Innovation Project

Energy Cluster

nordwest2050

Air-Conditioning Turkey Stalls: Use of the Waste Heat of a Block-Scale Cogeneration Plant

A farmer and turkey raiser in Varrel (Oldenburg, Germany) has set up an absorption cooling plant on his farm which provides the necessary air-conditioning for his stall on hot summer days with the help of the waste heat from a biogas plant. The biogas plant itself is fueled partially by turkey manure, and the waste heat from the cogeneration plant linked to the biogas facility is used to operate an absorption cooling plant. The absorption cooling experts from the companies SolarNext AG and Meyer Kühlanlagen, together with the University of Bremen are working on implementation. The project has been subsidized to the tune of €185,000 by the Federal Ministry for Education and Research. The farmer's self-payment share amounted to €45,000.

The Need for Climate Adaptation

The vulnerability analysis of nordwest2050 has shown that for various sectors, including information and communications technology and agriculture, a significant increase in the requirement for cooling can be expected due to the temperature increases caused by climate change. Especially in agriculture, the health and well-being of animals depends on temperature. But also important economic parameters such as stall hygiene – the avoidance of the emergence and spread of disease – or weight gain of fattening poultry can be negatively affected by temperature increases. The costs to be expected from this could be reduced or avoided entirely by using the waste heat of cogeneration facilities, such as biogas plants, for cooling and air-conditioning the stalls.

Method and State of Implementation

At a farm operation in Varrel (Oldburg), the farmer raises turkeys in three stalls. The resulting turkey manure, together with the corn silage, serves as a fermentation substrate for a biogas facility. A fermentation container and a fermentation residue dryer are operated with the waste heat from the cogeneration plant. The stall and the farmhouse are heated by another satellite cogeneration plant. In the summer, the processing the cogeneration plant has hitherto been emitted to the atmosphere by means of a dry cooler, for want of a heat-sink.

In the context of a cooperative project between the farmer and nordwest2050, an absorption cooling plant was set up on the grounds of the farm. The absorption

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cooling plant generates a cold-water flow from the heat, with which the input air to one of the three turkey stalls is cooled. The cooling of the turkey stall is necessary in summer due to the high outside temperature. The sun and the body heat of the animals then heats the stall to the point that the animals suffer from heat stress. In case a particularly long heat waves, this could acutely endanger the lives of the animals, to the point of a total loss for the farmer. But even less extreme high temperatures increase the susceptibility of the animals to disease, and reduce their weight gain.

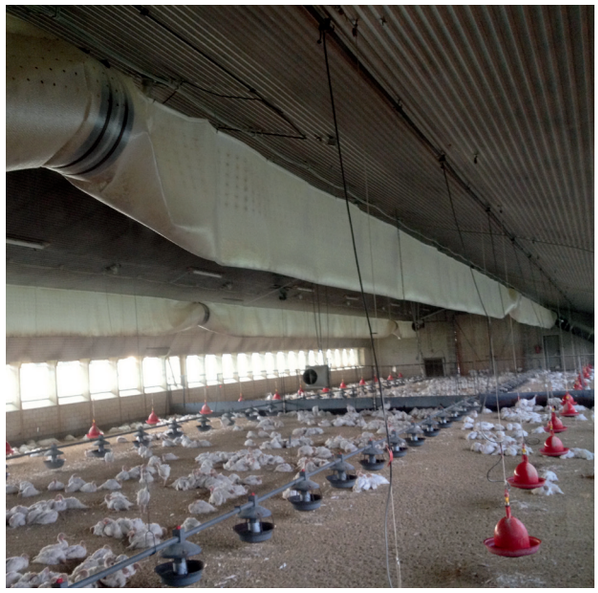
The generation of coolness from waste heat saves the additional use of expensive primary energy (electric power), and permits better utilization of the cogeneration plant. Moreover, it permits the farmer to dispense with the use of electrically operated coolant technologies, and thus reduces the burden on the power grid.

Results

The facility was completed in the spring of 2013, and handled the first heat wave of 2013, in July and August, very well. At the time to the highest outside temperatures to date, 34.9°C on August 2, 2013, the inside temperature of the stall could nonetheless be reduced by 4°C. As a result, a major increase in the well-being of the turkeys in the air-conditioned stall could be observed. Air-conditioning with cool, and hence dry air caused the litter, too, to be dryer, and hence better suited to avoid infections on the balls of the turkeys' feet.

Transferability

Cooling and air-conditioning by absorption cooling facilities which gain their operational energy from the use of residual or waste heat are transferable for various tasks in agricultural operations and food production. Especially interesting in this respect are commercial orchards which cool their fruit for lengthy periods in warehouses, and other food processors in the vicinity of suitable waste-heat sources. The use of cooling technology in the framework of mass animal husbandry is currently recommended especially from the point of view of animal protection. However, a sustainable climate-protection/



climate-adaptation strategy should also be oriented toward species-appropriate animal husbandry and the reduction of meat consumption.

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