



Can You Spot the Symptoms of an Inefficient Heating System?

An inefficient heating system can cost your business thousands of dollars a year in wasted energy. We have three easy steps that will help you quickly identify and work to solve issues.

Step 1

Take the efficiency quiz:

Check off any of the following symptoms that you may experience in your facility.

Signs noticeable in the office:

- 1. Is your gas consumption unusually high compared to previous years?
- 2. Do employees complain about hot/cold spots within your building?
- 3. Does your heating system run when the building is unoccupied?
- 4. Are you frequently having to call a service technician to repair your heating system?

Signs you might see in your utility room:

- 5. Is your boiler or furnace constantly turning on and off?
- 6. Is there water on the floor around your boiler?
- 7. Is your burner flame orange/red and limp?
- 8. Is there black smoke coming from the boiler stack, flue or chimney?



Step 2

If you identified one or more symptoms of inefficiency from Step 1, complete your heating self-assessment (starting on page 2) by reviewing the possible causes and solutions.

Step 3

Contact an Xcel Energy efficiency specialist to find out what rebates are available to help improve the efficiency of your system, saving you money year after year.

For more information call **855.839.8862**, email **energyefficiency@xcelenergy.com** or visit **xcelenergy.com/HeatingEfficiency**.

Heating self-assessment: signs of inefficiency noticeable from your desk

1. Your gas consumption is unusually high compared to previous years

Possible cause:

- A component of your system may have failed leading to inefficient functioning of your boiler or furnace.

Next steps:

- Run a heating bill analysis to determine your seasonal gas usage. Use the chart below to record your findings and help determine your system's efficiency.
 1. From your January gas bill, write down the total therms consumed that month. (For help finding your Therm Usage, see the sample bill on page 4).
 2. Divide the number of therms consumed by the number of Heating Degree Days (HDD) to determine the ratio of therms/HDD for that month. Do the same for your latest April gas bill.
 3. Compare the winter-month ratio with the spring-month ratio. If the spring-month ratio is equal to or greater than the winter-month ratio, then your boiler is inefficient and is probably short-cycling (see the following page for more information on short-cycling).
- Contact your maintenance technician, or service contractor to examine your boiler system.
- Regular tune-ups can help your system run more efficiently. Contact Xcel Energy for information on our Boiler Tune-Up rebate that can cover a portion of your cost.

Winter

Therms Consumed in January _____
 Heating Degree Days in January* _____
 Winter Ratio (Therms/HDD) = _____

Spring

Therms Consumed in April _____
 Heating Degree Days in April* _____
 Spring Ratio (Therms/HDD) = _____

Spring ratio \geq Winter Ratio = Inefficient System

*Visit www.degreedays.net for your area's HDD.

Contact the **Business Solution Center** at 855.839.8862 for help calculating your monthly ratio.

2. Some people complain of being too hot while others think it's too cold

Possible causes:

- Old or poorly functioning Energy Management System (EMS)
- Poor system design
- Faulty or failed steam traps
- **Cold spots** can be indicative of an air leak into a boiler system which causes a condition called "air lock". The infiltrating air congregates in the highest location in the distribution system and can prevent water from

passing. Cold spots can also indicate a water balancing problem where two distribution lines may be running in parallel and the pump does not have enough energy to deliver heat to both zones.

- **Hot spots** are most likely an indication of hot water zone valve bleed-by. If the valve is failing and no longer seats properly, hot water will bleed through the valve to the emitters and heat up the space even though the thermostat is satisfied.

Recommended action:

- Contact your maintenance technician or service contractor to examine your boiler system.
- Xcel Energy offers rebates that can potentially cover some of this service charge.

3. Your heating system runs when your building is unoccupied

How many times have you entered your office building on a Monday morning only to find that your heating system has been running all weekend?

Possible cause:

- You may still have the old round pneumatic heating/cooling controls (thermostats) instead of digital controls. Older controls can not be programmed to automatically adjust the temperature for those times when your building is unoccupied.

Recommended action:

- Install digital controls that allow you to automatically turn down or set back the temperature when the building is unoccupied. It can then be programmed to automatically kick on an hour before the work day begins, making it a comfortable temperature when employees arrive. For a low-cost digital control option, you can also consider wireless pneumatic thermostats.

4. You are frequently having to call a service technician to repair your heating system

Possible cause:

- Systems more than 25 years old may lack the reliability and efficiency you need to:
 - Reduce costs
 - Increase safety
 - Improve comfort
- The EMS system "unoccupied mode" temperature setpoints may be incorrect or disabled

Recommended action:

- The cost of service calls add up quickly. Tune-up rebates from Xcel Energy can help pay for routine maintenance, but substantial rebates are also available to offset the up-front cost of a new system. Contact your maintenance technician or service contractor to check the setpoints.

Heating self-assessment: signs of inefficiency noticeable from your utility room

5. Your boiler or furnace is constantly turning on and off (short-cycling)

Four cycles or more per hour is inefficient. See the right sidebar for more information on short-cycling.

Possible causes:

- An oversized or poorly designed system
- Poorly located thermostat controls

Recommended action:

- Contact a technician to check the placement of your thermostat controls. Thermostats near windows or doors can send inaccurate information.
- Modulating burners and a properly sized system could help correct this issue.
- How to physically document short-cycling of your system:
 1. Spend an hour in your boiler room. If your boiler cycles on and off more than three to four times in that hour, it is short-cycling.
 2. If you prefer not to spend an hour in your boiler room, locate the Flame Safeguard (it's in a blue box); about 70% of boilers use them. It will tell you both the number of cycles and the boiler run hours. Divide the number of cycles by the boiler run hours to calculate the number of cycles per hour. Apply the rule of thumb in number 1 above to determine if your boiler is short-cycling.

6. There is water on the floor around your boiler

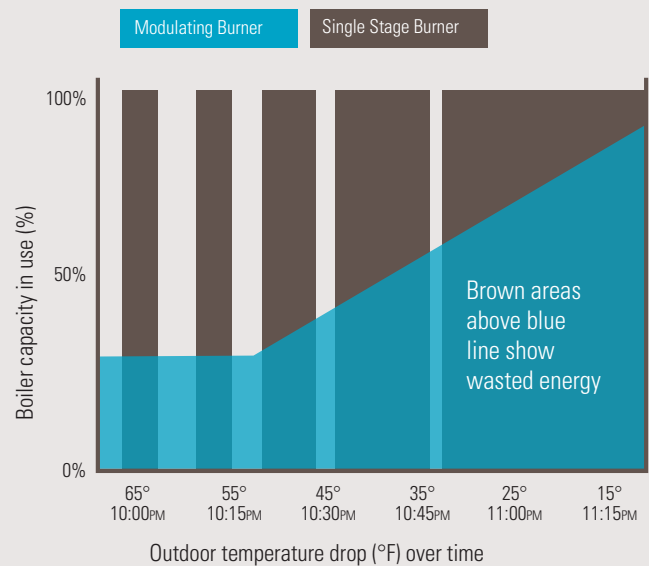
Possible causes:

- This indicates a leak or leaks, most often from a pipe, heat exchanger or relief valve. Leaks decrease boiler system efficiency by requiring the addition of make-up water (new, cold water) to the otherwise closed-loop, hot water system.
- Make-up water is generally about 50 °F and typical boiler water return temperature is around 170 °F. Heating this make-up water diverts burner energy from doing the useful work of supplying heat to the distribution system.
- Additionally, many boiler systems have a small water meter in the boiler room that logs the amount of make-up water supplied to the system. The ideal amount, of course, is zero. If the water meter indicates a substantial amount of water but there is not water on the boiler room floor, it is indicative of a leak somewhere in the distribution system.

Recommended action:

- Contact a service technician to perform a tune-up and identify/fix the leaks.

Burner Modulation vs. Single Stage



What is short-cycling?

Because boilers are designed to operate most efficiently at full load, winter is the time that they will experience the fewest on/off cycles. Short-cycling typically reduces a boiler's efficiency by about 30% due to energy loss from the purge cycle.

Each time the burner is turned on, the combustion chamber is purged with ambient air at about 50 °F to ensure that no explosive gases can accumulate. This purge cycle process removes heat that must be replaced before the boiler does any useful work.

A single stage boiler cannot automatically modulate (regulate) its output relative to how much heat the distribution system needs. This means it cannot avoid these on/off cycles, leading to greater energy waste through combustion chamber purging.

7. What color and shape is your burner flame?

- A short, sharp, blue flame. This indicates efficient burning of your gas.
- A red or orange flame. Your boiler is not burning all of the available fuel that you are using and paying for. A portion of the fuel is not being converted into heat and is being wasted.
- A long, limp flame. This is also a sign of inefficient combustion.

Possible causes:

- These conditions could partly be caused by inadequate ventilation to the boiler/furnace room. This is a very big safety concern. If outside air is not delivered to the boiler or furnace, it will take inside air—the air you are breathing!

8. There is black smoke coming from the boiler stack, flue or chimney

Possible cause:

- This indicates incomplete combustion due to a poorly burning flame.

Recommended action:

- Call in a boiler technician if you suspect a combustion problem.



System maintenance:

What you should know

- Xcel Energy offers boiler tune-up rebates to our customers every two years.
- The State of Colorado inspects boilers every year. They do this because there can be safety issues with improperly installed or poorly functioning systems.

Schedule your boiler tune-up and inspection now to ensure your customers and employees are safe.

You can find your monthly Therm Usage under the Gas Service-Account Summary and Comparison Information sections of your energy bill

SERVICE ADDRESS		ACCOUNT NUMBER		DUE DATE
ABC School 123 Smith St. Anytown, CO 12345		12-0123456789-0		06/09/2017
STATEMENT NUMBER	STATEMENT DATE	AMOUNT DUE		
12345678	05/19/2017	\$2,173.35		

METER READING INFORMATION			
METER 10000000 Read Dates: 04/19/17 - 05/18/17 (29 Days)			
DESCRIPTION	CURRENT READING	PREVIOUS READING	USAGE
Total Energy	40671 Actual	40562 Actual	109 ccf

NATURAL GAS ADJUSTMENTS			
DESCRIPTION	VALUE UNITS	CONVERSION	VALUE UNITS
Therm Multiplier	109 ccf	x 0.911370	99 therms

NATURAL GAS CHARGES			
RATE: CSG Commercial			
DESCRIPTION	USAGE UNITS	RATE	CHARGE
Service&Facility			\$39.06
Usage Charge	99 therms	\$0.141818	\$14.04
Interstate Pipeline	99 therms	\$0.066170	\$6.55
Natural Gas 2 Qtr	99 therms	\$0.267660	\$26.50
Pipe Sys Int Adj	99 therms	\$0.033550	\$3.32
Subtotal			\$89.47
Franchise Fee		3.00%	\$2.68
Total			\$92.15

YOUR MONTHLY NATURAL GAS USAGE		
DAILY AVERAGES	Last Year	This Year
Temperature	49° F	52° F
Gas Therms	4.6	3.4
Gas Cost	\$3.31	\$3.18

Contact us today

We'll help you work through the available rebate options and find the solution that best fits your facility and your budget. Call your Xcel Energy account manager or an energy efficiency specialist in our Business Solutions Center.

Call 855.839.8862 or visit us online at xcelenergy.com/HeatingEfficiency