Heat Pipe Condensing Economiser

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This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 680599.

Steam Generator, China National Offshore Oil Corp, China Sea, China

- GA 6400 smooth pipe 2 stage steam generator
- On-site assembly
- High reliability required for offshore location
- Low footprint required by space limitations
- Instant start up from gas turbine

Gas to Steam

Exhaust Temp In/Out	400 C/250 C
Water/Steam Temp In/Out	50 C/180 C
Exhaust Flow/Steam Rate	130,000/ 8,000 Kg/h
Energy Recovered	6.4 MW
Recovered Energy	£2,100K p/a
Project Cost	£1,200K
Payback Period	7 Months
£/KW recovered	£328

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Gas to Air Unit, Automotive, Aluminium Furnace, USA

Gas to Air	
Exhaust Temp In/Out	400 C/266 C
Air Temp In/Out	30 C/293 C
Exhaust/Air Mass Flow	12,000/ 6,374 Kg/h
Energy Recovered	528 KW
Recovered Energy	$155K p/a
Project Cost	$150K
Payback Period	16 Months
$/KW recovered	$123 (£76)

- GA 360 smooth pipe heat exchanger
- 500 kW combustion air pre-heater
- High particulate matter exhaust from furnace
- Low fouling, easy cleaning and maintenance, high reliability
- Unit positioned outside main factory premises
- Customer advised it was not possible by consultants (acid etc)

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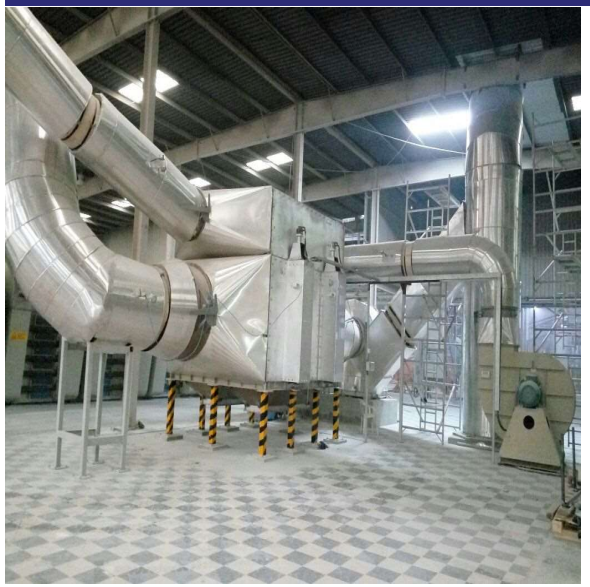
3 Kiln Heat Recovery, RAK Ceramics, UAE



Gas to Air

Exhaust Temp In/Out	235 C/162 C
Air Temp In/Out	34 C/160 C
Exhaust/Air Mass Flow	41,771/ 27,400 Kg/h
Energy Recovered	970 KW
Recovered Energy	£209K p/a
Project Cost	£190K
Payback Period	11 Months
£/KW recovered	£195

- GA 970 smooth pipe heat exchanger
- 970 kW drier air pre-heater sourcing exhaust from 3 tunnel kilns
- Pre-heated air delivered to multiple usage points
- High particulate matter exhaust from kilns
- Integrated moving plate cleaning system

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Heat Pipe Condensing Economiser in the Food Industry

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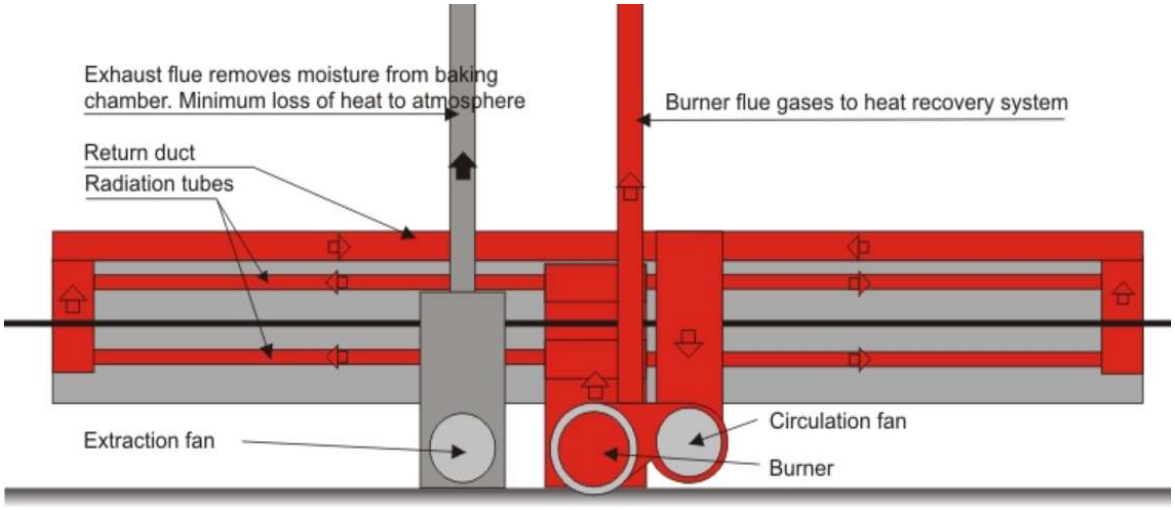
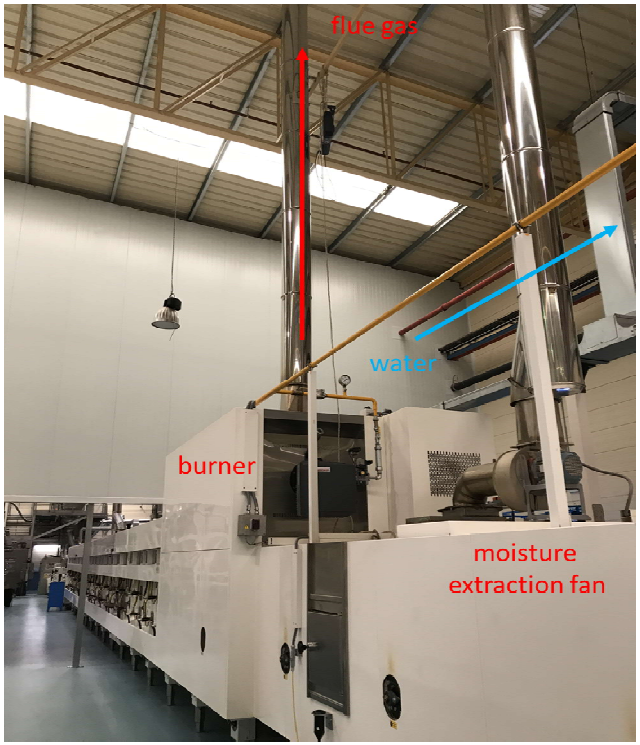
Site visit summary

- Location and date: ARLUY (Spain), June-2017
- Heat Source: Indirect radiant oven for biscuit cooking
- Heat sink: pre-heating water used for cleaning manufacturing machines





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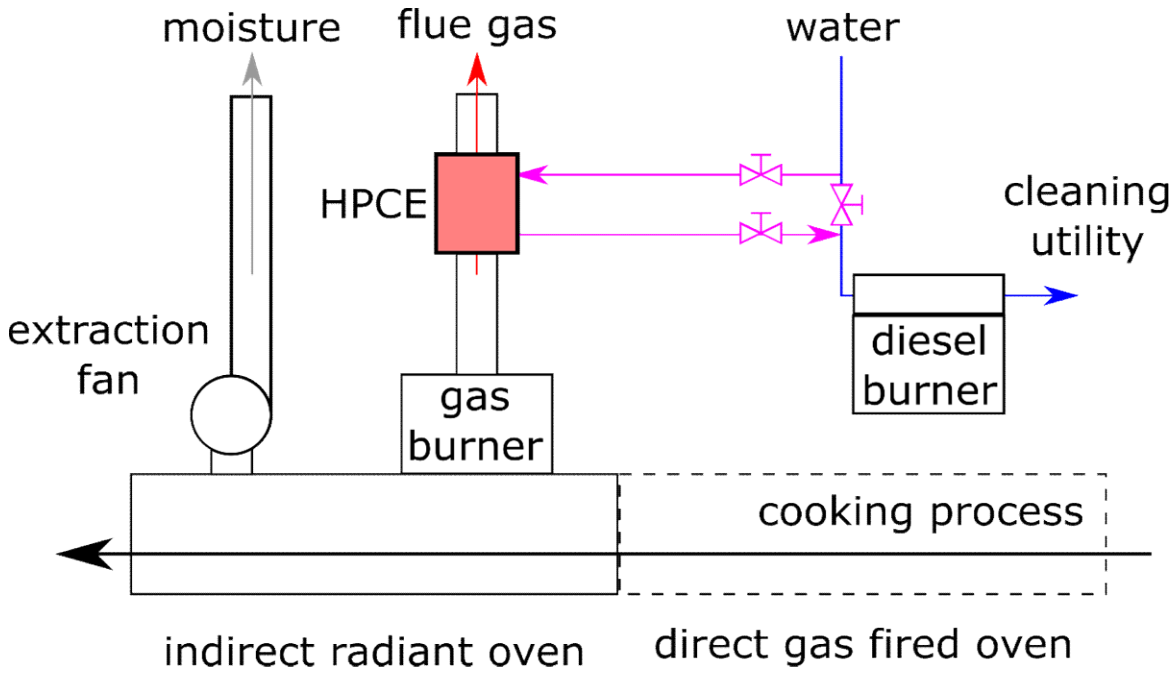
Proposed Application

- The proposed HPCE will be installed downstream the gas burner
- The HPCE will preheat the water before it enters the fuelled boiler
- Heat source (gas fire) is available 24/7



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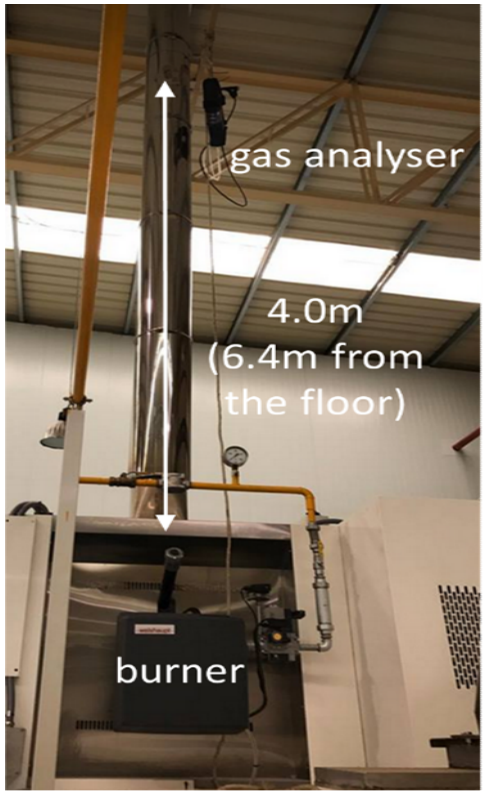
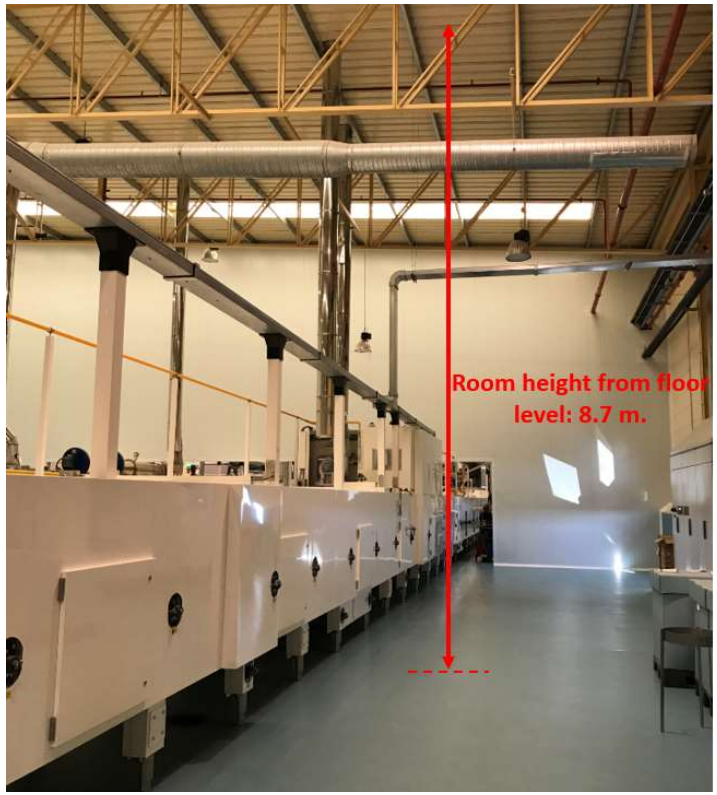
Space availability





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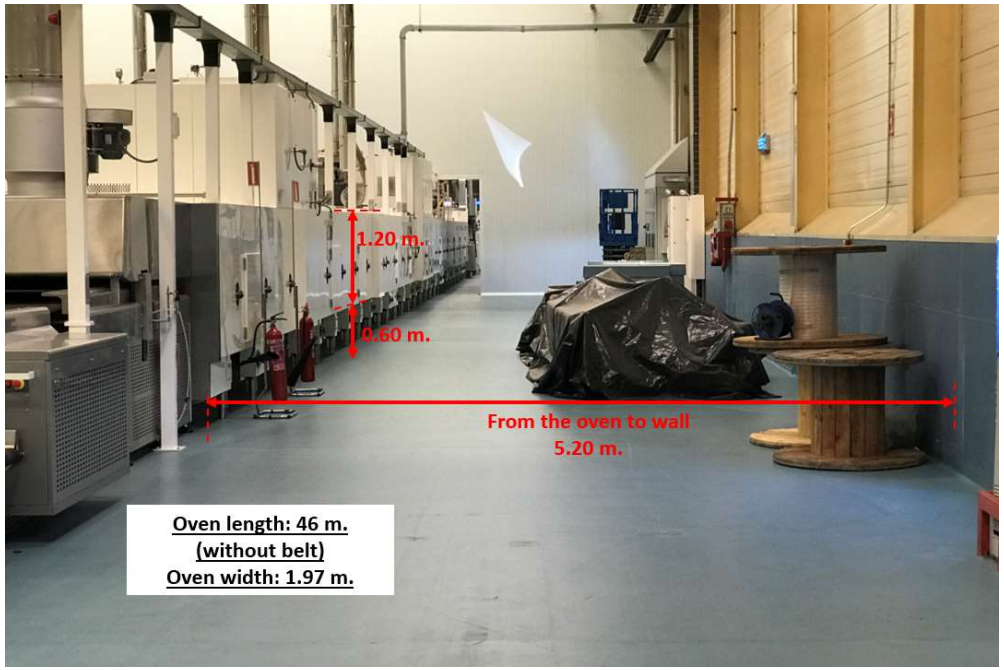

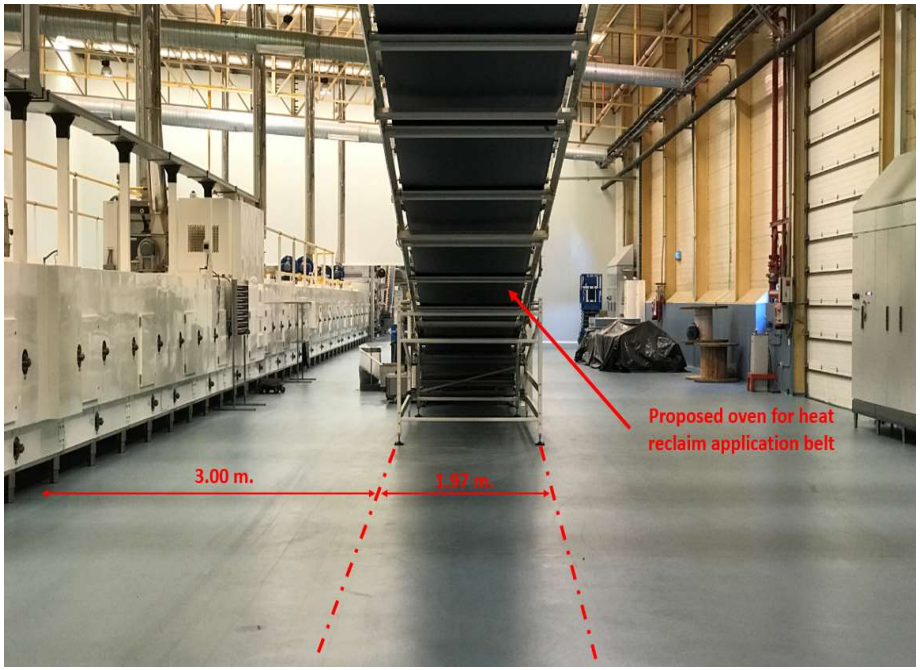

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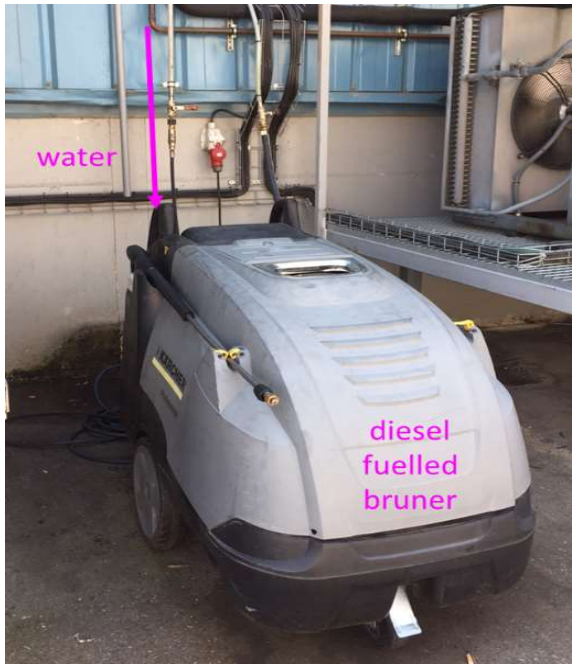
Heating Demand

Cleaning Water specifications

Temperature	**10-18°C**
Pressure	4bar
Flow rate	15 L/min
Pipe size	1”/2
Duty cycle	2 hrs continuously, 3 times/week (220hrs/year approx.)



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HPCE Thermal design

Thermal Design Parameters	
Exhaust mass flow rate	357 kg/h
Water Mass flow Rate	500 kg/h
Exhaust average specific heat capacity	0.288 Kcal/Kg.°C
Water average specific heat capacity	1 Kcal/Kg.°C
Exhaust inlet temperature	203°C
Exhaust outlet temperature	50°C
Water Inlet temperature	20°C
Water Outlet temperature	45-48°C
Recovered heat	**18.349 kW**

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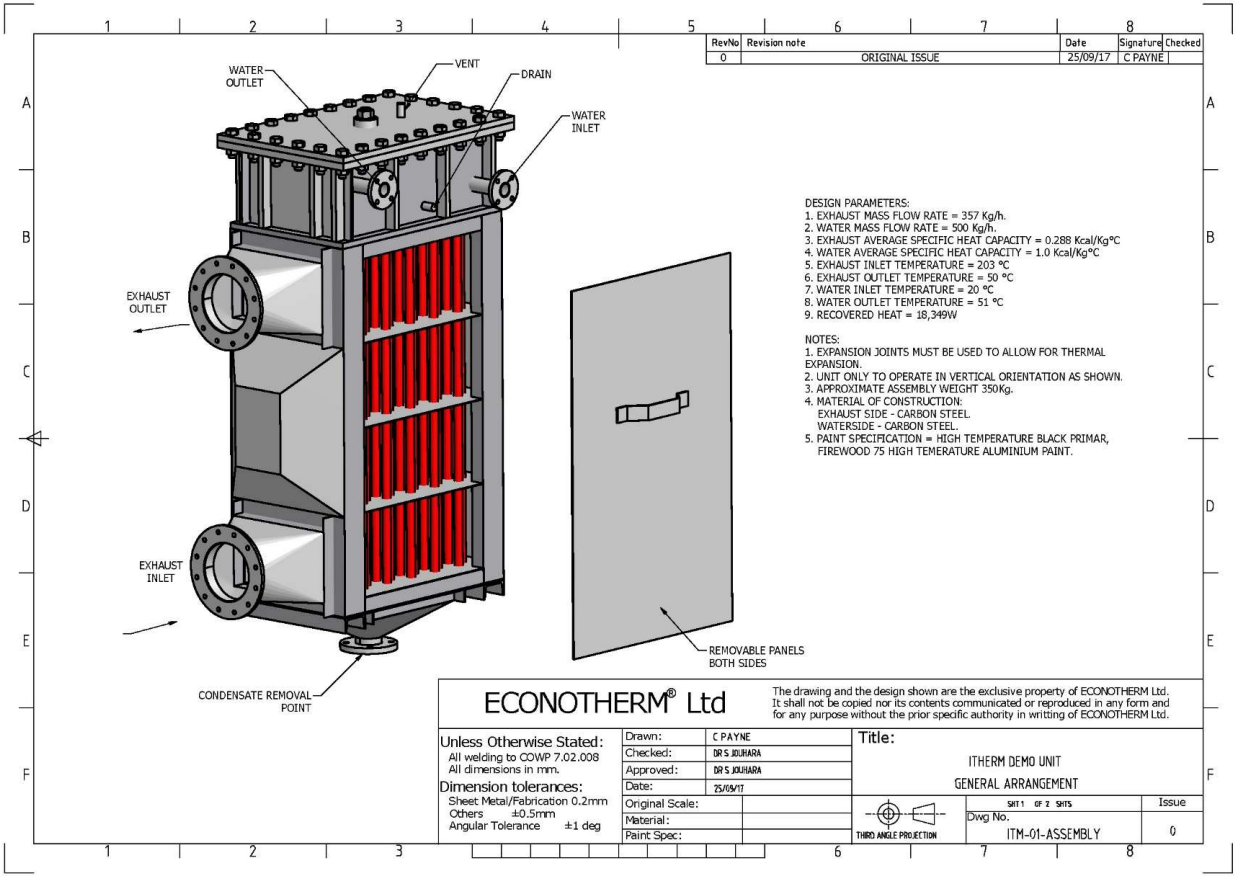
HPCE Mechanical Design



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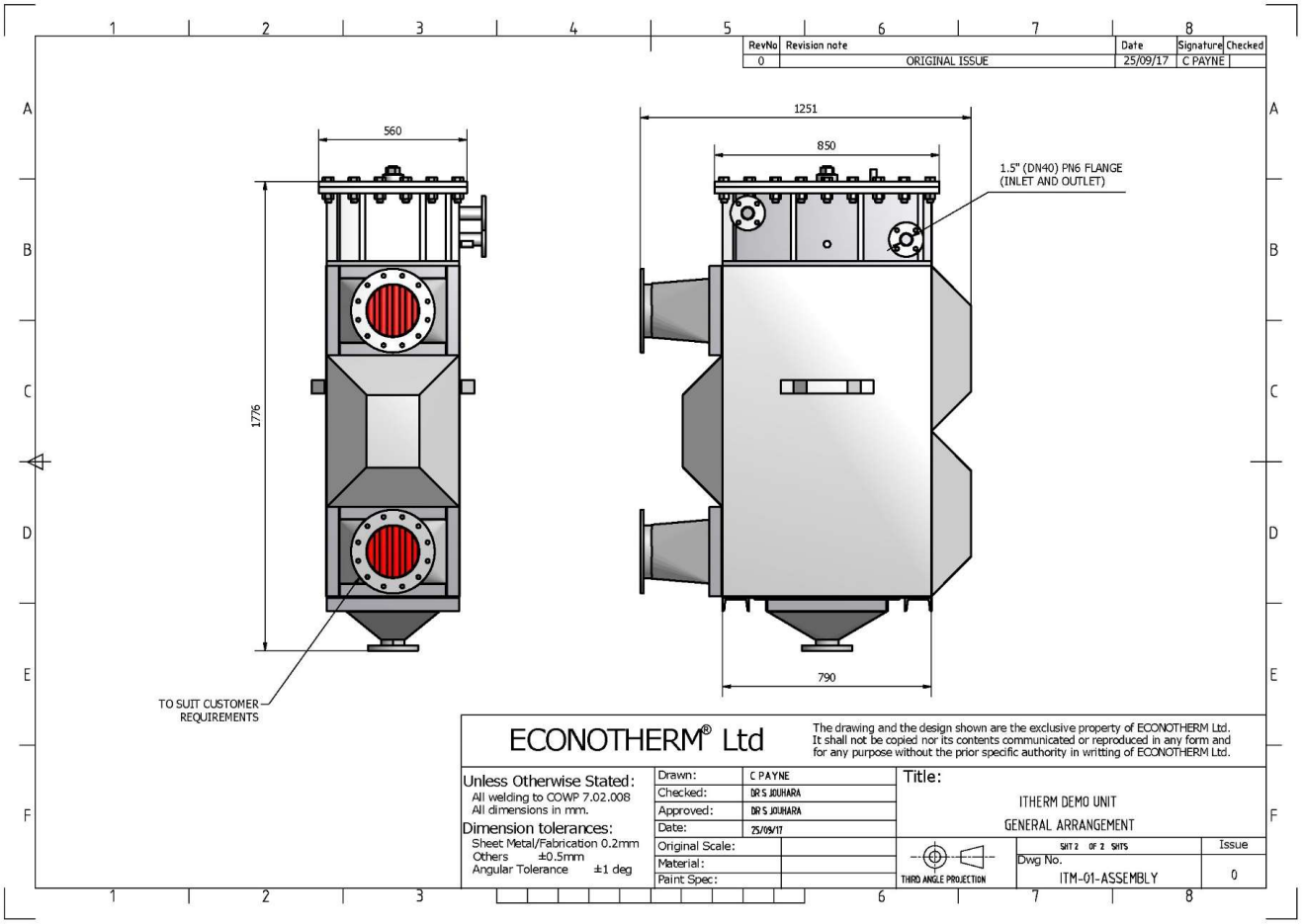

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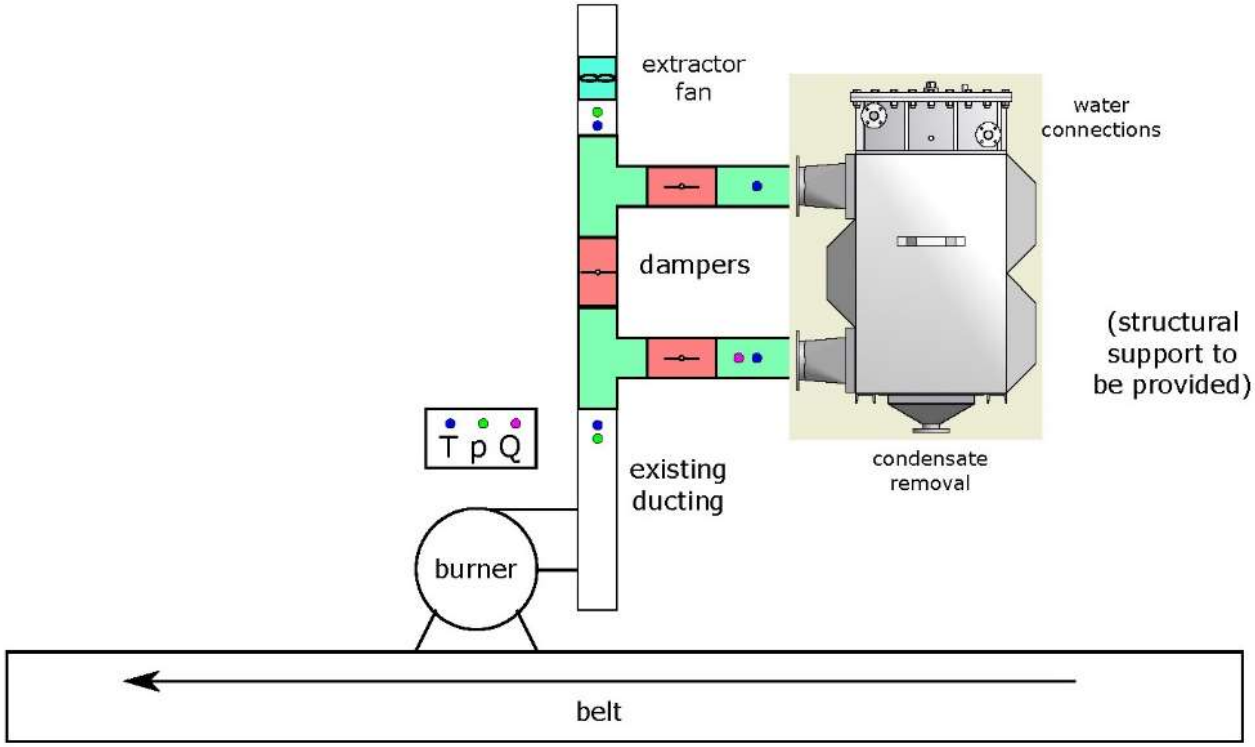
HPCE Installation



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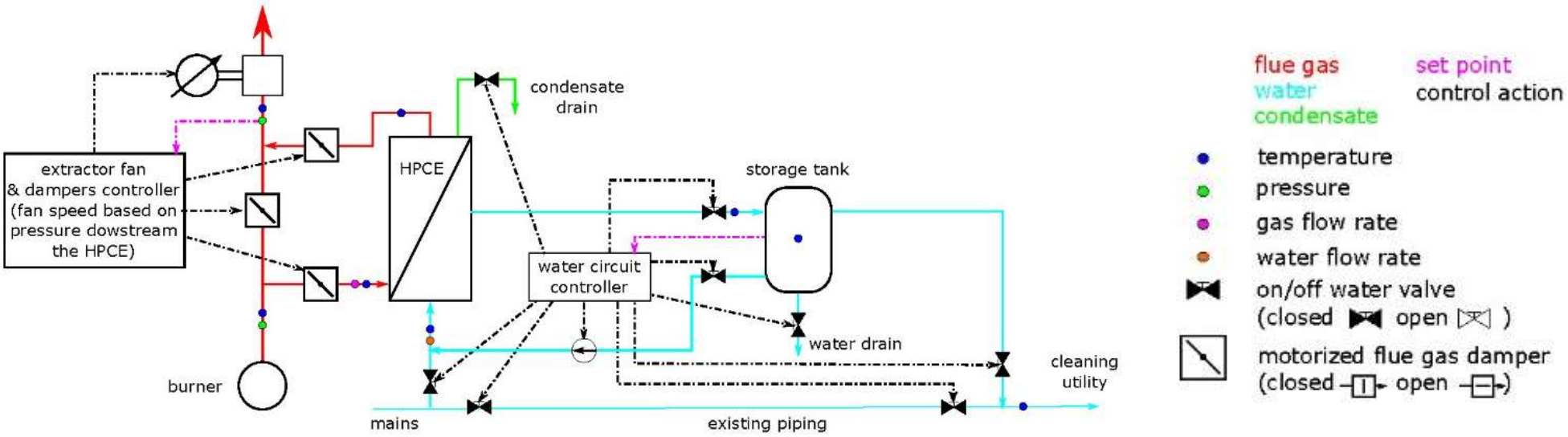
HPCE Installation

Sensor Layout



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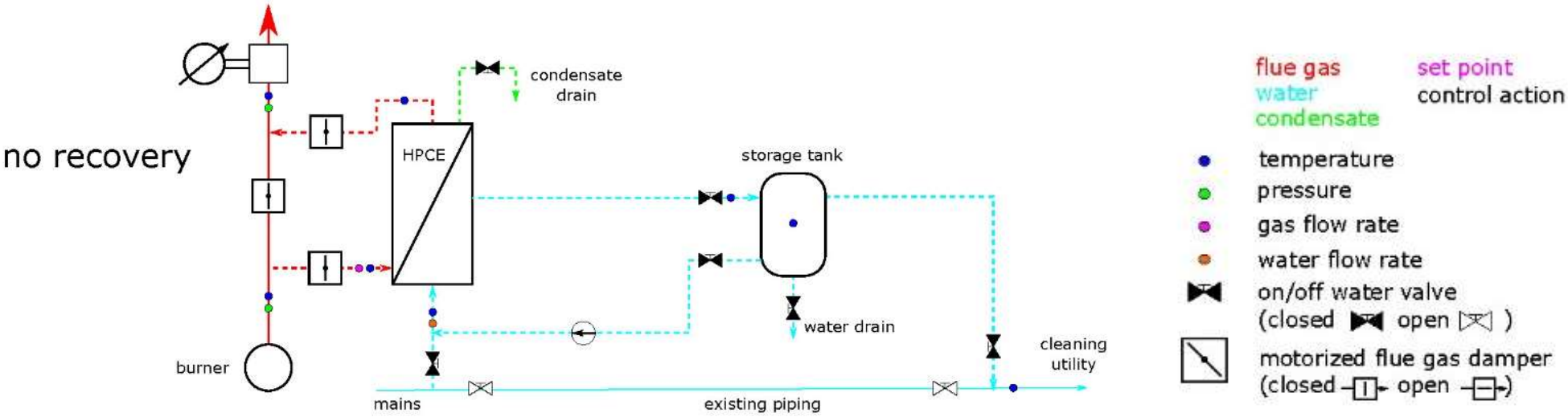

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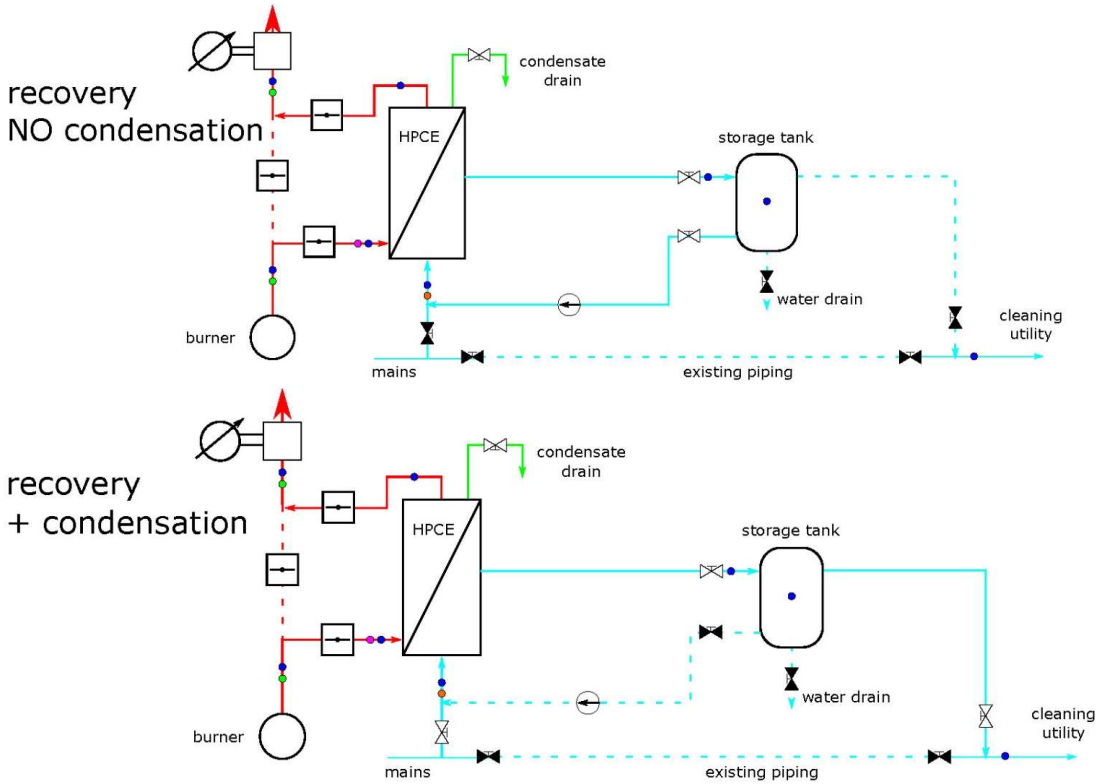
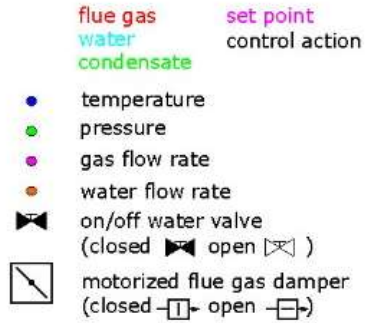
HPCE Installation





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