

Driven Geothermal energy pile foundations for heating/cooling buildings

Speaker: Prof. Rao Martand Singh (Email: rao.m.singh@ntnu.no)

Geothermal energy piles also known as thermal piles or energy foundations or energy piles are a direct adoption of vertical borehole closed loop ground source heat pump (GSHP) technology into pile foundations where closed heat exchanging loops are installed within the pile. Energy piles have great potential of improving energy efficiency of a new building resting on pile foundation by using ground as heat source/sink to provide building space heating/cooling. Energy pile foundations of a building are being used as heat source during the winter to keep the building warm and heat sink during the summer to keep the building cool. Recently, the use of thermal piles especially in European countries such as Austria, Switzerland, Germany and UK, has increased significantly as European Union is committed to reduce greenhouse gas emission to 50% below 1990 levels by 2030 as set out in the Glasgow Agreement. However, while construction of thermal piles is increasing limited investigation of their thermodynamic and geotechnical aspect is available to date. Recently NTNU has developed a Driven Energy Pile solution and patented it. The talk is going to explain this emerging technology.

Biography: Rao Martand Singh is a Professor of Geotechnical Engineering at the Department of Civil and Environmental Engineering, NTNU, Norway. He is mainly carrying out his research in the field of Energy and Environmental Geotechnics doing physical and numerical modelling of heat, moisture and gas transport in porous media. Currently, he is leading a project related to Geothermal Driven Energy Pile investigating potential of Energy Piles for heating buildings in Norwegian conditions and has patented the innovative solution to convert Driven Piles into Energy Piles. Previously he worked as an Assistant Professor at the University of Surrey, UK and as a Research Fellow on Geothermal Energy Piles at Monash University, Australia. He received his PhD degree at Geoenvironmental Research Centre (GRC), Cardiff University, UK. Prof Singh has got 15 years of international experience in the field of geothermal energy pile foundations, energy tunnels, energy walls, soil-structure interaction, nuclear waste disposal, gas/liquid flow characteristic of cement bentonite used in cut-off walls and borehole walls, thermal properties/suction measurement techniques, thermo-hydro-mechanical (THM) behaviour of unsaturated soils and geosynthetics, and landfill liner and cover design. His research has been awarded in the form of best paper awards in 2013, 2016 and 2017 from prestigious international journals including ICE.