

USING EUROPEAN UNDERGROUND RAILROAD TUNNELS AS LOW ENTHALPY GEOTHERMAL WELLS

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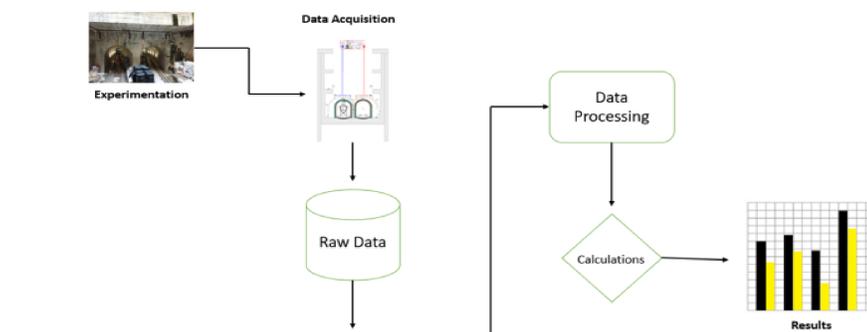
Thermal comfort is an essential requirement to improve the working ability of mankind. Heating and cooling systems consume considerable amount of energy and produce greenhouse gas emissions. Depleting situation of fossil fuels, rising costs of conventional fuels and current climatic actions urge the need for more environmentally friendly and sustainable technologies for heating and cooling. Geothermal energy being the uninterrupted source can be good alternative for low enthalpy heating source.

There are more than 600 underground railway tunnels in Europe which are longer than 1000 meters and there are a lot more which are smaller in length. The additional opportunities of harnessing the heat from underground railway tunnels could be using the foundation as energy piles or utilizing the ground freezing probes as ground heat exchanger after the completion of the tunnel. This could have a huge impact of energy consumed by the heating/ cooling loads as most of the tunnels are made under the urban areas with buildings constructed above them. The additional benefit of such system is the reduction of excavation cost. Similar kind of project was undertaken by our research with the name of GEOGRID project funded by the region of Campania with reference number CUP B43D18000230007 – POR CAMPANIA FESR 2014/2020 .

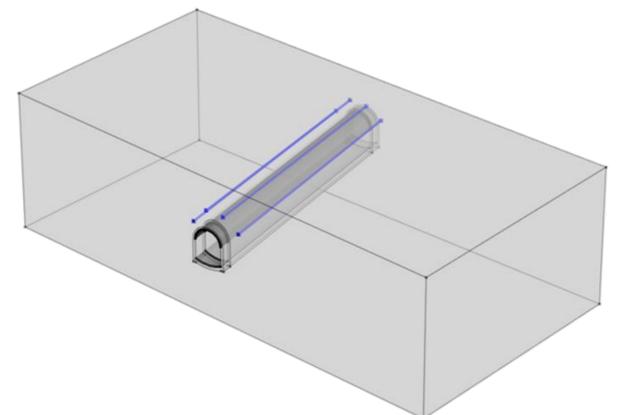


The experimental data was gathered from the probes 9,11,13 & 15 for analysis. The data was stored with data acquisition system and then processed for analysis. The data flow chart shown below illustrate the process of data analysis carried out.

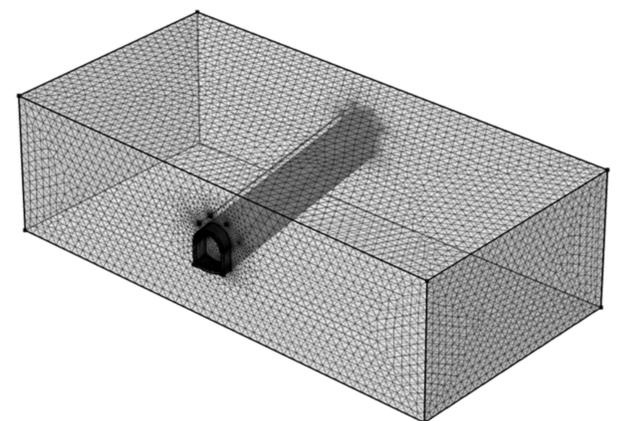
Data Flow Chart



Monthly total power (W)



The above figure shows the test model for the experimentation carried out in Municipio station with 4 probes. The division of mesh elements are described in the figure below that contain around 2878302 mesh elements.



REFERENCES

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