



What impact would new generation variable capacity heat pump systems equipped with permanent magnet motor and vapour injection create for sustainable energy utilization?

By

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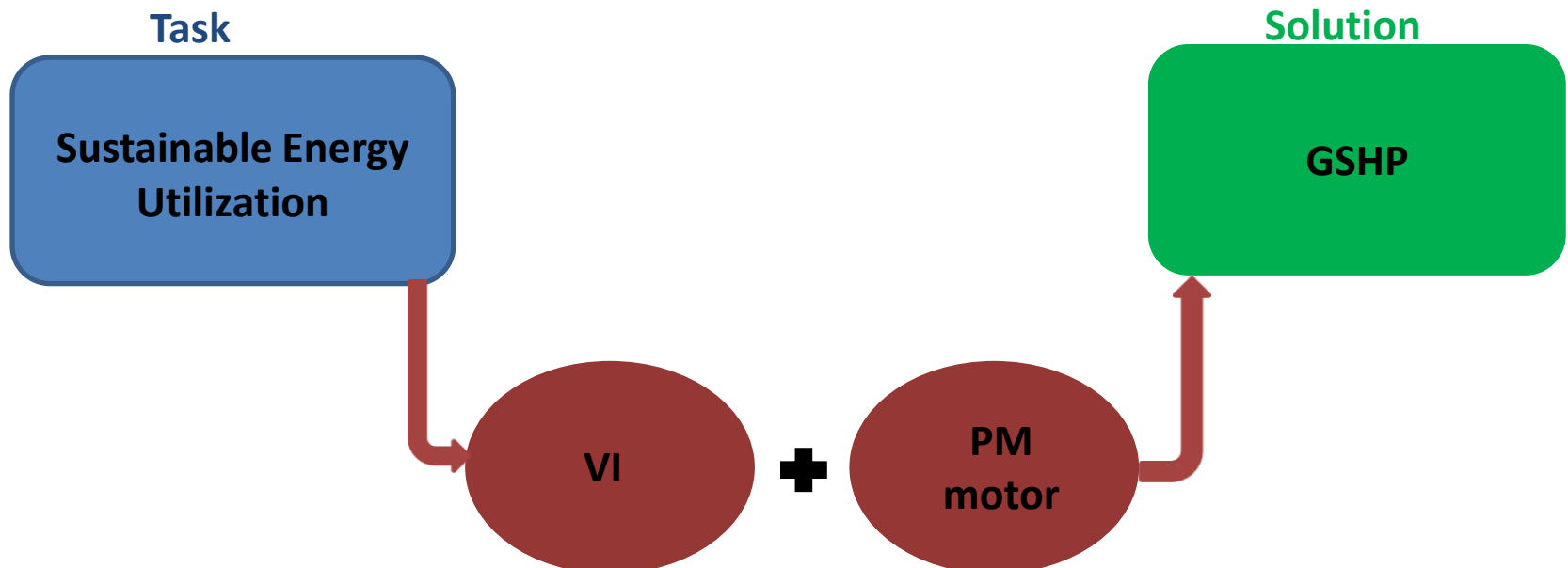
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What is the motivation?

- **Task identification:** To make energy utilization inside **residential buildings** sustainable.
- **Solution:** **Ground source heat pumps** (GSHP) provide promising solution.
- **Method:** Equip GSHP with **vapour injection** (VI) and **permanent magnet** (PM) motor.





What is the project's idea?



IDEA behind the project

- Is to experimentally investigate variable capacity heat pump, filled with R410A and equipped with vapour injection (VI) and permanent magnet (PM) motor.
- To analyze the benefits of vapour injection, heat pump's COPs, capacities are analyzed: first without VI and then with VI.

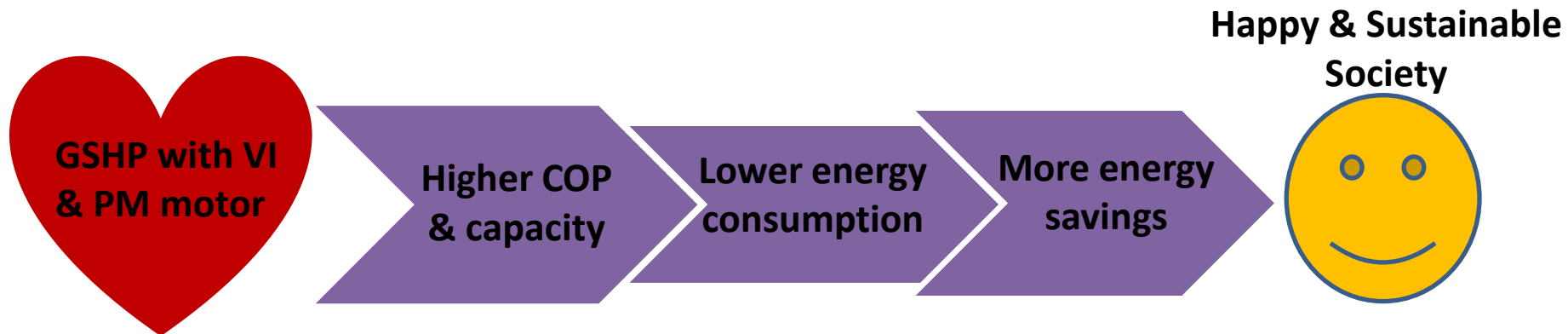
RESULTS that SPEAK

Following results are achieved over variable compressor speed 30Hz to 90Hz.

- Using VI, GSHP's COP Cool increases by an average of 10.66% while COP heat increases by an average of 9.4%, as compared to heat pump with no VI.
- System with VI witnesses an average increase of 21.82% in cooling capacity and 19.26% in heating capacity, as compared to heat pump with no VI .
- Using PM motor, compressor motor and compression losses are reduced by 51% as compared to compressor with induction motor.

What is the achievement?

- The project addresses the concern of reducing energy consumption inside buildings using GSHPs.
- The way it helps address this problem is shown in the figure.



5 Steps process towards a sustainable society

- In light of the results of this study, for GSHP systems to be used, it is recommended to use compressors with VI and PM motors instead of compressors with induction motors and no VI.