

Low-Temperature Heat Engine

Licensing Overview

Confidentiality Level: Non-Confidential / IP-Safe Audience: Non-technical buyers, brokers, licensees Date: October 2023

Low-Temperature Heat Engine (FM)

Licensing Opportunity Granted US Patent

Patent Number: US12049876B2 (Granted)

International Family: WO2021053369A1

Technology Area: Waste Heat Recovery, Renewable & Energy Efficiency

Executive Summary for Licensees

The world is rich in thermal energy that is currently too cool to convert efficiently into electricity. The patented Fotuhi Low-Temperature Heat Engine (FM) addresses this critical gap. This technology offers a novel, closed-loop system designed from the ground up to extract valuable power from low-grade heat sources (typically between 60°C and 120°C), where conventional technologies fail or become prohibitively expensive.

Licensing this technology provides immediate access to a proven method for decarbonization, efficiency gains, and accessing stranded energy assets across numerous global industries.

The Challenge: Wasted Thermal Energy

A significant portion of thermal energy generated globally is classified as "low-grade heat." This includes residual heat from industrial processes, cooling loops, medium-temperature solar collection, and large HVAC operations.

- Temperature Range: Approximately 60–120°C.
 - Current Limitations: Existing power conversion technologies, such as conventional steam turbines or standard Organic Rankine Cycle (ORC) systems, suffer sharp drops in thermodynamic efficiency when operating at these low temperatures.
 - The Result: Large volumes of usable, non-combustion thermal energy are regularly wasted, leading to higher operational costs and increased environmental footprints for industrial operators worldwide.
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The Patented Solution: The Fotuhi Engine (FM)

The FM is a proprietary, patented heat-to-power conversion technology specifically engineered to overcome the thermodynamic limitations inherent in low-temperature energy recovery.

The engine operates as a closed-loop system, meaning it requires no fuel input, produces zero combustion byproducts on-site, and avoids the high pressures associated with steam systems.

How It Works (Conceptually): The FM exploits the thermal gradient between the low-temperature heat source and a lower-temperature sink (e.g., ambient air or water). It utilizes a specialized working fluid and unique thermodynamic cycle pathways detailed in Patent US12049876B2 to efficiently drive a turbine or generator from a modest temperature differential, converting waste heat into reliable electricity.

Core Technical Advantages

The FM technology offers distinct advantages over legacy solutions, making it highly attractive for integration into existing infrastructure:

Feature	FM Technology	Traditional ORC/Steam
Optimal Operating Temp.	60°C - 120°C	Generally > 150°C for economic viability
Cycle Type	Proprietary Closed-Loop System	Established ORC or Steam Cycle
Operational Pressure	Significantly lower and safer	Can require high pressure to maximize efficiency
Complexity	Modular, designed for simplified maintenance	Can be complex, especially concerning fluid handling
Start-up Time	Rapid, suitable for intermittent heat sources	Often slower and more complex

This differentiation means the FM can be deployed in locations and applications previously deemed uneconomical for waste heat recovery.

Strategic Market Applications

The FM's efficiency in the 60 - 120°C range opens up vast new commercial applications across numerous sectors:

1. Industrial Waste Heat: Power generation from cooling towers, furnace exhausts, and process heat in manufacturing, chemical, and food processing plants.
 2. Renewable Energy: Boosting the output of low-enthalpy geothermal reservoirs or enhancing the efficiency of large-scale solar thermal facilities (especially flat-plate or evacuated tube collectors).
 3. Infrastructure: Capturing energy from large data center cooling systems and commercial HVAC exhaust loops.
 4. District Energy: Providing decentralized power generation within energy grids or industrial parks.
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Commercial Potential and Licensing Terms

The global drive toward Net-Zero and increased energy independence validates the immediate and long-term market value of the FM technology. Companies

licensing this IP can rapidly enter or expand their footprint in the energy efficiency and distributed power sectors.

Licensing Status:

- IP Secured: A fully granted US Patent (US12049876B2) protects the core innovation.
- Global Coverage: Corresponding international patent applications are active, offering protection in key global territories.
- Availability: The technology is available for licensing, joint development partnerships, or strategic technology acquisition.

We invite qualified entities with manufacturing capability or significant market access in the energy, industrial equipment, or renewables sectors to explore this opportunity.

Next Steps: Detailed technical specifications, cycle diagrams, and performance modeling data are available for review under a standard Non-Disclosure Agreement (NDA).

Contact Information

This opportunity is managed exclusively through the PatentMonetize platform for initial inquiries.

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