Simulation Of Oil Sands Induction Heating Using Voltage-Driven Coils With Magnetic Core

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Abstract

The most common method for in-situ recovery of oil sands is Steam Assisted Gravity Drainage (SAGD). SAGD is based on injecting pressurized steam into the ground to heat up the highly viscous bitumen and reduce its viscosity allowing oil to flow. This process is energy and emissions intensive, and consumes large quantities of water. Consequently, there has always been interest in alternative methods to recover oil sands. This work aims to investigate the feasibility of using induction heating as one of the alternatives to raise the temperature of oil sand formations to sufficient levels that allow oil production. We use the Induction Heating multiphysics interface in COMSOL to model and simulate an innovative design of a voltage-driven coil with a magnetic core to heat a resistive medium representing oil sands formations. Finally, we conclude that it is feasible to heat oil sands using the proposed induction heating coil configuration, with higher temperatures realized in formations with lower resistivities.