CASE STUDY: **GRAIN DRYING, FINLAND**

BOWMAN HEAT TRANSFER TECHNOLOGY IN ACTION

Energy costs significantly reduced in new grain drying solution.

Project

Drying is an essential part of the grain production process in Nordic countries such as Finland. After harvesting, the grain has to be dried to reduce its moisture content from around 25% to 12-14% for storage. Large grain dryers blow hot air through the grain, usually via an oil or gas burner. However, the energy costs involved are significant and directly impact on food production costs.

During the drying process, warm air, which has passed through the grain, is exhausted to outside atmosphere, in a 'total loss' cycle. Typically this exhaust air still has a temperature of 35° C and 50-75% humidity, so a valuable energy source is lost. It takes up to 24 hours to achieve the required moisture level in a 30 ton batch of grain, so a farms typical drying season can last for up to 2 months, consuming between 25,000 and 40,000 litres of oil during that time.

A Bowman exhaust gas heat exchanger has been used as part of a new heat recovery system that dramatically reduces the amount of energy required and the emissions produced during the grain drying process.

BOWMAN®

A World Leader in Heat Exchanger Technology

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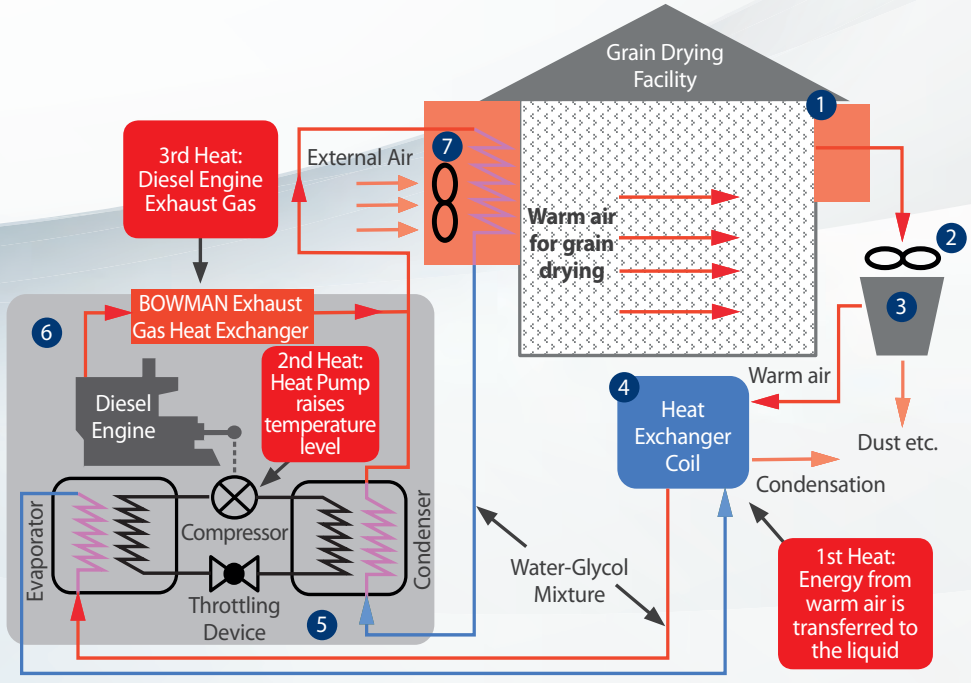
Solution

The drying solution has been successfully installed at the Ronimus Farm in Litti, Southern Finland, which is a well-established arable business. It is the first time this kind of installation has been undertaken in Finland, and possibly the first of its type in the world.

The system works by recovering a significant proportion of the warm exhaust air that is traditionally expelled from the farm's grain dryer to atmosphere. Any contaminants and grain debris are removed from the exhaust air prior to it being recirculated and the 'cleaned' air transferred through a high efficiency Bowman exhaust gas heat exchanger in the main heat pump container, where it is heated back up to 65° C.

The CHP system has been set up to recover heat energy from half of the exhaust air that would normally exhaust to atmosphere. In the first year of operation, it has reduced the farm's fuel oil consumption by half, saving around 18,000 litres of fuel and halving its CO_2 emissions.

The system is designed to operate with outside air temperatures between -5° C to +30° C which is the typical outside air temperatures in the Nordic drying season. It can be retrofitted very easily to existing grain drying systems as well as new installations. As an additional bonus, the diesel engine is fitted with a generator with a shaft power of 55kW - enabling it to provide power to the pumps and other actuators of the heat recovery system.



Grain Drying from Diesel-Powered Air Source Heat Pump

System Overview

1: a closing damper channels warm exhaust air from the drier to an inside duct.

2: warm air is blown into a cyclone at high speed.

3: the warmed air is cleaned of debris in the cyclone.

4: heat from the warmed air is transferred to a water-glycol mixture and piped to the heat pump container.

5: the transferable heat pump container houses the diesel engine, compressor and a generator.

6: The diesel powered heat pump increases the temperature of the water/glycol mixture from around 35°C to around 65°C using heat recovered from the diesel engine via the Bowman EGHE.

7: the water/glycol mixture is then transferred to a pre-heating coil and from there to the dryer inlet air stream.

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