Waste heat recovery from corrosive flue gas

Project: CS-10-22
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Partners: HeatMatrix, VION food ingredients / Indorama, NL GUTS
Budget: 50,000 Euro

Objective:

The objective of this project is to demonstrate waste heat recovery from corrosive flue gas with a demonstration size plastic heat exchanger from HeatMatrix. This plastic heat exchanger is fully corrosive resistant to concentrated acids.

Motivation:

Many combustion processes have acidic flue gasses, which makes heat recovery close to or beyond the acid dew point very complicated. Corrosion resistant metal heat exchangers are expensive and are frequently too heavy for easy implementation in existing infrastructure. This is unfortunate because this waste heat could be easily integrated with cold combustion air, which increases the efficiency of such furnaces by up to 4 %.

Project scope:

A skid based demonstration size plastic heat exchanger with flue gas and combustion air fans and instrumentation will be constructed. The heat exchanger will be tested with two different kind of acid flue gasses.

Applicability:

There is a need for a low weight corrosion resistant and cost effective gas/gas heat exchanger for waste heat recovery from hot flue gas from a variety of combustion processes. The flue gas temperature from a typical combustion process that fires sulphur containing fuel (refinery gas, oil) is 150 °C or higher. Significant energy savings and carbon reductions can be realized on a global scale.

Results:

Cooling against ambient air

- Stable heat recovery at constant low pressure drop
- Some fouling at flue gas side
- No fouling at ambient air side
- Material properties not affected

Cooling against fouling process air

- Stable heat recovery similar to cooling against ambient air
- No fouling at flue gas side
- Fouling at process air side but with stable pressure drop
- Material properties not affected