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Oil-Fired Heating Shows Cost-Cutting Potential

Cost of utilities (electric and heating) is the greatest out of pocket expense category facing poultry growers. While electricity rates and consumption are fairly constant from year to year, such is not the case for heating fuel, and we have seen record high fuel bills for heating and brooding on poultry farms in recent months. While these figures are highest during cold weather, they are also significant during warmer months. As a result of these price levels, poultry growers are facing a profitability crisis. The chart below shows typical per house expenses for propane (LPG) and electricity for the past 13 years in a modern Class A house.

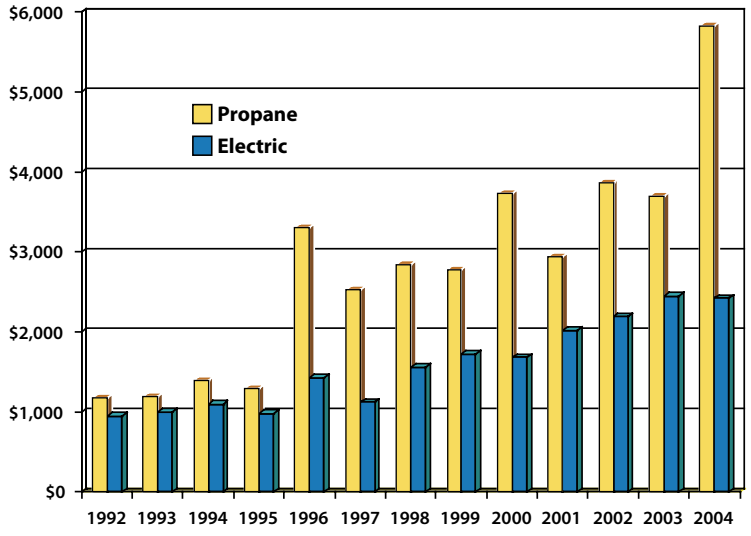
One way that growers might be able to cut heating costs has been demonstrated on a multi-house poultry farm in North Alabama. This is a new oil-fired heating system consisting of a conventional oil furnace burning #5 heating oil, with heated air blown into the house through an 18-inch collapsible nylon duct suspended on winch cables over the total length of the house. Exit holes are cut into the fabric on each side of the duct every 20 feet and forced air is directed toward the juncture of the sidewall and floor, to avoid flowing air directly onto the birds. The system is available with either 350,000 or 500,000 BTU/hr burners.

Since any given flock will require a certain amount of BTUs for heating and brooding, it makes sense to look at the economic efficiencies of alternative fuels. Propane generally contains about 90,000 BTUs per gallon, and #5 oil contains about 140,000 BTUs per gallon. Since #5 oil is reclaimed motor oil which has been filtered but not re-processed, it is available at low cost in many areas. If propane is valued at 90 cents per gallon and #5 oil at 50 cents per gallon, one dollar will buy about 100,000 BTUs of propane or about 280,000 BTUs of #5 oil. At these prices, propane costs almost three times as much as #5 oil for the same amount of heat energy.

Oil-Fired Heating – New House Test

Two identical side by side broiler houses on a farm in North Alabama were compared over 5 flocks. One house had a 500,000 BTU/hr oil fired heating system installed in addition to the identical forced-air heaters and radiant brooders as in the other house using LPG heating only. Both are new 42' X 500' Class A houses, with chain wall foundation, solid sidewall and endwalls, drop ceilings, and full insulation, with half-house brood chambers. Both houses were equipped with electronic controllers and a large number of various environmental sensors (temperature, humidity, etc.). Actual production figures and detailed fuel consumption figures for the two houses were directly compared to calculate improvements in profitability.

Typical Per House Expenses, North Alabama, 1992-2004



Initially, the oil furnace was intended to supplement propane heaters and brooders. However, the oil-fired heating system was observed to be working so well during the first two flocks, that for the following flocks the set points for the oil furnace were set 2-3 degrees above the set points for the brooders in the LPG-only house. This resulted in brooders only needing to come on as an oc-

casional supplement to the furnace, so that for flocks 3-5 heaters and brooders were supplementing the oil furnace, and only occasionally used at all.

Fuel Usage and Expense

Overall total heating (in BTUs) for the two houses was about the same, although for some flocks the LPG-only house used more heat and for others the oil-fired house used more heat. The heating costs, however, calculated using $0.90 per gallon for propane and $0.50 per gallon for #5 oil, were markedly different, with the oil-fired house consistently costing less to heat. Overall cumulative fuel savings over the five flocks gained by using the oil-fired heating system were calculated at $1,053 (Table 3 on facing page). However, during the period of this study, the price of propane was observed to steadily rise from the $0.90 range to the $1.20 range. Additional fuel savings over the five flocks would be more than $500 with the price of propane increasing to $1.20 per gallon.

Production Results

Not only did the oil-fired heating system produce significant fuel savings, flock performance in the oil heated house was also improved, as shown in Table 2. Using a price of $0.05 per pound of liveweight, the cumulative increase in grower revenue was computed to be $1,371, with an average per flock revenue increase of $274. These data do not include any additional compensation received by the growers for relative ranking position in performance factors (feed conversion, average live cost, etc.)

Improved flock performance in the oil heated house apparently resulted from improved environmental conditions. Smoke testing indicated extremely good air mixing and airflow uniformity in the house using the oil-fired heating, similar to that seen with stirring fans. Much lower relative humidity was observed (about 15% to 20% lower), and litter quality was noticeably better, as was air quality. Litter in the oil heated house was virtually free of cake and extremely dry, although excess dust has not been observed. Because of the improvement in litter quality through lower moisture, less frequent clean-outs will be required and less volume of caked litter will need to be removed between flocks. In minimum ventilation mode, electronic controller ventilation times required to maintain appropriate air and litter quality were noticeably less per 5 minute cycle, ranging between 20 and 110 seconds less. This will significantly reduce fan run times and the electrical cost associated with running fans. It also results in retaining BTUs for longer periods of time each cycle, thereby reducing the BTU requirement.

Profitability

For the five flocks studied, the calculated fuel savings plus the increased grower revenue from improved performance totaled $2,424.50, as shown in Table 3. A true cold weather flock has not occurred during the period of this study; however, the coldest winter flocks in North Alabama could result in fuel savings of some $500 to $600, and summer flocks about $75 to $200, assuming a propane price of $0.90 per gallon. Conservatively, an expected annual reduction in fuel cost would be at least $1,500 to $2,000. These figures naturally would be higher in the colder areas of the Broiler Belt or with higher propane prices, and would be lower in milder climates or with lower propane prices. Additionally, consistent live production performance improvements with the #5 oil furnace greater than $200 per flock would be expected for every flock, for a conservative annual increase of $1,300. Thus, annual profitability would be improved by at least $3,200 per house on a typical North Alabama broiler farm, given prices of $0.90 and $0.50 per gallon of propane and #5 oil, respectively.

Oil-Fired Heating – Test in Old Class C Houses

The test farm also had five older Class C houses built in the early 1970s, each 36 ft X 400 ft, with post-in-ground foundation, curtain side-walls, open ceilings, thermostat controls, and no insulation. In seven flocks grown between October 1999 and January, 2001, propane usage ranged from 467 to 3,223 gallons per house per flock, with an aver-

Photo shows oil-fired furnace installed at a modern broiler house in North Alabama. Duct from top of furnace takes heated air into the house. Black tank behind furnace is an old propane tank converted to hold the #5 oil supply for the furnace.

Oil-fired heating system uses 18-inch nylon ducts running the length of the house to distribute heat from the outside furnace. Ducts collapse when furnace and blower is off, and are hung on winch cables so they can be hoisted to the ceiling when not needed.

Holes cut at intervals in the sides of the nylon ducts direct warm air toward juncture of sidewall and floor, so as not to blow air directly onto birds. As this smoke bomb test shows, airflow has good velocity and air mixing in the house is excellent, comparable to using stirring fans.

Table 1. Production Data, LPG-Heated Class A House vs. Class A House With Oil-Fired Heat

Flock/Birds Placed	Growout Days	Birds Caught		Liveweight Pounds		Average Weight		Percent Mortality	
Both	Both	LPG Only	Oil-Fired	LPG Only	Oil-Fired	LPG Only	Oil-Fired	LPG Only	Oil-Fired
1 - 27,400	47	26,270	26,321	137,511	141,720	5.29	5.45	4.1241	3.9380
2 - 27,900	48	26,772	26,930	128,259	137,395	4.79	5.10	4.0430	3.4767
3 - 26,500	46	25,586	25,660	119,166	123,635	4.66	4.82	3.4491	3.1698
4 - 31,000	39	30,134	30,257	111,854	113,707	3.71	3.76	2.8738	2.4556
5 - 26,200	46	24,555	25,053	124,780	132,540	5.08	5.29	6.2786	4.3779

Table 2. Production Improvements – Oil-Fired House

Flock	Birds Caught	Liveweight Pounds	Avg Weight	Percent Mortality	Grower Revenue
1	+51	+4,209	+0.16	-0.1861	+$210.45
2	+158	+9,136	+0.31	-0.5663	+$456.80
3	+74	+4,469	+0.16	-0.2793	+$223.45
4	+123	+1,853	+0.05	-0.4182	+$92.65
5	+498	+7,760	+0.21	-1.9007	+$388.00
Avg.	+181	+5,485	+0.18	-0.6701	+$274.27
Total	+904	+27,427	-----	-----	+$1,371.35

- ✔ **Tables include actual production and fuel usage data, with cost and savings figures based on calculations using a propane price of $0.90/gallon and a #5 oil price of $0.50/gallon.**
- ✔ **Average calculated increase in net profit per flock over five flocks (value of production improvement plus fuel savings): $484.90**
- ✔ **Total calculated increase in net profit over five flocks (avg. value of production improvement plus avg. fuel savings) : $2,424.50**

Table 3. Heating Fuel Usage and Computed Costs and Savings, Class A Houses - LPG Only vs. Oil-Fired

Flock - Weather	Fuel Use (gallons)			Total BTUs (millions)		Total Fuel Cost		Fuel Savings (Oil-Fired)	Profit Increase (fuel savings + revenue, Tbl 2)
	LPG House	Oil-Fired House							
	LPG	LPG	#5 Oil	LPG Only	Oil-Fired	LPG Only	Oil-Fired		
1 - Cool	1,011	300	455.0	91.0	90.7	$910.00	$497.50	+$412.50	+$622.95
2 - Mild	450	50	409.5	40.5	61.8	$405.00	$249.75	+$155.25	+$612.05
3 - Hot	250	0	149.5	22.5	20.9	$225.00	$74.75	+$150.25	+$373.70
4 - Hot	125	20	49.7	11.3	8.8	$112.50	$42.85	+$69.65	+$162.30
5 - Cool	400	70	63.0	36.0	15.1	$360.00	$94.50	+$265.50	+$653.50
Total	2,236	440	1,126.7	201.3	197.3	$2,012.50	$959.35	+$1,053.15	+$2,424.50

age of 1,368 gallons per flock. Following the January, 2001 flock, one house had a 350,000 BTU/hr #5 oil furnace system installed. For the next flock, the house with the supplemental oil heat burned 655 gallons of propane plus 556 gallons of #5 oil. The other four houses burned 6,078 gallons of propane, an average of 1,520 gallons per house. Heating cost for the oil heat house was $868.00, while the other four houses averaged $1,368.00 each. As a result, the oil furnace system was installed in the remaining four houses. Propane currently provides about 30% and #5 oil about 70% of the total BTUs used in these five houses.

In comparing fuel usage before and after the oil furnace installation in all five of these older houses, total fuel cost is averaging $710.60 per house per flock, a savings of $520.60 per house per flock. That translates to about $2,600.00 in fuel savings per flock over the five houses, or $15,600 total savings per year, assuming 6 flocks annually.

Cost of Oil Furnace System

The total initial investment cost is $10,000 per house. If we assume a salvage value of $2,000, an interest rate of 7 percent on a 5-year loan, a $100.00 per year repair cost, and a useful life of 10 years, annual fixed costs are estimated to be $2,050 per house. If we assume 6 flocks per year with a $200 per flock production improvement and a conservative estimate of annual fuel savings of $2,000, annual income would be increased by $3,200. $3,200 less the $2,050 annual fixed cost results in an additional $1,150 per house per year in net profit for the first five years, and returns the full $3,200 in net profit for later years. These figures would be slightly higher with more flocks per year and slightly lower with fewer flocks. Additionally, areas with colder and/or longer winters would realize modest increases, and more temperate climates would expect slightly lower returns.

Bottom Line

The #5 oil furnace heating system has demonstrated an ability to consistently increase grower profitability in both modern Class A and very old Class C poultry houses in a variety of weather conditions. In Class A solid walled, insulated houses, with oil furnace setpoints maintained 2-3 degrees above brooders and heaters, brooders and heaters will only come on when needed to maintain temperature uniformity. Over time, we may see new Class A houses equipped with fewer brooders than the twenty to thirty currently specified.

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