

Reducing energy cost by using innovative heating equipment

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As energy becomes more and more expensive it is in everybody's interest to reduce the cost of heating poultry houses.

Not only are national governments introducing regulations in order to reduce carbon dioxide emissions, but the Kyoto Protocol also dictated the world to be conscious about the reserves we have on our planet.

Traditionally, poultry houses are heated by direct fired heaters which use 100% of the consumed energy. There are no flue- and system losses. As a result of this type of heating carbon dioxide and water vapour will remain in the poultry house.

In order to reach an acceptable level of carbon dioxide₂ (for example maximum 2500ppm) additional ventilation is needed, which costs more energy.

General studies have shown that ventilation losses by heating the traditional way can be as much as 60% of the total heat capacity!

In general, the best way to conserve energy for every building is to have good insulation and to keep the ventilation to a minimum.

This also applies for the poultry house. The minimal ventilation which is applicable should be respected.

It is possible to reduce these costs and the solution is not that difficult!

The solution is to introduce indirect fired



Direct fired unit, Winterwarm DXA heater.

heaters which transport the carbon dioxide production of heating and water vapour by means of a flue system outside the poultry house.

An important advantage of the application of indirect heaters is that the installed capacity can be less than before as ventilation losses are significantly reduced. This can save approximately 20% on the installed capacity, so less investment and less running costs.

Also, indirect fired heating contributes to a better environment in the house which leads to:

- Better bird performance as there is more oxygen available instead of carbon dioxide.
- Dry atmosphere and dry litter.
- Less bird diseases like podod.

Three examples of different ways of heating a typical broiler house include traditional direct gas heaters, indirect gas heaters and a central boiler house with water heaters.

The figures given are an estimate of instal-

lation costs and running cost based upon the following assumptions:

- Dimension: 100m x 20m, average height of 4.5m.
- Mild weather conditions minimum design temperature of -10°C. Ventilation losses in this example only 30%.
- Prices mentioned are list prices of equipment.

Traditional gas heaters

Heating by traditional direct gas heaters is well known, easy and cheap. All thermal energy used will come into the broiler house and there are no flue losses. The chemical reaction when burning natural gas (G20 or methane) is as follows:



Consequently, it means that every m³ of natural gas brings 1 m³ of carbon dioxide. This needs to be removed by ventilation. Ventilation with cold air costs extra energy.

● Installed capacity: 400kW, four units of each 100kW. Investment (approximately): €9000, equipment only, excluding installation costs.

● Total estimated annual gas consumption 35,000m³ of natural gas, total seven flocks per year.

Indirect gas heaters

The main difference of indirect gas heaters compared to the traditional gas heaters is

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Fig. 1. Traditional gas heaters floor plan.

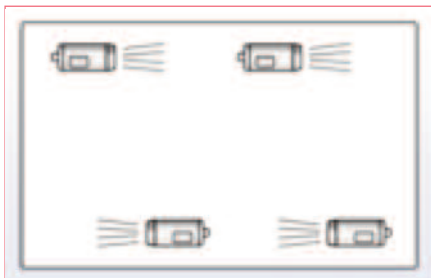


Fig. 2. Indirect gas heaters floor plan.

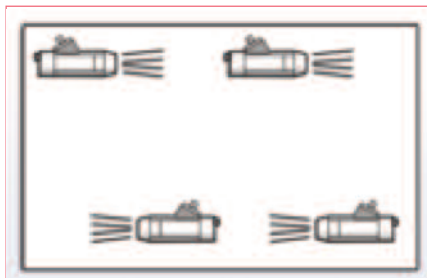
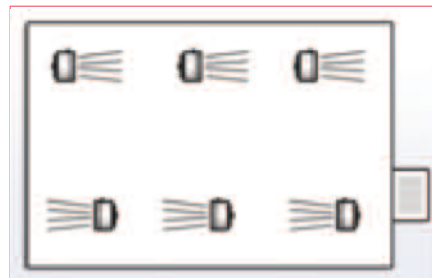


Fig. 3. Central boiler with water heaters.





Indirect fired unit, Winterwarm DXC heater.



Winterwarm DXW water units, the boiler house is adjacent.

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that only thermal heat will come into the house, and carbon dioxide and water vapour are discharged. The efficient tubular heat exchanger ensures that flue losses are limited to approximately 6%.

Oxygen for the burning process is also coming from outside, consequently this system is a room sealed appliance. No extra ventilation is necessary to extract carbon dioxide and water vapour, therefore ventilation can be kept to the required minimum level.

- Installed capacity: 320kW, four units of each 80kW. Investment (approximately): €17,500, equipment only, excluding installation costs.

- Total estimated annual gas consumption 28,000m³ of natural gas, total seven flocks per year.

This type of heater is very robust and easy to clean. The heat exchanger is easily accessible by means of two large doors.

The principle of the heat exchanger comes from industry and has proven its reliability for many years.

The heater connections are a flexible gas hose and a flexible stainless steel flue system, which allow the user to place the heaters in different positions.

Central boiler house

In this example we choose a normal cast iron central heating boiler with a fan assisted burner on gas. The hot water is distributed towards water heaters. In this situation the carbon dioxide of the heating system will also be extracted.

In principle, the situation is not very different when a boiler suitable for wood chips or oil is applied.

- Installed capacity: 330kW, six units of each 55kW. Investment (approximately): €35,500 (€21,000 for the water heaters and €14,500 for the central heating boiler), equipment only, excluding installation costs.

- Total estimated annual gas consumption 28,000m³ of natural gas, total seven flocks per year.

In this case we also need an additional

small building adjacent to the poultry house to install the central heating boiler.

The boiler heats the water and the hot water is distributed towards the water heaters. Consequently, we will have system losses of about 8% compared to indirect gas fired heaters.

The total investment of this installation is the highest. In some countries the government is subsidising alternative heating sources like bio-mass or wood chips. This type of heating can be interesting in these situations.

Return on investment

It is interesting to know when the additional investment turns back. There are two situations:

- Traditional installation versus indirect gas heaters.

The expected annual saving can be estimated as 20% of 35,000m³ of natural gas. The additional investment costs are €8,500.

Assuming that the actual price of natural gas is stable at €0.65/m³, the payback period will be as follows: $8500 / (0.20 \times 35,000) \times 0.65 = 1.9$ years.

- Traditional installation versus an installation with a central boiler house with water heaters: Estimate of saving is 18.4% of 35,000m³ of natural gas. The saving is about 8% less as a result of system losses. In this situation the additional investments costs are €26,500.

The payback period is $26,500 / (0.184 \times 35000) \times 0.65 = 6.3$ years.

Installation cost

In all examples the installation costs are not taken into account. However there is a difference in the three situations.

- Example 1: Only a simple gas connection is needed, which is relatively cheap.

- Example 2: Also requires a simple gas connection. An additional flue system is needed.

- Example 3: A separate boiler house must be available with flow and return water con-

nection and the cost of a separate boiler house. This solution will have the highest installation costs.

Conclusion

In the overview the most logical choice appears to be indirect fired gas heaters. Although we have flue losses of about 6%, carbon dioxide is discharged and ventilation can be kept to a minimum level in the first days of the flock. Units can be moved and the farmer is flexible where to place the heaters.

The additional investment costs are earned back in an acceptable 1.9 years in this example. Costs of this type of installation are the lowest for the investment as well as for the running cost considering that we do not accept carbon dioxide in the poultry house. In the given examples there are a couple of assumptions taken like price of energy and also climate conditions. These can influence the outcome of the calculation significantly.

In the examples a situation was given with a mild climate like an average West European country. When the outside temperature is lower the profit will be much more.

In climate conditions like in Ukraine or Russia one could imagine much more can be saved on cost of energy, and the payback period is shorter. Also the price of energy is important. The higher the price the shorter the payback period. And one thing is for sure: the price of energy will only rise as the sources of energy are not endless.

Think about it: the annual energy consumption of one poultry house is equivalent to the consumption of 20 family houses.

Therefore, the total demand for energy in poultry production is certainly something not to be neglected. A short payback period is nice for the investor.

However, poultry producers, governments and manufacturers, and companies or people related to poultry production should think about this in a wider perspective and look more in the longer term and install as many sustainable solutions as possible. ■