

FITCH FUEL CATALYST
FUEL EFFICIENCY “TEST BED” REPORT

For
State of Connecticut
Office of Policy & Management

Regarding
Department of Environmental Protection’s
Burlington Trout Hatchery
Burlington, CT

By
Douglas M. Rode, P.E.

Of



ErgCubed

Empowering Energy Enlightenment

DBA of Hydrogen Safety, LLC
222 Pitkin Street, Suite 102
East Hartford, CT. 06108-3220

April 9, 2010

Purpose:

Under the auspices of the Connecticut Office of Policy and Management, a “Test Bed” program to measure the benefits of the Fitch Fuel Catalyst on #2 oil fired boiler and furnace at the Connecticut Department of Environmental Protection’s Burlington Trout Hatchery in Burlington, CT was conducted.

Location: 34 Belden Road, Burlington, CT

Background:

The Burlington Fish Hatchery uses both a boiler to provide heating to the large room that houses the fish tanks and a smaller hot air furnace for some auxiliary rooms

Boiler: Weil Mclean 408,000 BTU Hot water system

Burner: Becket

Nozzle: 1.75 gal/hr at 150 Psi

Note: Boiler is significantly downsized because its output capacity is too large for the required service duty. Original nozzle size was rated for 2.5 gal/hr

Furnace: C.A. Olsen, Model OH-85E

Burner: Becket AF

Nozzle: 0.75 gal/hr at 100 Psi

Both units use #2 heating oil. The boiler is supplied from a 1,000 gallon in ground fuel tank and the furnace has a 275 gallon above ground tank located inside the building.

Test equipment: UEI Combustion analyzer

Personnel Involved:

Facility: - Jamie Hays, Manager of the Burlington Trout Hatchery facility

Installer & Tester: Bob Carlson, Carlson heating, LLC

Fitch On-Site Support: Nora Hewitt and Mickey Wiernasz, Advanced Power Systems International, Inc.

Test Verifier: Douglas Rode, P.E. – ErgCubed (Connecticut PE License: PEN.0011021)

Record of Events

1. Both the boiler and furnace were cleaned on January 5, 2010 by Carlson Heating
2. April 7, 2010 a visual inspection was made to confirm both units were relatively clean of soot buildup.
3. Base readings for stack temperature, efficiency, and emissions are documented and shown in Table A
4. April 7, 2010 the Fitch units were installed by Carlson Heating LLC.
5. The heating systems operated for 15 minutes before retesting for the same parameters as in 3.
6. Combustion analysis indicated a necessary reduction in nozzle size to reduce fuel supply to the system.
 - o Boiler –from base of 1.75 to retrofit 1.50 gal/hr - Fitch model HO-5UL
 - o Furnace – from base of 0.75 to retrofit of 0.50 gal/hr - Fitch Model HO-5UL
7. A smoke test was done after the Fitch Catalyst was installed and the burner nozzles downsized. In both cases, there was no evidence of smoke residue.
8. Fitch Retrofit readings for stack temperature, efficiency, and emissions are shown in Table A

Comparison of Baseline and Post Installation Data.

Fuel Consumption Reduction Estimates

Based on consumption figures provided by the Hatchery for the period of 1/1/2009 through 12/31/ 2009 and the benefits provide by the Fitch would indicate a combined average fuel savings of approximately 389 gallons of oil.

Emission Reductions

There were reductions in NO_x, CO and CO₂ emissions after the Fitch Catalyst was installed. This reduction of greenhouse gases has a direct public health benefit and offers the potential for obtaining Emission Credits especially if all State building reductions are aggregated. In both cases, there was no evidence of smoke residue.

Table A

Test date	Combustion & emissions measurements	Baseline data	Final reading after adjustments	% Change	Comments/ Adjustments made
Boiler					Tried to obtain same stack temp
	Primary temp °F	64	60		
	Stack temp °F	422	393.3	-6.9%	
	Net stack temp °F	358	333.3		
	O2 %	5.1	6.0		
	Excess air %	32.2	39.3		
	CO2 %	11.7	10.4	-11%	
	CO PPM	33	30	-9%	
	NOX PPM	93	86	-7.5%	
	Efficiency %	84.6	84.8	0%	
Furnace					Slight increase in room temp over time Same comment as above Increased to get same eff
	Primary temp °F	55.6	58.5		
	Stack temp °F	571.7	469.3	-18%	
	Net stack temp °F	515.5	410.8		
	O2 %	8.5	11.4		
	Excess air %	68.5	120		
	CO2 %	9.2	7.1	-23%	
	CO PPM	27	18	-33%	
	NOX PPM	110	68	-38%	
	Efficiency %	77.1	77.1	0%	

Appendix A

Test Data Printouts

Boiler

Baseline

C155 1.0
YOUR COMPANY NAME &
PHONE NUMBER HERE

DATE 04/03/10
TIME 00:51:25

FUEL L OIL

COMBUSTION

O2 %	5.1
CO2 %	11.7
CO ppm	422.2
NO ppm	4.0
FLUE %F	358.0
INLT %F	
NETT %F	

EFF (G) 84.6
LOSSES 15.4
XAIR % 32.2

CO/CO2 0.0002
CO AIR FREE 39

PRS mbar 0.01

FUE L OIL

O2 %	4.4
CO2 %	12.3
CO ppm	330.0
NO ppm	3.3
FLUE %F	330.0
INLT %F	330.0
NETT %F	330.0

EFF (G) -----
LOSSES 100.1
XAIR % 23.7

CO/CO2 0.0002
CO AIR FREE 40

PRS hPa 0.04

with nozzle down sized

C155 1.0
YOUR COMPANY NAME &
PHONE NUMBER HERE

DATE 04/03/10
TIME 01:34:14

DIFF TEMP

T1	%F	330.5
T2	%F	65.0
ΔT	%F	324.1

Customer

Appliance

Ret.

C155 1.0
YOUR COMPANY NAME &
PHONE NUMBER HERE

DATE 04/03/10
TIME 01:37:23

FUEL L OIL

COMBUSTION

CO ppm	30
NO ppm	30
FLUE %F	330.0
INLT %F	330.0
NETT %F	330.0

EFF (G) 84.6
LOSSES 15.4
XAIR % 32.2

CO/CO2 0.0002
CO AIR FREE 41

PRS hPa 0.03

Furnace

Baseline - Furnace

C127 1.3

DATE 01/31/10
TIME 20:47:47

COMBUSTION

FUEL L OIL

O2 %	8.5
CO2 %	9.2
CO ppm	27
NO ppm	110
FLUE %F	571.7
INLT %F	55.6
NETT %F	516.1

EFF (G) 77.1
LOSSES 22.9
XAIR % 68.5

CO/CO2 0.0002
CO AIR FREE 45

PRS hPa 0.03

Note: date not properly set

DATE 01/31/10
TIME 21:41:19

w/Downsized nozzle

COMBUSTION

FUEL L OIL

O2 %	11.4
CO2 %	7.1
CO ppm	18
NO ppm	68
FLUE %F	469.3
INLT %F	58.5
NETT %F	410.8

EFF (G) 77.1
LOSSES 22.9
XAIR % 120.0

CO/CO2 0.0002
CO AIR FREE 39

PRS hPa 0.04

Appendix B

<u>Fuel Deliveries</u>				
<u>Date</u>	<u>1500g Gas</u>	<u>500g Diesel</u>	<u>Boiler</u>	<u>Furnace</u>
			<u>1000g Heating Oil</u>	<u>275g Heating Oil</u>
1/21/09	702.4	335.0	500.1	202.5
2/24	976	—	—	—
3/13	—	326.1	—	—
3/16	—	—	400	144.7
3/18	900.9	—	—	—
3/31	—	298.5	—	—
4/9	—	285.2	—	—
4/10	707.1	—	—	—
4/28	—	402.5	—	—
5/2	—	385	—	—
5/13	1004.5	—	—	—
5/29	1101.8	—	—	—
6/2	—	388.9	—	—
6/26	1101.9	—	—	—
8/5	1251.2	—	—	—
8/27	700	343.2	—	—
9/14	1001.8	—	—	—
10/7	899.9	—	—	—
11/3	—	286	—	—
11/23	925.6	—	—	—
12/7	—	—	630.8	162.2
12/28	1100.2	—	—	—
1/29	1003.3	—	—	—
2/3/10	—	—	424.6	243.2
3/1/10	800.8	—	—	—
3/2/10	—	480.4	—	—
3/18/10	681.2	325.3	—	—



Burlington Fish Hatchery
James Hays – State of CT Facility Manager
34 Belden Road
Burlington, CT 06013
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860.673.2340

LUX AIR (.75 gph) furnace
105,000 BTU (Hot Air System)
Carlin - Beckett Burner
Fitch Model: HO-5UL
Service Company: Carlson Heating
Fitch Installation date: 4/7/10
UEI Combustion Analyzer used for baseline & retrofit data

Facility has 2 Oil Tanks:

- #1 - 1,000 gallon in ground tank
 - #2 - 275 gallon inside tank (services the Carlin – Beckett Hot Air System)
- Diesel Gen Set
2009 Consumption:
#1 - 1,530 gallons
#2 - 509.4 gallons





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Oil Heat Systems

#1 - Weil McLain (1.75 gph) Boiler
 408,000 BTU (Hot Water System)
 Beckett Burner
 Fitch Model: HO-5UL
 Service Company: Carlson Heating
 Fitch Installation date: 4/7/10

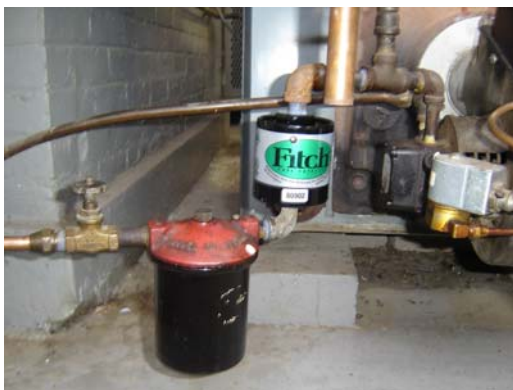


Using UEI Combustion Analyzer – Collect Baseline Data

Facility has 2 Oil Tanks:

#1 - 1,000 gallon in ground tank
 #2 - 275 gallon inside tank
 Diesel Gen Set
 2009 Consumption:
 #1 - 1,530 gallons
 #2 - 509.4 gallons

FITCH INSTALLATION



Clean – no soot



Clean – no soot

