Xcel Energy®

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	Signs you might see in your utility room
☐ Is your gas consumption unusually high compared to previous years?	☐ Is your boiler or furnace constantly turning on and off?
☐ Do employees complain about hot/cold spots within your building?	☐ Is there water on the floor around your boiler?
☐ Does your heating system run when the building is unoccupied?	☐ Is your burner flame orange/red and limp?
☐ Are you frequently having to call a service technician to repair your heating system?	☐ 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

Visit **xcelenergy.com/HeatingEfficiency** or contact an energy efficiency specialist to find out what rebates are available to help improve the efficiency of your system, saving you money year after year.

Phone – **855.839.8862** • email – **energyefficiency@celenergy.com** • website – **xcelenergy.com/HeatingEfficiency**

Heating self-assessment – Signs of inefficiency noticeable from your office

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.

Recommended action:

- 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 your account manager or energy efficiency specialist for information on our boiler tune-up rebate that can cover a portion of your cost.

Winter		Spring	
Therms consumed in January	_____	Therms consumed in April	_____
Heating degree days in January	_____	Heating degree days in April	_____
Winter ratio (therms/HDD) =	_____	Spring ratio (therms/HDD) =	_____
Spring ratio ≥ winter ratio = inefficient system			

Figures show heating degree days for Minneapolis only. Visit **degreedays.net** for your area's heating degree days.

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 causes:

- 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.

Contact an energy efficiency specialist at **855.839.8862** or visit **xcelenergy.com/HeatingEfficiency**.

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

Possible causes:

- 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 sidebar below 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.

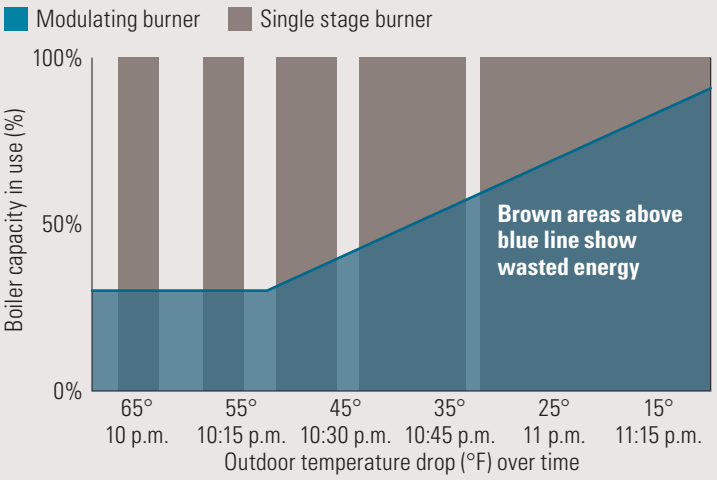
What is short-cycling?

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.

Burner modulation vs. single stage



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.

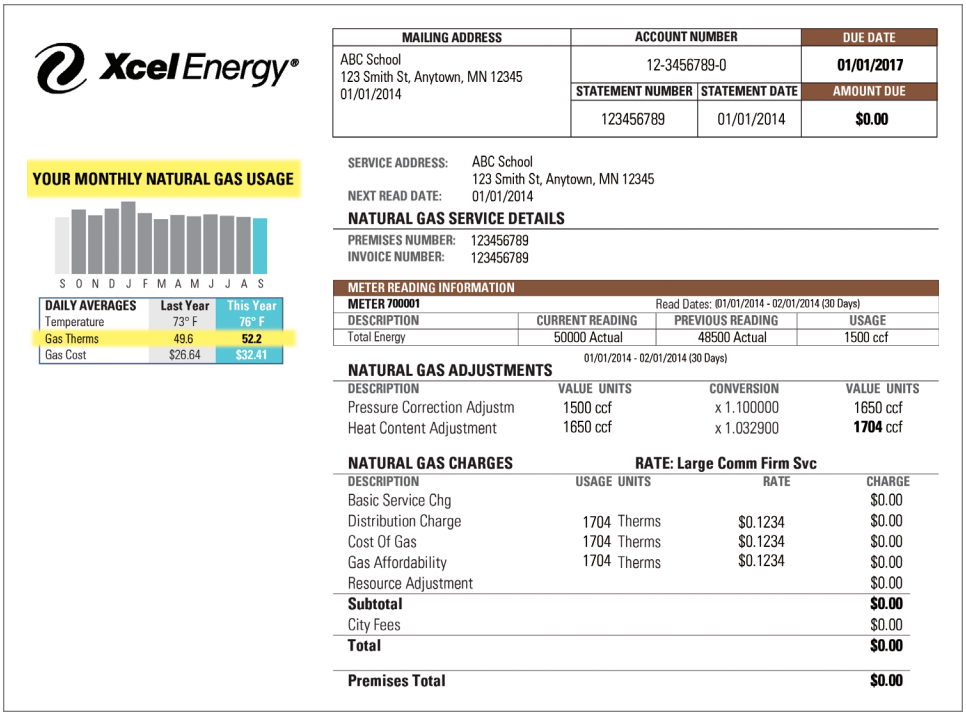
Possible causes:

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

Recommended action:

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

Visit our "get started" page for ideas at **xcelenergy.com/GetStarted**.



Xcel Energy®

MAILING ADDRESS	ACCOUNT NUMBER		DUE DATE
ABC School 123 Smith St, Anytown, MN 12345 01/01/2014	12-3456789-0		**01/01/2017**
	STATEMENT NUMBER	STATEMENT DATE	AMOUNT DUE
	123456789	01/01/2014	**$0.00**

YOUR MONTHLY NATURAL GAS USAGE

S O N D J F M A M J J A S

DAILY AVERAGES	Last Year	This Year
Temperature	73° F	76° F
Gas Therms	49.6	52.2
Gas Cost	$26.64	$32.41

SERVICE ADDRESS: ABC School, 123 Smith St, Anytown, MN 12345
NEXT READ DATE: 01/01/2014

NATURAL GAS SERVICE DETAILS

PREMISES NUMBER: 123456789
INVOICE NUMBER: 123456789

METER READING INFORMATION

METER 700001 — Read Dates: 01/01/2014 - 02/01/2014 (30 Days)

DESCRIPTION	CURRENT READING	PREVIOUS READING	USAGE
Total Energy	50000 Actual	48500 Actual	1500 ccf

01/01/2014 - 02/01/2014 (30 Days)

NATURAL GAS ADJUSTMENTS

DESCRIPTION	VALUE UNITS	CONVERSION	VALUE UNITS
Pressure Correction Adjustm	1500 ccf	x 1.100000	1650 ccf
Heat Content Adjustment	1650 ccf	x 1.032900	**1704** ccf

NATURAL GAS CHARGES — **RATE: Large Comm Firm Svc**

DESCRIPTION	USAGE UNITS	RATE	CHARGE
Basic Service Chg			$0.00
Distribution Charge	1704 Therms	$0.1234	$0.00
Cost Of Gas	1704 Therms	$0.1234	$0.00
Gas Affordability	1704 Therms	$0.1234	$0.00
Resource Adjustment			$0.00
Subtotal			**$0.00**
City Fees			$0.00
Total			**$0.00**
Premises Total			**$0.00**

Analyzing usage on your bill

You can see your Therm Usage trend over the past twelve months in the column on the left as well as daily averages comparing this year to last year.

System maintenance: what you should know

By taking these measures to improve your system's performance, you may be eligible for rebates to offset your investment:

- Gas boiler tune-ups (every two years)
- Pipe insulation
- Steam trap repair-replacement
- Outdoor air reset controls
- Modulating burners with turndown > 5:1
- Turbulators
- Stack dampers
- O_2 trim controls

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