



Low Carbon Barrels

Disrupting Thermal EOR

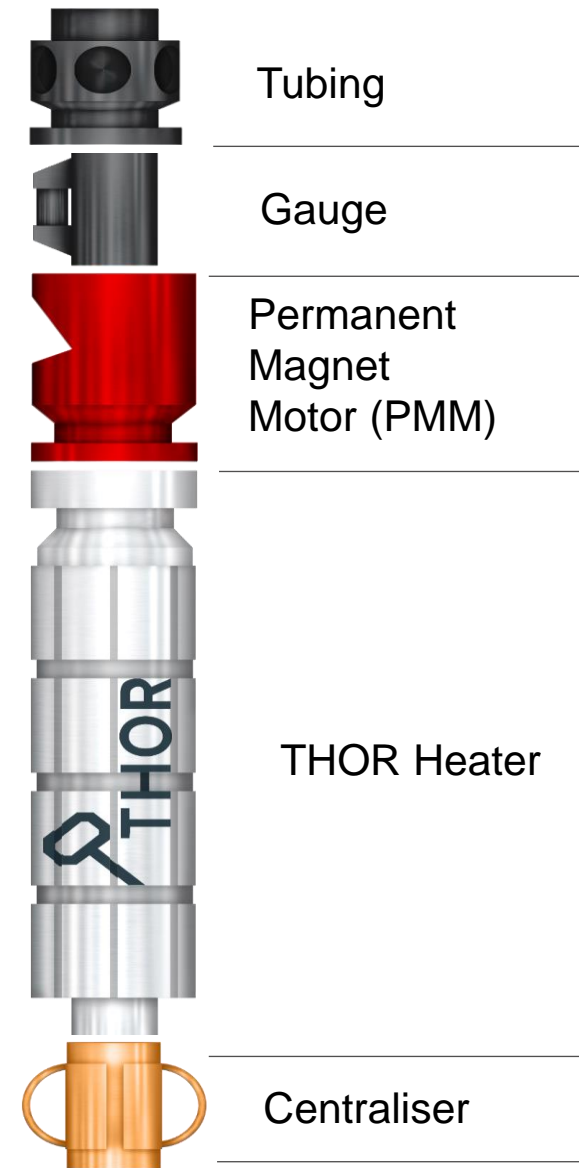
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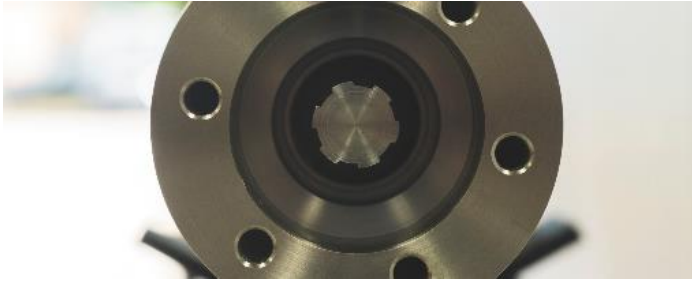
THOR Heater Assembly

Heater

- A highly efficient, cost effective, carbon neutral downhole heater [Patent: 1819138.7]
- Heating Element – well fluids to target temperature
- Near well heating can more than double production
- Flow assurance in wax, asphaltene, hydrates, sulfur and condensates
 - Highly Efficient (90%) reliable mechanical design
 - Powerful heating element (up to 55 kW/m)
 - Real time temperature control from Variable Speed Drive and Gauges
 - Fully sealed, fluid flows past, nothing enters or exits



THOR completion sizes

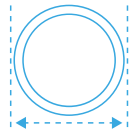


Casing Size

3 1/2"
(88.9mm)

5 1/2"
(139.7mm)

7"
(177.8mm)

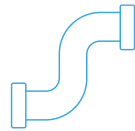


Tool OD

2.72"
(69mm)

4"
(101.6 mm)

5.62"
(143mm)



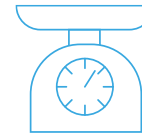
Tool Length

10 ft – 49 ft
(3m – 15m)



Energy Density

Up to 25 HP per foot
(55 kW per meter)



Tool Weight

551 lbs – 1322 lbs
(250 kg – 600 kg)



Temperature










32°F – 500°F
(0°C – 260°C)



Power Available

Up to 863 HP
(644 kW)

Thermal EOR Comparison

	THOR  1.5 gC02/MJ Cavitas California	Electrical Heater  2.3 gC02/MJ Andmir Canada	Topside Steam  29.3 gC02/MJ Chevron Kern River
Carbon Footprint (0-5)			
Tool Efficiency (%)	Over 91%	60-85%	60-80%
Operating Expense (OPEX)	\$	\$\$	\$\$\$\$
Break Even (Time)	4-8 weeks	6-24 months	Over 24 months
Ease to Install / Retrieve			
Visible Footprint (0-5)			

Example 1st Year Economics

Assumptions

Waxy Shut in 200 BPD well

40°C Temp Increase

Revenue

Incremental BPD: 200
 $\frac{\$80 \text{ per barrel}}{\text{day}}$
 $\$16,000 / \text{day}$

Costs

Workover

Mobilise: \$5,000
 Install: \$35,000

Equipment & Engineers

Shipping \$12,000
 Consumables \$71,000
 Personnel \$24,200

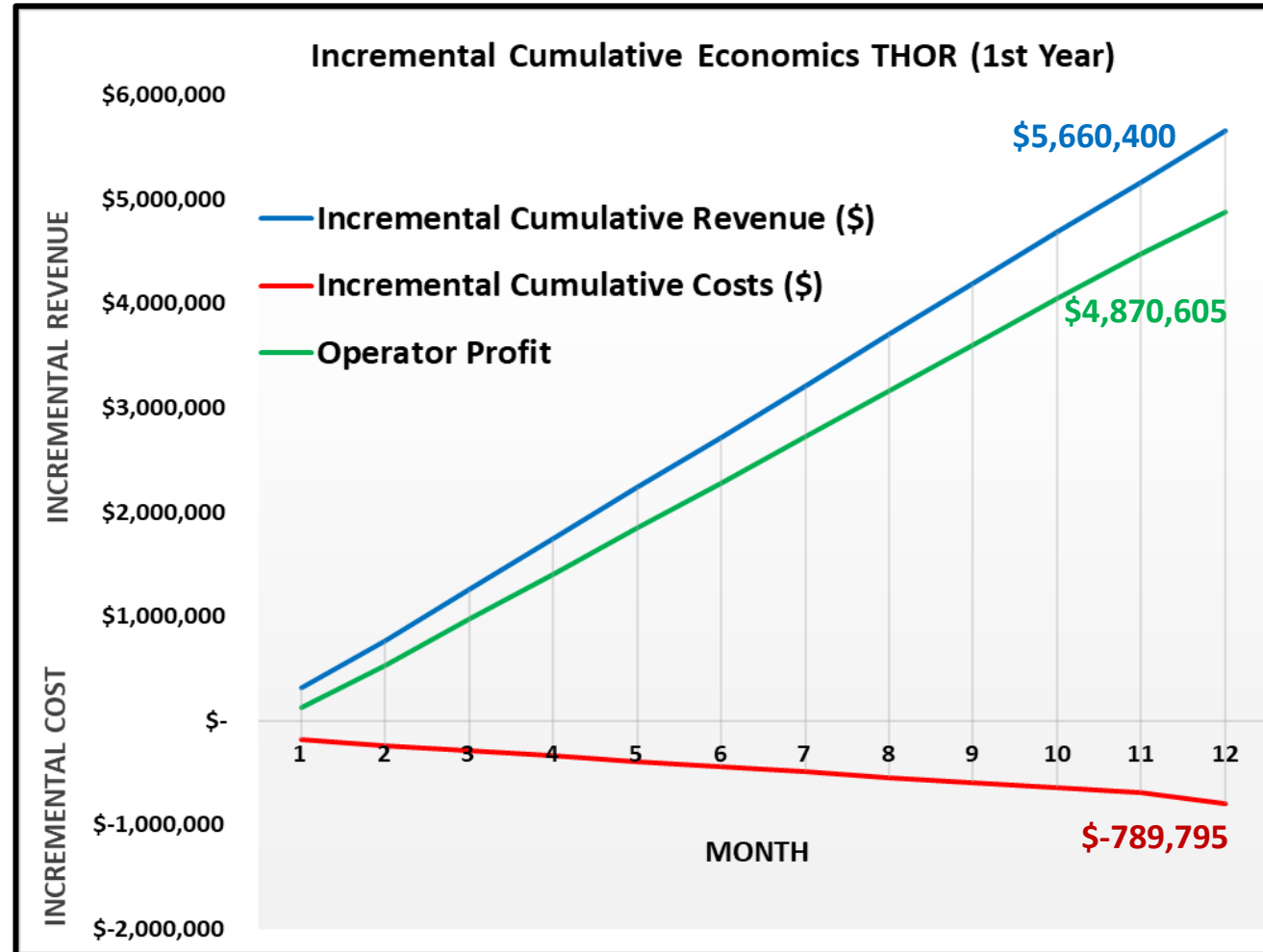
Total: \$147,200

Electricity

70 kW @ \$0.08 / kWh
 $\frac{\$134.40}{\text{day}}$

THOR

$\frac{\$1,500}{\text{day}}$



Outcome

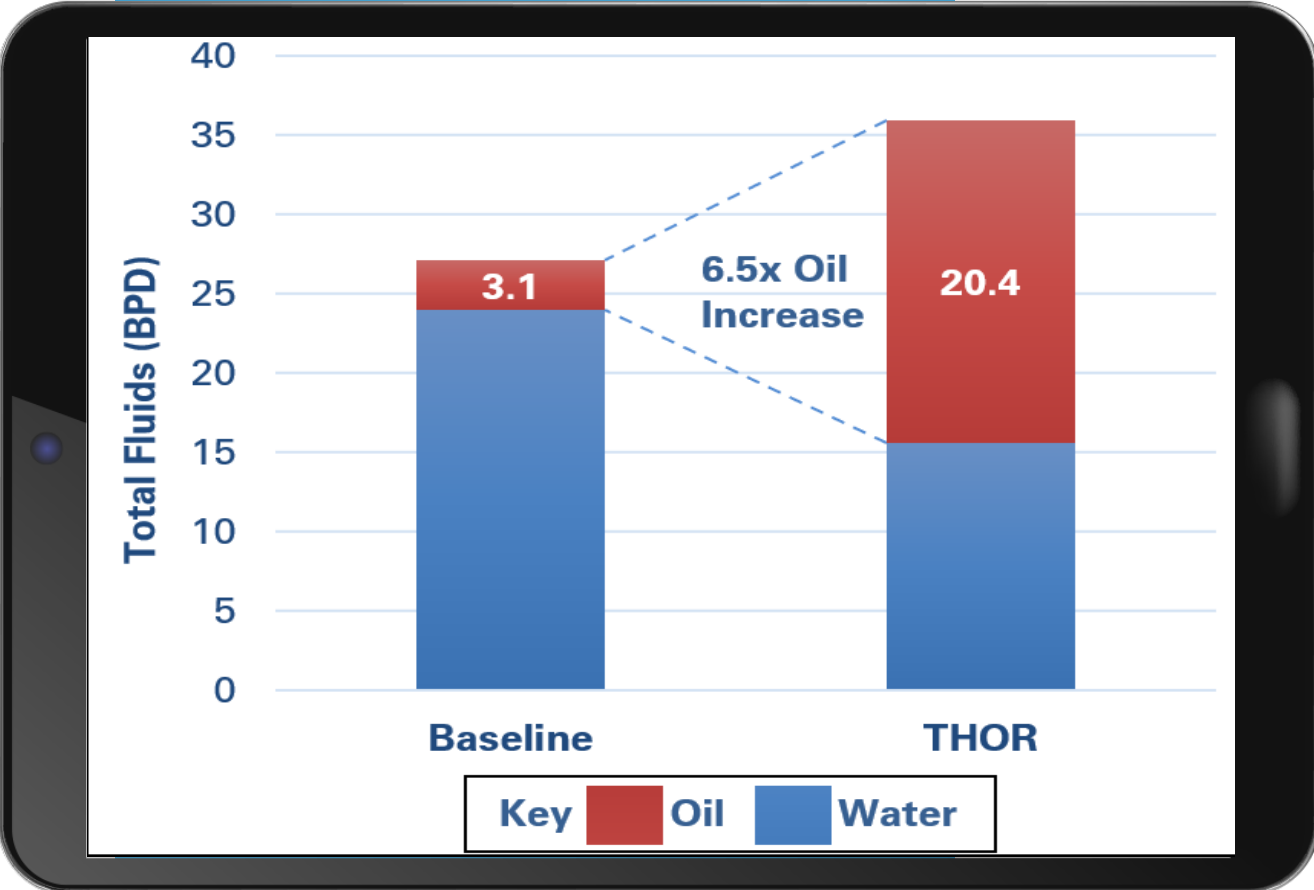
**Break Even after
22 days**

**Incremental Revenue:
\$ 5,660,400
Per well per year**

**Incremental Profit
\$ 4,870,605
Per well per year**

**Carbon
Saving: 186,732 KG
Per well per year**

Californian Berry Pilot



6.5x

Oil Production Increase
Near wellbore viscosity reduction and clearing of reservoir skins

Water cut

Water cut reduced from 88% to 43%



>\$505k

ROI in 29 days,
incremental revenue
\$505,160 per well per year

Higher Flow

Projects in Africa and Middle East at 200 BPD, South America 3000 BPD

Approved commercial deployments Q1 2023:

Wax & Heavy: KOC (Kuwait), ST Oil (USA), Sharif (Sudan)

Additional Applications:

- Restoring production in Liquid Loaded Gas wells
- Flow assurance in asphaltene, sulfur and hydrates
- Intervention in risers and pipelines with 5D bends or less

Conclusion

- THOR – A highly efficient and cost effective carbon neutral downhole heater
- Deploy in injection or production wells in viscous fields to more than double oil production
- Maintains flow assurance in waxy, asphaltenic, sulfur and hydrates wells or risers
- Restore production in liquid loaded gas wells
- Deploy through tubing riglessly offshore
- Power by renewables to be carbon neutral
- Rental model – Break Even in under 50 days



A blue-tinted photograph of an industrial pipeline stretching across a desert landscape. The pipeline is the central focus, leading from the foreground into the distance. The background shows rolling hills and a clear sky. The entire image has a monochromatic blue color scheme.

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