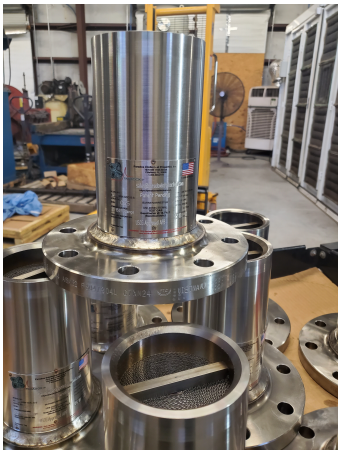
8031 NW Camp Azalea Rd.
Chiefland, Florida, USA 32626

A-BRN Anti-Flashback Burner (AFB) USCG Approved



AFB's in Lue of Liquid Seals

On March 2, 2017, the Chemical Transportation Advisory Committee's Vapor Control System Subcommittee offered recommendations to CG-ENG-5 on design criteria for accepted AFBs. The recommendations mentioned above were used to augment Policy Letter 02-16 and promulgate Coast Guard acceptance procedures and criteria for anti-flashback burners installed in marine vapor control systems. Manufacturers can submit AFB's for acceptance and posting on the "Accepted Anti-Flashback Burner List" after the following;

The AFB must have a flame arresting cell called a metal crimped ribbon style from a commercial flame arrester manufacturer with an established commercial design used in a flame arrester. The flame arresting cell must be manufactured with appropriate material and crimping gaps.

- Submission to USCG office should include:

Design specs for the AFB including a drawing, materials, and ribbon gauge
Depth of flame arresting cell
Manufacturer of flame arresting cell
List of sizes used (e.g., diameters)
List of manufacturer-assigned model numbers to which the design applies

A facility that installs an accepted anti-flashback burner from the list instead of a liquid seal will not need an exemption or case-by-case acceptance.

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email:dwight@paradoxip.com
Office: +1 352-493-0616
Mobile: +1 352-949-4442

Series-A Flame Arrestors

Why are Approved AFBs failing?

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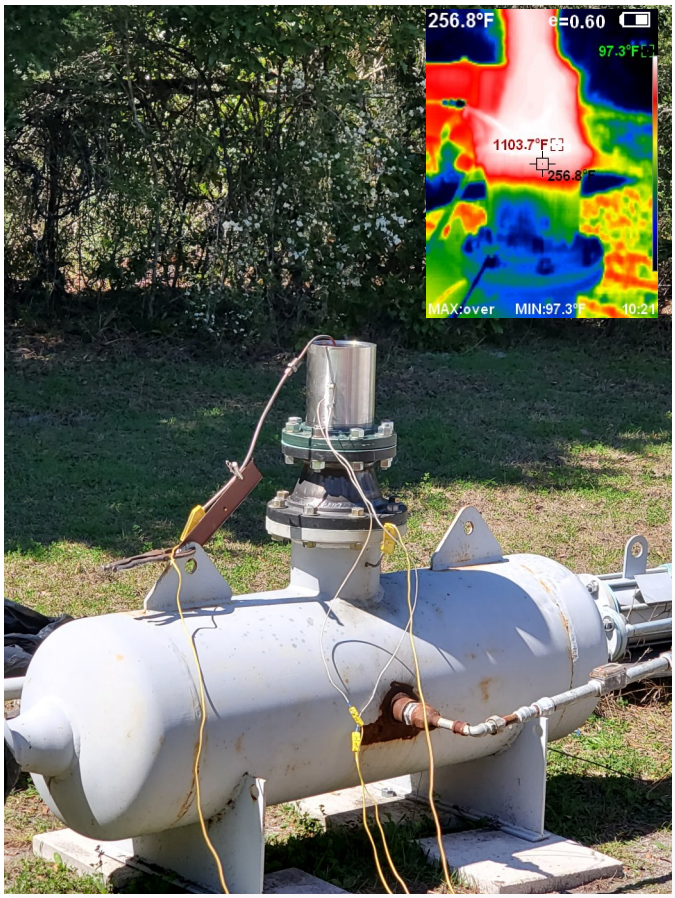
The original recommendation was not a "standard"; it gave no minimum design or testing requirements. It also did not establish a min-imum required burn time performed at any par-ticular flow rate. It also did not outline or rec-ommend a burn test procedure in which the AFB's should meet. Companies just purchased ran-dom crimp ribbon elements and stuffed them into a pipe—no basic design requirements and no testing to determine any performance.

After two years of testing multiple manufacturers AFB's in Paradox's laboratory, we found that there are just too many design and quality control issues discovered to begin to list in this short discussion.

All of the tests conducted were performed on eight inch AFBs made by four manufacturers using elements supplied by four popular flame arrester manufacturers. All of the eight inch units were tested under the exact conditions. As do Flame arresters, AFB's fail while stabilizing a flame on the element's upstream side. The time it takes the element to allow the flame to heat the element sufficiently that it flashes through to the protected side is directly proportional to the flow rate—usually, the lower the flow rate, the shorter the time to fail.



Paradox's A-6BRN AFB Burner on Test vessel.

- Tested with Gasoline
- Lasted 2-1/2 hours before failing
- 4 thermocouples used for data & fail prediction
- 8" NPT connection
- Thermal imaging camera aids in data analysis.

Repetitive tests gave us data (test factor)showing the worst-case flow rate (WCFR) Vs. Shortest burn time (SBT). The testing protocol devel-oped was derived by calculating the average WCFR per square inch of element area on five manufacturer's 8" AFB's. To test other-sized AFBs, we utilized the factor for determining the WCFR by multiplying it by total cross-sectional ele-ment area... That way, we could maintain the exact testing condition for each AFB diameter/size test-ed.

This testing method showed all tested, "approved" AFB sizes would fail from 10 and 30 minutes from the start on a cold element.

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After some of the AFB's failed, the resulting shockwave would destroy the tested units allowing burn-ing crimp material to rain down on the test site, starting ground fires. In the field, this scenario would be hazardous to personnel and property.

The overall results of this two-year study show a need for an established design and test benchmark.

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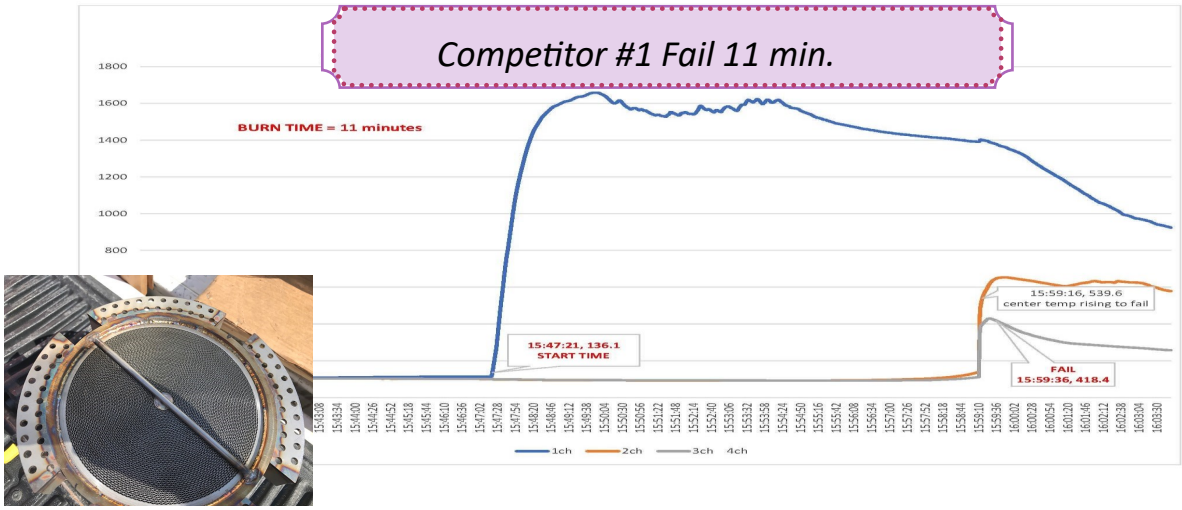
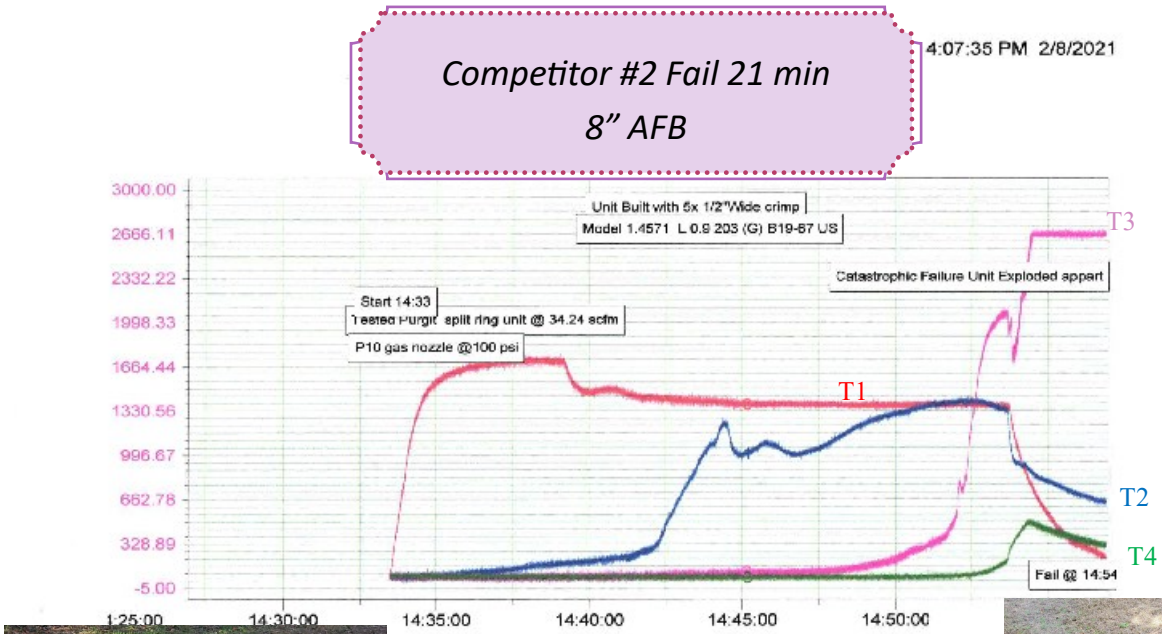
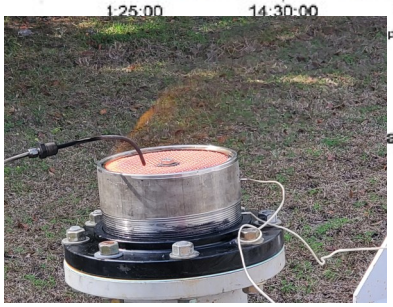
A sample of USCG Approved Competitor units under test.







Unit #2 was completely destroyed when it failed and subjected to very low pressure shockwave.

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Paradox has developed, patented and gained USCG Approval on a Superior AFB product line .

The Paradox IP LLC A-BRN Anti-Flashback Burners are the only purpose build AFB manufactured by a flame arrester manufacturer that is USCG Approved. It is built to and tested to an "Internally Developed Design & Test Standard.", not a colossal assembly of pipe and random crimp ribbons as is the norm

When tested under the same conditions as the competitors, the Paradox IP AFB's lasted from over 1 hour to 2-1/2 hours depending on size of unit.

Test on Paradox IP LLC A-4BRN

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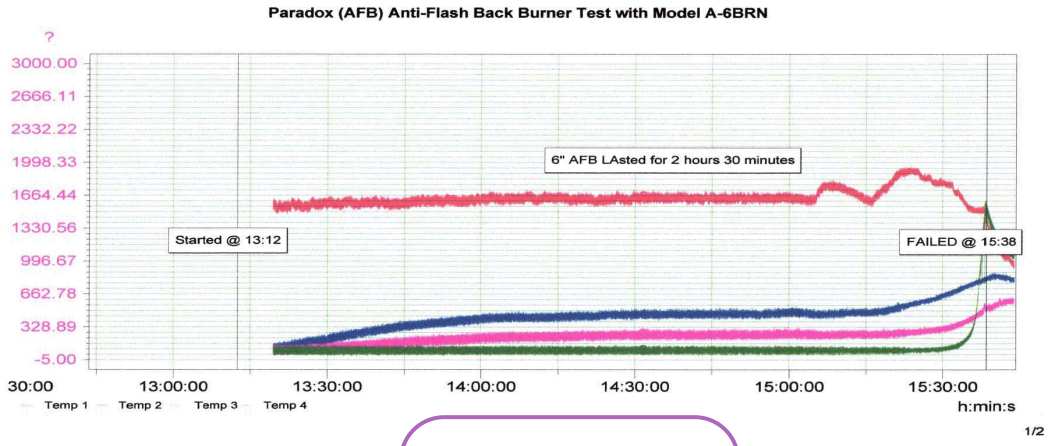

Dwight Brooker
4Chanel Thermocouple-Stripchart.DSB

A-6BRN 2-1/2 hour

Multiple manufacturers of AFBs contributed products for testing after experiencing problems in the field. Names of the AFB contributors have been kept confidential out of professional courtesy. Most are aware of frequent failures of all these devices and contacted Paradox for answers.

Play it safe, "Buy Paradox"

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PARADOX AFB MODELS

Model	Body Material	Element Material	Approval	Minimum Tested Flow Rate in SCFM (WCFR*area)	Tested Shortest Burn Time (SBT) @ WCFR
A-3BRN	304SS	304SS	USCG	4.56 SCFM (273 SCFH)	2 + Hrs. Units marked + did not fail during test.
A-4BRN	304SS	304SS	USCG	10.45 SCFM (627.49 SCFH)	2 +Hrs Units marked + did not fail during test.
A-6BRN	304SS	304SS	USCG	26.39 SCFM (777.49 SCFH)	2-1/2 Hrs.
A-8BRN	304SS	304SS	USCG	42.0 SCFM (2520 SCFH)	72.8 minutes + Units marked + did not fail during test
A-10BRN	304SS	304SS	USCG	73.9 SCFM 4433.89 (SCFH)	1 hr.

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