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Organic Rankine Cycle Market Forecasts to 2032 – Global Analysis By Working Fluid (Hydrocarbons, Refrigerants, Siloxanes and Other Working Fluids), System Type, Capacity, Application, End User and By Geography

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Abstracts

According to Stratistics MRC, the Global Organic Rankine Cycle Market is accounted for $18.20 billion in 2025 and is expected to reach $33.00 billion by 2032 growing at a CAGR of 8.87% during the forecast period. The Organic Rankine Cycle (ORC) is a thermodynamic process that uses an organic working fluid with a low boiling point to transform low-temperature heat sources into electrical power. In contrast to conventional Rankine cycles, which rely on water, ORC uses hydrocarbons or refrigerants, enabling effective energy recovery from biomass, geothermal, or waste heat. After vaporising and expanding through an expander or turbine to generate electricity, the fluid condenses and recirculates. The capacity of ORC systems to stably capture low-grade heat enhances overall energy efficiency in industrial and power generating applications.

Market Dynamics:

Driver:

Rising demand for waste heat recovery

Energy efficiency is increased via ORC systems, which effectively transform low-grade waste heat from industrial operations into useable electricity. Businesses are compelled to use ORC technology for economic power generation due to rising industrialisation and energy expenses. Adoption of ORC is also aided by environmental restrictions that encourage lower carbon emissions. The technology's application is further expanded by its capacity to use a variety of heat sources, such as biomass and geothermal. All things considered, the ORC market is expanding due to the increased focus on renewable and sustainable energy sources.

Restraint:

High initial capital investment

Small and medium-sized businesses find it challenging to deploy ORC systems due to their high cost of purchase and installation. Due to this financial barrier, many potential consumers postpone or refrain from investing, which inhibits market growth. Furthermore, investors looking for rapid profits find the lengthy payback period less appealing. Widespread adoption is also hampered by high upfront expenditures, particularly in areas with little support. As a result, even if ORC technology has efficiency advantages, its market penetration is limited by its initial capital required.

Opportunity:

Development of compact and modular ORC systems

The creation of modular and compact Organic Rankine Cycle (ORC) systems has increased their adaptability, making them appropriate for a range of uses and smaller-scale power production. Their modular design lowers total costs by facilitating simpler maintenance, scalability, and installation. Compact designs increase their utilisation in sectors like waste heat recovery and renewable energy by allowing integration into constrained places. These developments also increase system dependability and efficiency, which draws in more end users. All things considered, the development of small and modular ORC systems drives market uptake and global expansion.

Threat:

Competition from alternative technologies

In certain applications, technologies such steam Rankine cycles, Kalina cycles, and other heat recovery systems frequently offer superior performance. Furthermore, investments are drawn away from ORC by developments in solar thermal, waste heat recovery, and electric power production technologies. Adoption is further constrained by ORC systems' greater initial capital cost and complexity in comparison to some alternatives. Customers are also reluctant to convert because existing technologies have a larger market presence and a track record of dependability. All things considered, these obstacles impede the expansion and broader application of ORC technology in the energy industry.

Covid-19 Impact

The Covid-19 pandemic temporarily disrupted the Organic Rankine Cycle (ORC) market due to halted industrial activities and delayed projects worldwide. Supply chain interruptions and reduced investments slowed market growth in 2020. However, increasing focus on sustainable energy recovery and government stimulus for green technologies accelerated market recovery post-pandemic. The demand for waste heat recovery and renewable energy solutions strengthened, driving innovation and adoption of ORC systems across power generation, manufacturing, and oil & gas sectors. Overall, Covid-19 caused short-term setbacks but boosted long-term growth prospects.

The refrigerants segment is expected to be the largest during the forecast period

The refrigerants segment is expected to account for the largest market share during the forecast period by offering efficient working fluids that enhance heat recovery from low-grade thermal sources. These refrigerants have favorable thermodynamic properties like low boiling points, which improve the cycle's energy conversion efficiency. Environmentally friendly refrigerants also align with global regulations, boosting ORC adoption in sustainable energy solutions. Moreover, advances in refrigerant formulations reduce system corrosion and increase equipment lifespan, lowering operational costs. Together, these factors propel the growth and technological advancement of the ORC market.

The food & beverage segment is expected to have the highest CAGR during the forecast period

Over the forecast period, the food & beverage segment is predicted to witness the highest growth rate by utilizing waste heat recovery from processes such as cooking, pasteurization, and refrigeration. This sector generates significant low-grade heat, which ORC systems efficiently convert into usable power, enhancing energy efficiency. Increasing demand for sustainable and energy-saving technologies in food processing plants boosts ORC adoption. Additionally, regulatory pressure to reduce carbon footprints encourages this sector to implement ORC solutions. Overall, the food & beverages industry's energy needs and sustainability goals propel the growth of the

ORC market.

Region with largest share:

During the forecast period, the Asia Pacific region is expected to hold the largest market share by industrial growth and rising energy demand. Countries like China, Japan, and India are investing heavily in sustainable power generation and waste heat recovery to reduce carbon emissions. The surge in manufacturing and heavy industries offers vast opportunities for ORC system deployment. Additionally, government initiatives promoting green technologies and increased infrastructure spending are accelerating market adoption, positioning the region as a key hub for ORC innovation and implementation.

Region with highest CAGR:

Over the forecast period, the North America region is anticipated to exhibit the highest CAGR, owing to demand for renewable energy and waste heat recovery solutions. Key industries such as oil & gas, manufacturing, and geothermal power plants are adopting ORC technology to enhance energy efficiency. Supportive government policies and investments in clean energy infrastructure further boost market growth. Additionally, the presence of leading ORC technology providers and ongoing R&D activities contribute to expanding the market across the region.

Key players in the market

Some of the key players profiled in the Organic Rankine Cycle Market include Mitsubishi Heavy Industries, Ormat Technologies Inc., Exergy International Srl, Enogia S.A.S., ORCAN Energy AG, Kaishan USA, Triogen Limited, Climeon AB, ElectraTherm, Inc., Baker Hughes Company, Atlas Copco AB, Alfa Laval AB, Siemens Energy AG, General Electric Company, Kawasaki Heavy Industries Ltd., IHI Corporation and Dyckerhoff.

Key Developments:

In October 2024, Mitsubishi Heavy Industries signed an agreement with Empower, the world's largest district cooling services provider, to supply advanced chillers with a total capacity of up to 100,000 Refrigeration Tons (RT). This collaboration aims to enhance energy efficiency and support sustainable cooling solutions in Dubai's district cooling projects, including Deira Waterfront Development, Jumeirah Village, and Al Sufouh.

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In October 2023, Ormat acquired geothermal and solar assets from Enel Green Power North America for USD 271 million. This acquisition includes two operational geothermal plants and a hybrid facility combining solar PV, geothermal, and solar thermal plants.

In February 2023, MHI and MHI Marine Machinery and Equipment Co., Ltd. developed a 100kW class cryogenic ORC power generation system utilizing a hermetically sealed, oilless turbine. Demonstration tests using liquid nitrogen as a cryogenic energy source confirmed stable operation, paving the way for efficient LNG and hydrogen cryogenic power generation.

Working Fluids Covered:

- Hydrocarbons
- Refrigerants
- Siloxanes
- Other Working Fluids

System Types Covered:

- Modular ORC Systems
- Custom-built ORC Systems

Capacities Covered:

- Small Scale (up to 100 kW)
- Medium Scale (100 kW – 1 MW)
- Large Scale (Above 1 MW)

Applications Covered:

- Waste Heat Recovery
- Geothermal Power Generation
- Biomass Power Generation
- Solar Thermal Power Generation
- Marine and Transportation
- Other Applications

End Users Covered:

- Power Generation
- Oil & Gas
- Chemical & Petrochemical
- Food & Beverage
- Automotive
- Manufacturing
- Other End Users

Regions Covered:

- North America
  - US
  - Canada

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    Mexico

Europe

    Germany

    UK

    Italy

    France

    Spain

    Rest of Europe

Asia Pacific

    Japan

    China

    India

    Australia

    New Zealand

    South Korea

    Rest of Asia Pacific

South America

    Argentina

    Brazil

Chile

Rest of South America

Middle East & Africa

Saudi Arabia

UAE

Qatar

South Africa

Rest of Middle East & Africa

What our report offers:
- Market share assessments for the regional and country-level segments
- Strategic recommendations for the new entrants
- Covers Market data for the years 2024, 2025, 2026, 2028, and 2032
- Market Trends (Drivers, Constraints, Opportunities, Threats, Challenges, Investment Opportunities, and recommendations)
- Strategic recommendations in key business segments based on the market estimations
- Competitive landscaping mapping the key common trends
- Company profiling with detailed strategies, financials, and recent developments
- Supply chain trends mapping the latest technological advancements

Free Customization Offerings:

All the customers of this report will be entitled to receive one of the following free customization options:

Company Profiling

Comprehensive profiling of additional market players (up to 3)

SWOT Analysis of key players (up to 3)

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Regional Segmentation

- Market estimations, Forecasts and CAGR of any prominent country as per the client's interest (Note: Depends on feasibility check)

Competitive Benchmarking

- Benchmarking of key players based on product portfolio, geographical presence, and strategic alliances

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