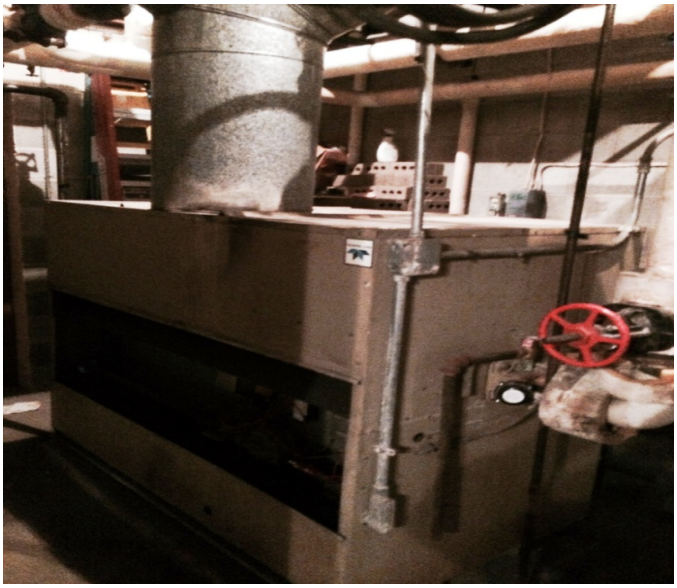
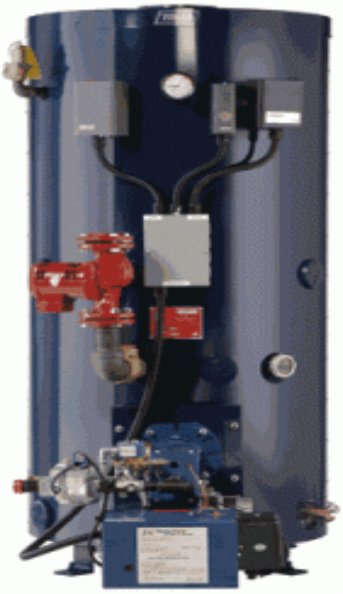
Boiler Replacement Energy Operating Cost Study

Building:					
Address:					
City:		State:	PA	Zip:	15234

Existing Boiler



New Triad Boiler



Contractor:

Study Performed by Fire & Ice Heating & Cooling

834 Kerry Hill Drive
Pittsburgh, PA 15234
Tel 1-866-226-8600

Building Information

Building		Date	10/9/19

Boiler Plant Information

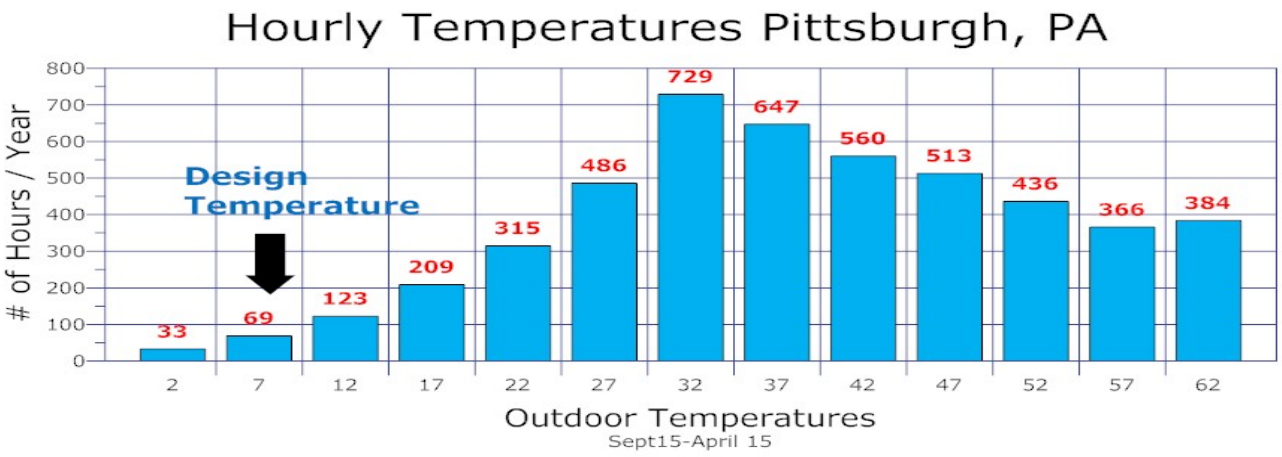
	Existing	New
Boiler Mfgr	Teledyne Laars	Triad
Model	HL-1266-C-N-06-B	GPS 600 SH
Input Hour High Fire	1,266,000	600,000
Input /Minute High Fire	21,100	10,000
Boiler Efficiency High Fire	79.00%	85.00%
Output Hr High Fire	1,000,140	510,000
Output/ Min High Fire	16,669	8,500
Input / Hr Low Fire		198,000
Input/ Min Low Fire		3,300
Output Hr Low Fire		168,300
Output/ Min Low Fire		2,805
Boiler Efficiency Low Fire		85.00%
Boiler HP Each	30	15
Total Boiler HP	30	30
Cu Ft Gas Hour	1,206	571
Cu Feet Gas Min	20	10
Combustion Air Hr	24,114	7,429
CFM Combustion Air	402	124
Combustion Air per cu ft gas	20	13
Prepurge Minutes		1
Boiler Quan	1	2
Total Btu Capacity	1,266,000	1,200,000
Jacket Loss Percentage	3.00%	1.00%
Jacket Loss Min/Boiler *	633	100
Boiler Type	Copper	Steel

*Jacket loss is for both existing boilers

Building Information

Building Square Footage	40,000
Btu/Square Foot	20
Heat Loss @ Design Temperature	800,000
Heat Loss Minute	13,333
Cost per MCF Natural Gas	$5.11
System Water Capacity Gallons	598
Heating Plant Difference	66,000
Heating Plant Reduction %	5.21%
Boiler Room Temperature	60

Anticipated Energy Reduction	**14.19%**
Anticipated Emissions Reduction	**14%**



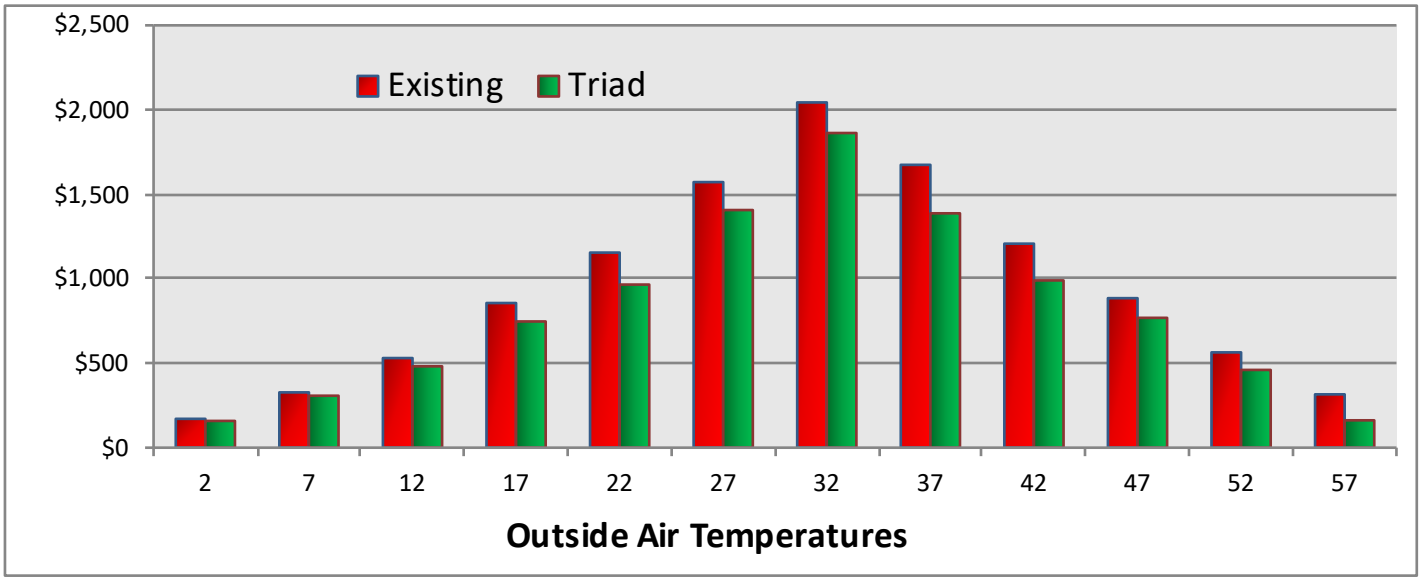
Energy Savings Comparison

Fuel Consumption in $

OA Temp	Existing Fuel Cost	Triad Fuel Cost	Savings
2	$171	$158	$12
7	$327	$308	$20
12	$530	$482	$49
17	$856	$747	$109
22	$1,155	$965	$189
27	$1,572	$1,407	$165
32	$2,044	$1,863	$181
37	$1,674	$1,387	$287
42	$1,208	$990	$217
47	$885	$769	$116
52	$564	$460	$104
57	$316	$162	$154
TOTALS	$11,302	$9,698	$1,604

Fuel Consumption in Btu's

Saving %	OA Temp	Existing Fuel Cost	Triad Fuel Cost
7.25%	2	33,422,400	31,000,200
6.03%	7	64,059,600	60,195,600
9.19%	12	103,812,000	94,267,200
12.75%	17	167,576,200	146,216,400
16.39%	22	225,981,000	188,937,000
10.52%	27	307,638,000	275,270,400
8.86%	32	399,929,400	364,500,000
17.14%	37	327,640,800	271,481,200
18.01%	42	236,320,000	193,760,000
13.15%	47	173,188,800	150,411,600
18.40%	52	110,395,200	90,077,600
48.70%	57	61,780,800	31,695,600
14.19%	TOTALS	2,211,744,200	1,897,812,800



Environmental Impact Statement

	Existing Boilers	New Boilers	Reduction Amount	Pollution Reduction %
PM	15,482,209	13,284,690	2,197,520	14%
Nox	203,480,466	174,598,778	28,881,689	14%
SO2	2,211,744	1,897,813	313,931	14%
VOC*	5,418,773,290	4,649,641,360	769,131,930	14%
CO2	258,774,071,400	222,044,097,600	36,729,973,800	14%
CO	88,469,768	75,912,512	12,557,256	14%

Estimated consumption

Existing Boilers	New Boilers
2,211,744,200	1,897,812,800

Average Emission Reduction

14%

Pounds/ million Btu

Fuel	PM	Nox	SO2	VOC *	CO	CO2
Natural Gas	0.007	0.092	0.001	2.45	0.04	117.00
#2 Fuel Oil	0.084	0.448	1.122	1.81	0.033	164.00

Source: Natural Gas.org

VOC is measure in Grams per million Btu's Source EPA-AP-42 Emissions Factors

PM = Particulate Matter
Nox = Nitrogen Oxides
SO2 = Sulfur Dioxide
VOC = Volatile Organic Compound
CO= Carbon Monoxide
CO2= Carbon Dioxide

Building Water Temperature Requirements

OA Temp	HW Supply	Hrs Yr	Heat Loss		Multiplier	Building Heat Loss Minute
2	180	33	800,000		61,538	13,333
7	175	69	738,462			12,308
12	170	123	676,923			11,282
17	165	209	615,385			10,256
22	160	315	553,846			9,231
27	155	486	492,308			8,205
32	150	729	430,769			7,179
37	145	647	369,231			6,154
42	140	560	307,692			5,128
47	135	513	246,154			4,103
52	130	436	184,615			3,077
57	125	366	123,077			2,051
62	120	384	61,538			1,026

Study based upon replacing two Teledyne Laars boilers with two Triad model 700 boilers.

Assumptions

Jacket loss is continuous for existing boiler as it is not isolated. Triad jacket loss is only when the boiler is firing.
Cu Ft Gas Hr = 1050 Btu's per cubic feet
Cu Feet Air for burner based upon 13 cu feet air per cu foot of gas or 30% excess air Stochiometric is 10 parts air per 1 part gas
System water capacity is 20 times Existing boiler HP
Simulation based upon 30 minutes Estimated savings based upon doubling results to obtain hourly costs and savings
Boilers start when loop temperature drops 5 degrees F
Bin temperatures based upon Pittsburgh, PA and NOAA Weather Data
Natural gas cost for study is $3.74 per MCF Actual gas cost

HEATING FIRE & ICE COOLING

834 Kerry Hill Drive Pittsburgh, PA 15234
Tel 1-866-226-8600