

BlueFlameStoker

Earl Ray Zimmerman, Organic Chicken Farm, Ephrata, PA -
Tuesday, May 13th, 2014



Earl Ray showing his new and unique furnace for burning chicken manure to create hot water to heat the chicken barns. See www.BlueFlameStoker.ca for more information.

Courtesy of <http://usagproductionsystems.blogspot.com/2014/05/earl-ray-zimmerman-organic-chicken-farm.html>

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One of Earl Ray's 25,000 capacity organic broiler (meat chickens) barns. Earl owns two barns. View is of the area required for the chickens to have access to the outside.

Door on Earl's chicken barn to allow access to the outside for the chickens. Access to the outside is required to meet the standards for organic chicken production.



Earl Ray Zimmerman is a Mennonite farmer also based out of Lancaster County, PA. Earl raises organic chickens and beef cattle as well as 65 acres of production land, which he uses to feed all 60 of his cows. Earl has two chicken houses that

hold 25,000 birds each. He receives an order of 25,000 chicks and feeds them organic corn and soybean meal for 45-47 days before they are large enough to be sold. He has a furnace where he burns his chicken litter to produce hot water, which is then used to heat his 2 chicken houses to their appropriate temperatures. Bags of phosphorus rich ash is stored in wait as Earl searches to find farms that have soils deficient in phosphorus so that it could be used as fertilizer. Earl also goes to farm machinery auctions to buy machinery and sell them at higher prices. The hot water from the furnace is also used to clean the machinery he buys; he is one of only a few other people in Pennsylvania that uses this water heating technology.

- Joey

Exploring the agricultural market Biofuel heating system raises profits for organic poultry farmer.

Poultry and livestock products are big business. Canada's red meat industry had annual shipments worth \$16.3 billion in 2013, with poultry and egg products contributing \$4.0 billion in the same year.^{1,2} In 2011, Canada had 205 730 census farms.³ Opportunities to utilize hydronics within this segment are plentiful.

Heating systems in this market must be reliable and provide consistent temperatures. Chickens in particular require precise temperatures as they need to keep gaining weight to go to market as fast as possible. Precise temperature balancing is critical in each of the 45 x 500 ft. (14 x 152 metre) houses Zimmerman uses for broilers, chickens specifically raised for meat production.

"Chickens are affected by temperature," observed Matt Aungst, co-owner of the firm that engineered a heating system for organic poultry farmer Earl Ray Zimmerman. "A change of just a few degrees affects the birds' eating habits. And if they don't eat, they don't put on weight. Missing the growth schedule for thousands of birds for just one day stretches a farmer's time to market and cash flow, something poultry producers want to avoid at all costs.

"Each building is wide open," added Aungst. "So each area has a different heat loss profile depending on the location in the building. The goal is to keep the entire building at 93F (34C) at the beginning of every flock."

To achieve that goal, his firm utilized an air handler system designed specifically for chicken houses. The system uses a centrifugal fan to circulate air through the mixer's coil into the chicken house to maintain even temperature throughout the living area. Each building employs eight of the units suspended from the ceiling. A heating coil in each unit is supplied by a hot water circuit, which is regulated by its own pressure independent temperature control and system-balancing valve.

PRECISE TEMPERATURE CONTROL

On warm days, to eliminate stratification the mixer pulls hot air from the ceiling level and expels it in a 360-degree circular flow just above the floor. On cold days, a boiler supplies hot water to the internal heat exchanger inside each air handler unit. The system uses an unusual fuel source – dried chicken waste – to fire the 1.5 million Btu boiler, which can handle 100 per cent of the heat load.

"The water flow to each coil is based on the heat load," explained Aungst. "At full load, the system supplies 180F water at 11 gallons per minute to each unit. But conditions seldom call for that much heat."

That is why Aungst is using eight pressure independent temperature control and system-balancing valves along the main piping circuit that runs near the peak of the roof in each building. One valve is used to control the water flow to one coil. The valve increases or reduces the flow of hot water supplied to the coil depending on whether the zone temperature sensors call for more or less heat. Because 100 per cent flow is usually not needed, a variable-frequency drive (VFD) incorporated into the circulating pump motor can reduce pump speed as flow is reduced, which cuts electricity consumption.

However, changing the flow also changes pressures, which creates problems for the system. Aungst determined that alternatives to the pressure independent control valve (PICV) design would not provide sufficient stability or controllability at low loads in this application. The control valve would have to do double duty: to provide water at the required flow rate to the air handler coil and to maintain that exact flow by eliminating the effects of pressure fluctuations on the valve as system loads change.

REMOTE MONITORING

The PICVs and the variable speed drive pump work in harmony. Redundant pumps circulate the hot water to the circuits. The valve matches the flow to the exact load. And at lower loads, the pump reduces speed to save electricity. The pump only needs to produce the minimum required differential pressure for the valves to operate.

The valve actuator is controlled by a proportional-integral-derivative (PID) loop in a programmable logic control (PLC) system that uses inputs from a thermistor located in each zone. The control network runs over Ethernet. Local control can be done on the PLC's colour touch-screen. The system can also be monitored remotely from the comfort of Zimmerman's home, combining convenience and reliability.

The biofuel system has been delivering. "Across a 22 500-square-foot floor area, the readouts on the eight thermistors are all within one degree F," concluded Aungst.

For Zimmerman, getting temperatures that consistent over an area about half the size of a football field is impressive. "Some days require just a little heat. The chicks like an even temperature. So the valves open a little to provide heat without temperature swings. I'm very happy with how things are working," said Zimmerman. <>

With over 40 years in the hydronic industry, Bill Boss is responsible for the sale of Danfoss' hydronic heating and cooling controls, and oil burner components throughout North America.

<https://www.hpacmag.com/features/hydronic-agricultural-market-biofuel/>

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