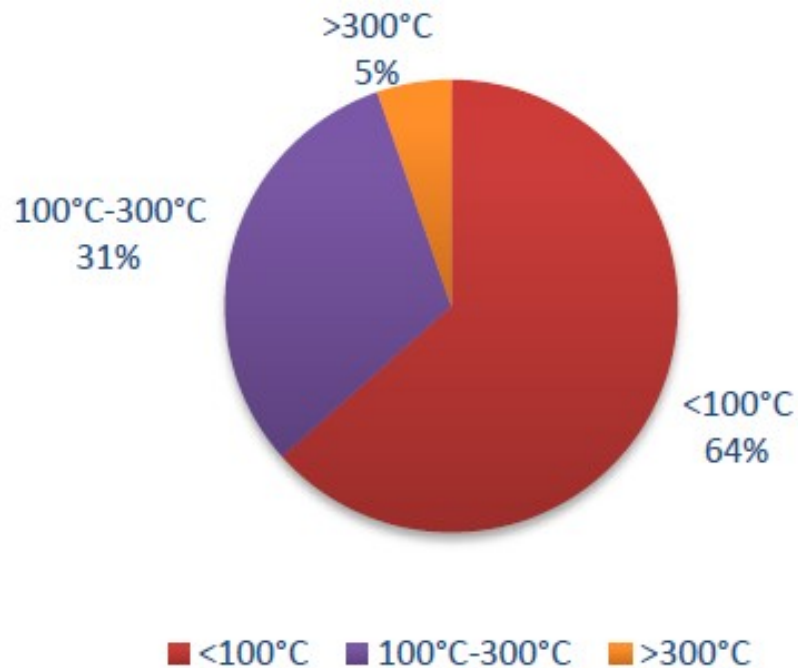


Heat transfer analysis of a dual modular heat recovery system

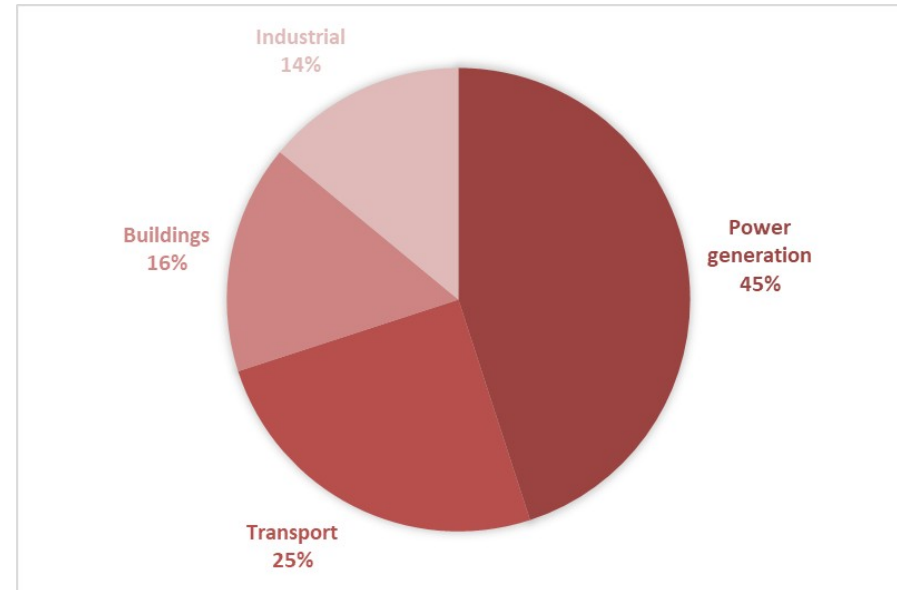
Authors: Robert Stefan VIZITIU, Andrei BURLACU, Marius BRANOAEA



Waste heat recovery potential



Temperature distribution of waste heat



Sectoral distribution of waste heat



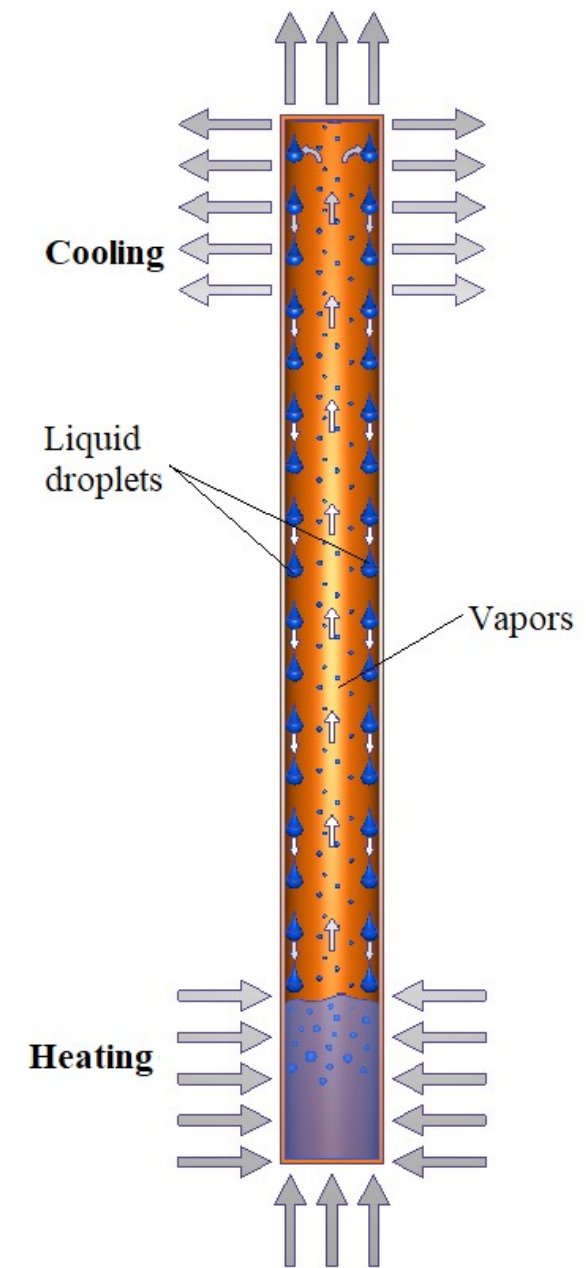
Heat recovery technologies

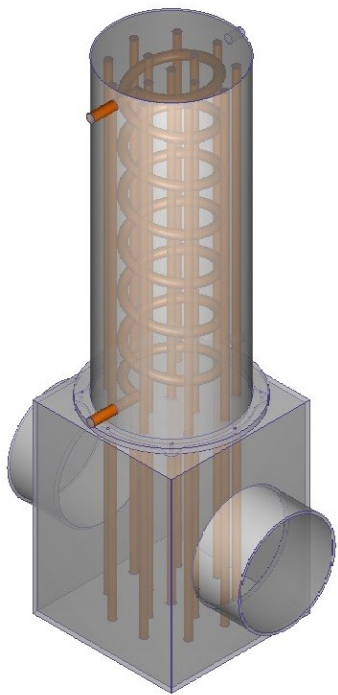
- Waste heat boilers
- Economisers
- Regenerators;
- Heat wheels
- Plate heat exchangers
- Heat pipe heat exchangers



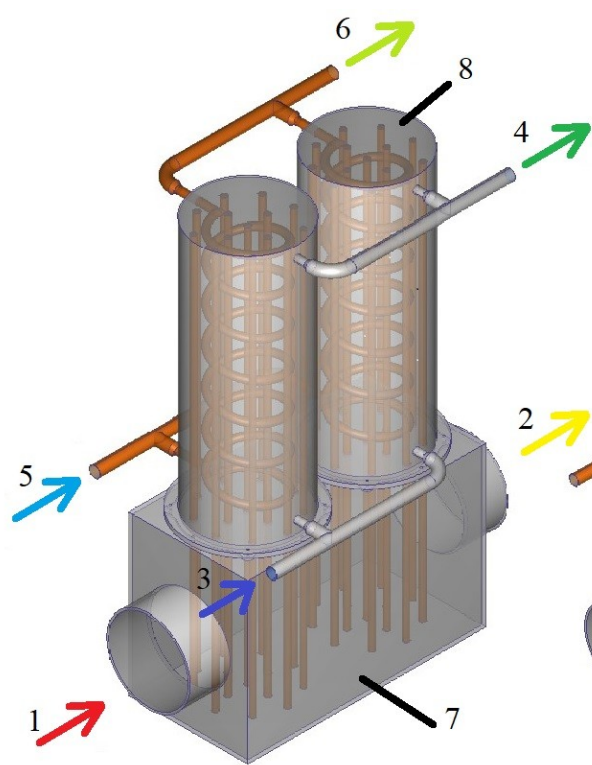
Heat pipe heat recovery systems

- Passive and very efficient thermal energy transport
- Separate heat exchange zones
- Compact equipments at small costs

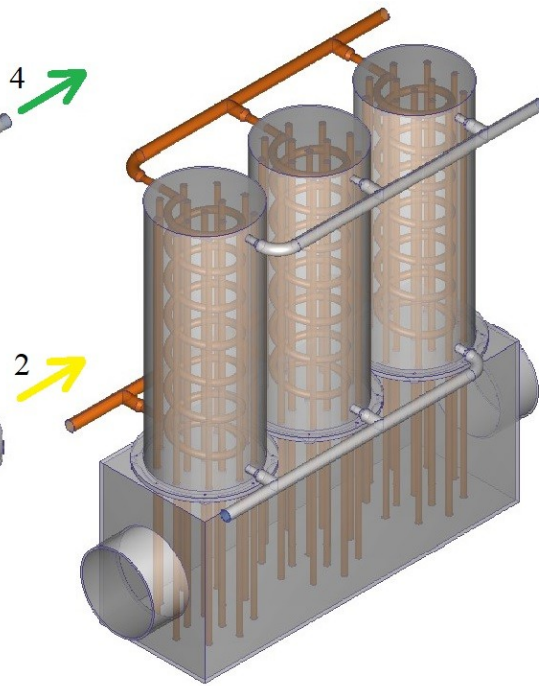




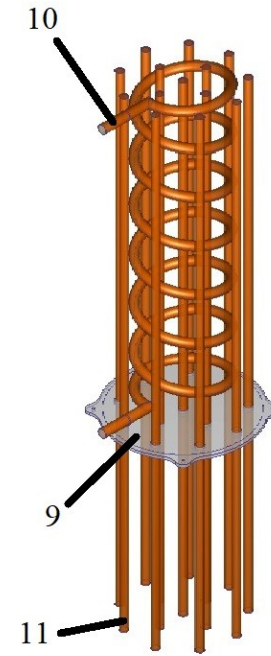
Type A - 1 module



Type B - 2 modules



Type C - 3 modules

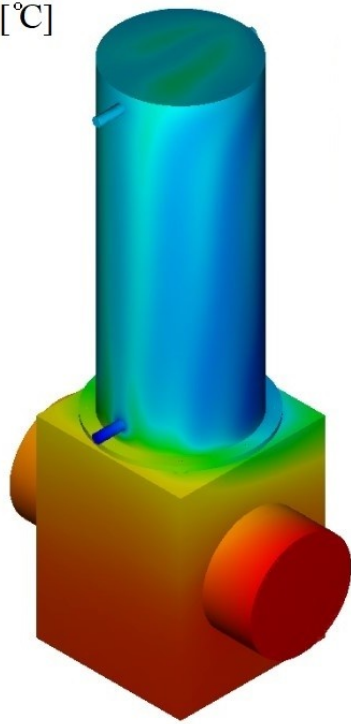
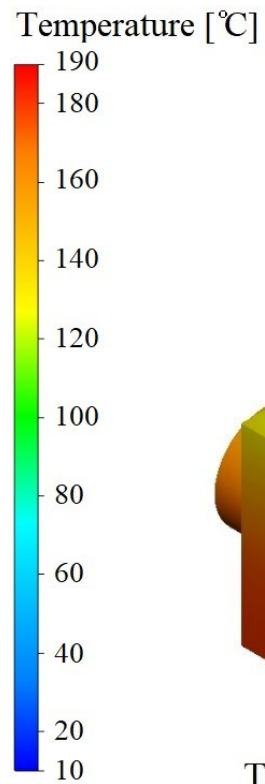


Detail 1

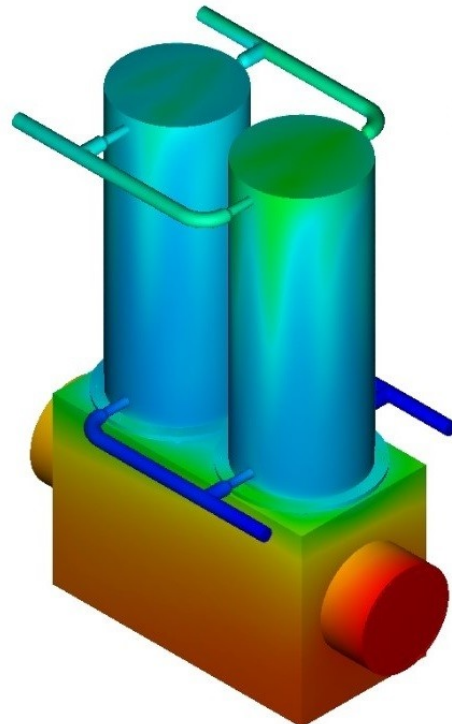
- 1-Flue gas inlet;
- 2-Flue gas outlet;
- 3-Water inlet;
- 4-Water outlet;
- 5-Air inlet;
- 6-Air outlet;
- 7-Evaporator;
- 8-Condenser;
- 9-Separation plate;
- 10-Air coil;
- 11-Heat pipe.



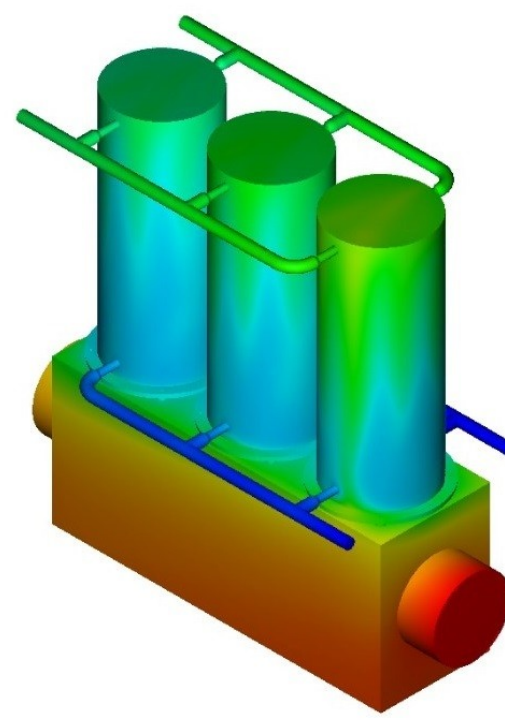
Dual modular heat recovery system



Type A - 1 module



Type B - 2 modules



Type C - 3 modules

Primary agent (waste flue gas):

- Inlet temperature: 190°C
- Mass flow rate: 50kg/h

Secondary agent (water):

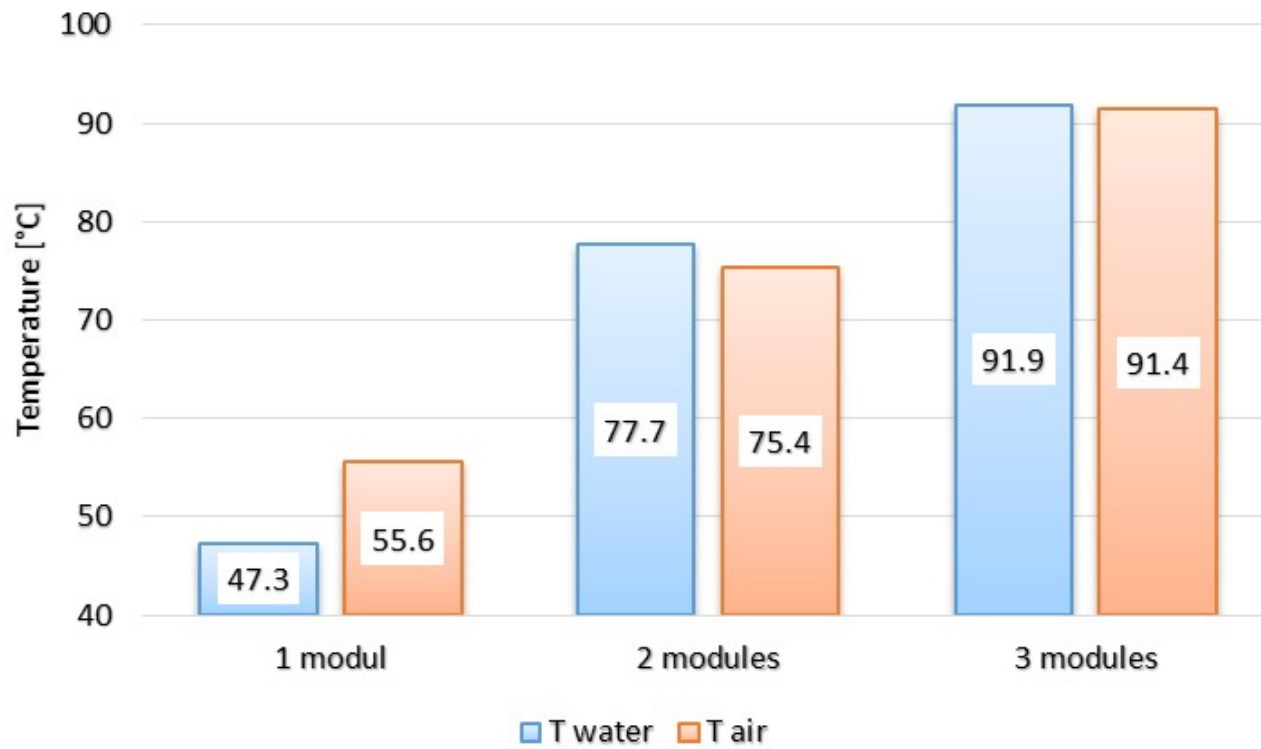
- Inlet temperature: 10°C
- Volume flow rate: 5l/min

Secondary agent (air):

- Inlet temperature: 10°C
- Mass flow rate: 10kg/h



Boundary conditions



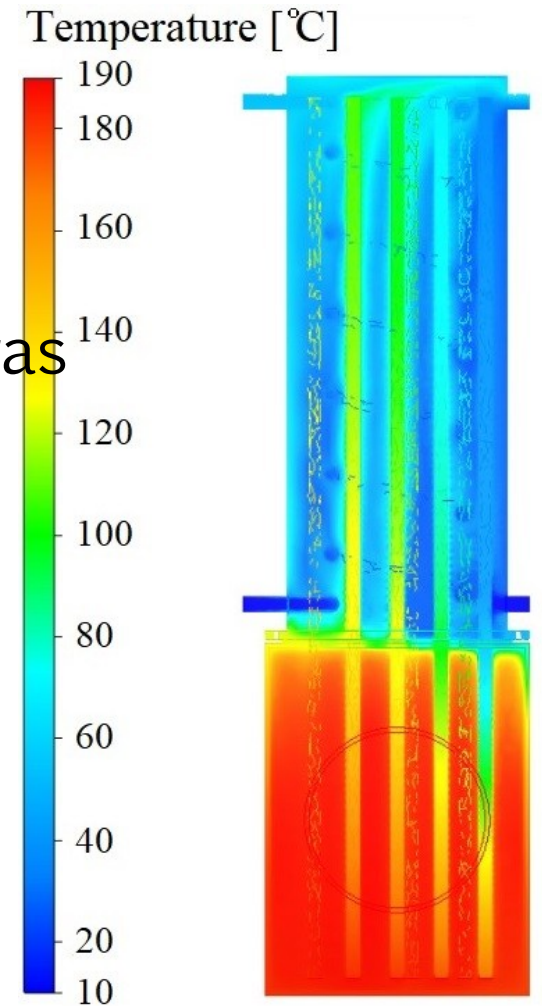
	<i>Water temperature [°C]</i>	<i>Air temperature [°C]</i>
Type A	47,2	55,6
Type B – Module 1	82,2	81,7
Type B – Module 2	72,2	70,6
Type C – Module 1	97,3	104,6
Type C – Module 2	91,8	93,8
Type C – Module 3	83,3	86,1

Results



Conclusions

- Feasible solution for heat recovery from waste flue gas
- Can prepare two different agents simultaneously
- Modular capability
- Continuity in operation in case of malfunctioning
- Positive impact on the environment



Mid-plane section through the DMHR



Thank you!

