Fit4Micro

MICROCHCP HYBRID HEATING AND COOLING SYSTEM RUNNING ON SUSTAINABLE LIQUID BIOFUELS

Fit4Micro is a Horizon Europe project aimed at developing a new generation of combined heat, power and cooling system, based on a novel technology of micro gas turbine working on renewable energy.
The project's activities will focus on the implementation of the Intercooled Regenerative Reheat Gas Turbine (IRRGT) micro gas turbine: an important phase will be the one concerning the identification of resistant materials and combustors for the turbine, that will also comprehend several test campaigns for assessing its performance and optimizing its technology.

THE FIT4MICRO SOLUTION AND ITS APPLICATIONS: BUILDINGS SUITABLE FOR THE PROJECT'S TECHNOLOGY

This phase of the project is mainly focused on the identification of heating and cooling applications for the micro gas turbine (mGT) systems under development in the Fit4Micro Project. For this reason, Fraunhofer ISE, together with the support of Fahrenheit, MITIS and OWI, has defined and evaluated the use cases that can be suitable for the Fit4Micro technology, and will hence be used to assess the techno-economic performance of the hybrid combined mGT system.

During the first year of the project lifetime, simulated load profiles of different building applications have been evaluated in terms of achievable full load hours, since a high utilization factor is crucial for the economic feasibility of such a system. The focus was on buildings with high and constant hot water demand over the year, such as hospitals or retirement homes, and buildings with high heating and/or cooling demand, such as offices or multi-family homes in central and northern Europe.
Here, the main aim is to identify promising use cases for the implementation of a micro gas turbine (mGT), possibly in combination with an electric heat pump, a thermally driven chiller and/or a photovoltaic system.

The picture below geographically shows the use cases that have been defined and analysed for the project.

Use cases for evaluating the Fit4Micro system:

- ***multi-family house in Helsinki***
- ***office building in Strasbourg***
- ***old existing health and lodging buildings in Potsdam***

For what concerns office and residential buildings, this evaluation has pointed out that only sufficiently large existing buildings can have a number of full load hours able to support a CHP technology, similar to the one developed by Fit4Micro. More specifically, the mGT seems promising as a base load supplier of heat, with a dimensioning of the heat power up to 15% of maximum load. Moreover, in office buildings with an extended cooling demand, the combination of the mGT with a thermally driven chiller could be attractive.
Together with residential buildings, also non-residential ones (hence hospitals and retirement homes) are feasible for the mGT technology: in this case, the high demand of domestic hot water results in a more constant load – and consequently the mGT can cover a higher share of the required load. The analysis has proven that a dimensioning up to 30% of the peak demand can be feasible, and hence a high share of the electricity produced by the mGT can be consumed in the building itself.
This evaluation has been made by calculating a substantial number of full load hours required for the economic feasibility of CHP technologies (4000 FLH in this case).

The main result is that the Fit4Micro technology can be adapted in all the analysed use cases, but with some differences for what concerns its application:

- For residential buildings, only large ones can be considered suitable for the heat supply;
- For non-residential buildings, the feasibility of an mGT system can be suitable if there is a high demand of hot domestic water (or heat for other processes).

After the evaluation and definition of the use cases suitable for the Fit4Micro technology, the next activities of this Work Package will focus on the development of robust and efficient control strategies, together with the testing of a system demonstrator for the two most promising use cases.

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