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Impact of shale oil on the environment

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DESCRIPTION

Shale oil is a hydrocarbon trapped in the shale rock layer and can be extracted for refining, exploration of shale oil will be beneficial to the development of horizontal drilling technology and hydraulic fracturing, allowing oil and gas producers to efficiently extract resources from shale and other low permeability rock formations.

Shale oil is unconventional oil extracted from rock fragments of oil shale by pyrolysis, hydrogenation, or thermal melting. These processes convert organic matter in rock into synthetic oils and gases. The resulting oil can be used immediately as fuel that can be processed to meet refinery raw material specifications by adding hydrogen to remove impurities such as sulfur and nitrogen. Refined products can be used for the same purposes as those derived from crude oil.

Shale oil is obtained from the pyrolysis, hydrogenation, or hot melting of oil shale. Pyrolysis of rock takes place on the ground or in a retort inside the rock layer itself. As of 2008, most oil shale industries perform a shale oil extraction process after rock has been mined, crushed and transported to a retort facility, but some experimental techniques carry out the process. The temperature at which kerogen decomposes into available hydrocarbons depends on the time scale of the process. In the ground retort process, decomposition begins at 300°C (570°F), but is faster and more complete at high temperatures. Decomposition occurs fastest at temperatures between 480 and 520°C (900 to 970°F).

The environmental impact of the oil shale industry includes addressing issues such as land use, waste management, and water and air pollution caused by oil shale extraction and treatment. Open pit mining of oil shale deposits causes the usual environmental impact of open pit mining. In addition, incineration and heat treatment produce waste that needs to be disposed of and harmful atmospheric emissions such as carbon dioxide, the main greenhouse gas. Extracting oil from shale has potentially serious environmental impacts. The resource development debate is dominated by four specific problem areas: greenhouse gas emissions, water use and pollution, surface turbulence, and socio-economic impacts.

IMPACTS

Water Management

Mining influences water outflow behavior in affected areas. In some cases, the water table may need to be lowered below the level of the oil shale layer, which can adversely affect the surrounding farmland and forests. In Estonia, for every cubic meter of oil shale extracted, 25 cubic meters of water must be pumped from the mining area. At the same time, heat treatment of oil shale requires water to quench hot products and control dust. The water problem is especially delicate in dry areas where there are plans to expand the oil shale industry, such as the western United States and the Negev Desert in Israel. Depending on the technology, ground retorts use 1-5 barrels of water per barrel of shale oil produced.

Air Pollution

The main air pollution is caused by oil shale power plants. These plants provide the atmospheric release of gaseous products such as nitrogen oxides, sulfur dioxide, hydrogen chloride, and suspended particulate matter (fly ash). This includes particles of different types (carbonaceous, inorganic) and of different sizes. The concentration of air pollutants in flue gas depends primarily on combustion technology and regime, but the emission of particulate matter is determined by the efficiency of the fly ash collector.

Greenhouse Gas Emissions

Carbon dioxide emissions from shale oil and shale gas production are higher than emissions from traditional oil exploration, and the European Union report states that growing public interest in the negative effects of global warming is driving oil shale development. It warns that it may lead to the opposite of. Emissions come from multiple sources. This includes CO_2 emitted from the decomposition of kerogens and carbonate minerals in the extraction process, the generation of energy required for shale heating and other oil and gas processing operations, and the fuel used for rock mining and disposal. Due to the large differences in the diverse mineral composition and calorific value of oil shale deposits, actual values will vary significantly.