

# 3EPlus QUIZ

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**Slide 1:** For this quiz, go to the Energy tab, and calculate the Insulation Thickness for Insulation with the parameter below. Hit enter after each input, to advance the screen. Use “Heat Loss per Year’ calculation type.

Parameters:

- 1.) a Process temperature of 450 F
- 2.) an Ambient temperature of 70 F
- 3.) a Nominal Pipe Size of 8 inches and length of 10 feet

Select “**Energy**” Tab at the top of the first screen.

Screen will change to these parameters:

## Energy Tab

Insulation Thickness (Data Entry Screen)

Item Description *[blank]*

System Application: Pipe Horizontal

System Units: ASTM C585

Calculation Type: Personnel Protection

*Use the Drop-down Menu to select “Heat Loss per Year” option.*

Process Temp: 350.0 °F

*Type” 450” in the space. Hit “Enter”*

Ambient Temperature: 75.0 °F

*Type” 75” in the space. Hit “Enter”*

NPS Pipe Size: 4

*Use the Drop-down Menu to select ” 8”. Hit “Enter”*

Wind Speed: 0.0 mph

Max Surface Temp: 140.0 °F

Insulation Layers

*Add Button*

*Delete Button*

#	Type	Name	Lock Thickness	Thickness, Inches
-	Base Metal	Steel		
1	Insulation	850F Mineral Fiber PIPE, Type I, C547-07	Vary	
-	Jacket Material	0.9 All Service Jacket		

**Slide 6:** Now, calculate your results.

*Select “Calculate” Tab at the top of the screen.*

*Screen will change to these parameters:*

**Slide 7:** Here are your results for: insulation thickness, surface temperature, heat loss, and efficiency.

Heat Loss Per Year Report (Results Screen)

Item Description = [blank]

System Units = ASTM C585

Geometry Description = Steel Pipe - Horizontal

Bare Surface Emittance = 0.8

Nominal Pipe Size = 8 in.

Process Temperature = 450 °F

Ave. Ambient Temperature = 70 °F

Ave. Wind Speed = 0 mph

Relative Humidity = N/A

Dew Point = N/A

Condensation Control Thickness = N/A

Hours Per Year = 8000

Outer Jacket Material = All Service Jacket

Outer Surface Emittance = 0.9

Insulation Layer 1 = 850F Mineral Fiber PIPE, Type I, C547-07, Varied

Results for:  
 -Surface Temperature  
 -Heat Loss  
 -Efficiency

<b>Variable Insulation Thickness</b>	<b>Surface Temp (°F)</b>	<b>Heat Loss (BTU/ft/yr)</b>	<b>Efficiency (%)</b>
Bare	448.8	23660000	
0.5	177.4	4760000	79.87
1.0	129.2	2530000	89.31
1.5	112.3	1840000	92.21
2.0	102.8	1470000	93.77
2.5	95.4	1200000	94.93
3.0	91.4	1060000	95.54
3.5	88.5	948900	95.99
4.0	86.2	866400	96.34
4.5	84.4	800700	96.62
5.0	82.9	747100	96.84
5.5	81.7	702500	97.03
6.0	80.7	664800	97.19
6.5	79.8	632300	97.33
7.0	79.1	604200	97.45
7.5	78.4	579500	97.55
8.0	77.8	557600	97.64
8.5	77.3	538000	97.73
9.0	76.9	520500	97.80
9.5	76.5	504600	97.87
10.0	76.1	490200	97.93

**Slide 8:** Now calculate the Cost of Energy for Fuel Oil at \$1.90 per gallon and a boiler efficiency of 80 percent.

*On the left side of the screen, select “Cost of Energy: Bare and Insulated Surfaces” button.*

Insulation Thickness (Data Entry Screen)

Item Description *[blank]*

System Application: Pipe Horizontal

System Units: ASTM C585

Fuel Type: Natural Gas

*Use the Drop-down Menu to select “Oil” for “Fuel Oil”.*

*Notice the following inputs changed automatically:*

Heat Content: 1026 BUT/cuft to 138700 Btu/gal

Fuel Cost: 10.00 \$/Mcf to 1.50 \$/gal

*Type” 1.9” in the space. Hit “Enter”*

Efficiency: 75%

*Type” 80” in the space. Hit “Enter”*

Process Temp: 450.0 °F

Ambient Temperature: 70.0 °F

NPS Pipe Size: 8

Wind Speed: 0.0 mph

Annual Operation: 8000 hrs/yr

*Use the Drop-down Menu to select ” 8”. Hit “Enter”*

Insulation Layers

*Add Button*

*Delete Button*

#	Type	Name	Lock Thickness	Thickness, Inches
-	Base Metal	Steel		
1	Insulation	850F Mineral Fiber PIPE, Type I, C547-07	Vary	
-	Jacket Material	0.9 All Service Jacket		

Select "**Calculate**" Tab at the top of the screen.

Screen will change to these parameters:

**Slide 9:** Here are your results for: Installation Costs, Heat Loss, and Cost Savings.

Cost of Energy (Results Screen)

Item Description = [blank]

System Units = ASTM C585

Geometry Description = Steel Pipe - Horizontal

Bare Surface Emittance = 0.8

Nominal Pipe Size = 8 in.

Process Temperature = 450 °F

Ave. Ambient Temperature = 70 °F

Ave. Wind Speed = 0 mph

Fuel Name = Oil

Heat Content = 138700 Btu/gal

Fuel Cost = 1.90 \$/gal

Efficiency = 80%

Hours Per Year = 8000

Outer Jacket Material = All Service Jacket

Outer Surface Emittance = 0.9

Insulation Layer 1 = 850F Mineral Fiber PIPE, Type I, C547-07, Varied

Results for:  
 -Installation Costs  
 -Heat Loss  
 -Cost Savings

<b>Variable Insulation Thickness</b>	<b>Cost (\$/ft/yr)</b>	<b>Heat Loss (BTU/ft/yr)</b>	<b>Savings (\$/ft/yr)</b>
Bare	405.10	23660000	
0.5	81.54	4760000	323.600
1.0	43.32	2530000	361.800
1.5	31.54	1840000	373.600
2.0	25.25	1470000	379.900
2.5	20.56	1200000	384.500
3.0	18.08	1060000	387.000
3.5	16.25	948900	388.900
4.0	14.83	866400	390.300
4.5	13.71	800700	391.400
5.0	12.79	747100	392.300
5.5	12.03	702500	393.100
6.0	11.38	664800	393.700
6.5	10.83	632300	394.300
7.0	10.35	604200	394.700
7.5	9.92	579500	395.200
8.0	9.55	557600	395.600
8.5	9.21	538000	395.900
9.0	8.91	520500	396.200
9.5	8.64	504600	396.500
10.0	8.39	490200	396.700

**Slide 10:** “Nice job! It looks like you are ready to evaluate your insulation improvement options with 3EPlus software tool!”