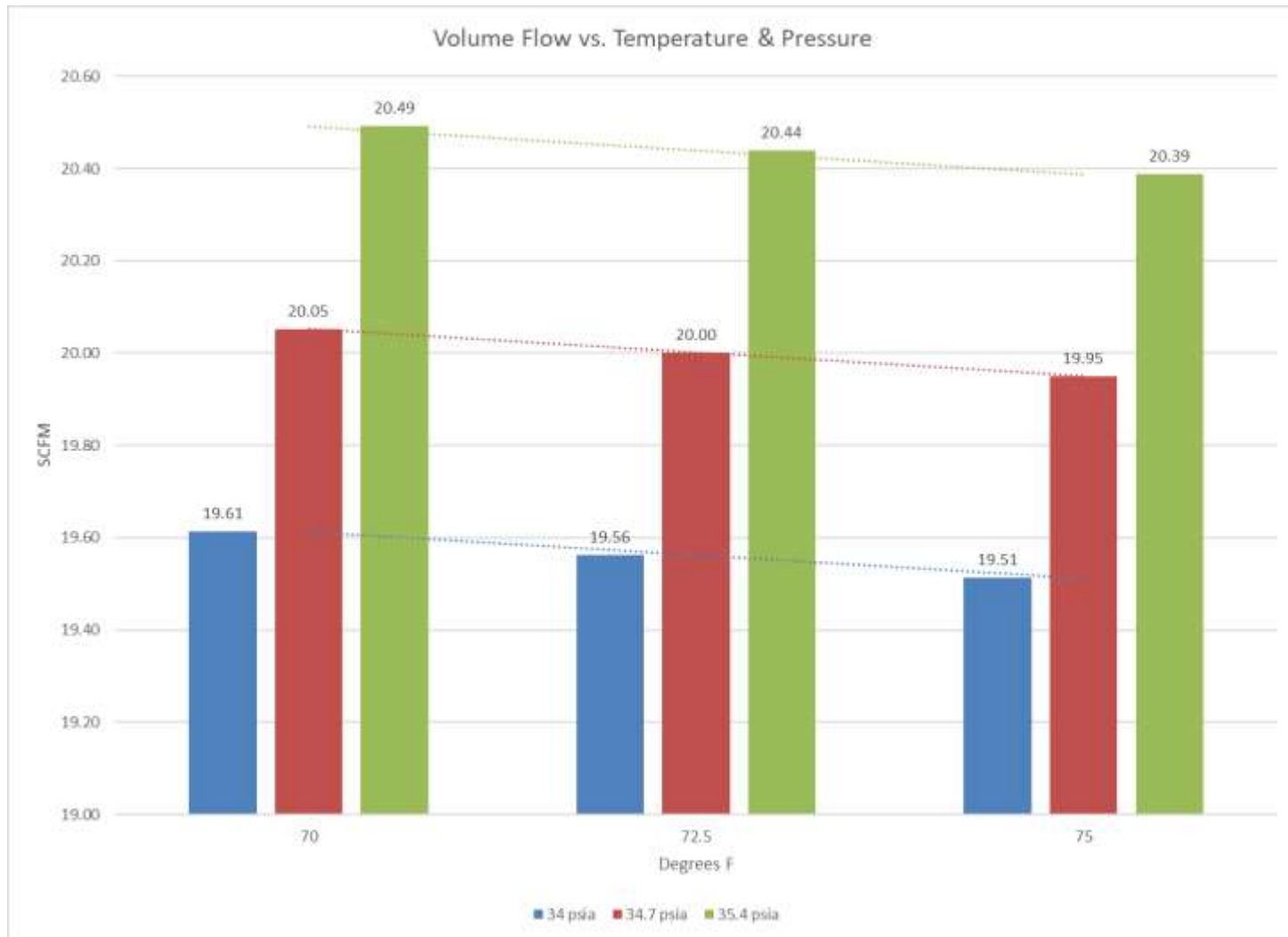


# HR2 Sonic Choke





# HR2 Sonic Choke Theoretical Data



# HR2 Task Group Input

## HR2 Sonic Choke

- Cost: \$950
- Colorado Engineering Experiment Station Inc. (CEESI) Calibration: \$1,785 each
- Some questions for TG members:
  - How/where to install (lower plenum, remotely etc.)?
  - Distance from inlet fitting to lower plenum?
  - Change lower plenum 1½” opening to accommodate a ¾” female NPT (choke/pressure regulator)?
  - Location of pressure transducer and TC as standard configuration?



# HR2 Task Group Input

## HR2 Sonic Choke

- Temperature requirements will change from the lower plenum temperature TC  $72.5 \pm 2.5^{\circ}\text{F}$  to the sonic choke inlet temperature.
- Use of pressure or temperature sensors
  - Absolute pressure gauge required (0-50 psia)
  - Type K TC
- Frequency of calibration of pressure and temperature sensors



# HR2 Task Group Input

## HR2 Sonic Choke

- Filtration requirements: Specific filter recommendation?  
Micron size?
- Calibration frequency (none required)? CEESI does not give a specific re-calibration interval.
  - The sonic choke does not have any moving parts, and assuming there are no changes to internal dimensions or surface finish performance should be consistent.
- Cleaning requirements or standardized method?
- If desired, update placeholder document.



# Questions?

