

Poultry Engineering, Economics & Management

Newsletter of the National Poultry Technology Center, Auburn University

Critical Information for Improved Bird Performance Through Better House and Ventilation System Design, Operation and Management

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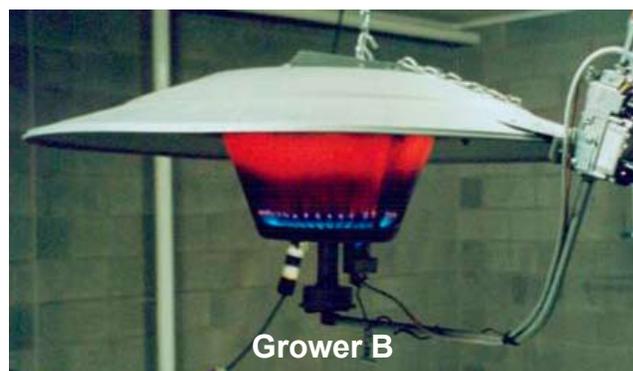
Improving Gas Heat System Efficiency

By Jess Campbell, Jim Donald and Gene Simpson
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When the weather turns cooler we start getting calls from growers wanting to know what they can do to get their houses ready for cold weather. Often the answer to the question is simply to clean and maintain what you already have installed and not to buy something new. However, if equipment is damaged beyond repair, is unsafe to operate, or cheaper to replace instead of repairing, then yes, go ahead and replace it. One of the first and most cost effective ways to make sure that you are spending your time and money wisely is to make sure that you do a good job cleaning and maintaining your existing heating equipment. During most of our field visits, we often find that many growers could get more efficiency out of their existing equipment if they followed some simple guidelines for cleaning and maintaining heating equipment. This newsletter focuses on getting the most out of existing heating appliances.

Why should I clean brooders and heaters?

Most growers don't have extra money set aside to purchase brooders and heaters prematurely. To get best use of your brooding and heating system and most out of the gas you buy, routine maintenance must not be overlooked. Brooders and heaters lose heating efficiency quickly as they become dirty and neglected. Protecting your heating system investment is a must and ensures you get the most out of each unit in burning gas and the longest possible service life out of each unit, as well. Before you begin maintenance, first consult your brooder or heater manufacturer for recommendations on heater placement, height, pressure, and maintenance for best results. We want to get 100% of what we pay for in gas during preheating, brooding, and growing winter flocks and the only way to get that is to make sure brooders and heaters are in tip-top shape.



What a difference routine maintenance can make! Grower A, who did the needed wintertime cleaning, adjusting and testing, is getting 100% of the BTUs he paid for. Grower B, who may have skipped just one of the recommended 8 maintenance steps, is getting less than half what he paid for because his brooder is running at less than half the required gas pressure. Which means that only about half the brooder radiant emitter is glowing. When we depend on radiant heat, no glow means no heat. Failure to do the needed maintenance on box heaters can result in the same kind of drastic heating and dollar losses. Only it's harder to tell because with convective heat you can't see whether air coming out of the heater is fully warmed or not.

When should I clean brooders and heaters?

Brooders and heaters should be cleaned before birds are placed each and every flock regardless of what they look like on the outside. A brooder or heater that appears clean on the outside will still likely have a considerable amount of dust and dander build up on the interior parts. The better job a grower does of cleaning and maintaining brooders and heaters, the better heating efficiency he will realize and the longer the appliance will last. Should I clean my brooders and heaters after the first flock? Yes, and prior to every flock after that.

How should I clean brooders and heaters? (manufacturer's recommendations may vary)

Step 1: Turn Gas and Power Off! Prior to doing anything with any heating appliance it is imperative to turn the gas supply and power supply (including control voltage) off to all zones and all appliances that will be worked on. Once this is done heaters should be lowered to a comfortable height so that every part of the brooder or heater can be comfortably reached during cleaning and maintenance.

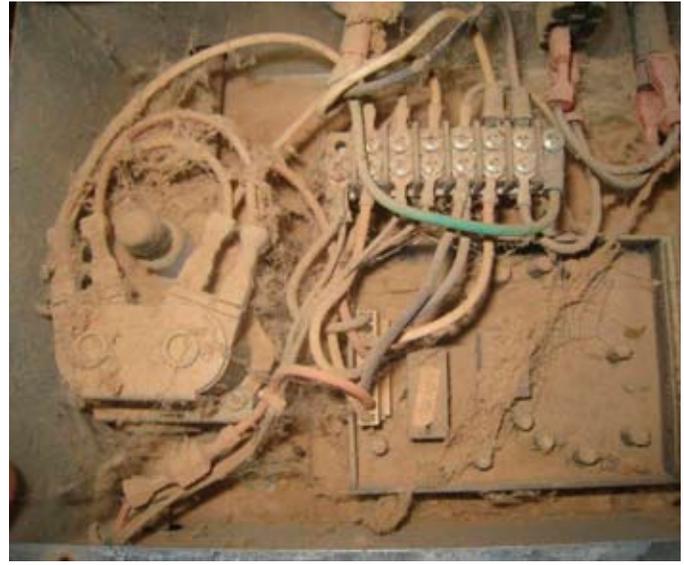
Step 2: Remove Dust and Dander. A high velocity blower or compressed air can be very helpful in removing dust, dander, and other debris from the brooders and heaters. Be careful with compressed air, since air at too high a pressure can damage brooder or heater components. It may be helpful to turn on one or more tunnel fans and open the tunnel inlet or end wall door to allow air flow down the house and away from you while you are cleaning the appliances. Start at the front end wall when cleaning appliances and work toward the tunnel end of the house. Blow off the top of the heaters first and then begin cleaning the undersides. Filters must be blown off. Porcelain type emitters typically used with "pancake" style heaters should have the dust removed from the surface, and tops should be blown off, too. Radiant steel emitter surfaces and holes must be blown off and free from dust. The combustion chamber must also be blown out. The goal is to remove any and all dust from the appliance that might restrict air and/or gas flow. Allowing dust buildup to remain in the heater can affect the heating and combustion efficiency and overall efficiency of the heater itself.

Step 3: Remove Residual Dust. Radiant brooder reflector canopies or shields might require a wet rag to clean the remaining dust residue from the reflector and improve heater performance and canopy life. If excessive dust cannot be removed with air alone, a stiff bristle brush can be helpful in removing caked dust from a brooder or heater.

Step 4: Check Electrical and Electronic Parts. Most brooders and heaters have electronic control boxes that house the control boards and igniter connections of the heater. All electrical connections should be kept clean and tight. These connections and parts may be blown off with a blower and lower pressure compressed air, but higher compressed air pressure may damage electronic boards and could loosen electrical connections. Dust and dander combined with moisture may result in electrical shorts, so it is very important to make sure that dust and moisture are not allowed to build up in the control boxes.

Step 5: Inspect Brooders and Heaters. A thorough visual inspection of each brooder and heater should be done to ensure that no heaters are damaged. Any part of a brooder or heater that is damaged must be replaced to prevent fire hazards. Make sure gas orifices, burners, electronic igniters, and all parts are free from any obstructions. Box furnaces must be thoroughly inspected to ensure bird nests or other obstructions are not present in the heater outlet, diverter, or sail switches. Make sure all hoses used to supply gas to brooders and heaters are rated for gas use and not rated for air or water. Hoses rated for gas use will often be marked "for use with gas." Inspect hoses for visual signs of dry-rot, splitting, or burned hoses, and if any portion of the hose is damaged it must be replaced. Kinked hoses restrict gas flow to brooders and heaters, may severely shorten the life of the hose, and could cause a fire. Hoses must not rest on a brooder or heater canopy. Make sure power supply wires and control voltage wires are in good shape, and any wires found to have any nicks or damaged insulation should be replaced.

Step 6: Test Gas Pressure. It is a good idea to conduct a pressure test on your heating system at least once every three years. If you have never conducted a gas pressure test then it is a good idea to conduct one now. Regulators can weaken over time and allow gas pressure to rise above the recommended operating range set by the brooder or heater manufacturer. Frequently rust, dirt, or other debris can build up in the piping system and clog supply lines, resulting in lowered pressure. Many low pressure heaters are designed to operate at about 11 inches of water column (w.c) for propane (LP) units, and natural gas (NG) units at about 7 inches w.c. Some other heaters are designed to operate at a much higher gas pressures. Regardless of make or brand, consult the manufacturer's recommended gas pressure rating for the specific heater you have installed. Heaters operating at too high pressures can overheat, cause fires, and shorten the life of the heater. Heaters operating at too low pressures cause heaters to produce low levels of heat, decreased radiant heat output, increased heater run times, and lower house temperatures. Your municipal gas supplier, equipment installer, or equipment manufacturer should be able to provide you with instruction and tips on checking gas pressure. If you are not comfortable with checking gas pressure, seek help from a gas professional!



Picture to the left above shows dust and dirt attached to cobwebs on the intake of a radiant heater that will restrict air flow into the combustion chamber causing this heater to be choked for air. The heater will not operate at design potential. Picture to the right shows dirt and dust collected in the control box of a radiant heater that will shorten life of heater control components. Electronic boards and electrical connections don't hold up under dirt and moisture, so it is imperative that control boxes are kept clean.



A quarter-inch of dirt can collect on the canopy of a brooder in just one flock. Most of this dirt can be removed with a leaf blower or air from a compressor. It might require a brush and then a wet rag to finish the job. Inset picture to the left shows the radiant emitter being blown out to ensure that all dust is cleaned out of the emitter. Making sure all dust is removed from all heater components will help ensure the heater burns gas efficiently and radiates heat to the floor. Keeping the emitter clean will increase the life of the emitter and ensure that it radiates heat at full potential.

Also, check all gas supply line connections for leaks. Gas leaks often go unnoticed and can be very dangerous and very costly. A thorough inspection of every gas piping and hose connection is imperative. This can be done with a simple spray bottle and soapy water. Spray every gas connection with the soapy solution to check for gas leaks; you might be surprised at what you might find. This should be done on outside lines especially – we see a lot of bent and damaged main copper gas supply lines on houses that could be costing big dollars in gas leaks.

Step 7: Brooder Height and Sensor Placement. Radiant heaters must be installed and operated at their recommended distances from the floor. Radiant heaters installed too high will not place the recommended radiant floor pattern and designed intensity to the floor. Radiant heaters installed too close to the floor will place too much radiant heat intensity on the litter and on chicks, feeders and drinkers, with a smaller radiant floor pattern. Each appliance has a recommended height to operate at and this must be checked and marked somehow. Guessing is not an acceptable method of determining radiant brooder appliance height. Sensor placement should be consistent throughout the house and accuracy checked periodically to ensure proper readings are being sent to the house controller. Sensors for heaters placed in the radiant heat zone of a radiant brooder will prematurely shut heaters off because the sensor is reading the radiant temperature and not true air temperature. Sensors placed too far away from radiant heaters or too far out of the radiant zone will cause heaters to run too much. Consult the radiant heater manufacturer for recommended sensor placement and live production recommendations as well.

Step 8: Conduct a Test Run. Sometimes cleaning brooders and heaters can result in the heater not lighting or operating properly. It is helpful to test and visually inspect each heater while it is running so that when it is time to start preheating and brooding houses, all of the heaters are in good operation and will start up and ignite as expected.

The Bottom Line

As with any system in a poultry house, we need to squeeze every ounce of potential out of what we have without hindering bird performance. That means we want to get every possible BTU of heat out of each gallon of gas we burn. Brooders and heaters give us the ability to place chicks in the best possible environment that will get them off to a good start when they cannot regulate their own body temperature. To do that we have to combine several systems together to provide that environment, and our brooders and heaters are a critical part of our environmental control systems. If dirty or poorly maintained heating system equipment in a poultry house is operating at only 90% efficiency, then that means 10% of the gas being burned is effectively being wasted. Thus, 300 to 500 gallons of gas, worth \$400 to \$700, is being wasted, and flock performance may be reduced, as well. Maintenance of heating systems is well worth the small amount of time invested.

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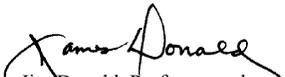
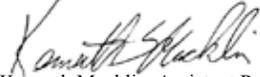


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