

## **Saudi Aramco and sCO<sub>2</sub>**

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### **ABSTRACT**

Saudi Aramco is helping to accelerate the development of super-critical CO<sub>2</sub> (sCO<sub>2</sub>) technology with a proposed pilot plant in the Eastern Province of Saudi Arabia. A pilot will allow the Company to de-risk and obtain operating knowledge of sCO<sub>2</sub> as a fluid for transferring heat and performing work (turning an expander that drives a generator, pump, or a compressor). Once the sCO<sub>2</sub> process has been successfully demonstrated at temperatures of approximately 1,000oF, the next step will be to demonstrate an open-loop system operating at temperatures up to 2,000oF to validate this process as having the lowest cost of CO<sub>2</sub> capture from fossil fuels. This pilot is being proposed to demonstrate the capital efficiency, operating cost savings, and inherent safety of sCO<sub>2</sub> over cyclo-pentane or toluene in an Organic Rankine Cycle (ORC) plant or water/steam in a conventional combined cycle plant. Capital efficiency is obtained by the much smaller size of the sCO<sub>2</sub> facilities. The sCO<sub>2</sub> equipment is less than 25% of an equivalent ORC system or 10% of the size for a water/steam system. This smaller size is achieved by operating the sCO<sub>2</sub> facilities at much higher pressures than the alternative ORC or cogeneration processes. Operating savings are achieved as a result of the anticipated higher thermal efficiency and simplicity of the sCO<sub>2</sub> process, which should reliably operate without continuous operator surveillance and minimal maintenance. The sCO<sub>2</sub> process does not require make-up water nor any anti-scaling chemicals that are required for a water/steam system. CO<sub>2</sub> is not combustible and is used to extinguish electrical fires. Whereas, cyclo-pentane and toluene are highly flammable. Water/steam systems require corrosion protection chemicals that can be hazardous. Lastly, this pilot will demonstrate the viability of commercializing the emerging sCO<sub>2</sub> technology that the U.S. Department of Energy forecasts as exceeding \$65 billion in sales by 2022. The proposed pilot will enable Saudi Aramco to lead in the development of the sCO<sub>2</sub> technology and benefit from this emerging technology.