



NS U1 Acoustic Cleaning Evaluation – Follow Up Analysis 12/18/2006

Champion: Randy Stroupe

Team:

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Fred Knoche Greg Graham Steve Elmore

Sabina Pryce Jones & Brad Saad

BB: John Kang

	Assigned	Complete
Sched	2/15/06	Open
Actual	2/15/06	8/2/06



Unit 1 Boiler Acoustic Cleaning System Overview

System description:

The boiler acoustic cleaning system installed in Unit 1 is an Advanced Acoustics Technologies (AAT) Wavemaster Acoustic Cleaner consisting of 2 resonator tubes, a dedicated roots blower and 2 pulse air generators.

- System installed December 2005
- Initial activation Jan 2006
- Fine tuning completed 6/21/06

Potential benefits:

- Primary benefit of Economizer cleanliness improvement
- Secondary benefit of Reheater and Primary Superheater cleanliness
- Benefits measured by heat rate improvement and economizer exit gas temperature drop.

BB project objective:

- Assist the project team to verify the performance of the system.
- Analyze data and determine cost savings.



Unit 1 Boiler Acoustic Cleaning System Overview

Follow Up Analysis Of Acoustic Cleaning Benefits:

Comparison of ----- run with 90/10 low sulphur blended fuel show the following results:

1. **Bartlett's Test of Equal variance showed that the distribution variances are equal. This shows that Unit 1's operating processes with and without the acoustic cleaning system were similar ie. the unit was operating the same.**
2. **The heat rate data was normal indicating a process which was relatively stable without major swings.**
3. **2 sample T-Test showed that the distribution of the means was different. There was a statistically significant shift in the means of the heat rate with and with out the acoustic cleaning system.**
 - **Heat rate with acoustic cleaning = 9626 Btu/Kwh**
 - **Heat rate with out acoustic cleaning = 9790 Btu/Kwh**
 - **Difference = 64 Btu/Kwh**

Fuel cost saving:

- **64 Btu/ Kwh = approximate cost saving of \$950/ day. (Mr. Steve Elmore)**
- **Annual saving = \$950/ day x 300 day/ yr run = \$285,000/ yr.**

Conclusion:

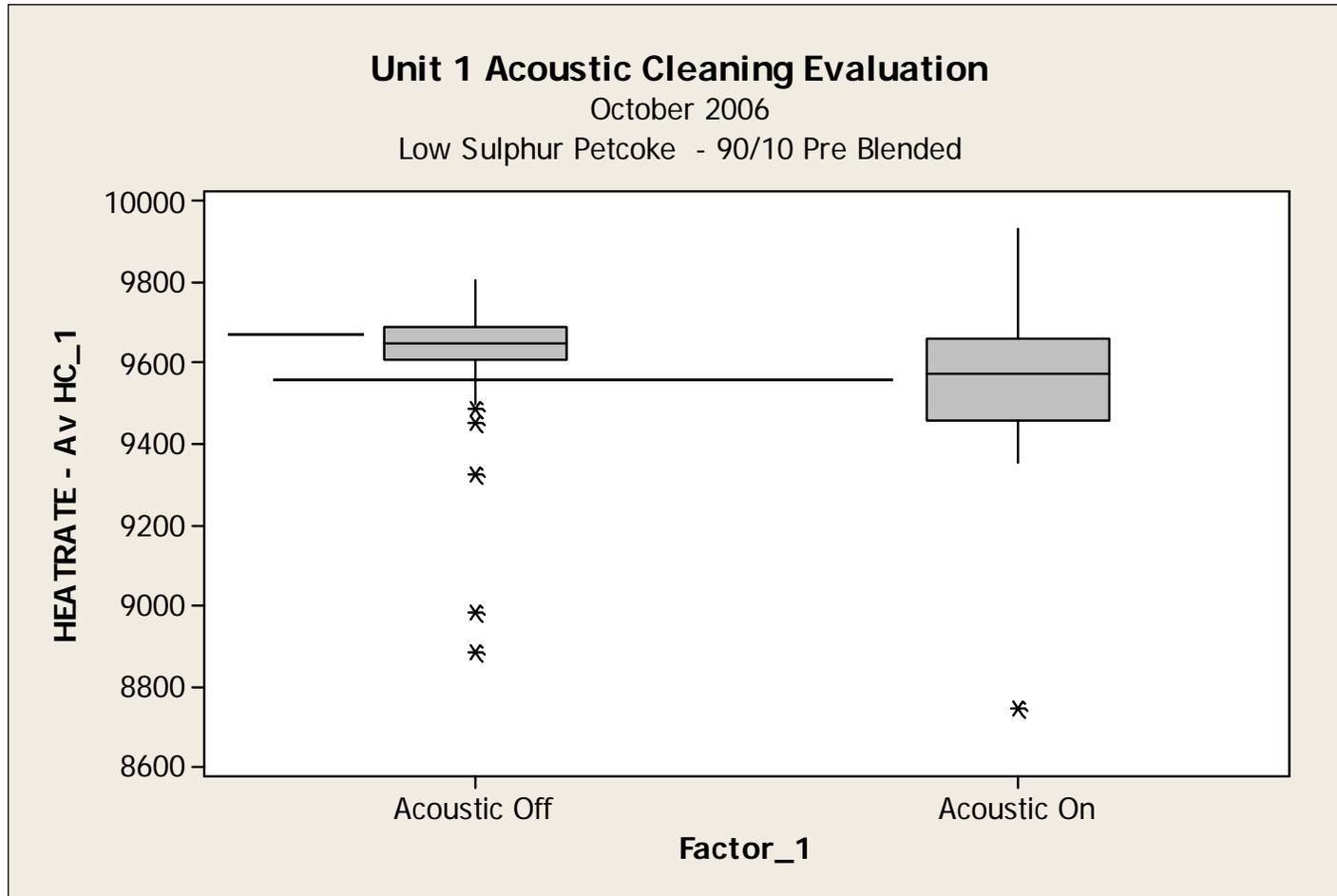
October 2006 Acoustic Cleaner On vs. Off Test with audited fuel measurements (Donald Drake) and similar operating conditions show a heat rate cost benefit of \$285,000/ year (Steve Elmore). This is comparable to the previous analysis estimation of \$228K / year.

Recommendation:

The project team would like to recommend that the acoustic system be installed on Unit 2 to improve heat rate cost and improve operating boiler characteristics.

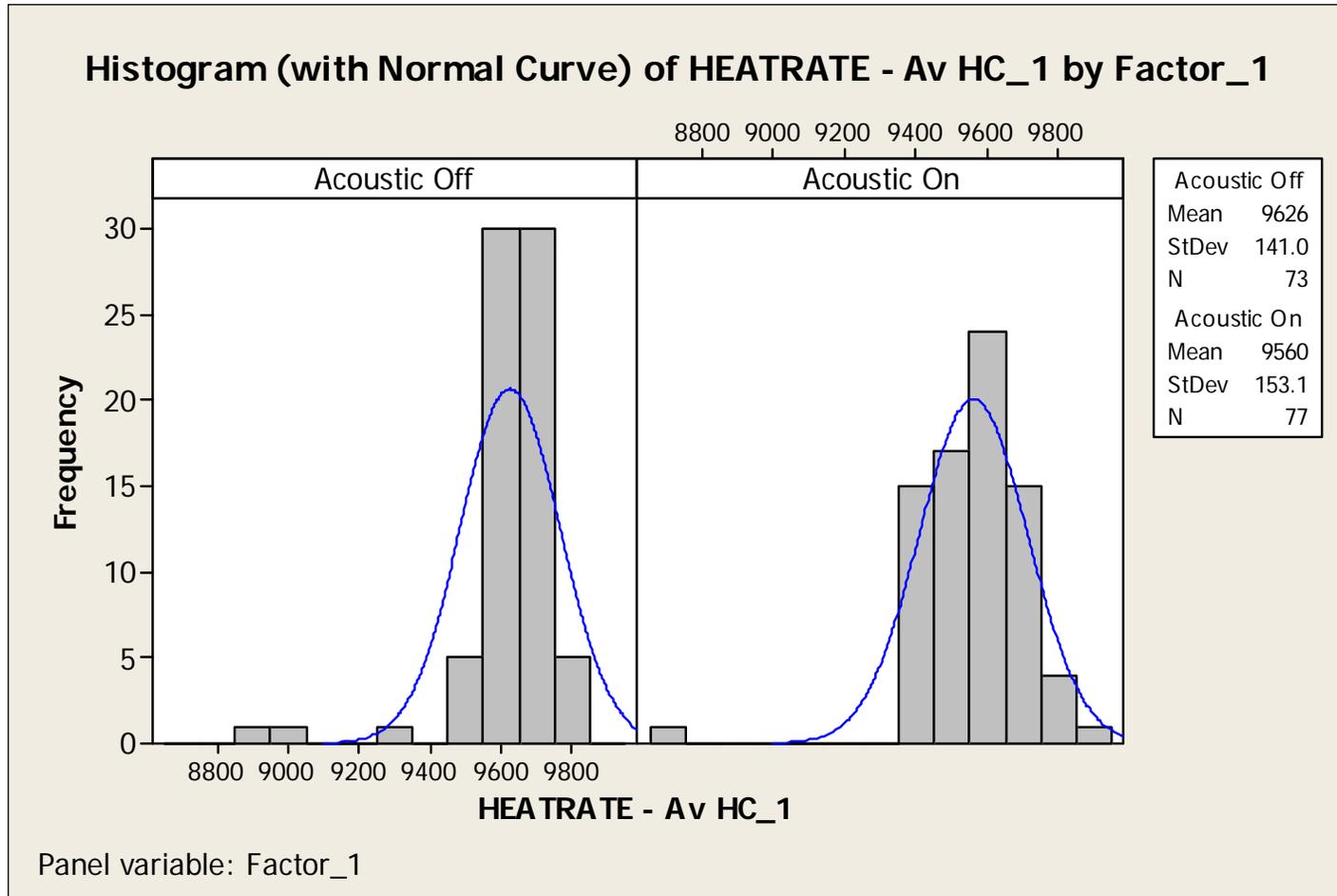
Big thanks to *Tim Kendron, Joel Looney, Fred Knoche, Greg Graham, Steve Elmore, Sabina Pryce Jones and Brad Saad for a job well done.*

Unit 1 Acoustic cleaning comparison Sept- Oct 2006

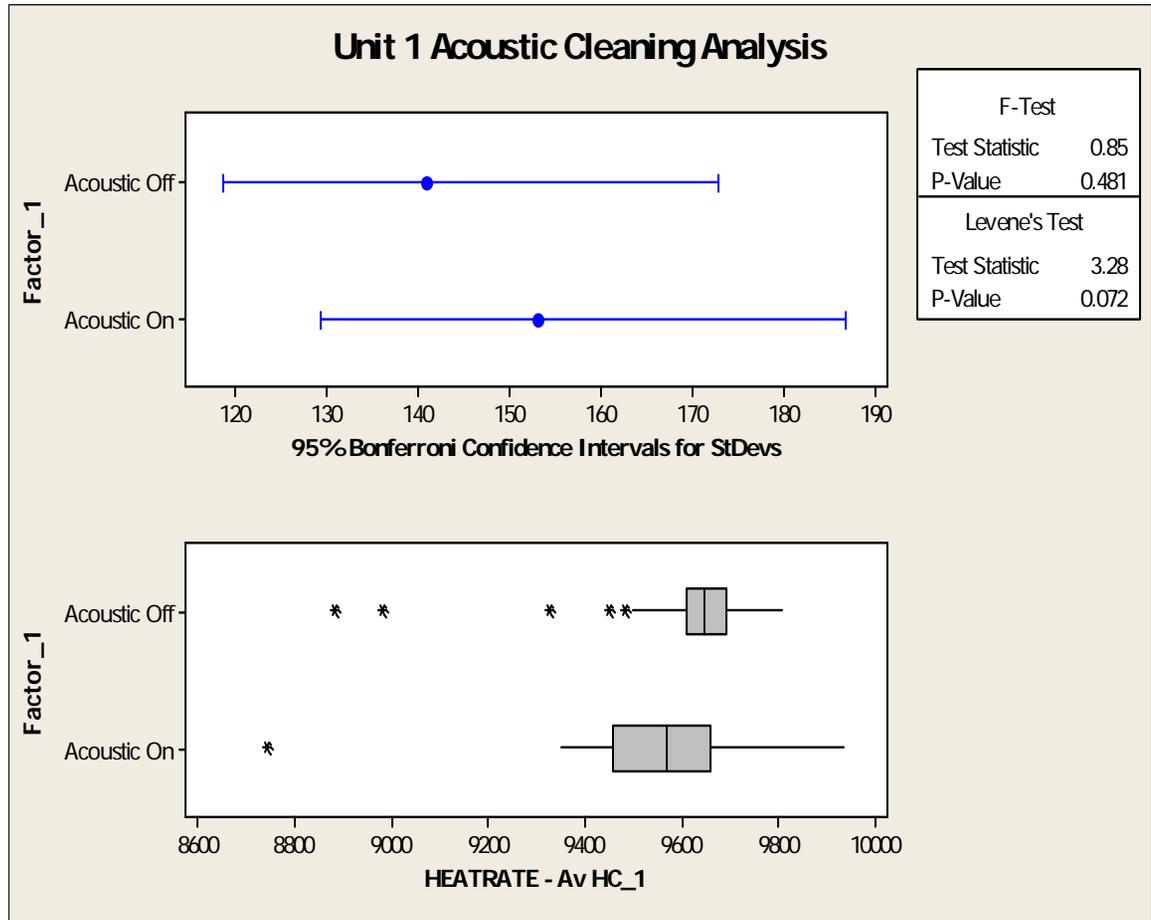
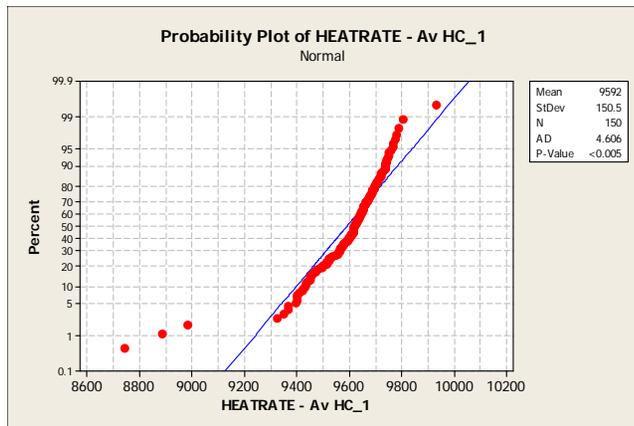


Lower heat rate with acoustic cleaner on

Unit 1 Acoustic cleaning comparison Sept- Oct 2006



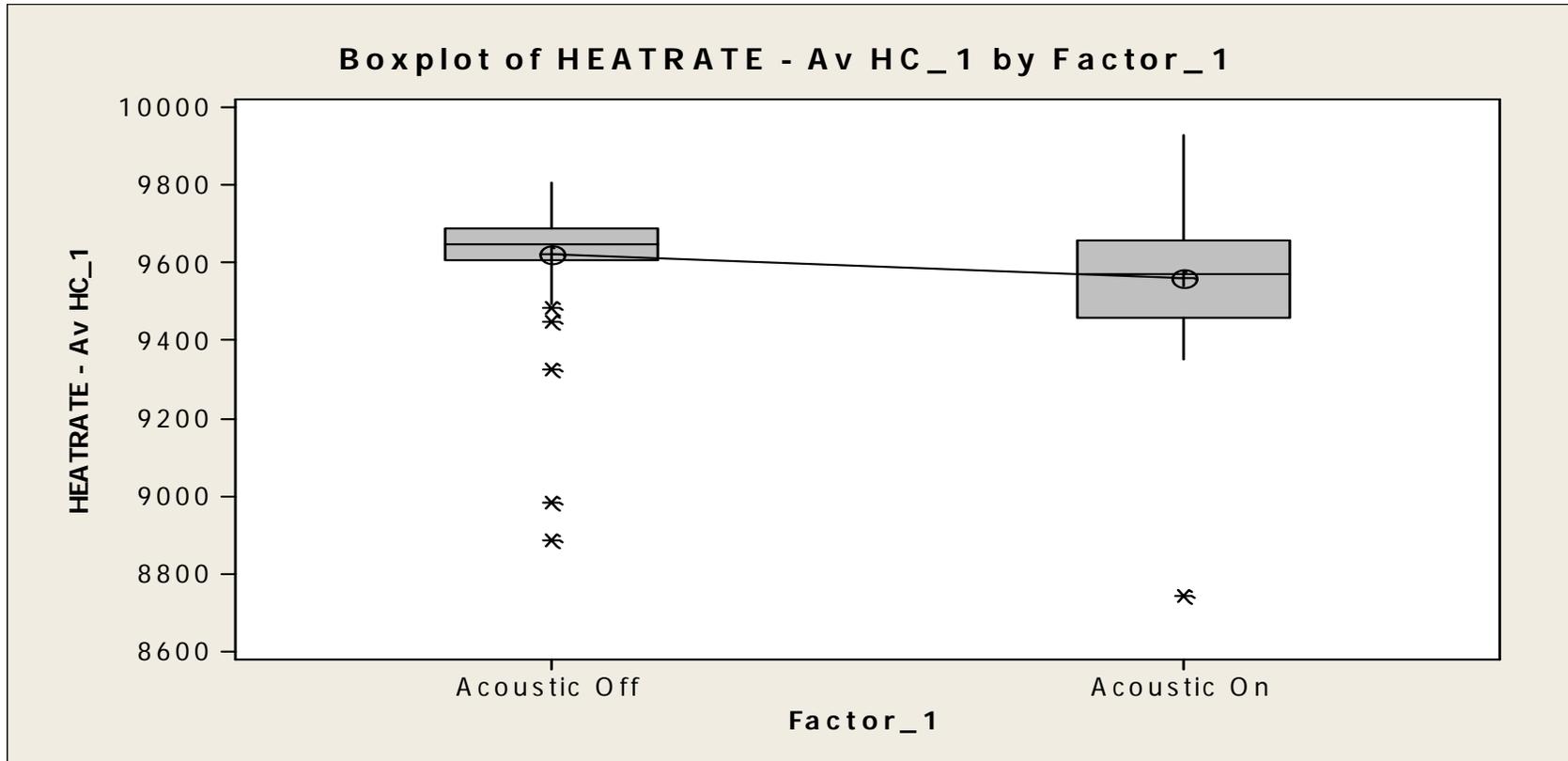
Unit 1 Acoustic cleaning comparison Sept- Oct 2006



Bartlett's test show variances are similar ie. unit was operating similarly during the acoustic cleaner "On" vs. "Off" Test.



Unit 1 Acoustic cleaning comparison Sept- Oct 2006



T-Test of difference = 0 (vs not =): T-Value = 2.73 P-Value = 0.007 DF = 147

The means are statistically not the same ie. acoustic cleaner has a lower average heat rate.

