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Application of renewable energy in heavy oil industry – History of Solar thermal EOR and demonstration of energy and exergy performance of an existing solar steam generator

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Thermal Enhanced Oil Recovery (EOR) is a tertiary level Improved Oil Recovery (IOR) mechanism employed by upstream oil business to extend the producing field's life by means of injecting high pressure steam to the reservoir. When solar energy is harnessed to produce the required steam, it is named solar thermal EOR. In recent times, as there is quantum leap towards reducing the hydrocarbon footprint and to increase harnessing of renewable energy, this concept has become significant. The concept of solar thermal EOR was introduced as early as 1982. Subsequently, there were several investigations, including the effect of diurnal aspects of solar steam on oil production, along with pilot based selection of technologies like parabolic trough, linear Fresnel, solar tower and GPTC etc for solar steam generations. The present study analyses the historical data of how the solar thermal EOR concept has developed to its current level of maturity and also demonstrates how the energy and exergy performance of the process looks like, based on data collected from an existing Glasshouse enclosed Parabolic Trough Collector (GPTC) installation. GPTC is the latest in the series which is now commercially proven and hence selected for energy and exergy performance analysis. Experimental data were collected from an existing GPTC plant to investigate the energy and exergy performance. It is found that the overall energy efficiency of the system was in the range of 46 -56 %, while the overall exergy efficiency ranged between 34-43%. This analysis would help to mitigate the design challenges and facilitate design improvement and would help to reduce the future capital investment.

Keywords: Solar thermal EOR, Steam generation, GPTC, Energy analysis, Exergy analysis

Biography:

Ramesh V Kundalamcheery is a Chartered Engineer (CEng) and Fellow (FIE) of Institution of Engineers (India). He is an M Tech graduate in Quality Management from Birla Institute of Technology and Science (BITS), Pilani and is a research scholar at University of Petroleum and Energy Studies (UPES), Dehradun, India. He has published a number of papers in solar thermal EOR field and is a senior professional working in the energy industry. His area of expertise is project and contract management. He is a certified Project Management Professional (PMP) and certified Project Risk Management Professional (PMI-RMP) by Project Management Institute, USA.