



An integrated CO₂ unit for heating, cooling and DHW installed in a hotel. Data from the field

EU GREEN WEEK 2021 PARTNER EVENT

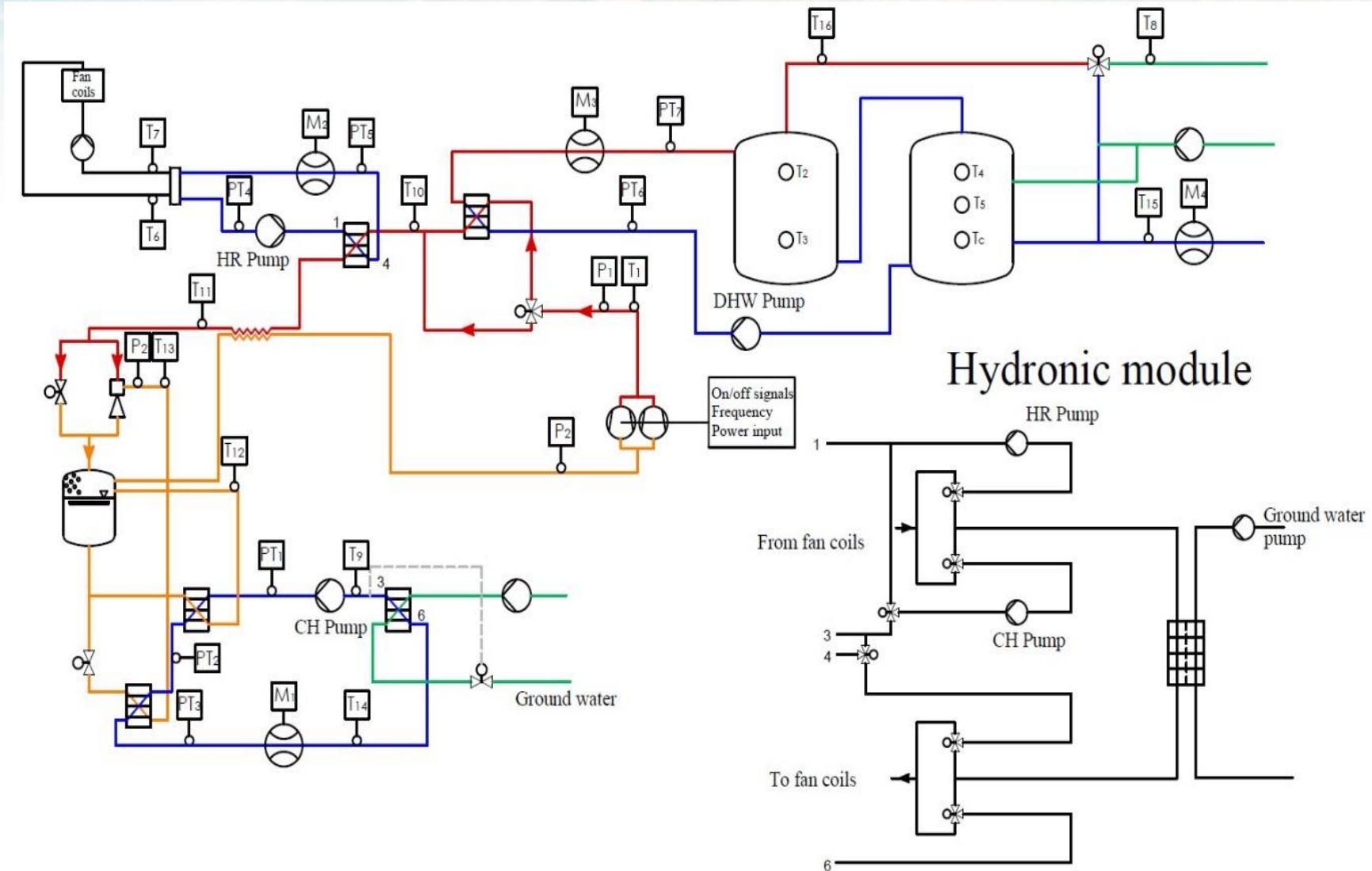
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INTRODUCTION

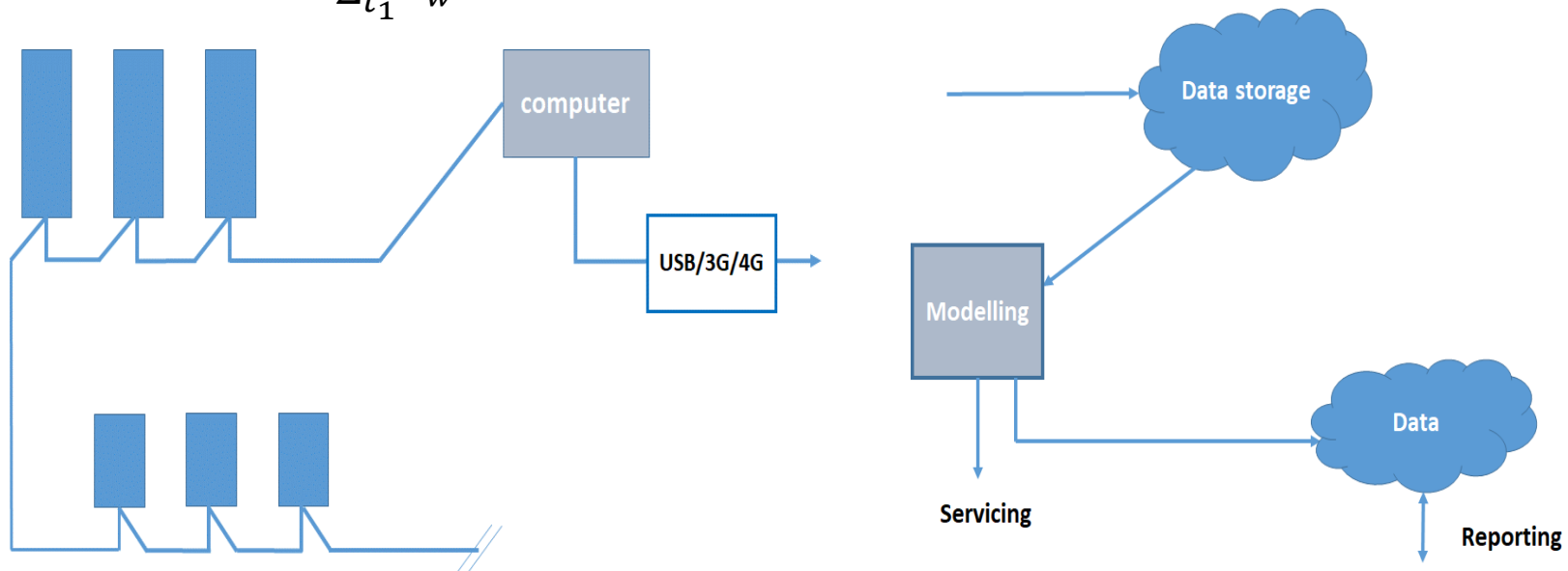
- CO₂ unit installed in a hotel in North Italy.
- The unit provides heating, cooling and DHW for the building
- The heat sink and source is groundwater.
- An original two evaporator layout is implemented, with two-phase multiejector as expansion device.
- Data from the field are collected and analyzed to assess **energy performances** and **useful effects** under different boundary conditions and load requirements.

UNIT LAYOUT AND SENSOR LOCATION

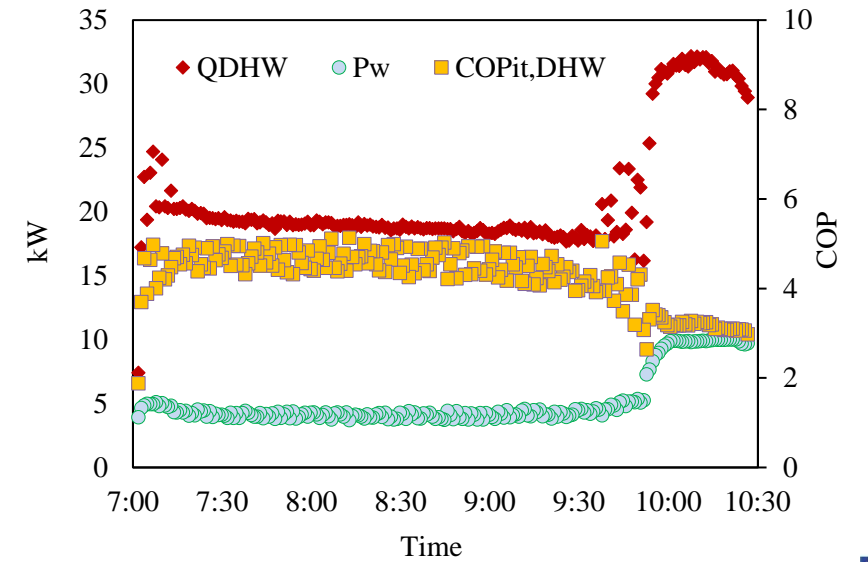
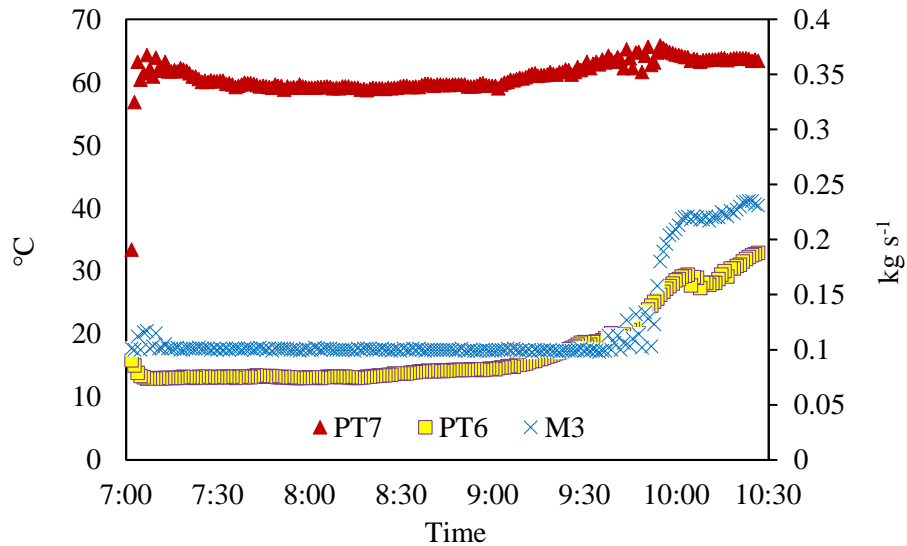
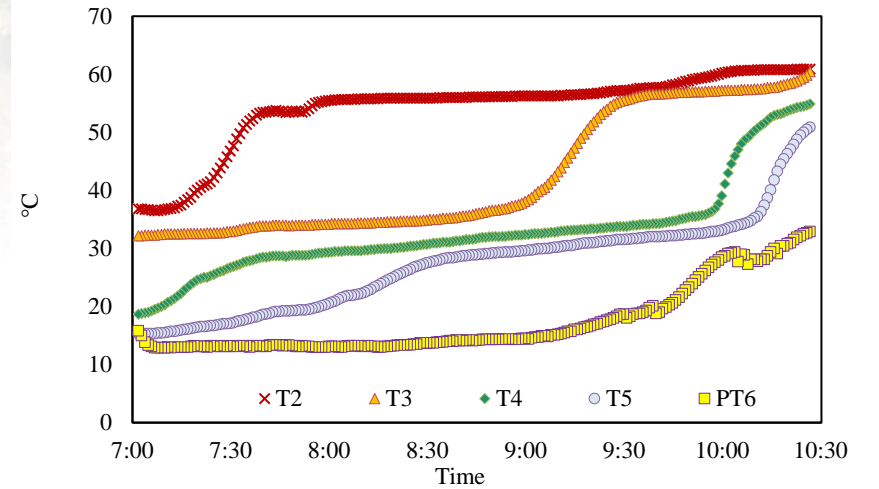
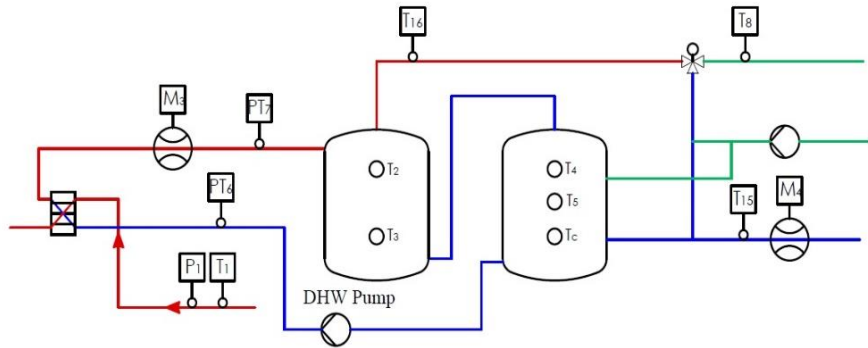


DATA COLLECTION

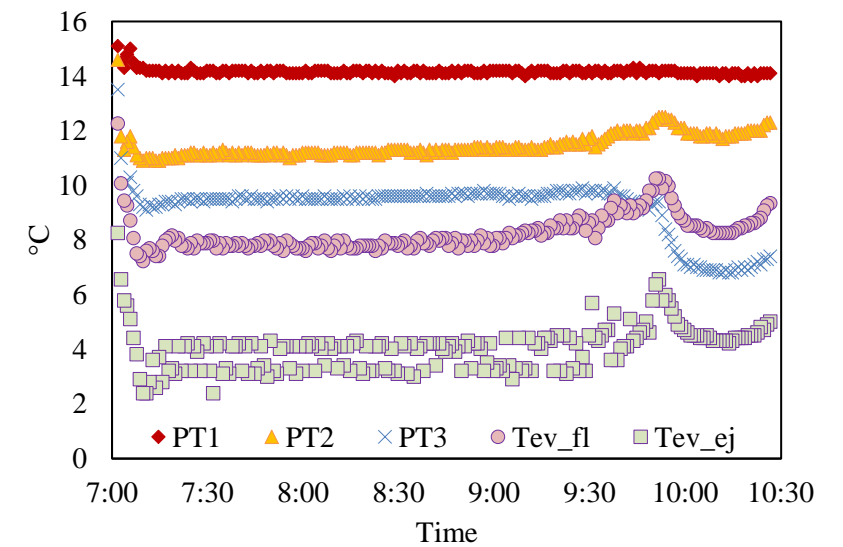
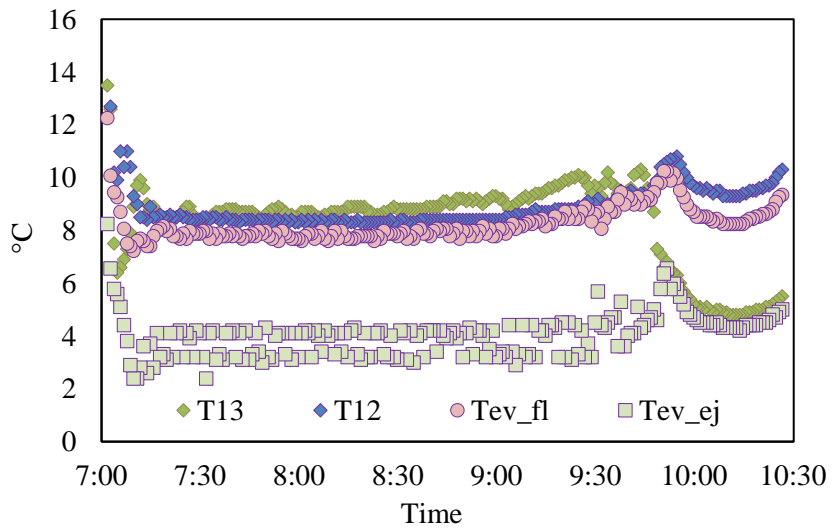
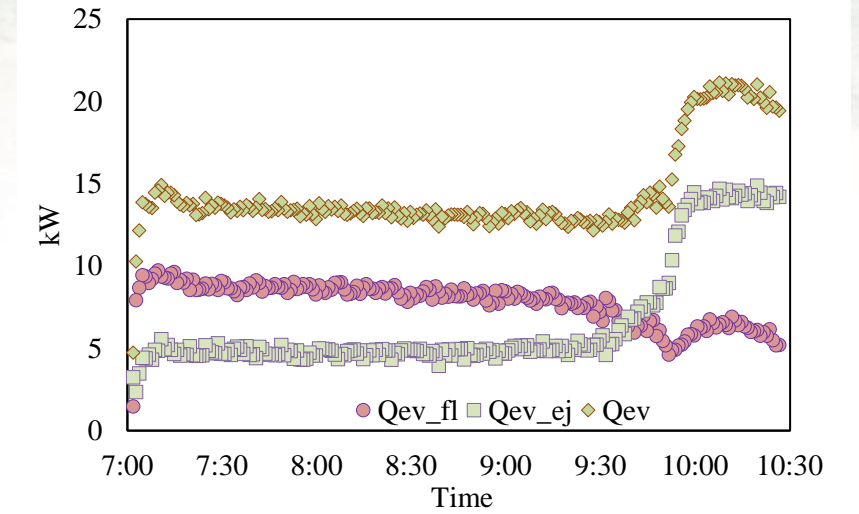
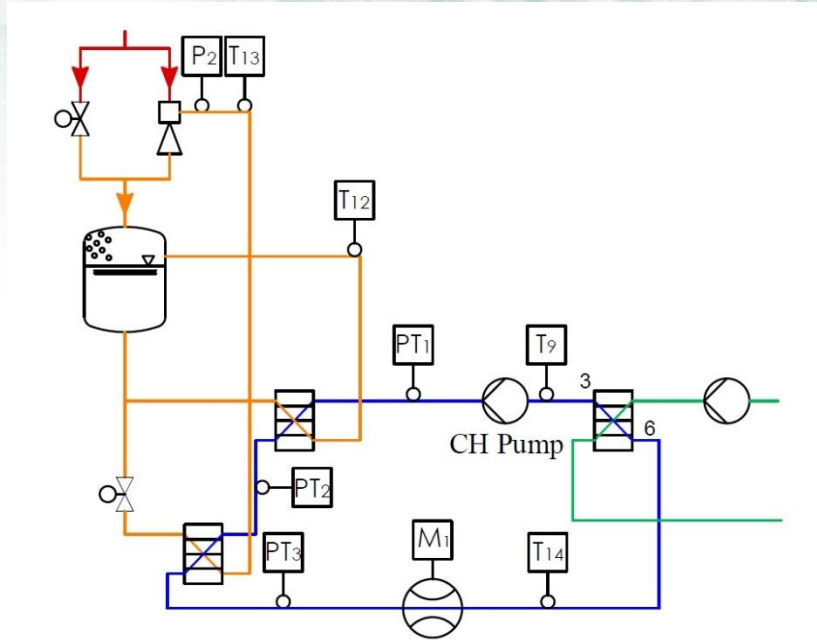
- $Q = M_j C_p | T_{PT_{in}} - T_{PT_{out}} |$
- $COP_{it} = \frac{Q}{P_w}$
- $COP_{av} = \frac{\sum_{t_1}^{t_2} Q}{\sum_{t_1}^{t_2} P_w}$



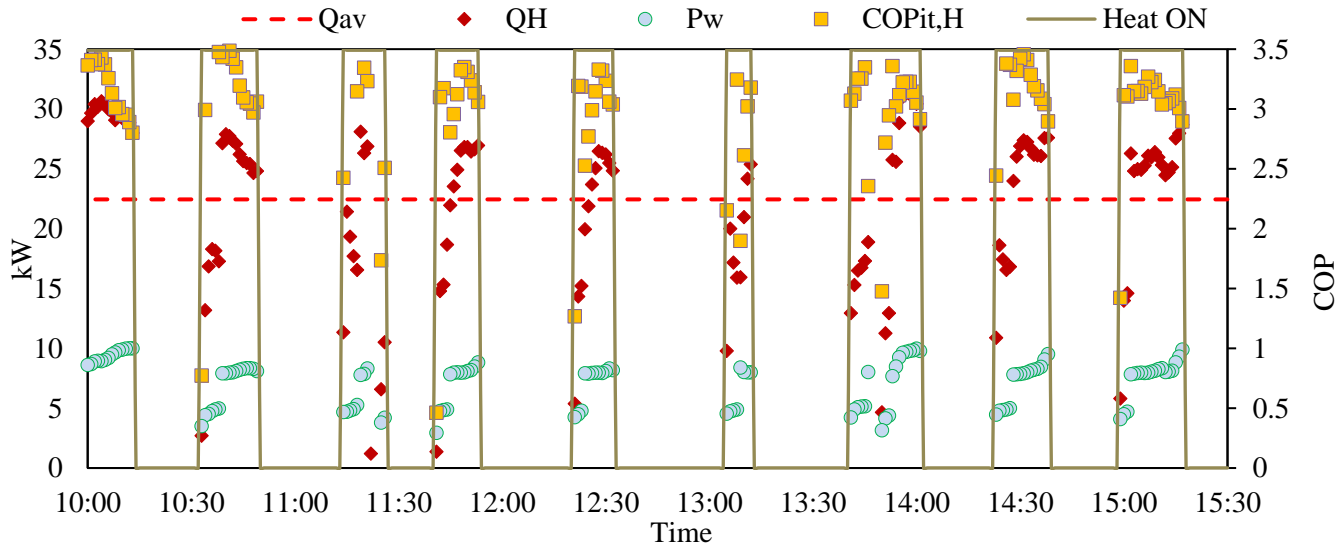
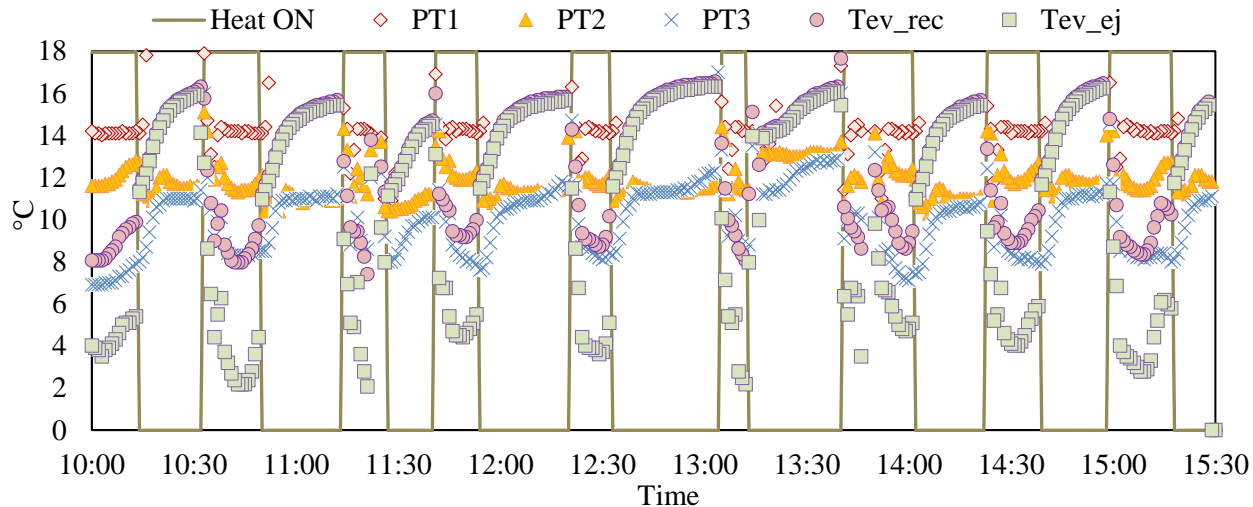
DHW WORKING MODE



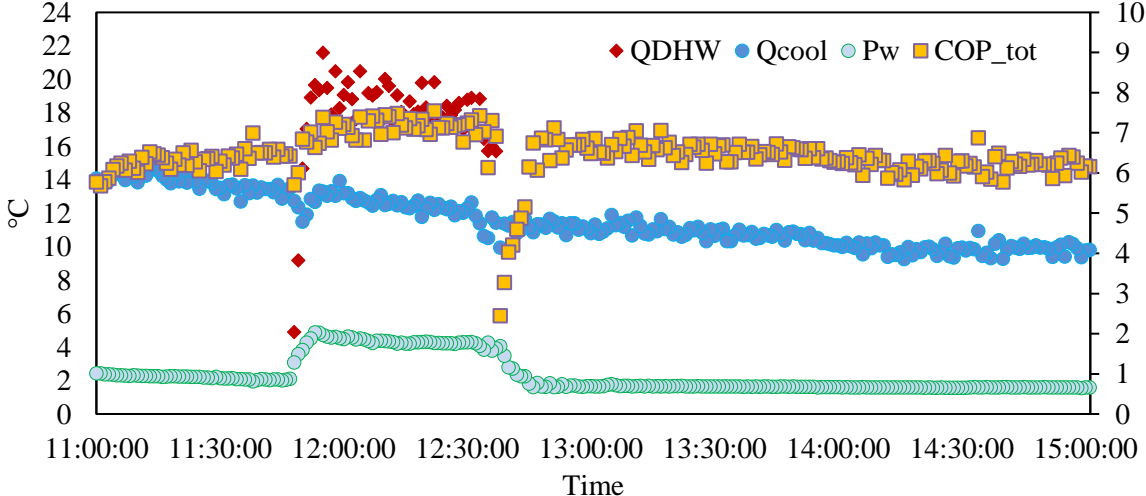
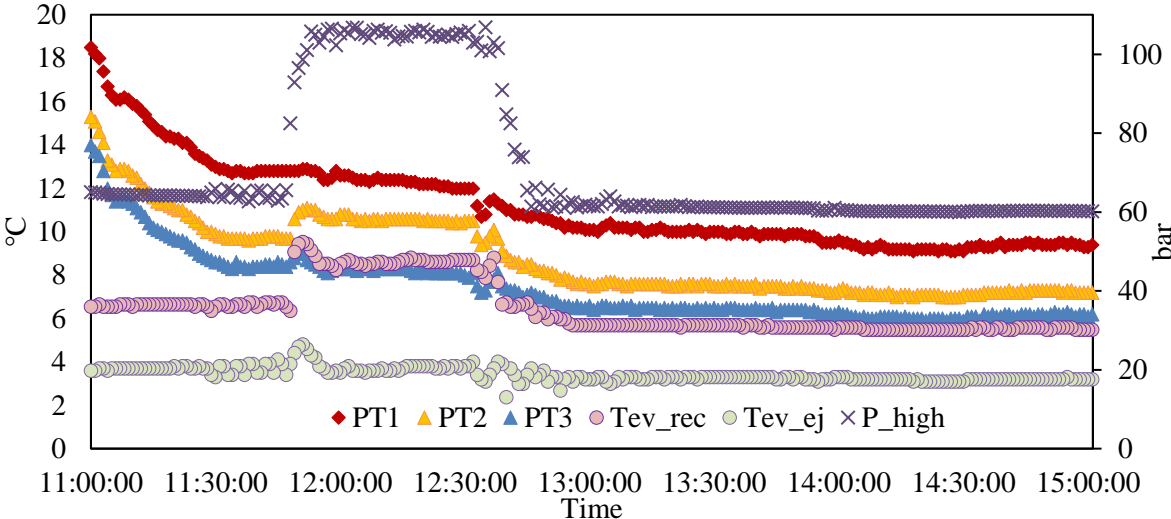
EVAPORATOR PERFORMANCE



HEATING MODE



COOLING MODE



$$COP_{av,COOL} = 6.2$$

$$COP_{av,COOL+DHW} = 6.9$$

CONCLUSIONS

- Field results of a CO₂ unit installed in a hotel in North Italy are analysed, showing good performances especially during **DHW production and simultaneous cooling and DHW production**.
- During DHW, it is crucial to keep the **stratification** inside the tanks. Storage has to be properly sized.
- Control of the compressor has to be improved to reduce on-off working conditions.
- The two evaporator layout work smoothly and guarantees unit operations regardless of partialization and ejector circulation ratio.

Thank you

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CNR-ITC

Enex Srl



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