An integrated CO\textsubscript{2} unit for heating, cooling and DHW installed in a hotel. Data from the field.

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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

- \( Q = M_j C_p \left| T_{PT_{in}} - T_{PT_{out}} \right| \)
- \( COP_{it} = \frac{Q}{P_w} \)
- \( COP_{av} = \frac{\sum_{t_1}^{t_2} Q}{\sum_{t_1}^{t_2} P_w} \)
DHW WORKING MODE
EVAPORATOR PERFORMANCE

Diagram showing a flowchart of an evaporator system with temperature sensors and heat output lines.

Graphs showing time vs. temperature and heat output for different conditions in the evaporator system.
HEATING MODE

HEAT Engine Mode

- Heat ON
- PT1
- PT2
- PT3
- Tev_rec
- Tev_ej

Temperature vs Time

- Qav
- QH
- Pw
- COPit,H
- Heat ON

Energy vs Time

- kW
- COP

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COOLING MODE

\[ COP_{av,COOL} = 6.2 \quad COP_{av,COOL+DHW} = 6.9 \]
CONCLUSIONS

• Field results of a CO\textsubscript{2} unit installed in a hotel in North Italy are analysed, showing good performances especially during \textit{DHW production} and \textit{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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