

USING ELECTRICAL RESISTANCE HEATING FOR OIL PRODUCTION FROM OIL SANDS AND SHALES

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With oil prices rising above \$65 per barrel, oil production from the oil sands in Alberta and Saskatchewan, and oil shales in Colorado have become more economically viable. The oil sands deposits in Alberta represent an estimated 175 billion barrels, of which it is estimated that 70 to 80% will involve some form of in situ recovery method. In situ recovery is required for depths of greater than 90m. A variety of in situ recovery methods have been developed, including Steam Assisted Gravity Drainage (SSAGD) and Toe to Heal Air Injection (THAI). SAGD involves the use of horizontal steam injection wells paired with production wells. The steam inject well is located above the production well to accept drainage of oil from the heated zone above. THAI ignites oil in the reservoir to create a "fire front" that upgrades the hydrocarbon in front of it and drains the crude oil to a producing horizontal well. SAGD requires a fuel and a source of water to create the steam. THAI requires burning a portion of the resource that is being recovered. Electrical Resistance Heating (ERH) was originally developed for the purpose of recovering heavy oil, and was modified for environmental remediation by the U.S. Department of Energy and patented for this purpose in the early 1990s. ERH heats up the subsurface through the resistance to flow of electrical current, not by the electrodes themselves. ERH requires only a source of electricity and potentially water (in smaller amounts than required by the SAGD process). ERH can be utilized in a number of ways: 1) the horizontal production well can be heated electrically or electromagnetically to produce steam in situ; 2) water can injected through the electrically-heated production well to produce steam; or, 3) electrodes (oriented vertically or horizontally) can be used to heat areas of bitumen, reducing its API gravity and allowing it to flow to production wells. The appropriate configuration of the application is dependent upon the depth from which production is to occur.

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