



SECOND EDITION

As a result of high energy costs and the desire to lessen our nation's dependence on foreign oil, the corn heating industry has expanded rapidly in the past few years. Heating with corn is an excellent alternative to the traditional heating methods of natural gas, propane, and electricity. This second edition of the CORN newsletter has been updated to reflect the changes in the corn heating industry over the past year. This newsletter is a collection of information assembled from a variety of sources to provide an educational piece to consumers and producers regarding the corn stove industry. For the purposes of this newsletter, "corn heating unit" will refer to corn stoves, furnaces, and boilers.

*Jody E. Pollok
Executive Director*

Corn Marketing Program
of Michigan
12800 Escanaba Drive
Suite B
DeWitt, MI 48820
517.668.CORN (2676)
www.micorn.org

HEATING WITH CORN 2007 UPDATE

What is a Corn Heating Unit?



Corn heating units are devices which generate heat from burning shelled corn. Although corn heating units are similar to wood-burning stoves, they have been designed to burn a dry granular fuel, such as shelled corn. Some units commonly called biomass furnaces are capable of burning corn in addition to other fuels such as pellets, nutshells, small wood chips and other grains such as rye, wheat and barley.

Corn heating units can be used to heat a single room, an entire house, an outdoor building like a shed or a barn, a greenhouse, a factory, or even an entire school system or college campus. Depending on your heating needs, corn heating units come in various sizes, shapes and with many different features. Once the need has been determined, consumers can choose from a fireplace insert, stove, furnace or boiler and can also choose between an indoor or an outdoor unit.



Shelled corn which will be used for heating purposes in the stove must be dry, preferably at 15 percent moisture content or less. The corn must also be free of fine particulates. Corn with a lot of fine particulates and corn cobs can cause problems with a fuel stoker auger system. In most situations, corn heating units burn more efficiently when corn which is free of particulates is used.

Corn heating units differ from wood stoves in many ways. Most importantly, corn heating units burn 20 percent hotter and burn much cleaner than wood. The use of a corn heating unit eliminates the smoky smell of burning wood and also eliminates the messy clean-up. Corn heating units have a combustion air fan and a fuel stoker, both of which are not common on standard wood stoves. Corn heating units do not require a traditional chimney system but instead require an exhaust vent. Some vents can exit the side of the building, much like a vent for a clothes dryer.



History of Corn Heating Units

Corn heating units date back to as early as the beginning of the twentieth century. During hard economic times, farmers burned corn as a way to heat their homes. It became highly prevalent during the Great Depression because the market price of corn was very low and farmers did not have the money needed to buy fuel.

How a Corn Heating Unit Works

Corn heating units have become increasingly more efficient over the past decade as a result of technological advances. Shelled corn is typically delivered from a local farmer or dealer and is stored on-site for larger units. For smaller units, corn can be bought by the bag usually in 50 lb increments. In some instances the corn is stored in a metal or plastic bin which helps to protect it against moisture and pests. Depending on the system in place and the storage capabilities, corn is either dumped directly into the hopper by the consumer or the corn is transported from a storage bin into the corn hopper or burn pot through an auger system. The unit can either be a top-fed system where the auger is placed above the burn pot and the corn is dropped in, or the auger can be a bottom-fed system where the auger feeds into the bottom of the pot. The corn pushes up into the pot and the fire burns at the top of the corn pile. Temperature controls determine how much corn is added into the pot. The feed rate of the auger can be adjusted to regulate the amount of corn burned, which in turn controls the amount of heat produced. There are some corn heating units designed with computers that monitor the temperature and signal the auger to automatically transport more corn to the pot when needed. This allows the system to automatically adjust to the temperature in the room or building.

Types of Corn Heating Units

A number of different manufacturers make corn heating units. They are available in several different sizes and styles. They are available as a:

- fireplace insert
- space or room heater
- stove
- hot air furnace
- hot water boiler

The size of the fuel hopper (storage) also varies greatly with a range of one to ten days worth of storage.

Since corn will not burn readily in an open pile in the fire chamber, some manufacturers use a small combustion chamber into which the corn is fed and combustion air is pumped through. In order to support combustion, oxygen is blown into the combustion chamber by means of a small fan. The combustion air is usually brought in from outside and is not typically air from inside the room. This combustion chamber is actually quite small and could easily fit into a child's lunch box.

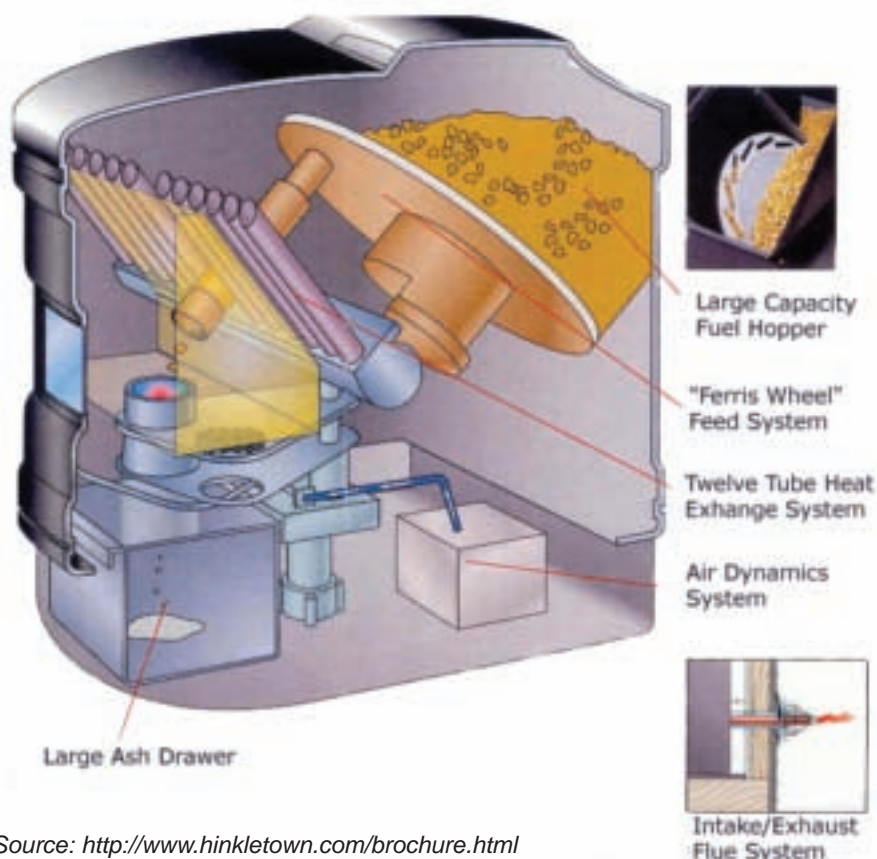
Inside the unit, a heat exchanger is used to remove heat from the flue gases and heat the room air. A fan is used to move the room air through the stove where it is warmed. This fan may also help in moving the heat further away from the stove.

By-Product

As corn burns, it produces a by-product commonly known as clinker, which is a hard ash-like material. Clinker is mainly made up of silicon dioxide, so it is essentially a glass-like substance. Top-fed auger systems have to be shut down and cooled in order to clean the pot of clinker. In bottom-fed systems, the clinker can run over the sides of the burn pot and fall into a catch-pan, which can be dumped without shutting down the unit. Depending on the size of the combustion chamber, the clinker may have to be removed from the unit daily or weekly. With practice, the removal of the clinker can be done without having to shut down the unit. A specifically designed poker is used to suspend the clinker, and then tongs are used to remove it.

Once the clinker has been removed from the unit, it can be placed on a garden or on grass. Clinker can be used as an acid neutralizer and therefore can act as a soil stabilizer. It will fertilize grasses or flowers and help them to grow.

Components of a Corn Stove



Source: <http://www.hinkletown.com/brochure.html>

Maintenance

Like any other furnace or heating unit, corn heating units require minimal maintenance. In addition to adding the corn or removing the clinker, these units need annual routine maintenance.

Each year, the unit should be inspected to ensure that all components including the hearth, connecting pipe, air inlets, vents, and the auger are functioning efficiently and safely. The fans and motors should be inspected and maintained regularly.

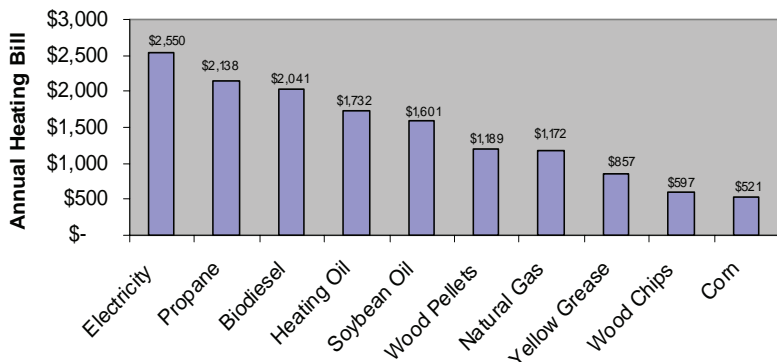
Cleaning out the inside of the stove with a wire brush to help remove buildup will also help heat your home or building more efficiently.

Benefits of Using a Corn Heating Unit

Corn heating units can be used for many different heating purposes and can take the place of other heating sources that have been used in the past, such as electricity, propane, heating oil, natural gas or wood. Corn heating units are economical and are a very cost-effective alternative to heating with propane or electricity, or even wood. To heat a 2,000 square foot home would require approximately 250 bushels of corn a year. As shown below in the “Comparisons of Heating Options” chart done by Dr. Chris Schilling at Saginaw Valley State University in July, using a corn heating unit can save anywhere from \$300-1500 a year on a heating bill for a 2,000 square foot home/building. This represents a great economic savings.

The chart “Burn Corn or Propane” illustrates the

Comparisons of Heating Options



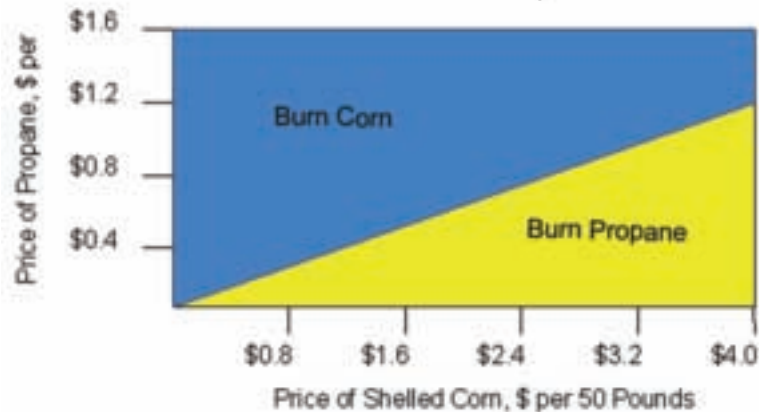
Source: Dr. Chris Schilling,
Saginaw Valley State University
July 18, 2006

breakeven points of when it is more economical to heat using corn or propane. As the chart shows, if the price of corn is \$1.60 per bushel, propane would have to be priced below \$0.40 per gallon in order to be more

economical than burning corn.

In addition, corn heating units utilize an annually renewable fuel source. Corn is grown across the United States and was about an 11 billion bushel crop for the last three years. Corn can also be grown in many other countries as well. By using corn for heating purposes, we can help to decrease our use of fossil fuels and other

Burn Corn or Propane



Source: Dr. Dennis Buffington, Penn State University

rapidly depleting energy sources. As our forests, oil and other energy sources are becoming increasingly depleted, corn is replenished annually and therefore makes an alternative fuel source that is renewable year after year.

Since corn heating units are designed to burn under oxidizing conditions, the resulting smoke is nearly odorless and consists largely of carbon dioxide and steam. Unlike the combustion of ordinary fossil fuels, the carbon dioxide produced during corn burning does not add greenhouse gases (GHG) to the atmosphere. Instead, carbon emissions from corn heating units are annually renewable as the carbon dioxide is reabsorbed in plant matter by photosynthesis during the growing season.

Not only are corn heating units cost effective, but they are also environmentally-friendly. Ordinary household sized corn burning stoves do not emit significant particulate emissions.

It took more than four million years to create fossil fuels (oil, gas and coal).

It takes 40 years to grow mature trees.

It only takes four months to grow corn.

CORN MARKETS

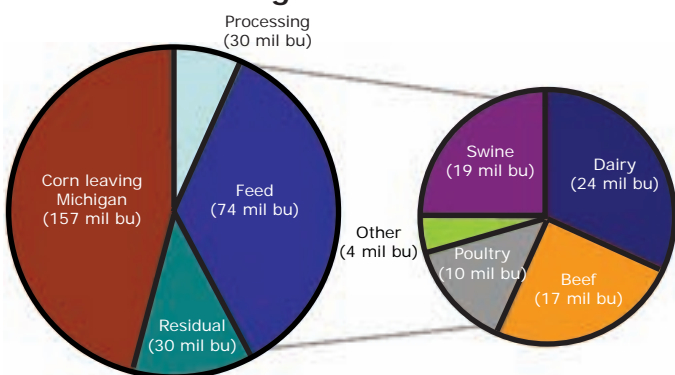
In 2005, U.S. corn producers harvested 75.1 million acres of corn with an average yield of 148 bushels per acre. Combined statistics show production of 11.1 billion bushels of corn. Seed companies continue to develop hybrids and genetically modify varieties for increased yield potential, vigor, novel traits, resistance to disease, insects and other pests. Research partnerships of private, academia and the farming sector have enhanced the efficiency and production capacity of the corn industry.

Michigan Corn Production/Usage Statistics

According to the Michigan Agricultural Statistics Service, corn producers plant an average of 2.2 million acres per year with approximately two million acres harvested, yielding an average of 143 bushels per acre, for a total crop of 289 million bushels. Of the state's total production in 2005, approximately 157 million bushels were shipped out of state. In addition, 74 million bushels of corn, or 26 percent is used in-state for animal feed and another 30 million bushels is used for ethanol and Distillers Dried Grains (DDGS) production.

Next to exporting corn, livestock feed is Michigan's second largest corn usage, which breaks down further into various animal consumptions.

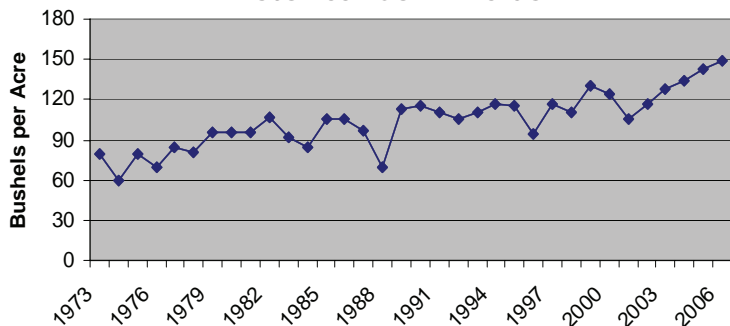
2005 Michigan Corn Utilization



Corn Crop

Michigan is the second most agriculturally diverse state, behind California. Of Michigan's field crops in 2005, corn acreage made up 34 percent or over two million acres. Yield per acre has increased over 60 bushels

Historical Corn Yields



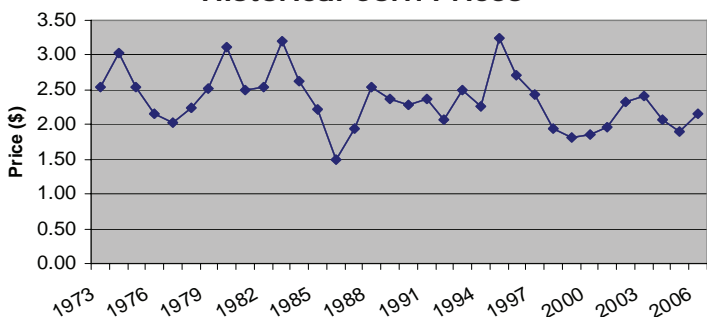
From the National Agriculture Statistics Service

in the last thirty years to 149 bushels in 2006 and is projected to increase by at least 1.2 bushels per year.

Corn Pricing

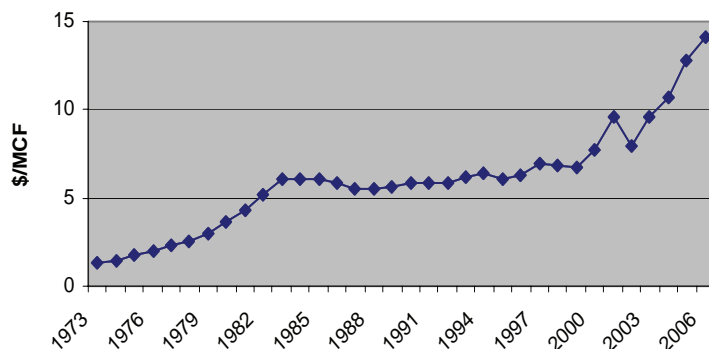
Corn pricing has remained relatively stable throughout the past twenty years. As shown by the Historical Corn Prices Chart, the price of corn has remained between \$1.50 and \$2.50. In comparison, propane and natural gas costs have greatly fluctuated for many years and have skyrocketed over the past year.

Historical Corn Prices



From the National Agriculture Statistics Service

Historical Natural Gas Prices



From the Energy Information Administration as of Sept. 28, 2006

Those heating with corn have a unique market. They can purchase corn directly from neighboring farms or farmers which gives them the ability to contract the corn for the entire heating season. This allows them to set their heating prices at the beginning of the season and know what their heating bill will be all winter long.

Questions to Ask Before Purchasing a Corn Stove, Furnace or Boiler

How much heat is required for your desired space? What is the heat output of the stove?

An energy audit may be needed to determine your actual heating needs. The necessary heat output of the stove will vary based on your location, square footage, and the type of house or building you would like to heat. A contractor may be able to help determine your needs.

What products are the stove designed to run on?

Some units are capable of burning corn, wood, pellets, nutshells, cherry pits, rye, wheat, or barley. Make sure the stove has the capabilities you want.

Is the stove certified by Underwriters Laboratories Inc. (UL)?

Some stoves have UL listings which provides a certification that the product has undergone quality testing and is deemed safe. Some stoves have specific components that are listed.

What size is the hopper? How long will the stove operate on a fill of corn?

Depending on the size of the hopper and the setup of the unit, you may be required to fill more frequently, such as daily rather than weekly. Ask how often the stove should have to be filled.

Does the stove have a “Self Cleaning Burn Pot”?

Some stoves have manually cleaned burn pots requiring daily cleaning for continuous use.

Is the stove self starting? Does it have an electronic igniter? If so, will it start corn?

Many companies have igniters which start wood or pellet stoves, but will not ignite corn. Be sure to check if it is guaranteed to start every time. If so, what is the cost to operate the igniter?

Does the stove have electronic safety features?

Look for features such as low temperature and high temperature auto-shutdown, lid open safety switch, and auto switching on high fuel settings.

What type of exhaust venting is required?

If the stove is an outside model, the venting system could be incorporated right into the stove. Most inside models require a class A chimney, which is the same as wood stoves or fireplaces. Some vents can exit the side of the building, much like a vent for a clothes dryer.

What material is used in the burn pot (fire area)?

Burn pots are made with a variety of materials including stainless steel, cast iron, ceramics, etc.

Does the stove have backup electrical capabilities?

Having backup electrical capabilities will keep heat flowing, even when the power goes out.

Does the unit have hot exposed surfaces?

If the unit has hot exposed surfaces, these areas could easily cause burns. Be careful of this, especially if young children will be around the unit.

Who will be taking care of you after the sale?

Before making a purchase, ensure that someone will be available to answer any questions you have once the unit is installed and operating.

What are the side and rear clearances?

You need to know how much area you have available for the stove and how much clearance space is specified for the model you are considering.

How will corn be stored?

Take into consideration how you plan to store the corn, whether it be a wagon or a bin. This will allow you to buy the corn in larger quantities.

Do you have easy access to a reliable supplier of corn?

Corn is grown across Michigan by more than 13,000 producers. You are making an investment in a unit which will require corn for years to come and there will be corn available.

How will a corn stove affect your insurance?

Check with your insurance carrier to determine how your insurance premiums might be affected.

Are there any local ordinances to be aware of?

Check with local government to ensure compliance with all necessary codes and ordinances. Most counties and townships in Michigan do not have specific codes dealing with corn heating units.

What types of permits are needed for installation of a corn stove?

Call your township office to obtain the necessary permit. The permit may be issued by your township or the State of Michigan. A permit is required before beginning installation.

Will an inspection be needed after installation?

An inspection is required. Call your township office to determine who serves as your mechanical inspector. Some townships have their own, while others rely on the State of Michigan. Once installation is complete, the inspector should be summoned.



Information to Gather Before Visiting a Dealer

- How many square feet of space do you want to heat? How tall are your ceilings?
- How good is your insulation? How about your windows?
- How much money did you spend heating your home last year?
- Where do you spend most of your leisure time in your home?
- Draw a simple sketch of the layout of your home. Include hallways, direction of the stairs and doorway openings.

Potential Funding Sources

Grants and loan programs may be available to help offset the initial cost of installing a corn stove, furnace or boiler. Visit www.micorn.org for a list of grants and loan programs that may be available for corn heating units.

Sellers of Corn

Al's Top Crop Service, Inc.
4183 West M55
Tawas City, MI 48763
(989) 362-2846

Falmouth Co-Op Co.
260 East Prosper Road
Falmouth, MI 49632
(231) 826-3301

Bill Minarik
10378 W. Pierson Road
Flushing, MI 48433
(810) 659-1696

Richard Slovak
11304 E. Juddville Road
Corunna, MI 48817
(810) 638-5152

Ann Arbor Agri Center
4175 Whitmore Lake Road
Ann Arbor, MI 48105
(734) 662-9400

Tom Grabowski
2013 West Beyer Road
Ludington, MI 49431
(231) 843-1306

Gordon Munsell
6400 W. Mason Road
Fowlerville MI 48836
(517) 223-9639

Howard Stack
1665 Baldwin Road
Lapeer, MI 48446
(810) 664-3006

Battle Creek Farm Bureau
14325 East O.P. Avenue
Climax, MI 49034
(269) 746-4286

Lee Grumbaugh
6365 East Maple Rapids
Elsie, MI 48831
(989) 862-5232

Jon Oakes
12250 Bishop Road
St. Charles, MI 48655
(989) 845-5936

TLC Corn
4700 Van Orden Road
Webberville, MI 48892
(517) 749-9101
www.tlccorn.com

Tony Benkert
9025 Swan Creek Road
Saginaw, MI 48609
(989) 245-1444

Johnson's Farm Company
1132 E. Coggins Road
Pinconning, MI 48650
(989) 879-2248

Penn Acres Grain, Inc.
6830 Clinton-Macon Road
Clinton, MI 49236
(517) 423-5955

George Zmitko
5105 W. Mason Road
Owosso, MI 48867
(989) 723-1886

Country Side Corn Stoves
10320 Lincoln Lake Road
Greenville, MI 48838
(616) 754-4390

Jim & Kelly Kissane
2723 N. DeWitt Road
St. Johns, MI 48879
(989) 224-3778

Tim Rumfield
6887 Grand Ledge Hwy
Sunfield, MI 48890
(517) 566-7178

If you sell corn for corn stoves and would like to be listed, call the Michigan Corn office, (517) 668-2676.

D.R. Farms LLC
3125 Butler Road
Marlette, MI 48453
(989) 670-2835

Litchfield Grain Company
113 Stock Street
Litchfield, MI 49252
(517) 542-3763

Chris Schmidt
1068 N. Union Road
Auburn, MI 48611
(989) 662-2695

DeRussel Farms
Keith DeRussel
11385 East Washington
Reese, MI 48757

Lott Elevator
1495 Cohoctah Road
Cohoctah, MI 48816
(517) 546-4202

Mark Senk
7552 N. Smith Road
Henderson, MI 48841
(989) 666-7869

Eaton Farm Bureau Co-op
2166 East Clinton Trail
Charlotte, MI 48813
(517) 543-1160

McKimmey Farms
2125 Glidden Road
Beaverton, MI 48612
(989) 435-4128

Steve Slivinski
2584 Goslow Road
Gaylord, MI 49735
(989) 732-4790

Established under 1965 P.A. 232, and voted in by the state's corn producers in 1992, the Corn Marketing Program of Michigan receives one penny per bushel for all field corn grown in Michigan and sold. The "check-off" funding is invested in education, market development, new uses and research. Those who are supplying corn to be burned in corn heating units are required by law to pay the "penny" check-off.

Manufacturers and Dealers Partnering with the Michigan Corn Growers Association

Ready to shop for a corn stove?

To receive more information regarding a specific model or brand of corn heating units, contact one of the following manufacturers and dealers.

The following manufacturers and dealers have partnered financially with the Michigan Corn Growers Association to help educate consumers about the benefits of heating with corn.

Manufacturers



American Energy Systems
150 Michigan Street SE
Hutchinson, MN 55350
(320) 587-6565
www.magnumheat.com



Eco-Tech Heating Systems, Inc.
4130 Market Place Drive
Flint, MI 48507
(810) 732-2400
www.ecotechheat.com



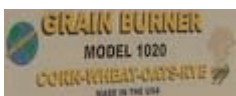
Harman Stove Company
352 Mountain House Road
Halifax, PA 17032
(717) 362-9080
www.harmanstoves.com



J & H Industries, Limited
PO Box 81398
Rochester, MI 48308-1398
(586) 336-5066
www.grainburner-plus.com



L.R. Equipment
4064 Lyle Road
Beaverton, MI 48612
(989) 435-9052
www.lrequipment.com



Universal Grain Burner & Biomass Heating Systems, Inc.
151 W. Main Street
Farwell, MI 48622
(989) 588-6533
www.universalgrainburner.com

Michigan Corn Growers Association



Dealers

Big L Corporation
620 S. Main Street
Sheridan, MI 48884
www.big-l-lumber.com
(989) 291-3289

MacDowell's
228 S. Bridge Street
Grand Ledge, MI 48837
(517) 627-9400

The Corn Crib
151 W. Main Street
Farwell, MI 48622
www.cornburns.com
(989) 588-0711

Maize Blaze Corn Stoves
4100 Old M-10
Standish, MI 48658
www.maizeblazecom
(989) 846-2676

Corn2Heat LLC
13015 W. Michigan Avenue
Marshall, MI 49068
(269) 789-2676

Monsma Marketing Corporation
2450 Buchanan Avenue SW
Grand Rapids, MI 49548
www.monsma.com
(616) 245-8714

Daryl's Used Truck Sales,
8305 Geiger Road
Pigeon, MI 48755
www.thumbtruck.com
(989) 453-3133

Renewable Energy Systems
221 S. Main Street
Oakley, MI 48649
www.michigancornburner.com
(989) 845-1550

Future Heat
2313 E. Aitken Road
Crowell, MI 48422
www.futureheatllc.com
(800) 933-2592

The Kernel Burner
6171 Tittabawassee Road
Saginaw, MI 48603
www.thekernelburner.com
(989) 792-2808

Golden Heat Corn Stoves
1216 N. Maple Island Drive
Hesperia, MI 49421
www.goldenheatstoves.com
(231) 854-1777

Wood & Son's Corn Bin
164 W. Grand River Avenue
Williamston, MI 48895
(517) 655-2998



Corn Marketing Program of Michigan
12800 Escanaba Drive, Suite B
DeWitt, MI 48820

PRST STD
U S POSTAGE
PAID
PERMIT # 108
LANSING MI

CMPM Board of Directors

Carl Barth, Three Rivers

Jay Drozd, Allegan, *Secretary*

Clark Gerstacker, Midland, *Vice President*

Mark Kies, Allen

Frank Lipinski, Buckley

Scott Lonier, Grand Ledge

Bruce Noel, Leslie, *Treasurer*

Lyndon Uphaus, Manchester, *President*

Ken Wadsworth, Sandusky

Ex-Officios

Jody E. Pollok, Executive Director

Doug Buhler, Michigan State University

Robert Craig, Michigan Dept. of Agriculture

Pat Feldpausch, MI Corn Growers Assoc.

Ken Lake, Michigan Ag Commodities

The Corn Marketing Program of Michigan and the Michigan Corn Growers Association have partnered with Michigan State University Extension and Saginaw Valley State University to educate the public regarding corn heating units.



Headquartered in DeWitt, CMPM is a legislatively-established statewide program that utilizes one-cent per bushel of corn grown in Michigan and sold. Investments are made in the areas of research, education and market development in an effort to enhance the economic position of Michigan corn producers. CMPM works cooperatively with the Michigan Corn Growers Association, a grassroots-membership association representing the state's corn producers' political interests.

For more information on the Corn Marketing Program of Michigan, call the office toll-free at 1-888-323-6601 or visit us online at www.micorn.org.