

Biofuel, reengineered

Self-Sensing Pumps Win Approval on this Chicken Farm

Leave it to a big-dreaming farmer in Lancaster County, PA, to create a paradigm shift in the agricultural and heating industries worldwide.

Chicken grower Earl Ray Zimmerman's passion is all about sustainability, and he's climbed a mountain of nutrient-rich debris to get it.

In Pennsylvania, poultry is the state's biggest business. And that means giant piles of bird waste typically trucked to fields. But that creates a lot of work, and surface runoff. While Zimmerman was exploring his options, a local energy-solutions firm helped him combine the need for a heating system with manure disposal.

Today, Zimmerman's two, 500-foot long chicken houses are heated with a state-of-the-art, bio-fueled hydronic system.

His poultry houses are each equipped to organically raise 30,000 broilers, from peeps to slaughter in just five to seven weeks, requiring a lot of chicken feed. Of course, what goes in must come out.

Birds love it, too

"We teamed up with two companies that lead their markets in ingenuity," said Matt Aungst, co-owner of Total Energy Solutions, LLC in Willow Street, PA, the company that crafted the system's design.

"Farmer Boy Ag Supply, in Myerstown, PA, was our general contractor and installer, and Taco provided the engineering brainpower to get the BTUs where they need to be using KV series sensorless pumps."

Depending on outdoor temperatures and the age of the birds, one house can call for up to 600 MBH at any given time, though an average winter heat load is typically 200-300MBH/house. The heat plant is a 1.5 million BTU biofuel boiler.

Sustainable heat

When a bird flock "goes out" every six weeks, Zimmerman uses a skid-loader to clean out all of the chicken house

litter, storing it until needed.

The boiler occupies its own remote building. An auger feeds dry manure from the hopper into the boiler, while another removes ash remnant from its base.

The heart of the distribution system is also in the mechanical building. Two redundant pumps and their VFD counterparts sit side by side, plumbed in parallel. Ten feet above, a suspended Taco 4903 air and dirt separator keeps the water lines clean and quiet; a 125-gallon Taco expansion tank smoothes the loop out.

Three-inch, pre-insulated PEX water lines disappear underground through the concrete floor to a distribution manifold between the two chicken houses.

Hi-tech, down on th' farm

Taco SKV3009 SelfSensing pumps include a motor-mounted VFD to deliver precise flow and pressure. The pumps accurately respond to changes in system demand with no need for pressure sensors. If a main supply valve to one of the houses is closed, the pump senses the change and ramps down according to lower demand. Seconds later, the pressure gauge drops on the supply side.

Inside each chicken house, eight unit heaters hang from the ceiling, providing water-to-air heat exchange. Automatically, the pumps react to the specific call for waterborne BTUs. "Before the SKV3009 SelfSensing pumps were shipped, the VFDs were programmed in our Cranston, RI factory, according to data collected for specific flow rates, head pressures and system characteristics," said Eugene

Fina, senior product manager at Taco who was involved with the design of the inline pump portion of distribution system.

"A specific program enables the pumps to 'know' exactly what speed to run at any given time. You get tremendous energy savings this way," continued Aungst. When in design phase,



Aungst calculated a Delta-T of 25°F.

The seven-and-a-half horsepower pumps are each programmed to supply a maximum of 125 GPM at 85 feet of head. According to Jeff Pitcairn, Taco's commercial regional manager, pump A runs as "duty," leaving pump B for backup. After several days of run time, the pumps automatically switch roles.

For best use of mechanical room space, the distribution piping incorporates Taco's Plus Two multi-purpose valves which combine all the valve functions normally required on the discharge side of a centrifugal pump. This includes shut off, check, balancing and flow metering valves.

Zimmerman's an early-adopter. The roof of one of the chicken houses is adorned with a 72 kW photovoltaic array, and he has protected a nearby stream from runoff by growing a riparian buffer zone.

Inspired agriculture systems have the ability to produce more food with less cost and lower environmental impact. That's smart farming.