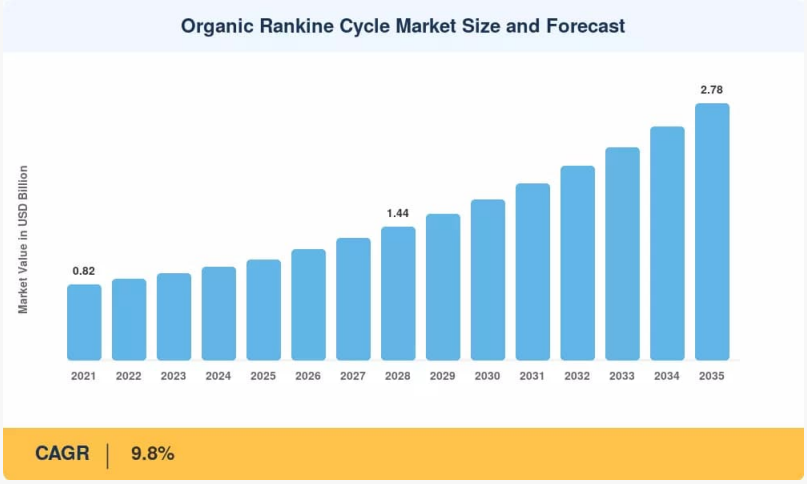
Organic Rankine Cycle Market Anticipated to Record a 9.8% CAGR Fueled by Industrial Waste Heat Recovery

A typical 50 MW data center can generate 2–4 MW of parasitic electricity from server exhaust heat using ORC systems, cutting Scope 2 emissions by 5–8% annually



Organic Rankine Cycle Industry

NEW YORK, NY, UNITED STATES, July 24, 2026 /EINPresswire.com/ -- The Organic Rankine Cycle Market reached an estimated USD 1.09 Billion in 2025 and is projected to grow from USD 1.20 Billion in 2026 to USD 2.78 Billion by 2035, registering a CAGR of 9.8% across the forecast window.

Market Overview

The Organic Rankine Cycle (ORC) is a thermodynamic technology that converts low to medium-temperature heat sources into mechanical power and electricity, utilizing an organic working fluid with a lower boiling point than water. Unlike conventional steam Rankine cycles that require high-temperature heat sources, ORC systems can efficiently operate with heat sources at temperatures ranging from 80°C to 350°C, making them ideal for waste heat recovery, geothermal energy, biomass combustion, solar thermal, and industrial process heat applications. The organic working fluid evaporates at lower temperatures and pressures than water, enabling efficient energy conversion from low-grade heat sources that would otherwise be wasted. ORC systems consist of four main components: an evaporator, an expander (turbine or screw-type), a condenser, and a pump.

> Indirect ORC systems led the 2024 landscape with an estimated 42.5% share of the Organic Rankine Cycle Market, reflecting broad adoption in medium-temperature waste-heat applications.”
>
> *Prashant Hake*

The Organic Rankine Cycle market trends is experiencing robust growth driven by several key factors. The increasing global focus on energy efficiency and waste heat recovery is a primary growth driver, as industrial processes across manufacturing, oil and gas, cement, and chemical sectors generate substantial waste heat that can be recovered and converted into electricity. The growing deployment of renewable energy sources, including geothermal, biomass, and concentrated solar power, is creating demand for ORC systems as efficient power conversion solutions. The need for distributed power generation and the increasing emphasis on reducing greenhouse gas emissions are accelerating ORC adoption.

Key industry trends shaping the ORC market include the development of higher-efficiency systems with advanced expander technologies and improved working fluids. The integration of ORC systems with existing industrial processes for waste heat recovery is gaining momentum. The increasing adoption of ORC in geothermal power generation, particularly in small to medium-scale projects, is driving market growth. The emergence of micro-scale ORC systems for residential and small commercial applications is creating new market segments.

The market is also benefiting from technological advancements in expander technology, heat exchanger design, and working fluid development. Innovations in radial and axial turbine designs, as well as screw and scroll expanders, are improving ORC efficiency and reliability. Research into new organic working fluids with improved thermodynamic properties and lower environmental impact is expanding application possibilities.

Policy and regulatory frameworks are influencing the ORC market landscape. Government policies promoting renewable energy generation, energy efficiency, and waste heat recovery are supporting market development. Feed-in tariffs, renewable energy certificates, and tax incentives are improving the economic viability of ORC projects. Emission reduction regulations and carbon pricing mechanisms are creating financial incentives for industrial waste heat recovery.

The demand outlook for ORC systems remains positive, supported by the growing need for energy efficiency, the expansion of renewable energy generation, and the increasing focus on distributed power solutions. The modernization of industrial facilities with waste heat recovery systems and the continued development of geothermal resources will drive market growth.

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Market Segmentation
By Application: The market is segmented into waste heat recovery, geothermal power generation, biomass power generation, solar thermal power generation, and other applications. Waste heat recovery is the largest segment, driven by substantial waste heat from industrial processes. Geothermal power generation is a significant and growing segment, with ORC systems enabling power production from low-temperature geothermal resources. Biomass

power generation represents a substantial market, with ORC systems providing efficient power conversion from biomass combustion.

By Power Output: The market is categorized into micro-scale (up to 50 kW), small-scale (50 kW to 500 kW), medium-scale (500 kW to 5 MW), and large-scale (above 5 MW) ORC systems. Medium-scale systems currently dominate the market, driven by industrial waste heat recovery and geothermal applications. Large-scale systems are growing in geothermal and biomass power plants, while micro-scale systems are emerging for residential and small commercial applications.

By Working Fluid Type: The market is segmented by working fluid type, including hydrocarbons (pentane, butane), refrigerants (HFCs, HFOs), and siloxanes. Hydrocarbons are widely used due to favorable thermodynamic properties, though they present flammability concerns. Refrigerants are increasingly adopted for lower temperature applications, while siloxanes are used in high-temperature applications such as geothermal and solar thermal systems.

By End-User Industry: The market serves various end-user industries including industrial manufacturing, oil and gas, power generation, geothermal energy, biomass energy, and chemical processing. Industrial manufacturing is the largest segment, driven by waste heat recovery opportunities. The power generation segment includes utility-scale renewable energy projects, while geothermal and biomass sectors are significant and growing end-users.

By Region: The market is analyzed across North America, Europe, Asia-Pacific, Latin America, and the Middle East and Africa. Europe is the largest regional market, while Asia-Pacific is the fastest-growing region.

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Regional Analysis
North America: The North American ORC market is characterized by a strong focus on industrial waste heat recovery and geothermal energy development. The United States leads the region, driven by industrial energy efficiency initiatives and growing geothermal deployment. Canada is a significant market with its geothermal resources and industrial base. The oil and gas sector presents substantial opportunities for ORC deployment.

Europe: Europe is the largest regional market, driven by ambitious energy efficiency targets and strong renewable energy policies. The European Union's energy efficiency directives and renewable energy targets are powerful market drivers. Germany, Italy, and the United Kingdom are leading countries with significant ORC installations in geothermal, biomass, and waste heat recovery applications.

Asia-Pacific: The Asia-Pacific region is the fastest-growing ORC market, driven by rapid

industrialization, increasing energy demand, and growing environmental awareness. China leads the market, followed by India, Japan, and South Korea. The region's significant geothermal resources in Indonesia, Philippines, and Japan present substantial opportunities for ORC deployment.

Latin America: The Latin American ORC market is in the development stage, with Mexico, Brazil, and Chile as key markets. Chile's geothermal resources and mining sector present opportunities, while Brazil's industrial sector supports market development.

Middle East and Africa: The region presents emerging opportunities, primarily in the oil and gas sector for waste heat recovery. South Africa and North African countries represent nascent markets with future potential.

Competitive Landscape / Key Players
The global Organic Rankine Cycle market is characterized by a mix of established technology providers, engineering companies, and specialized ORC manufacturers. Key companies operating in the market include:

Turboden S.p.A.: A leading global provider of ORC systems, offering a comprehensive product portfolio for waste heat recovery, geothermal, and biomass applications.

Exergy International S.r.l.: A specialist in ORC technology, providing systems for geothermal, biomass, and waste heat recovery applications with a focus on high-efficiency solutions.

Orcan Energy AG: A German company specializing in ORC technology for waste heat recovery, particularly in industrial applications and marine engines.

Enertime S.A.: A French ORC manufacturer providing systems for industrial waste heat recovery, geothermal, and biomass applications.

Rankine Energy, Inc.: A US-based ORC technology provider focusing on waste heat recovery and geothermal applications.

Other notable players include General Electric, Siemens AG, Atlas Copco, and Calnetix Technologies. Strategic developments include technology partnerships, major project contracts, and expansion into emerging markets.

Latest Industry News & Developments
December 2025: Turboden commissioned a 5 MW ORC system at a cement plant in Germany, utilizing waste heat from clinker production. The project represents one of the largest industrial waste heat recovery ORC installations in Europe.

November 2025: Exergy International signed a contract for ORC systems totaling 15 MW for

three geothermal power projects in Indonesia, supporting the country's geothermal development targets.

October 2025: Orcan Energy launched a new micro-scale ORC product for heat recovery from gas engines and small industrial processes, featuring improved efficiency and modular design.

Market Challenges & Opportunities
Key Restraints: The ORC market faces several challenges. High capital costs of ORC systems create investment barriers. The complexity of system design and integration requires specialized expertise. Performance sensitivity to heat source characteristics requires careful system optimization. Limited awareness of ORC technology among potential users constrains market development. Competition from alternative technologies affects market share.

Emerging Opportunities: The ORC market presents substantial opportunities in the expanding waste heat recovery market. The development of modular and standardized ORC solutions is reducing costs. Integration with CHP systems and district heating networks offers additional benefits. Potential for ORC in ocean thermal energy conversion, concentrated solar power, and hydrogen production offers new market segments.

Future Potential: The long-term potential of the ORC market is supported by global commitment to energy efficiency, renewable energy generation, and industrial decarbonization. Continued development of more efficient and cost-effective systems will enhance market viability. Expansion of geothermal energy development will drive ORC deployment. The essential role of ORC in enabling efficient conversion of low-grade heat sources ensures sustained market demand and growth potential.

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Final Market Summary
The global Organic Rankine Cycle market is poised for robust growth, with projections indicating an expansion from USD 1.20 billion in 2026 to USD 2.78 billion by 2035, at a CAGR of 9.8%. This growth is driven by increasing focus on industrial waste heat recovery, growing renewable energy deployment, and global commitment to energy efficiency. Europe leads as the largest market, while Asia-Pacific is the fastest-growing region. Technological advancements in expander technology and working fluids are enhancing system efficiency. Despite challenges including high capital costs and system complexity, the market offers substantial opportunities in waste heat recovery, renewable energy applications, and industrial decarbonization. The essential role of ORC technology in unlocking the potential of low-grade heat sources ensures sustained market momentum and long-term growth potential throughout the forecast period.

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