

### SYSTEM AND METHOD FOR RECOVERING ENERGY OR MINERALS FROM A RESERVOIR

#### IITM Technology Available for Licensing

##### Problem Statement

- As global energy demands rise, there is a pressing need for efficient extraction methods for oil, gas, geothermal energy, and minerals from below the earth's surface.
- However, current methods have their drawbacks, as they often result in higher water and gas content in extracted oil, leading to decreased overall oil production and presenting environmental challenges.
- One major issue is the inefficiency of traditional oil extraction systems, which are not only expensive and time-consuming but also in need of improvement to increase productivity and reduce costs.
- Another crucial concern is the impact on the environment, as these outdated methods contribute to harmful effects such as excessive water and steam usage per barrel of oil.
- Thus, there is a pivotal need for the development of sustainable hydrocarbon recovery technologies to address these issues.

##### Technology Category/ Market

**Category - Advanced Well Drilling Systems**

**Applications -** Extraction & Mining, Chemical industries, Petroleum/ oil and Gas industry

**Industry - Energy or mineral recovery**

**Market -** Chemical Enhanced Oil Recovery (EOR) Market is forecast to surpass **US\$936.2 million in 2023**, with strong revenue growth predicted through to 2033.

##### TRL (Technology Readiness Level)

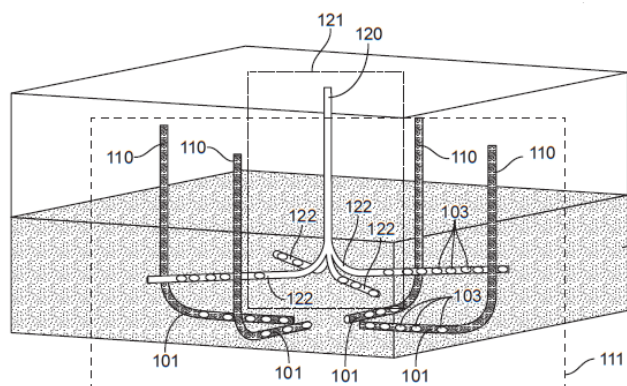
**TRL - 4: Technology validated in lab scale.**

##### Research Lab

**Prof. Jitendra Sangwai,**  
Dept. of Chemical Engineering

##### Intellectual Property

- IITM IDF Ref. **1825**
- IN 435587 - Patent Granted**



**FIG. 1. illustrates a system for improving production of hydrocarbon from a pay zone.**

##### Technology

- Staggered Well Design:** Introduces a system with injectors or producers having vertical and angled portions, extending into a pay zone, optimizing resource extraction.
- Enhanced Extraction:** Angled portions strategically configured to avoid overlap, boosting the extraction of hydrocarbons, energy, or minerals with variable azimuth and elevation angles.
- Configuration Flexibility:** Offers flexibility with adjustable angles ( $\varphi$  and  $\theta$ ) between injectors or producers, accommodating diverse geological conditions for optimal performance.
- Drilling Methodology:** Involves using a drilling apparatus to create the staggered well structure, including vertical portions around the pay zone periphery and angled portions towards the central area.
- Depth and Length Variability:** System allows for varied depth (5 to 30000 meters) and length (5 to 50000 meters) of angled portions, along with diameter options (25 mm to 1000 mm) for adaptability to different geological contexts.

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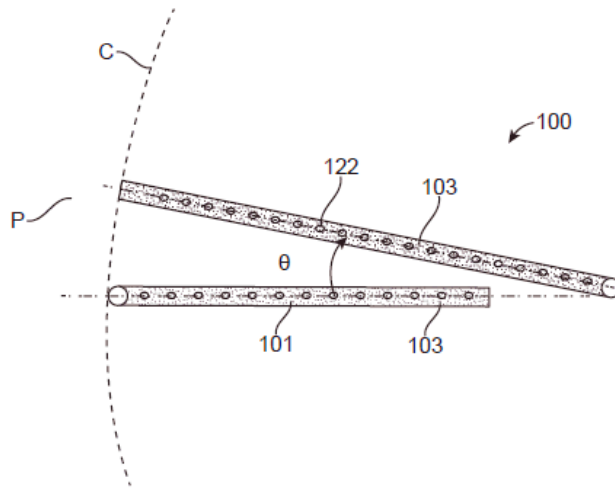


FIG. 2. illustrates azimuth angle between injectors and producers.

**Key Features / Value Proposition**

<b>Enhanced Hydrocarbon Recovery</b>	<ul style="list-style-type: none"> <li>Staggered well configuration with vertical and angled portions optimizes extraction efficiency, offering improved hydrocarbon recovery from both central and peripheral areas of the pay zone.</li> </ul>
<b>Precision Drilling Methodology</b>	<ul style="list-style-type: none"> <li>Utilizes a methodical approach, incorporating varied azimuth angles, elevation angles, and non-overlapping configurations to precisely target and extract hydrocarbons, energy, or minerals from specific zones within the reservoir.</li> </ul>
<b>Versatile Well Configuration</b>	<ul style="list-style-type: none"> <li>Adaptable system design allows for customization, featuring injectors or producers with angled portions strategically positioned at different levels, diameters, and lengths, providing versatility in addressing diverse geological conditions.</li> </ul>
<b>Optimal Resource Extraction</b>	<ul style="list-style-type: none"> <li>Methodology emphasizes optimal resource extraction through the utilization of perforated piping along angled portions, ensuring efficient injection or production of hydrocarbons, energy, or minerals from the production wells.</li> </ul>
<b>Comprehensive Drilling Method</b>	<ul style="list-style-type: none"> <li>Offers a comprehensive drilling method involving a combination of vertical portions and a central shaft branching towards the periphery, enabling a thorough exploration and extraction process for hydrocarbons, energy, or minerals from the entire pay zone.</li> </ul>

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