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The following pages will outline a case study, which shows the benefits in energy and cost savings of properly installed mechanical insulation.

Insulation is a proven means for conserving energy, reducing greenhouse gas emissions, increasing process productivity, providing a safer and more productive work environment, controlling condensation (which can lead to mold growth), supporting sustainable design technology and a host of other benefits.

Mechanical insulation does all of this, while providing a return on investment (ROI) rate, which is seldom rivaled. Despite the proven ROI, insulation is often overlooked and its benefits undervalued. Insulation is truly the lost or forgotten technology. Can you think of a more important time than now to think about how insulation can help you?

An insulation system is a technology, which needs to be engineered and maintained throughout the entire process. Several studies have estimated roughly 10 to 30 percent of all installed insulation is now missing or damaged.

The practice of not replacing or maintaining an insulation system in a timely and correct manner reduces the full benefits of insulation, and in return, decreases the ROI. In many cases, significant other issues - such as excessive energy loss, corrosion under insulation (CUI), mold development, increased cost of operations and reduced process productivity or efficiency - develop.

You can learn more on www.MechanicalInsulatorsLMCT.com, where additional case studies can be viewed.

Please do not hesitate to contact me should you have any additional questions.
Thank you,

Peter Ielimi

Executive Director
Mechanical Insulators Labor Management Cooperative Trust



INSULATION ENERGY APPRAISAL FINAL REPORT

For
Av Nackawic Inc

103 Pinder Rd, Nackawic, NB E6G 1W4



Date of Presentation
April 5th, 2019

Presented By:
Joshua Sherrard
Heat & Frost Training Centre
1041 Bayside Drive
Saint John, NB
E2J 4Y2

Executive Summary

The insulation energy appraisal evaluated the performance of three areas of your facility. Around paper machines, Digester Area and Steam Plant were all reviewed. Based On the analysis findings the appraiser calculated a) the cost of operating line with existing insulation(or lack of insulation); b) the cost to operate with 1 ½ inch thick mineral wool vs 2 inch thick mineral wool vs 2 ½ thick mineral wool and in some situation even thicker insulation based on 3E plus economical thickness rating. He also calculated emission saving if each facility was properly insulated. These calculations are summarized below.

Energy Cost

Heat loss at facility listed at 14,390,131.2 Btu per day

An estimated 5 year saving of \$510,218.85, and a simple payback return on investment in 1.6 years

Energy/Emissions Savings

Co₂ reduction at facility of 514.92 Mt per year

Insulation and Energy Efficiency

Insulation systems improved the energy efficiency of a plant and reduce the level of emissions of greenhouse gases into the atmosphere. Systems that have an upgraded insulation system can achieve an even more dramatic increase in savings. A properly selected, installed and maintained insulation system can, in many cases, provide an excellent return on investment and quick payback through cost savings. When compared to other conservation measures, the payback is often very quick- usually less then six months. The savings are significant in terms of reduced energy use, increased efficiency, and reduced greenhouse gas emissions. It can also reflect reduced maintenance cost of equipment that is being forced to work harder because of improper insulation.

Conclusion

The appraiser assessment of the facilities mechanical insulation system is sub-standard condition, and the findings show a relatively positive savings can occur at your facility. Our analysis shows that though each area of the facility is believed to be insulated with proper thicknesses. There are some areas that due to facility maintenance, have not been reinsulated or not insulated effectively. If insulated to meet insulation standards there would be significant reduction in energy loss and greater reduction to the levels of greenhouse gas emissions.

Results

Simple Payback Period, yrs	2.6
Internal Rate of Return (IRR or ROI)	38.4%
Net Present Value,	\$1,775,184

Calculations

Year	Investment	Annual Savings	Annual Cash Flow	Cumulative Cash Flow
0	\$-265,676	\$0	\$-265,676	\$-265,676
1	\$0	\$102,043	\$102,043	\$-163,633
2	\$0	\$102,043	\$102,043	\$-61,590
3	\$0	\$102,043	\$102,043	\$40,453
4	\$0	\$102,043	\$102,043	\$142,496
5	\$0	\$102,043	\$102,043	\$244,539
6	\$0	\$102,043	\$102,043	\$346,582
7	\$0	\$102,043	\$102,043	\$448,625
8	\$0	\$102,043	\$102,043	\$550,668
9	\$0	\$102,043	\$102,043	\$652,711
10	\$0	\$102,043	\$102,043	\$754,754
11	\$0	\$102,043	\$102,043	\$856,797
12	\$0	\$102,043	\$102,043	\$958,840
13	\$0	\$102,043	\$102,043	\$1,060,883
14	\$0	\$102,043	\$102,043	\$1,162,926
15	\$0	\$102,043	\$102,043	\$1,264,969
16	\$0	\$102,043	\$102,043	\$1,367,012
17	\$0	\$102,043	\$102,043	\$1,469,055
18	\$0	\$102,043	\$102,043	\$1,571,098
19	\$0	\$102,043	\$102,043	\$1,673,141
20	\$0	\$102,043	\$102,043	\$1,775,184

ENERGY AUDIT AV NACKAWIC

Total 5 year Energy
savings of

\$ 510,218.85

CO₂ Reduction of
514.92 MT/Year



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AV GROUP

Benefits:

- Simple payback period
- CO₂ Reduction
- Personnel safety

Audit Done By:

Joshua Sherrard

Certified Thermographer

Certified 3E Plus Auditor

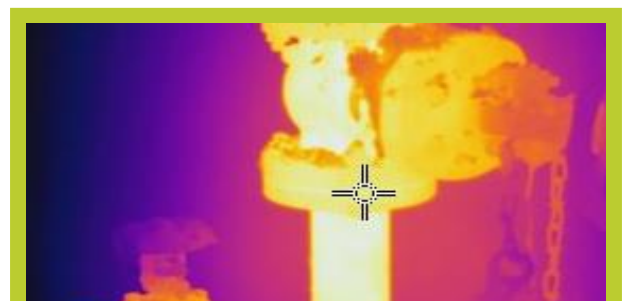
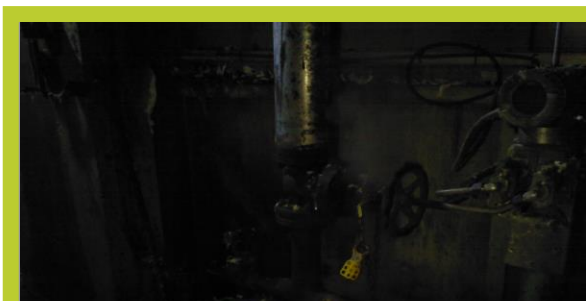
Condensate Tanks



Operating Temperature, *F	167	Emittance of Surface	0.95
Ambient Temperature, *F	82	Expected Useful Life of Insulation System	20 yrs.
Insulation selected	Mineral Wool	Operating hours per year	8760
		Selected fuel	Crude Oil
		Cost of Fuel,\$/KWH	\$ 2.00

Thickness (inches)	Surface Temp (°F)	Heat Loss (Btu/h)	Cost of Fuel (\$/yr)	1 st year Savings	5 Year Savings	20 Year Savings	CO2 Emissions (MT/yr)
0	166.9	30388	\$5,118.30	\$ 5,118.30	\$ 25,591.50	\$ 102,366.00	26.04
1.5	101.5	2155	\$363.00	\$ 4,755.30	\$ 23,776.50	\$ 95,106.00	1.85
2	98.1	1696	\$285.60	\$ 4,832.70	\$ 24,163.50	\$ 96,654.00	1.45

Condensate Tank Piping



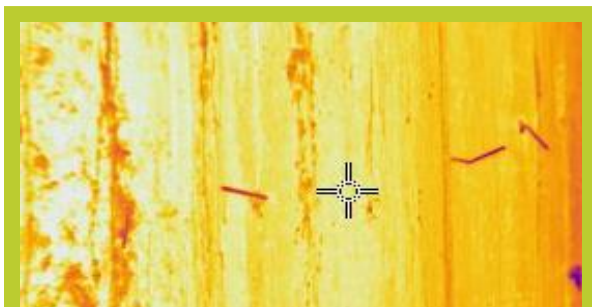


Operating Temperature, *F	149	Emittance of Surface	0.95
Ambient Temperature, *F	82	Expected Useful Life of Insulation System	20 yrs.
Insulation selected	Mineral Wool	Operating hours per year	8760
		Selected fuel	Crude Oil
		Cost of Fuel,\$/KWH	\$2.00

Thickness (inches)	Surface Temp (°F)	Heat Loss (Btu/h)	Cost of Fuel (\$/yr)	1 st year Savings	5 Year Savings	20 Year Savings	CO2 Emissions (MT/yr)
0	149	6460	\$ 1,088.12	\$ 1,088.12	\$ 5,440.6	\$ 21,762.40	5.53
1.5	91	562	\$ 94.60	\$ 993.52	\$ 4,967.60	\$ 19,870.40	.54
2	89	457	\$ 76.94	\$ 1,011.18	\$ 5,055.90	\$ 20,223.60	.42

2nd Floor Steam Plant

Cyclone Evaporators

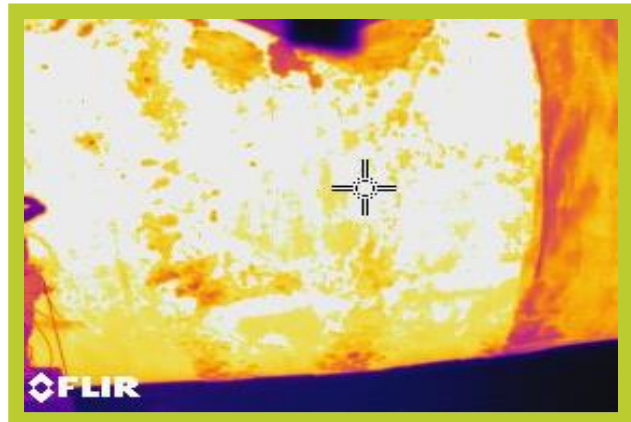
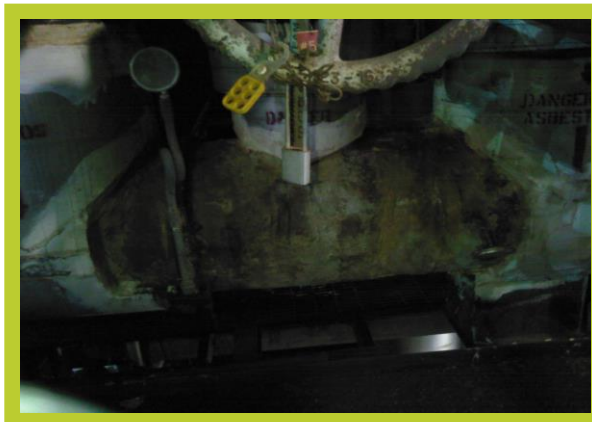


Operating Temperature, *F	192	Emittance of Surface	0.95
Ambient Temperature, *F	82	Expected Useful Life of Insulation System	20 yrs.
Insulation selected	Mineral Wool	Operating hours per year	8760
		Selected fuel	Crude Oil
		Cost of Fuel,\$/KWH	\$ 2.00

Thickness (inches)	Surface Temp (°F)	Heat Loss (Btu/h)	Cost of Fuel (\$/yr)	1 st year Savings	5 Year Savings	20 Year Savings	CO2 Emissions (MT/yr)
0	192	167294	\$ 28,177.89	\$ 28,177.89	\$ 140,889.45	\$ 563,557.80	143.34
2	100	9202	\$ 1,549.92	\$ 26,627.97	\$ 133,139.85	\$ 532,559.40	7.88
4	93	4937	\$ 831.62	\$ 27,346.27	\$ 136,731.35	\$ 546,925.40	4.23

2nd Floor Steam Plant

60 Pound Steam Header



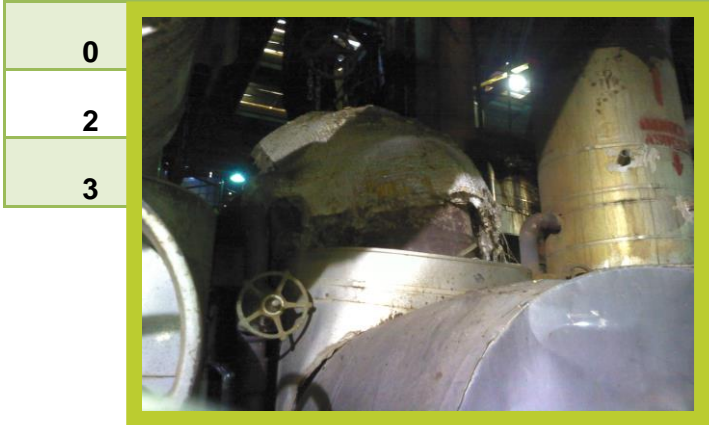
Operating Temperature, *F	160	Emittance of Surface	0.95
Ambient Temperature, *F	82	Expected Useful Life of Insulation System	20 yrs.
Insulation selected	Mineral Wool	Operating hours per year	8760
		Selected fuel	Crude Oil
		Cost of Fuel,\$/KWH	\$ 2.00

Thickness (inches)	Surface Temp (°F)	Heat Loss (Btu/h)	Cost of Fuel (\$/yr)	1 st year Savings	5 Year Savings	20 Year Savings	CO2 Emissions (MT/yr)
0	160	3889	\$ 654.90	\$ 654.90	\$ 3,274.5	\$ 13,098	3.3
1.5	98	319	\$ 53.75	\$ 601.15	\$ 3,005.75	\$ 12,023	.25
2	95	254	\$ 42.7	\$ 612.20	\$ 3,061	\$ 12,244	.2

2nd Floor Steam Plant

140 Pound Steam

Thickness (inches)	Surface Temp (°F)	Heat Loss (Btu/h)	Cost of Fuel (\$/yr)	1 st year Savings	5 Year Savings	20 Year Savings	CO2 Emissions (MT/yr)
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4
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Operating Temperature, *F	190	Emittance of Surface	0.95
Ambient Temperature, *F	82	Expected Useful Life of Insulation System	20 yrs.
Insulation selected	Mineral Wool	Operating hours per year	8760
		Selected fuel	Crude Oil
		Cost of Fuel,\$/KWH	\$ 2.00

2nd Floor Steam Plant

900 Pound Steam (16 inch)

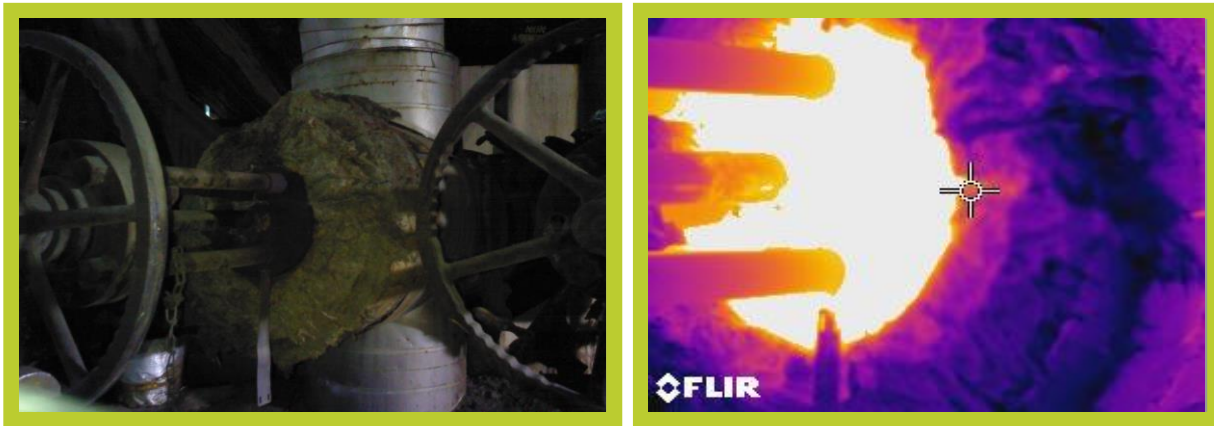


Operating Temperature, *F	250	Emittance of Surface	0.95
Ambient Temperature, *F	82	Expected Useful Life of Insulation System	20 yrs.
Insulation selected	Mineral Wool	Operating hours per year	8760
		Selected fuel	Crude Oil
		Cost of Fuel,\$/KWH	\$ 2.00

Thickness (inches)	Surface Temp (°F)	Heat Loss (Btu/h)	Cost of Fuel (\$/yr)	1 st year Savings	5 Year Savings	20 Year Savings	CO2 Emissions (MT/yr)
0	250	47,168.00	\$ 9,044.16	\$ 9,044.16	\$ 45,220.80	\$ 180,883.20	45.44
2	108	2,913.60	\$ 551.36	\$ 8492.80	\$ 42,464.00	\$ 169,856.00	2.88
3	100	2,123.20	\$ 399.68	\$ 8644.48	\$ 43,222.40	\$ 172,889.60	1.92

2nd Floor Steam Plant

900 Pound Steam (10 inch)

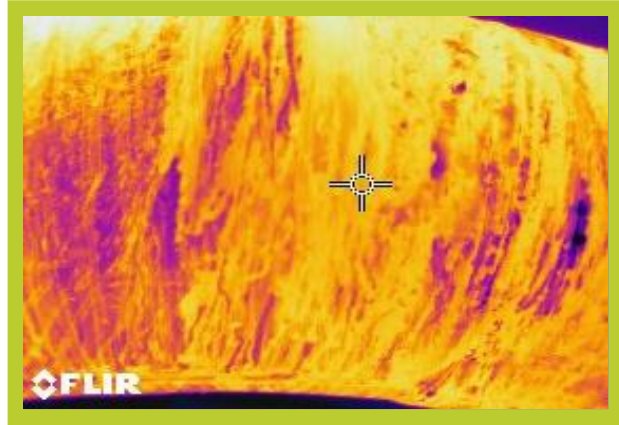


Operating Temperature, *F	192	Emittance of Surface	0.95
Ambient Temperature, *F	82	Expected Useful Life of Insulation System	20 yrs.
Insulation selected	Mineral Wool	Operating hours per year	8760
		Selected fuel	Crude Oil
		Cost of Fuel,\$/KWH	\$ 2.00

Thickness (inches)	Surface Temp (°F)	Heat Loss (Btu/h)	Cost of Fuel (\$/yr)	1 st year Savings	5 Year Savings	20 Year Savings	CO2 Emissions (MT/yr)
0	250	10,278	1730.97	\$ 1,730.97	\$ 8,654.85	\$ 3,4619.40	8.73
2	105	623	104.94	\$ 1,626.03	\$ 8,130.15	\$ 32,520.60	.54
3	99	465	78.66	\$ 1,652.31	\$ 8,261.55	\$ 33,046.20	.36

Digester Area

Elevation 350 (10 inch Loop)

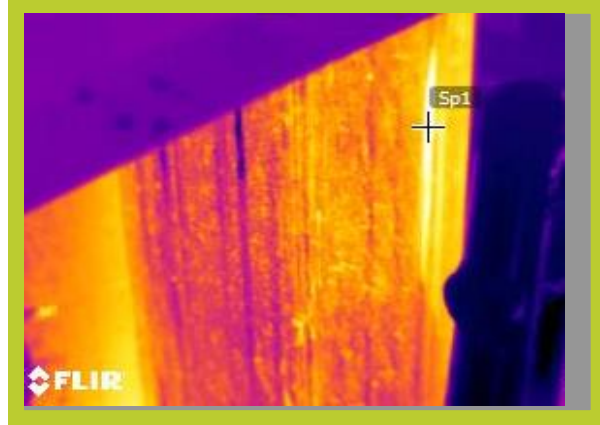


Operating Temperature, *F	169	Emittance of Surface	0.95
Ambient Temperature, *F	82	Expected Useful Life of Insulation System	20 yrs.
Insulation selected	Mineral Wool	Operating hours per year	8760
		Selected fuel	Crude Oil
		Cost of Fuel,\$/KWH	\$ 2.00

Thickness (inches)	Surface Temp (°F)	Heat Loss (Btu/h)	Cost of Fuel (\$/yr)	1 st year Savings	5 Year Savings	20 Year Savings	CO2 Emissions (MT/yr)
0	169	24,430	\$ 4,114.5	\$ 4,114.5	\$ 20,572.50	\$ 82,290.00	20.5
2	94.6	1,597	\$ 269	\$ 3,845.50	\$ 19,227.50	\$ 76,910.00	1.5
2.5	92.5	1,366	\$ 230	\$ 3884.5	\$ 19,422.50	\$ 77,690.00	1

Digester Area

Elevation 350 (10 inch down-commers)



Operating Temperature, *F	160	Emittance of Surface	0.95
Ambient Temperature, *F	82	Expected Useful Life of Insulation System	20 yrs.
Insulation selected	Mineral Wool	Operating hours per year	8760
		Selected fuel	Crude Oil
		Cost of Fuel,\$/KWH	\$ 2.00

Thickness (inches)	Surface Temp (°F)	Heat Loss (Btu/h)	Cost of Fuel (\$/yr)	1 st year Savings	5 Year Savings	20 Year Savings	CO2 Emissions (MT/yr)
0	160	234,528	\$ 39,499.20	\$ 39,499.20	\$ 197,496.00	\$ 789,984.00	196.8
2	95	15,326	\$ 2582.4	\$ 36,916.80	\$ 184,584.00	\$ 738,336.00	14.4
2.5	93	13,109	\$ 2,208	\$ 37,291.20	\$ 186,456.00	\$ 745,824.00	9.6

Digester Area

Elevation 350 (16 inch Flange)

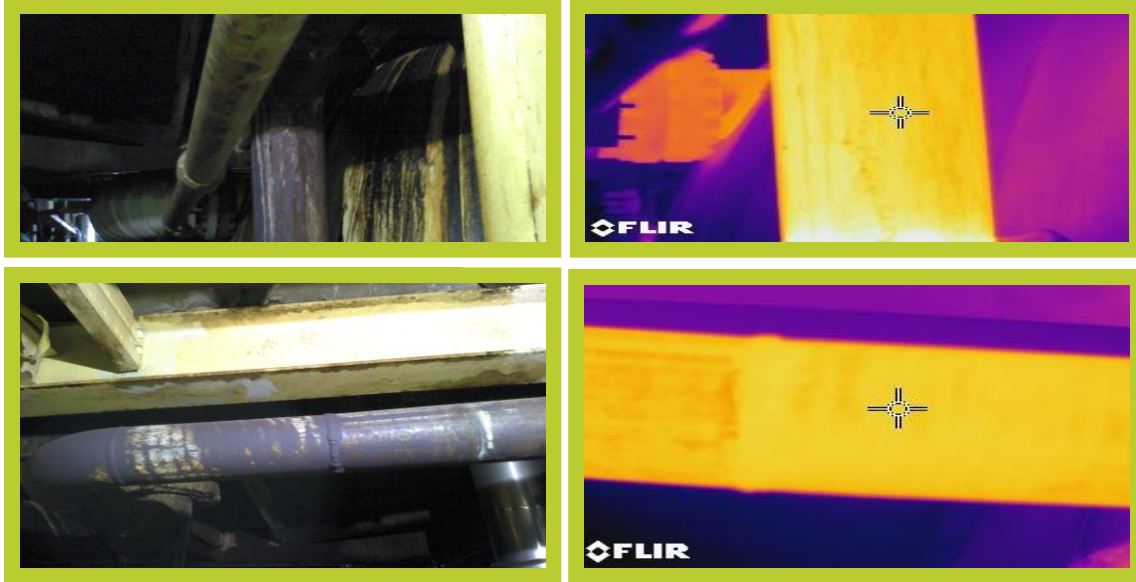


Operating Temperature, *F	250	Emittance of Surface	0.95
Ambient Temperature, *F	82	Expected Useful Life of Insulation System	20 yrs.
Insulation selected	Mineral Wool	Operating hours per year	8760
		Selected fuel	Crude Oil
		Cost of Fuel,\$/KWH	\$ 2.00

Thickness (inches)	Surface Temp (°F)	Heat Loss (Btu/h)	Cost of Fuel (\$/yr)	1 st year Savings	5 Year Savings	20 Year Savings	CO2 Emissions (MT/yr)
0	250	8,390	\$ 1,413.15	\$ 1,413.15	\$ 7,065.75	\$ 28,263.00	7.1
2	108	512	\$ 86.15	\$ 1,327.00	\$ 6,635.00	\$ 26,540.00	.45
2.5	104	428	\$ 72.15	\$ 1,341.00	\$ 6,705.00	\$ 26,820.00	.35

Digester Area

Elevation 350 (10 inch Black Iron/ 6 Inch Black Iron)



Operating Temperature, *F	298	Emittance of Surface	0.95
Ambient Temperature, *F	82	Expected Useful Life of Insulation System	20 yrs.
Insulation selected	Mineral Wool	Operating hours per year	8760
		Selected fuel	Crude Oil
		Cost of Fuel,\$/KWH	\$ 2.00

Thickness (inches)	Surface Temp (°F)	Heat Loss (Btu/h)	Cost of Fuel (\$/yr)	1 st year Savings	5 Year Savings	20 Year Savings	CO2 Emissions (MT/yr)
0	298	40,388	\$ 6,802.23	\$ 6,802.23	\$ 34,011.15	\$ 136,004.60	34.31
2	112	2487	\$ 418.82	\$ 6383.41	\$ 31917.05	\$ 127,668.20	2.16
2.5	107	2,126	\$ 358.3	\$ 6443.93	\$ 32,219.65	\$ 128,878.60	1.85

Digester Area

Capping Floor (14 Inch)



Operating Temperature, *F	300	Emittance of Surface	0.95
Ambient Temperature, *F	82	Expected Useful Life of Insulation System	20 yrs.
Insulation selected	Mineral Wool	Operating hours per year	8760
		Selected fuel	Crude Oil
		Cost of Fuel,\$/KWH	\$ 2.00

Thickness (inches)	Surface Temp (°F)	Heat Loss (Btu/h)	Cost of Fuel (\$/yr)	1 st year Savings	5 Year Savings	20 Year Savings	CO2 Emissions (MT/yr)
0	300	25,308	\$ 4,263.00	\$ 4,263.00	\$ 21,315.00	\$ 85,260.00	21.48
2	115	1,523	\$ 256.56	\$ 4,006.44	\$ 20,032.20	\$ 80,128.80	1.32
2.5	110	1,277	\$ 215.16	\$ 4,047.84	\$ 20,239.20	\$ 80,956.80	1.08

Digester Area

Capping Floor (10 Inch)



Operating Temperature, *F	300	Emittance of Surface	0.95
Ambient Temperature, *F	82	Expected Useful Life of Insulation System	20 yrs.
Insulation selected	Mineral Wool	Operating hours per year	8760
		Selected fuel	Crude Oil
		Cost of Fuel,\$/KWH	\$ 2.00

Thickness (inches)	Surface Temp (°F)	Heat Loss (Btu/h)	Cost of Fuel (\$/yr)	1 st year Savings	5 Year Savings	20 Year Savings	CO2 Emissions (MT/yr)
0	300	26,128	\$ 4,400.96	\$ 4,400.96	\$ 22,004.80	\$ 88,019.20	22.08
2	113	1,544	\$ 260	\$ 4,140.96	\$ 20,704.80	\$ 82,819.20	1.28
2.5	108	1,316	\$ 221.60	\$ 4,179.36	\$ 20,896.80	\$ 83,587.20	1.12

Results

Simple Payback Period, yrs	1.9
Internal Rate of Return (IRR or ROI)	52.0%
Net Present Value,	\$1,844,627

Calculations

Year	Investment	Annual Savings	Annual Cash Flow	Cumulative Cash Flow
0	-\$196,233	\$0	-\$196,233	-\$196,233
1	\$0	\$102,043	\$102,043	\$-94,190
2	\$0	\$102,043	\$102,043	\$7,853
3	\$0	\$102,043	\$102,043	\$109,896
4	\$0	\$102,043	\$102,043	\$211,939
5	\$0	\$102,043	\$102,043	\$313,982
6	\$0	\$102,043	\$102,043	\$416,025
7	\$0	\$102,043	\$102,043	\$518,068
8	\$0	\$102,043	\$102,043	\$620,111
9	\$0	\$102,043	\$102,043	\$722,154
10	\$0	\$102,043	\$102,043	\$824,197
11	\$0	\$102,043	\$102,043	\$926,240
12	\$0	\$102,043	\$102,043	\$1,028,283
13	\$0	\$102,043	\$102,043	\$1,130,326
14	\$0	\$102,043	\$102,043	\$1,232,369
15	\$0	\$102,043	\$102,043	\$1,334,412
16	\$0	\$102,043	\$102,043	\$1,436,455
17	\$0	\$102,043	\$102,043	\$1,538,498
18	\$0	\$102,043	\$102,043	\$1,640,541
19	\$0	\$102,043	\$102,043	\$1,742,584
20	\$0	\$102,043	\$102,043	\$1,844,627

*Calculation are based off Energy Cost Escalation Rate of 0%/yr

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