BOOST℠
PREPARED FOR: HEALTH CARE FACILITY

Prevented Cost of

$871,269

over Ten Years

CLEAVER-BROOKS INTEGRATED ENERGY SOLUTIONS

Over a decade ago we made a commitment to develop a group of energy saving products that could easily be retrofitted on existing boilers. We had a vision of making steam boilers — the foundation of the Industrial Revolution — a driving factor in the green revolution. Along the way, we helped create the most efficient boiler in the world (The Super Boiler), as well as paired these energy saving products with our new boilers.

Because we are the only fully integrated boiler solution provider in the industry — meaning we manufacture our own boilers, burners, combustion controls, and boiler room accessories — we are in a unique position to offer solutions that address boiler energy usage holistically as well as serve as a single point of contact. All of our energy saving products have been designed and tested together in our Research & Design facility, so you can be assured the products will integrate seamlessly with one another.

For more information visit www.cleaver-brooks.com.

BOOST PLAN

Let us show you how to save **$87,127** in energy cost every year. This plan outlines the best energy solution for your boiler retrofit.

Ultimately deciding to implement this plan is a business decision and must make smart financial sense. To that end, we have prepared a comprehensive life cycle financial analysis.

We also understand that improving energy consumption is important to you because reducing your green gas emissions and carbon footprint is essential to be competitive in today's marketplace. If your company is not demanding this improvement, your customer probably is. Implementing this plan will make a huge environmental impact.

The assumptions about your boiler room presented in the plan may need to be further refined, but think of this plan as a living document. As we verify assumptions and develop the details of the plan, the new assumptions and details can be integrated and the plan further improved.

In the end, this document will serve as a guide to making an informed decision about your boiler room energy management.

D.J CONLEY

D.J. Conley Associates is an authorized Cleaver-Brooks representative offering integrated hot water and steam solutions with the highest efficiency and lowest emissions. With an extensive line of Boilers, Burners, Controls and Accessories, we offer solutions for every industry--new or retrofit. We are your single source for full life cycle support including installation, aftermarket sales and service.

To further discuss this BOOST plan, or any other boiler needs, please contact:

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CleaverBrooks

D.J. CONLEY
COMMERCIAL & INDUSTRIAL HEATING, SALES, SERVICE, PARTS

BOOST KEY METRICS

ENERGY

9.3%

Reduction in Overall Energy Expense

COST PREVENTION

$87,127

Savings Each Year

GREENHOUSE GASSES

498

Metric Tons Reduction of CO2 per year and **9%** Reduction in NOx

BOOST
PREPARED FOR: HEALTH CARE FACILITY

OVERVIEW

This BOOST plan proposes the implementation of Cleaver-Brooks Energy Saving Solutions to your existing boiler room which will reduce overall energy consumption and lower greenhouse gas emissions.

Executing the plan will prevent energy cost of **$87,127** each year and reduce your boiler room's carbon footprint by **9.3%** . The total cost to implement the plan is **$103,584.18.**

PROPOSED ENERGY SAVING SOLUTIONS						
BOILER ROOM BREAKDOWN	Condensing Economizer	Stack Economizer	Advanced Linkageless Controls	High Turndown Burner	Blow Down Heat Recovery	Replace Boiler
1996 CB 600 BHP		X	X		X	

IMPLEMENTATION COST, SAVINGS AND PAYBACK			
BOILER ROOM BREAKDOWN	IMPLEMENTATION COST	ANNUAL SAVINGS	PAYBACK
1996 CB 600 BHP	$92,622.18	$69,216	24.0 Months
Blow Down Heat Recovery (BDHR)	$10,962.00	$17,911	12.0 Months
Total	$103,584.18	$87,127	21.0 Months

PROJECT LEVEL FINANCIAL RETURNS AND ASSUMPTIONS

While simple payback as presented above is a good indication of a project's merits, more detailed financial analysis is warranted. Detailed cash flow analysis is presented herein for the entire project and for each individual boiler. A snapshot of the key project level returns and assumptions is presented to the right:

PROJECT LEVEL FINANCIAL RETURNS AND ASSUMPTIONS						
IMPLEMENTATION COST	ANNUAL SAVINGS	PAYBACK	IRR	NET PRESENT VALUE (NPV)	DISCOUNT RATE	TAX RATE
$103,584.18	$87,127	21.0 Months	54.9%	$239,142	10.0%	40.0%

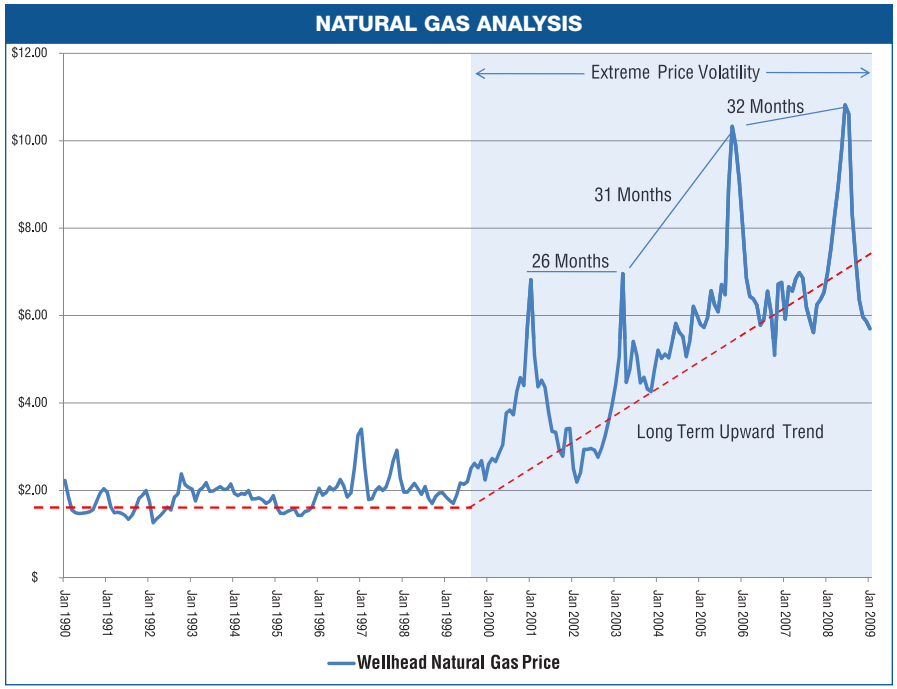
BOILER ROOM ASSUMPTIONS

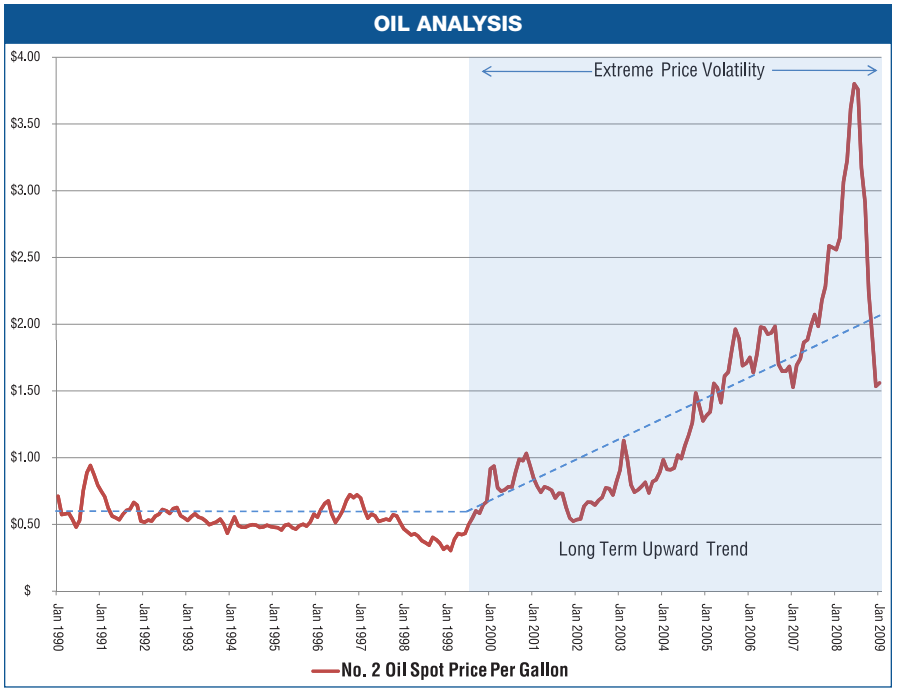
TOTAL BOILERS IN BOILER ROOM

BOILER 1
1996 CB 600 BHP

BOILER ROOM ASSUMPTIONS		
BOILER ASSUMPTIONS	**BOILER 1**	
Operating Pressure	100 PSI	
Primary Fuel Price Per Therm	Natural Gas $0.92	
Backup Fuel Price Per Gallon	#2 Oil $0.75	
Current NOx Level	100 ppm / 100 ppm	
WATER ASSUMPTIONS		
Feedwater Temperature	220 F	
Makeup Water Temperature	60 F	
Makeup Percentage	10%	
CURRENT ENERGY SAVING PRODUCTS		
Condensing Economizer	None	
Standard Economizer	None	
Advanced Linkageless Controls	None	
High-Turndown Burner	In Use	
Blow Down Heat Recovery	None	
QUARTERLY LOAD ASSUMPTIONS		
Quarter 1: Hours Per Day Days Per Week Average Load Fuel	24 7 50% Natural Gas	
Quarter 2: Hours Per Day Days Per Week Average Load Fuel	24 7 50% Natural Gas	
Quarter 3: Hours Per Day Days Per Week Average Load Fuel	24 7 50% Natural Gas	
Quarter 4: Hours Per Day Days Per Week Average Load Fuel	24 7 50% Natural Gas	

FUEL VOLATILITY & LONG-TERM UPWARD TREND





10-Year Cost of Doing Nothing

$871,269

COST OF DOING NOTHING

Fuel prices have leveled from their peaks over the past year, but we are still plagued with extreme price volatility in fuel commodities. We are averaging around 2.5 years between periods of peak price; this is just enough time for us to forget how painful extreme fuel prices can be.

A long-term upward trend in prices has emerged over the past decade. This long-term trend is almost certain to continue, even if prices are leveling in the short-term. Can you afford the cost of doing nothing and take on the extra risk associated with price volatility?

The good news is that this suggested BOOST plan makes smart financial sense today!

BOOST SUMMARY
FINANCIAL ANALYSIS AND ASSUMPTIONS

PROJECT SUMMARY

TOTAL ANNUAL SAVINGS: $87,127

TOTAL IMPLEMENTATION COST: $103,584

PAYBACK: 21.0 Months
NPV: $239,142
IRR: 54.9%

Tax Rate: 40.0%
Internal Discount Rate: 10.0%

PROJECT SUMMARY CASH FLOW												
YEAR	0	1	2	3	4	5	6	7	8	9	10	11
Total Implementation Cost	($103,584)											
Annual Incremental Pre-Tax Savings		$87,127	$87,127	$87,127	$87,127	$87,127	$87,127	$87,127	$87,127	$87,127	$87,127	$87,127
Less Depreciation from Boiler 1		($9,262)	($16,672)	($13,338)	($10,670)	($8,540)	($6,826)	($6,067)	($6,067)	($6,076)	($6,067)	($3,038)
Less Depreciation from BHR		($1,096)	($1,973)	($1,579)	($1,263)	($1,011)	($808)	($718)	($718)	($719)	($718)	($360)
Before Tax Savings		$76,769	$68,482	$72,211	$75,194	$77,576	$79,493	$80,342	$80,342	$80,332	$80,342	$83,729
Less Tax		($30,707)	($27,393)	($28,884)	($30,078)	($31,031)	($31,797)	($32,137)	($32,137)	($32,133)	($32,137)	($33,492)
After Tax Savings		$46,061	$41,089	$43,326	$45,116	$46,546	$47,696	$48,205	$48,205	$48,199	$48,205	$50,238
Add Back Depreciations		$10,358	$18,645	$14,916	$11,933	$9,550	$7,634	$6,785	$6,785	$6,795	$6,785	$3,398
Net After Tax Cash Flow	($103,584)	$56,420	$59,734	$58,243	$57,049	$56,096	$55,330	$54,990	$54,990	$54,994	$54,990	$53,635
Cumulative Net After Tax Cash Flow		$56,420	$116,154	$174,396	$231,446	$287,542	$342,872	$397,862	$452,852	$507,846	$562,836	$616,471

SENSITIVITY ANALYSIS

The graphics on the previous page identified the long-term upward trend in energy commodity prices which has emerged over the past decade. They also highlighted the market's extreme volatility. When evaluating any Energy Improvement Plan, we should evaluate the financial returns' sensitivity to fuel price changes, not just returns associated with current prices. Such a sensitivity analysis is presented in the table to the right:

SENSITIVITY ANALYSIS				
	(-15%) DECLINE	CURRENT PRICES	15% INCREASE	30% INCREASE
Annual Savings	$814,637	$958,396	$1,102,156	$1,245,915
Payback	24.7 Months	21.0 Months	18.9 Months	16.9 Months
IRR	47.0%	54.9%	62.7%	70.4%
NPV	$192,841	$239,142	$285,442	$331,742

FINANCIAL ANALYSIS AND ASSUMPTIONS
BOILER 1 : 1996 CB 600 BHP

BOILER 1 SUMMARY

TOTAL ANNUAL SAVINGS:$69,216

TOTAL IMPLEMENTATION COST: $92,622

PAYBACK: 24 Months
NPV: $183,044
IRR: 49%

Tax Rate: 40%
Internal Discount Rate: 10%

BOILER 1 CASH FLOW

YEAR		1	2	3	4	5	6	7	8	9	10	11
Total Implementation Cost	($92,622)											
Annual Incremental Pre-Tax Savings		$69,216	$69,216	$69,216	$69,216	$69,216	$69,216	$69,216	$69,216	$69,216	$69,216	$69,216
Less Depreciation: Standard Economizer		($4,023)	($7,241)	($5,793)	($4,634)	($3,709)	($2,965)	($2,635)	($2,635)	($2,639)	($2,635)	($1,319)
Less Depreciation: Hawk ICS Controls		($5,240)	($9,431)	($7,545)	($6,036)	($4,831)	($3,862)	($3,432)	($3,432)	($3,437)	($3,432)	($1,719)
Before Tax Savings		$59,953	$52,544	$55,878	$58,545	$60,676	$62,389	$63,149	$63,149	$63,140	$63,149	$66,178
Less Tax		($23,981)	($21,017)	($22,351)	($23,418)	($24,270)	($24,956)	($25,260)	($25,260)	($25,256)	($25,260)	($26,471)
After Tax Savings		$35,972	$31,526	$33,527	$35,127	$36,405	$37,434	$37,889	$37,889	$37,884	$37,889	$39,707
Add Back Depreciations		$9,262	$16,672	$13,338	$10,670	$8,540	$6,826	$6,067	$6,067	$6,076	$6,067	$3,038
Net After Tax Cash Flow	($92,622)	$45,234	$48,198	$46,864	$45,797	$44,945	$44,260	$43,956	$43,956	$43,960	$43,956	$42,745
Cumulative Net After Tax Cash Flow		$45,234	$93,432	$140,297	$186,094	$231,039	$275,299	$319,255	$363,211	$407,171	$451,127	$493,871

BOILER 1 ASSUMPTIONS

BOILER ASSUMPTIONS				WATER ASSUMPTIONS		
Operating Pressure	Primary Fuel (Price Per Therm)	Backup Fuel (Price Per Gallon)	Current NOx Level	Feedwater Temperature	Makeup Water Temperature	Makeup Percentage
100 PSI	Natural Gas $0.92	#2 Oil $0.75	100 ppm / 100 ppm	220 F	60 F	10%

QUARTERLY LOAD ASSUMPTIONS (Total Operating Hours Per Year: 8764)

QUARTER 1				QUARTER 2			
Hrs. Per Day	Days Per Week	Ave. Load	Fuel	Hrs. Per Day	Days Per Week	Ave. Load	Fuel
24	7	50%	Natural Gas	24	7	50%	Natural Gas
QUARTER 3				**QUARTER 4**			
Hrs. Per Day	Days Per Week	Ave. Load	Fuel	Hrs. Per Day	Days Per Week	Ave. Load	Fuel
24	7	50%	Natural Gas	24	7	50%	Natural Gas

PROPOSED ENERGY SOLUTIONS

SOLUTION	PRODUCT COST	INSTALLATION	REBATES	TOTAL COST	ANNUAL SAVINGS
Standard Economizer	$20,227	$20,000		$40,227	$12,402
Advanced Hawk ICS Controls	$27,395	$25,000		$52,395	$56,814
TOTAL	$47,622	$45,000		$92,622.18	$69,216

ENERGY SAVING SOLUTIONS IN-PLACE

High Turndown Burner Conversion

CleaverBrooks

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COMMERCIAL & INDUSTRIAL HEATING, SALES, SERVICE, PARTS

FINANCIAL ANALYSIS
SOLUTIONS IMPLEMENTED ON BOILER 1

STANDARD ECONOMIZER

TOTAL ANNUAL SAVINGS: $12,402

PAYBACK: 51.0 Months
NPV: $16,935
IRR: 19.7%

Product Cost: $20,227
Installation: $20,000
Rebates: $0
TOTAL COST: $40,227

Depreciation Period: 10 Years
Tax Rate: 40.0%
Internal Discount Rate: 10.0%

STANDARD ECONOMIZER CASHFLOW												
YEAR		1	2	3	4	5	6	7	8	9	10	11
Product Cost and Installation	($40,227)											
Annual Incremental Pre-Tax Savings		$12,402	$12,402	$12,402	$12,402	$12,402	$12,402	$12,402	$12,402	$12,402	$12,402	$12,402
Less Depreciation		($4,023)	($7,241)	($5,793)	($4,634)	($3,709)	($2,965)	($2,635)	($2,635)	($2,639)	($2,635)	($1,319)
Before Tax Savings		$8,379	$5,161	$6,609	$7,768	$8,693	$9,437	$9,767	$9,767	$9,763	$9,767	$11,082
Less Tax		($3,352)	($2,064)	($2,644)	($3,107)	($3,477)	($3,775)	($3,907)	($3,907)	($3,905)	($3,907)	($4,433)
After Tax Savings		$5,027	$3,096	$3,965	$4,661	$5,216	$5,662	$5,860	$5,860	$5,858	$5,860	$6,649
Add Back Depreciations		$4,023	$7,241	$5,793	$4,634	$3,709	$2,965	$2,635	$2,635	$2,639	$2,635	$1,319
Net After Tax Cash Flow	($40,227)	$9,050	$10,337	$9,758	$9,295	$8,925	$8,627	$8,495	$8,495	$8,497	$8,495	$7,969
Cumulative Net After Tax Cash Flow		$9,050	$19,387	$29,146	$38,440	$47,365	$55,992	$64,487	$72,982	$81,478	$89,973	$97,942

ADVANCED ICS CONTROL SYSTEM

TOTAL ANNUAL SAVINGS: $56,814

PAYBACK: 17.0 Months
NPV: $166,109
IRR: 69.8%

Product Cost: $27,395
Installation: $25,000
Rebates: $0
TOTAL COST: $52,395

Depreciation Period: 10 Years
Tax Rate: 40.0%
Internal Discount Rate: 10.0%

ADVANCED ICS CONTROL SYSTEM CASHFLOW												
YEAR		1	2	3	4	5	6	7	8	9	10	11
Total Product Cost and Installation	($52,395)											
Annual Incremental Pre-Tax Savings		$56,814	$56,814	$56,814	$56,814	$56,814	$56,814	$56,814	$56,814	$56,814	$56,814	$56,814
Less Depreciation		($5,240)	($9,431)	($7,545)	($6,036)	($4,831)	($3,862)	($3,432)	($3,432)	($3,437)	($3,432)	($1,719)
Before Tax Savings		$51,574	$47,383	$49,269	$50,778	$51,983	$52,952	$53,382	$53,382	$53,377	$53,382	$55,095
Less Tax		($20,630)	($18,953)	($19,708)	($20,311)	($20,793)	($21,181)	($21,353)	($21,353)	($21,351)	($21,353)	($22,038)
After Tax Savings		$30,945	$28,430	$29,561	$30,467	$31,190	$31,771	$32,029	$32,029	$32,026	$32,029	$33,057
Add Back Depreciations		$5,240	$9,431	$7,545	$6,036	$4,831	$3,862	$3,432	$3,432	$3,437	$3,432	$1,719
Net After Tax Cash Flow	($52,395)	$36,184	$37,861	$37,106	$36,503	$36,021	$35,633	$35,461	$35,461	$35,463	$35,461	$34,776
Cumulative Net After Tax Cash Flow		$36,184	$74,045	$111,151	$147,654	$183,674	$219,307	$254,768	$290,229	$325,693	$361,154	$395,929

FINANCIAL ANALYSIS
BLOW DOWN HEAT RECOVERY

BLOW DOWN HEAT RECOVERY

TOTAL ANNUAL SAVINGS: $17,911

PAYBACK: 12.0 Months
NPV: $56,098
IRR: 103.0%

Product Cost: $7,830
Installation: $3,132
Rebates: $0
TOTAL COST: $10,962

Depreciation Period: 10
Tax Rate: 40.0%
Internal Discount Rate: 10.0%

BLOW DOWN HEAT RECOVERY CASH FLOW												
YEAR	0	1	2	3	4	5	6	7	8	9	10	11
Product Cost and Installation	($10,962)											
Annual Incremental Pre-Tax Savings		$17,911	$17,911	$17,911	$17,911	$17,911	$17,911	$17,911	$17,911	$17,911	$17,911	$17,911
Less Depreciation		($1,096)	($1,973)	($1,579)	($1,263)	($1,011)	($808)	($718)	($718)	($719)	($718)	($360)
Before Tax Savings		$16,815	$15,938	$16,333	$16,649	$16,901	$17,103	$17,193	$17,193	$17,192	$17,193	$17,552
Less Tax		($6,726)	($6,375)	($6,533)	($6,659)	($6,760)	($6,841)	($6,877)	($6,877)	($6,877)	($6,877)	($7,021)
After Tax Savings		$10,089	$9,563	$9,800	$9,989	$10,140	$10,262	$10,316	$10,316	$10,315	$10,316	$10,531
Add Back Depreciations		$1,096	$1,973	$1,579	$1,263	$1,011	$808	$718	$718	$719	$718	$360
Net After Tax Cash Flow	($10,962)	$11,185	$11,536	$11,378	$11,252	$11,151	$11,070	$11,034	$11,034	$11,034	$11,034	$10,891
Cumulative Net After Tax Cash Flow		$11,185	$22,721	$34,100	$45,352	$56,503	$67,573	$78,607	$89,641	$100,675	$111,709	$122,600

BLOW DOWN HEAT RECOVERY FINANCIAL EVALUATION

BLOW DOWN ASSUMPTIONS

Boiler 1: 7% Blow Down

Boiler blow down is a recommended process to remove harmful scale and sludge. During the blow down cycle a boiler can use a blow down separator to recapture heat energy to preheat boiler feed water. A Blow Down Heat Recovery unit can recover 90% of the energy normally lost. The blow down heat recovered is transferred to the make-up water, thereby decreasing fuel usage and cost.

Blow Down Heat Recovery units service multiple boilers in the same boiler room, therefore only one Blow Down system is required per boiler room. **Because of this, the financial returns are evaluated on a system basis and include savings associated with all the boilers serviced by the Blow Down Heat Recovery unit.**

ENVIRONMENTAL METRICS

9%

Reduction in Carbon Footprint

498

Metric Tons CO_2 Reduced

9%

Reduction in NOx

YOUR YEARLY GREENHOUSE GAS REDUCTIONS ARE EQUIVALENT TO:

90 cars not being driven for one year.

70 homes not using electricity for one year.

12754 tree seedlings grown for 10 years.

5 acres of forest preserved from deforestation.

169 tons of waste being recycled.

BOOST
BEFORE AND AFTER

BOILER ROOM IMPROVEMENT PLAN: BEFORE AND AFTER

	CURRENT OPERATING SUMMARY	AFTER IMPROVEMENT PLAN	SAVINGS	CHANGE
Total Energy Cost	$940,501	$853,375	$87,127	9.3%
Total Units of Fuel Natural Gas Oil	 1,022,284 Therms -	 927,581 Therms -	 94,703 Therms -	 9.3% -
Thermal Efficiency	83%	86.2%	3.1%	3.8%

BOILER #1: BEFORE AND AFTER

	CURRENT OPERATING SUMMARY	AFTER IMPROVEMENT PLAN	SAVINGS	CHANGE
Total Energy Cost	$940,501	$871,286	$69,216	7.4%
Total Units of Fuel Natural Gas Oil	 1,022,284 Therms -	 947,050 Therms -	 75,234 Therms -	 7.4% -
Thermal Efficiency	83%	86.2%	3.1%	3.8%

BLOW DOWN HEAT RECOVERY SYSTEM

	SAVINGS AFTER IMPLEMENTATION
Total Energy Cost	$17,911
Total Units of Fuel Natural Gas Oil	 19,469 Therms -

COMMITTED TO PROVIDING

HOT WATER AND STEAM BOILER SOLUTIONS WITH THE

HIGHEST EFFICIENCY & LOWEST EMISSIONS

CleaverBrooks

D.J. CONLEY
COMMERCIAL & INDUSTRIAL HEATING, SALES, SERVICE, PARTS

PROPOSED ENERGY SAVING SOLUTIONS

TWO-STAGE CONDENSING ECONOMIZER

An economizer is a heat exchanger that is used to transfer energy from an air stream into a liquid stream. The Two-Stage Condensing economizer combines the functions of both a standard non-condensing economizer and a condensing economizer. They transfer both sensible heat as well as latent heat. The first (lower) section of the economizer recovers energy by preheating the boiler feed water. The second (upper) section uses the heat exhausting from the first stage to preheat a cool liquid stream such as make-up water. Using the energy from capturing both the sensible and latent heat increases the boiler's thermal efficiency and reduces your overall energy expense.

STANDARD ECONOMIZER

An economizer is a heat exchanger that is used to transfer energy from an air stream into a liquid stream. Standard economizers transfer energy from the boiler exhaust gas to the boiler feed-water in the form of "sensible heat." Sensible heat is the transfer of the heat energy of one body (in this case exhaust gas) to another, cooler body (the boiler feed-water). A Standard Economizer reduces the boiler exhaust temperature while preheating the boiler feed-water, increasing overall efficiency and saving money.

HIGH-TURNDOWN (HTD) BURNER CONVERSION OR REPLACEMENT

Increasing the burner's turndown rate will increase efficiency, reduce maintenance, and save fuel cost because it decreases the number of on and off cycles for the burner. Each of these cycles creates a pre-purge and post-purge. During these cycles and following purges, large volumes of air pass through the boiler, resulting in heat being blown out the stack. This causes the boiler to waste energy and money. A high-turndown burner will minimize the number of cycles by matching the boiler's firing rate with the required loan, saving significant amounts

For Cleaver-Brooks boilers with Integral burners, High Turndown Burners were standard after 1991, but a **Conversion** kit is available to convert older integral burners to High Turndown.

For Gun Style Burners, a complete burner **Replacement** is necessary to achieve HTD.

BLOW DOWN HEAT RECOVERY

Boiler blow down is a recommended process to remove harmful scale and sludge. During the blow down cycle a boiler can use a blow down separator to recapture heat energy to preheat boiler feedwater. A Blow Down Heat Recovery unit can recover 90% of the energy normally lost. The blow down heat recovered is transferred to the make-up water, thereby decreasing fuel usage and cost.

BOILER REPLACEMENT

Depending on the age and condition of an existing boiler, it may have outlived its useful life. A new boiler replacement with the most advanced Boiler Solution from Cleaver-Brooks will considerably lower fuel expenses and reduce greenhouse emissions. Using technology developed during the Super Boiler project we have developed solutions which can offer up to 90% efficiency and NOx levels below <9ppm. We will help you determine the proper new boiler solution based on your application and needs.

PROPOSED ENERGY SAVING SOLUTIONS						
BOILER ROOM BREAKDOWN	Two Stage Condensing Economizer	Standard Economizer	HTD Burner Replacement	HTD Burner Conversion	Blow Down Heat Recovery	New Boiler Replacement
1996 CB 600 BHP		X			X	

PROPOSED ENERGY SAVING SOLUTIONS

HAWK ICS ADVANCED BOILER CONTROL SYSTEM WITH PARALLEL POSITIONING.

The Cleaver-Brooks HAWK ICS is a revolutionary Boiler Management and Control System specifically designed to integrate the functions of a Programmable Boiler Controller and Burner Management Controller, as well as other boiler operating and ancillary controls. The linkageless **Parallel Positioning** controls combustion air, fuel(s), and flue gas recirculation with individual electronic actuators using control values. This type of control provides accuracy and flexibility which cannot be achieved with a standard single-point jack shaft system. The Programmable Controller (PLC) is a modular design providing flexibility for expansion with easily serviceable components. Other control options that can be seamlessly added are O2 Trim, VSD, and Lead Lag to complete the control scheme.

The Hawk ICS system incorporates a user-friendly graphical Touch Screen display which clearly indicates boiler operating parameters, fault and alarm history, as well as provides access to boiler set up and control functions. The Hawk ICS communicates, controls and monitors the boiler's functions through a variety of different communications protocols such as ModBus™ BackNet™, Lon Works™ and Ethernet I/P; allowing easy integration into almost any Building Energy Management System.

In addition to new boilers, the Hawk ICS can be integrated into existing boilers as a retrofit. Whether using an Energy Management System or just the Hawk Control System, this integrated communication system provides added efficiency, safety and accountability with a single solution.

STANDARD LINKAGESLESS CONTROLS WITH PARALLEL POSITIONING

The Standard Linkageless Controls with **Parallel Positioning** controls combustion air, fuel(s), and flue gas recirculation with individual electronic actuators using control values. This type of control provides greater accuracy and flexibility when compared with a single-point jack shaft system. This greater flexibility creates greater efficiency and saves money. Other control options can be added, such as O2 trim, VSD, and Lead Lag to complete the control scheme.

O2 TRIM

The O2 Trim system continuously senses oxygen content and provides a signal to the control system, which in turn trims the oxygen, maintaining a consistent oxygen concentration in the burner. This minimizes excess air while optimizing the air-to-fuel ratio. By keeping the air at optimal levels, your burner and boiler fires more efficiently and fuel waste is prevented.

VARIABLE SPEED DRIVE (VSD)

Variable Speed Drive provides variable speed output to the burner's combustion air fan blower motor for the purpose of improving boiler efficiency and reducing electrical energy consumption.

LEAD LAG

Lead lag sequences the operation of two or more boilers, matching system load to steam demand. The lead boiler operates at full capacity before relying on the lag boiler for additional capacity. Lead lag decreases boiler cycling which maximizes efficiency and reduces maintenance and downtime.

PROPOSED CONTROL SOLUTIONS						
BOILER ROOM BREAKDOWN	Advanced Hawk ICS	Standard Linkageless Controls	Parallel Positioning	Oxygen (O2) Trim	Variable Speed Drive (VSD)	Lead Lag
1996 CB 600 BHP	X		X	X		

NEXT STEPS

We hope we have demonstrated why implementing the proper BOOST plan is smart financial decision. Like we said before, the details of the plan may still need to be ironed out, so we would like to propose some next steps to help guide us through the process:

- ☐ **Verify Key Assumptions in the Plan**
- ☐ **Meet with Key Constituents**
- ☐ **Conduct Boiler Room Evaluation**
- ☐ **Update Plan with New Findings and Review**
- ☐ **Formalize Proposal; Update Plan and Review**
- ☐ **Finalize Order**
- ☐ **Implement the Solution**
- ☐ **Realize Savings and Higher Profits**

NOTES:

GLOSSARY

BLOWDOWN
The periodic or continuous removal of water from a boiler to remove concentrations of dissolved solids and/or sludge accumulating in the boiler.

BOILER
A vessel or tank in which heat produced from the combustion of fuels such as natural gas, fuel oil, wood, or coal is used to generate hot water or steam for applications ranging from building space heating to electric power production or industrial process heat.

BOILER HORSEPOWER
A unit of rate of water evaporation equal to the evaporation per hour of 34.5 pounds of water at a temperature of 212°F into steam at 212°F. One boiler horsepower equals 33,475 Btu per hour.

BHP
Abbreviation for Boiler Horsepower; see Boiler Horsepower.

CO_2
Abreviation for Carbon Dioxid; a colorless, odorless, incombustible gas, CO2, formed during combustion. Considered a greenhouse gas and monitored as a cause for global warming.

DEPRECIATION PERIOD
Also referred to as the Depreciation Schedule; the rate at which an asset is depreciated. This analysis assumes accelerated depreciation and uses 3, 5, 7, 10, or 20 year schedules as provided by the Internal Revenue Service (IRS).

DEPRECIATION
A noncash accounting expense that reduces the book value of an asset as a result of wear and tear, age, or obsolescence.

DISCOUNT RATE
Also known as Cost of Capital, is the opportunity cost of an investment; that is, the rate of return that a company would otherwise be able to earn at the same risk level as the investment that has been selected. Sometimes referred to as the company's "hurtle" rate.

FEEDWATER
Water sent into a boiler or a steam generator. Feedwater typically meets cleanliness criteria, contains treatment chemicals, and has been stripped of oxygen. Feedwater is typically stored in a collecting tank to ensure that a steady supply of heated water is available to the boiler.

GREENHOUSE GAS EMISSIONS
Those gases, such as water vapor, carbon dioxide, tropospheric ozone, methane, and low level ozone that are transparent to solar radiation, but opaque to long wave radiation, and which are believed to contribute to climate change.

INTERNAL DISCOUNT RATE
See Discount Rate.

IRR
Abbreviation for Internal Rate of Return; the Discount Rate for which the total present value of future cash flows equals the cost of the investment. It is the interest rate, or discount rate, that produces a 0 NPV. Generally, if the IRR is more than the Discount Rate, the investment should be made.

LEAD
The boiler load represents the total maximum capacity of a boiler, expressed in boiler horsepower, lbs of steam per hour, or BTU's. A load denoted as a percentage (%) represents the variable load, or the percentage of the maximum load the boiler is operating for a given period.

MAKE-UP WATER
Water brought into a boiler system from outside to replace condensate not returned to the boiler plant, water used in blowdown, steam lost through leaks, or water lost through evaporation or mist.

MMBtu
A unit of one million British thermal units (Btu).

GLOSSARY

NO_x
Abbreviation for Nitrogen Oxide, which is any of several oxides of nitrogen most of which are produced in combustion and are considered to be atmospheric pollutants.

NPV
Abbreviation for Net Present Value,; the present value of an investment's future net cash flows minus the initial investment. If greater than zero (positive), the investment should be made, otherwise it should not.

OPERATING PRESSURE
The system pressure required to operate a given process.

PAYBACK
The amount of time required for positive cash flows to equal the total investment costs. This is often used to describe how long it will take for energy savings resulting from using more energy-efficient equipment to equal the premium paid to purchase the more energy-efficient equipment.

THERM
A unit for quantity of heat that equals 100,000 British thermal units.

THERMAL EFFICIENCY
Also known as Fuel-to-steam efficiency; a measure of the overall efficiency of the boiler. It accounts for the effectiveness of the heat exchanger as well as the radiation and convection losses.

FOOTNOTES

Legal Disclaimer:
Cleaver-Brooks, Inc is committed to providing customers with the best value products and services in the field. The BOOST plan presents planning information which may include estimates of implementation costs, fuel savings, other efficiencies, and investment rates of return. This information is offered without obligation on the part of Cleaver-Brooks, Inc. and its Representatives. This information is provided by Cleaver-Brooks, Inc. solely as a convenience to its customers and sales representatives, without warranty of any kind, either express or implied, including, but not limited to, the implied warranties of merchantability, fitness for a particular purpose, or non-infringement. Cleaver-Brooks, Inc. and its Representatives assume no responsibility for errors or omissions in this information which may include technical or other inaccuracies, and not all products or services referenced herein are available in all areas. Cleaver-Brooks may change the products or services described in this information at any time. Contact your local Cleaver-Brooks Sales Representative for further information.

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