

Cooling Towers Market – Global Industry Size, Share, Trends, Opportunity, and Forecast, Segmented By Product (Open-circuit, Closed-circuit, Hybrid), By Material (FRP, Steel, Concrete, Wood), By Application (HVAC, Power Generation, Oil & Gas), By Region, By Competition, 2019-2029F

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Abstracts

Global Cooling Towers Market was valued at USD 4.2 Billion in 2023 and is anticipated to project robust growth in the forecast period with a CAGR of 4.7% through 2029. The Global Cooling Towers Market reflects a significant surge driven by the escalating demand for efficient cooling solutions across various industries. Cooling towers, pivotal in industrial settings, facilitate the dissipation of excess heat generated by machinery and processes. This market experiences robust growth owing to the continuous establishment of new industrial facilities worldwide, particularly in regions undergoing rapid industrialization. The pivotal role of cooling towers in maintaining optimal temperatures within industrial and HVAC systems reinforces their indispensability. With over 1,500 industrial enterprises relying heavily on water consumption for equipment cooling, the demand for cooling towers intensifies, especially in HVAC systems prevalent in large-scale structures like office buildings, hospitals, and educational institutions. This surge in demand is poised to persist, driven by the burgeoning adoption of HVAC systems, thereby solidifying the trajectory of the Cooling Towers Market in the forecast period.

Key Market Drivers

Industrial Expansion and Infrastructural Growth

The expansion of industries globally, particularly in emerging economies, serves as a primary driver for the Cooling Towers Market. As industrialization continues at a rapid pace, the establishment of new manufacturing plants, power generation facilities, and infrastructure projects is escalating. Cooling towers are essential components within these industrial settings, helping manage excessive heat generated by machinery and processes. The continuous development of industrial infrastructure, especially in regions like Asia-Pacific and Latin America, amplifies the demand for cooling towers, facilitating efficient heat dissipation to ensure operational stability. This driver is particularly crucial as industrial sectors like chemicals, power generation, and manufacturing increasingly rely on cooling towers to maintain optimal working temperatures and prevent overheating of equipment.

Rising Demand for HVAC Systems

The growing adoption of Heating, Ventilation, and Air Conditioning (HVAC) systems across commercial, residential, and industrial sectors drives the Cooling Towers Market. HVAC systems are fundamental in regulating indoor temperatures and providing comfort in large-scale structures such as office buildings, hospitals, and educational institutions. Cooling towers play a pivotal role in HVAC systems by efficiently managing temperature control through water cooling mechanisms. The increasing installation of HVAC systems, especially in commercial spaces and high-rise buildings, propels the demand for cooling towers globally.

Environmental Regulations and Energy Efficiency Demands

Stringent environmental regulations coupled with the global focus on energy efficiency drive the demand for energy-efficient cooling solutions. Governments and regulatory bodies worldwide impose strict guidelines to reduce carbon emissions and promote energy-saving practices. Cooling towers equipped with advanced technology are crucial in meeting these environmental standards. Manufacturers are innovating to develop eco-friendly and energy-efficient cooling tower solutions that comply with regulatory norms, leading to increased adoption in industries aiming for sustainability.

Infrastructure Modernization and Replacement

The need for upgrading aging infrastructure and replacing outdated cooling tower systems fuels market growth. Many existing cooling towers are reaching the end of their operational lifecycle, necessitating replacements with more efficient and modern systems. Industries are investing in new cooling tower installations equipped with

advanced features that offer improved performance, reliability, and energy efficiency compared to older models. This trend is notably observed in developed regions, where infrastructure renewal projects contribute significantly to market expansion.

Expanding Power Generation Sector

The growing demand for electricity, driven by urbanization, industrialization, and population growth, is bolstering the power generation sector. Cooling towers are integral in thermal power plants, nuclear facilities, and other electricity generation systems. The rising need for power, particularly in developing economies, leads to increased installation of power generation infrastructure, consequently driving the demand for cooling towers in these facilities. Additionally, the shift toward renewable energy sources like solar and wind also demands cooling solutions for efficient operation.

Key Market Challenges

Environmental Compliance and Water Conservation

Environmental compliance and the increasing emphasis on water conservation pose substantial challenges to the Cooling Towers Market. Cooling towers rely heavily on water for their operation, and the significant water consumption associated with these systems raises concerns regarding water scarcity and conservation. Stricter environmental regulations worldwide focus on reducing water usage and preventing water contamination, compelling industries to adopt more water-efficient cooling tower technologies. Manufacturers face the challenge of developing innovative solutions that optimize water consumption without compromising the efficiency of cooling towers. Moreover, ensuring compliance with stringent environmental norms while maintaining efficient heat dissipation poses a challenge for industries seeking eco-friendly and water-conserving cooling tower systems.

Aging Infrastructure and Retrofitting Challenges

The existence of aging cooling tower infrastructure presents a considerable challenge in the market. Many industrial facilities and commercial buildings possess outdated cooling tower systems that may lack energy efficiency and modern features. Retrofitting these aging towers with advanced technology to meet current environmental standards and energy efficiency requirements poses a challenge. Retrofitting involves upgrading the existing infrastructure to improve performance, efficiency, and compliance with evolving regulations. It often demands significant investments, technical expertise, and downtime

during the installation process. Companies encounter challenges in assessing the feasibility and cost-effectiveness of retrofitting versus replacing older cooling tower systems, considering operational disruptions and the long-term benefits of upgraded infrastructure.

Scaling and Corrosion Issues

Scaling and corrosion are persistent challenges affecting the efficiency and longevity of cooling towers. The accumulation of scale deposits and corrosion within cooling systems leads to reduced heat transfer efficiency, increased energy consumption, and equipment deterioration. These issues arise due to the presence of minerals and impurities in water used by cooling towers. Mitigating scaling and corrosion requires regular maintenance, water treatment, and the use of specialized chemicals. Implementing effective water treatment programs to prevent scaling and corrosion without compromising cooling tower efficiency poses a significant challenge for industries. Balancing effective water treatment while ensuring minimal environmental impact remains a challenge for companies aiming for sustainable and efficient cooling solutions.

Energy Efficiency and Operational Costs

Achieving optimal energy efficiency while managing operational costs is a critical challenge faced by the Cooling Towers Market. Cooling towers account for a substantial portion of energy consumption in industrial processes and HVAC systems. Balancing energy efficiency with operational costs presents a challenge for industries striving to reduce energy consumption without compromising cooling efficiency. Developing and implementing innovative technologies that improve energy efficiency, reduce power consumption, and minimize operational costs while ensuring consistent and effective heat dissipation remains a challenge for manufacturers and end-users alike. Additionally, selecting the most cost-effective cooling tower solutions that align with specific industry needs while maintaining operational efficiency poses a challenge in a competitive market landscape.

Key Market Trends

Shift Towards Energy-Efficient Cooling Tower Systems

A prominent trend in the Cooling Towers Market is the increasing demand for energy-efficient systems. Industries and commercial facilities are transitioning toward

sustainable and energy-saving cooling tower solutions to minimize operational costs and reduce environmental impact. The emphasis on achieving higher energy efficiency ratings in cooling towers aligns with global sustainability goals and stringent environmental regulations. Manufacturers are focusing on developing innovative cooling tower designs incorporating advanced materials, enhanced heat exchange surfaces, and optimized airflow to improve energy efficiency. Additionally, the integration of IoT-enabled monitoring and control systems enables real-time performance tracking and energy management, further driving the adoption of energy-efficient cooling towers across various industrial sectors.

Rise in Adoption of Hybrid and Dry Cooling Technologies

The market is witnessing a growing inclination towards hybrid and dry cooling technologies as alternatives to traditional evaporative cooling towers. Hybrid cooling systems combine evaporative and dry cooling methods, offering improved water conservation benefits without compromising cooling efficiency. These systems are particularly preferred in water-scarce regions or industries aiming for reduced water consumption. Similarly, dry cooling systems eliminate water usage by employing air as the cooling medium. The adoption of hybrid and dry cooling technologies is surging across power generation plants, data centers, and large-scale industrial applications seeking sustainable cooling solutions while addressing water scarcity challenges.

Focus on Smart and Connected Cooling Tower Solutions

Smart and connected cooling tower systems leveraging IoT and digital technologies are gaining traction in the market. The integration of sensors, data analytics, and cloud-based platforms allows remote monitoring, predictive maintenance, and optimization of cooling tower operations. Real-time monitoring enables proactive identification of potential issues, reducing downtime and enhancing system reliability. These smart systems facilitate automated adjustments, enabling precise control over cooling tower performance parameters such as water flow, temperature, and energy consumption. The trend towards smart cooling tower solutions supports industries in achieving operational efficiency, predictive maintenance, and improved asset management.

Adoption of Eco-Friendly Materials and Water Treatment Techniques

The market is experiencing a shift towards eco-friendly materials and advanced water treatment techniques in cooling tower construction and maintenance. Manufacturers are focusing on sustainable materials and coatings that minimize environmental impact and

enhance durability. Additionally, the implementation of advanced water treatment solutions, such as non-chemical and eco-friendly treatment methods, helps in preventing scaling, corrosion, and microbial growth within cooling systems. The use of environmentally friendly additives and filtration systems contributes to efficient water usage and reduced chemical discharge, aligning with stringent environmental regulations.

Growing Demand from Emerging Economies and Industrial Sectors

Emerging economies, particularly in Asia-Pacific and Latin America, are witnessing a surge in demand for cooling towers due to rapid industrialization, urbanization, and infrastructural developments. Industries such as power generation, manufacturing, petrochemicals, and HVAC systems in these regions are driving the market growth. The rising need for cooling towers in these sectors is attributed to the establishment of new industrial facilities, expanding commercial infrastructure, and the increasing demand for air conditioning and refrigeration systems in commercial and residential buildings. Additionally, government initiatives promoting industrial development and energy-efficient cooling technologies further stimulate market growth in these regions.

Segmental Insights

Product Insights

In 2023, the open-circuit segment emerged as the dominant force in the market. This growth is primarily attributed to the superior cooling capabilities, lower process temperatures, and minimal carbon footprint offered by open-circuit cooling towers. These features have led to an increased adoption of open-circuit cooling towers across various industries such as cement, chemicals, commercial real estate, pharmaceuticals, power generation, and refineries. MITA Cooling Technologies S.r.l., for example, offers a range of open-circuit cooling towers suitable for diverse applications, from medium to large industrial installations like those in the oil gas and cogeneration sectors.

Closed-circuit cooling towers offer several advantages, including reduced contamination risks to the primary circuit, lower freezing hazards, enhanced plant construction, and improved thermal efficiency. These benefits are particularly crucial for civic and industrial processes, including food production, where maintaining the process fluid's purity is paramount.

Hybrid cooling towers, combining wet and dry cooling technologies, present a

compelling solution with minimal environmental impact, aligning with stringent environmental regulations. This trend is expected to drive demand for hybrid cooling towers in the coming years. For instance, BW SPIG's hybrid technology effectively reduces environmental impact by integrating a wet cooling tower with a dry section. The dry section consists of conventional air-cooled heat exchangers positioned above the drift eliminators within the tower structure.

Material Insights

The fiberglass reinforced plastic (FRP) segment has captured the largest market share, driven by increasing global demand. FRP is sought after for its exceptional resistance to corrosion, acid rain, and snow. Furthermore, its lightweight nature, low maintenance requirements, versatility in both dry and wet operations, and ability to withstand diverse environmental conditions contribute to its popularity. These attributes are expected to fuel the demand for FRP cooling towers worldwide in the foreseeable future.

Steel cooling towers, constructed from galvanized and stainless steel, boast robust structural strength and efficient cooling capabilities. Ideal for large facilities, these towers are renowned for their conductivity and effectiveness. For instance, Berg's galvanized steel cooling towers offer cost savings in installation, maintenance, and operation for both new projects and replacements. Additionally, the GT Series ensures validated thermal performance, fully rated to accommodate various flow and temperature specifications.

High-Density Polyethylene (HDPE) cooling tower designs offer significant advantages such as ease of operation, maintenance, chemical balance upkeep, and tower erection. These benefits are expected to drive demand for HDPE over the forecast period. Patriot Forge Co., for instance, relies on modern HDPE cooling towers to maintain optimal bath temperatures for hydraulic systems and metal forging quenching. Unlike metal counterparts prone to degradation in chemical environments, HDPE ensures dependable, durable, and efficient process cooling solutions.

Application Insights

Cooling towers serve as indispensable assets within industrial infrastructures, managing excessive heat generated by machinery and processes. With a burgeoning number of new industrial facilities worldwide, the demand for cooling towers has witnessed a substantial upsurge. They play a pivotal role in industrial and HVAC applications, contributing to the energy-efficient operations of HVAC systems commonly deployed in

extensive infrastructures like office buildings, hospitals, and educational institutions.

Moreover, the oil gas sector, characterized by high water flow rates and substantial heat generation from industrial equipment, heavily relies on cooling towers to mitigate operational disruptions. These towers facilitate the cooling of process water used in industrial equipment to manage heat and enable its reuse, ensuring the seamless functioning of operations. In catering to industry-specific challenges, notable companies like Paharpur have introduced innovative cooling towers equipped with flame-retardant PVC fillings and fiberglass. These advancements address safety concerns, particularly in petroleum refineries dealing with hazardous gases like H₂S, where the incorporation of hazardous gas detectors enhances safety measures by alerting operators to critical toxicity levels.

The mounting adoption of HVAC systems and the imperative need for efficient heat management in industrial processes and oil gas operations are projected to sustain the demand for cooling towers across various sectors. This consistent growth trajectory reflects the pivotal role these towers play in maintaining operational efficiency, ensuring safety standards, and contributing to sustainable practices within industrial settings and critical sectors like oil gas.

Regional Insights

In 2023, Asia Pacific emerged as the market leader, driven by the improving economies of China, India and Indonesia. Governments in these regions are implementing supportive policies to encourage investments in natural resource extraction, particularly in crude oil and natural gas. This initiative is expected to boost the establishment of oil extraction units, consequently increasing the demand for cooling towers in the area.

North America, spearheaded by Canada and the U.S., held a significant share of the global market in 2023. This was largely due to the widespread presence of large-scale data centers, intelligent buildings, and building automation vendors in the region. Furthermore, the escalating demand for structured and unstructured data, coupled with the growing significance of cloud computing, is projected to drive the expansion of the global data center sector. As a result, there will be an increased need for cooling towers to maintain optimal temperatures in these data centers, ultimately leading to reduced energy consumption.

The robust presence of oil and gas reserves in countries like Brazil, Colombia and Argentina is anticipated to positively influence the market. Factors such as industrial

expansions and the development of large-scale commercial structures, particularly in Brazil and Colombia, are expected to drive demand for cooling towers for heat removal applications over the assessment period.

According to the World Bank, manufacturing production in the Middle East Africa region witnessed growth from 12% in 2020 to 13% in 2021. Rapid industrial growth is observed in countries like Turkey, Israel, and Saudi Arabia, which contribute significantly to manufacturing output. Consequently, the expanding manufacturing industry in the region is expected to drive the demand for water cooling towers, thereby fueling the growth of the cooling towers industry in the Middle East Africa.

Key Market Players

Babcock Wilcox Enterprises, Inc.

Baltimore Aircoil Company

Cooling Tower Systems, Inc.

Delta Cooling Towers Inc.

Engie Refrigeration GmbH

EVAPCO, Inc.

Johnson Controls International Plc.

Kelvion Holdings GmbH

Liang Chi Industry Co. Ltd

Report Scope:

In this report, the Global Cooling Towers Market has been segmented into the following categories, in addition to the industry trends which have also been detailed below:

Cooling Towers Market, By Product:

oOpen circuit

oClosed-circuit

oHybrid

Cooling Towers Market,By Material:

oFRP

oSteel

oConcrete

oWood

Cooling Towers Market,By Application:

oHVAC

oPower Generation

oOil Gas

Cooling Towers Market, By Region:

oNorth America

United States

Canada

Mexico

oEurope

France

United Kingdom

Italy

Germany

Spain

Belgium

oAsia-Pacific

China

India

Japan

Australia

South Korea

Indonesia

Vietnam

oSouth America

Brazil

Argentina

Colombia

Chile

Peru

oMiddle East Africa

South Africa

Saudi Arabia

UAE

Turkey

Israel

Competitive Landscape

Company Profiles: Detailed analysis of the major companies present in the Global Cooling Towers Market.

Available Customizations:

Global Cooling Towers market report with the given market data, Tech Sci Research offers customizations according to a company's specific needs. The following customization options are available for the report:

Company Information

Detailed analysis and profiling of additional market players (up to five).

Contents

1.PRODUCT OVERVIEW

- 1.1.Market Definition
- 1.2.Scope of the Market
 - 1.2.1.Markets Covered
 - 1.2.2.Years Considered for Study
 - 1.2.3.Key Market Segmentations

2.RESEARCH METHODOLOGY

- 2.1.Objective of the Study
- 2.2.Baseline Methodology
- 2.3.Formulation of the Scope
- 2.4.Assumptions and Limitations
- 2.5.Sources of Research
 - 2.5.1.Secondary Research
 - 2.5.2.Primary Research
- 2.6.Approach for the Market Study
 - 2.6.1.The Bottom-Up Approach
 - 2.6.2.The Top-Down Approach
- 2.7.Methodology Followed for Calculation of Market Size Market Shares
- 2.8.Forecasting Methodology
 - 2.8.1.Data Triangulation Validation

3.EXECUTIVE SUMMARY

4.IMPACT OF COVID-19 ON GLOBAL COOLING TOWERS MARKET

5.VOICE OF CUSTOMER

6.GLOBAL COOLING TOWERS

7.GLOBAL COOLING TOWERS MARKET OUTLOOK

- 7.1.Market Size Forecast
 - 7.1.1.By Value
- 7.2.Market Share Forecast

- 7.2.1.By Product (Open-circuit, Closed-circuit, Hybrid)
- 7.2.2.By Material (FRP, Steel, Concrete, Wood)
- 7.2.3.By Application (HVAC, Power Generation, Oil Gas)
- 7.2.4.By Region (North America, Europe, South America, Middle East Africa, Asia Pacific)
- 7.3.By Company (2023)
- 7.4.Market Map

8.NORTH AMERICA COOLING TOWERS MARKETOUTLOOK

- 8.1.Market Size Forecast
 - 8.1.1.By Value
- 8.2.Market Share Forecast
 - 8.2.1.By Product
 - 8.2.2.By Material
 - 8.2.3.By Application
 - 8.2.4.By Country
- 8.3.North America: Country Analysis
 - 8.3.1.United States Cooling Towers Market Outlook
 - 8.3.1.1.Market Size Forecast
 - 8.3.1.1.1.By Value
 - 8.3.1.2.Market Share Forecast
 - 8.3.1.2.1.By Product
 - 8.3.1.2.2.By Material
 - 8.3.1.2.3.By Application
 - 8.3.2.Canada Cooling Towers Market Outlook
 - 8.3.2.1.Market Size Forecast
 - 8.3.2.1.1.By Value
 - 8.3.2.2.Market Share Forecast
 - 8.3.2.2.1.By Product
 - 8.3.2.2.2.By Material
 - 8.3.2.2.3.By Application
 - 8.3.3.Mexico Cooling Towers Market Outlook
 - 8.3.3.1.Market Size Forecast
 - 8.3.3.1.1.By Value
 - 8.3.3.2.Market Share Forecast
 - 8.3.3.2.1.By Product
 - 8.3.3.2.2.By Material
 - 8.3.3.2.3.By Application

9.EUROPE COOLING TOWERS MARKETOUTLOOK

9.1.Market Size Forecast

9.1.1.By Value

9.2.Market Share Forecast

9.2.1.By Product

9.2.2.By Material

9.2.3.By Application

9.2.4.By Country

9.3.Europe: Country Analysis

9.3.1.Germany Cooling Towers Market Outlook

9.3.1.1.Market Size Forecast

9.3.1.1.1.By Value

9.3.1.2.Market Share Forecast

9.3.1.2.1.By Product

9.3.1.2.2.By Material

9.3.1.2.3.By Application

9.3.2.France Cooling Towers Market Outlook

9.3.2.1.Market Size Forecast

9.3.2.1.1.By Value

9.3.2.2.Market Share Forecast

9.3.2.2.1.By Product

9.3.2.2.2.By Material

9.3.2.2.3.By Application

9.3.3.United Kingdom Cooling Towers Market Outlook

9.3.3.1.Market Size Forecast

9.3.3.1.1.By Value

9.3.3.2.Market Share Forecast

9.3.3.2.1.By Product

9.3.3.2.2.By Material

9.3.3.2.3.By Application

9.3.4.Italy Cooling Towers Market Outlook

9.3.4.1.Market Size Forecast

9.3.4.1.1.By Value

9.3.4.2.Market Share Forecast

9.3.4.2.1.By Product

9.3.4.2.2.By Material

9.3.4.2.3.By Application

9.3.5.Spain Cooling Towers Market Outlook

9.3.5.1.Market Size Forecast

9.3.5.1.1.By Value

9.3.5.2.Market Share Forecast

9.3.5.2.1.By Product

9.3.5.2.2.By Material

9.3.5.2.3.By Application

9.3.6.Belgium Cooling Towers Market Outlook

9.3.6.1.Market Size Forecast

9.3.6.1.1.By Value

9.3.6.2.Market Share Forecast

9.3.6.2.1.By Product

9.3.6.2.2.By Material

9.3.6.2.3.By Application

10.SOUTH AMERICA COOLING TOWERS MARKET OUTLOOK

10.1.Market Size Forecast

10.1.1.By Value

10.2.Market Share Forecast

10.2.1.By Product

10.2.2.By Material

10.2.3.By Application

10.2.4.By Country

10.3.South America: Country Analysis

10.3.1.Brazil Cooling Towers Market Outlook

10.3.1.1.Market Size Forecast

10.3.1.1.1.By Value

10.3.1.2.Market Share Forecast

10.3.1.2.1.By Product

10.3.1.2.2.By Material

10.3.1.2.3.By Application

10.3.2.Colombia Cooling Towers Market Outlook

10.3.2.1.Market Size Forecast

10.3.2.1.1.By Value

10.3.2.2.Market Share Forecast

10.3.2.2.1.By Product

10.3.2.2.2.By Material

10.3.2.2.3.By Application

10.3.3.Argentina Cooling Towers Market Outlook

10.3.3.1.Market Size Forecast

10.3.3.1.1.By Value

10.3.3.2.Market Share Forecast

10.3.3.2.1.By Product

10.3.3.2.2.By Material

10.3.3.2.3.By Application

10.3.4.Chile Cooling Towers Market Outlook

10.3.4.1.Market Size Forecast

10.3.4.1.1.By Value

10.3.4.2.Market Share Forecast

10.3.4.2.1.By Product

10.3.4.2.2.By Material

10.3.4.2.3.By Application

10.3.5.Peru Cooling Towers Market Outlook

10.3.5.1.Market Size Forecast

10.3.5.1.1.By Value

10.3.5.2.Market Share Forecast

10.3.5.2.1.By Product

10.3.5.2.2.By Material

10.3.5.2.3.By Application

11.MIDDLE EAST AFRICA COOLING TOWERS MARKETOUTLOOK

11.1.Market Size Forecast

11.1.1.By Value

11.2.Market Share Forecast

11.2.1.By Product

11.2.2.By Material

11.2.3.By Application

11.2.4.By Country

11.3.Middle East Africa: Country Analysis

11.3.1.Saudi Arabia Cooling Towers Market Outlook

11.3.1.1.Market Size Forecast

11.3.1.1.1.By Value

11.3.1.2.Market Share Forecast

11.3.1.2.1.By Product

11.3.1.2.2.By Material

11.3.1.2.3.By Application

11.3.2.UAE Cooling Towers Market Outlook

11.3.2.1.Market Size Forecast

11.3.2.1.1.By Value

11.3.2.2.Market Share Forecast

11.3.2.2.1.By Product

11.3.2.2.2.By Material

11.3.2.2.3.By Application

11.3.3.South Africa Cooling Towers Market Outlook

11.3.3.1.Market Size Forecast

11.3.3.1.1.By Value

11.3.3.2.Market Share Forecast

11.3.3.2.1.By Product

11.3.3.2.2.By Material

11.3.3.2.3.By Application

11.3.4.Turkey Cooling Towers Market Outlook

11.3.4.1.Market Size Forecast

11.3.4.1.1.By Value

11.3.4.2.Market Share Forecast

11.3.4.2.1.By Product

11.3.4.2.2.By Material

11.3.4.2.3.By Application

11.3.5.Israel Cooling Towers Market Outlook

11.3.5.1.Market Size Forecast

11.3.5.1.1.By Value

11.3.5.2.Market Share Forecast

11.3.5.2.1.By Product

11.3.5.2.2.By Material

11.3.5.2.3.By Application

12.ASIA PACIFIC COOLING TOWERS MARKET OUTLOOK

12.1.Market Size Forecast

12.1.1.By Value

12.2.Market Share Forecast

12.2.1.By Product

12.2.2.By Material

12.2.3.By Application

12.2.4.By Country

12.3.Asia-Pacific: Country Analysis

12.3.1.China Cooling Towers Market Outlook

12.3.1.1.Market Size Forecast

12.3.1.1.1.By Value

12.3.1.2.Market Share Forecast

12.3.1.2.1.By Product

12.3.1.2.2.By Material

12.3.1.2.3.By Application

12.3.2.India Cooling Towers Market Outlook

12.3.2.1.Market Size Forecast

12.3.2.1.1.By Value

12.3.2.2.Market Share Forecast

12.3.2.2.1.By Product

12.3.2.2.2.By Material

12.3.2.2.3.By Application

12.3.3.Japan Cooling Towers Market Outlook

12.3.3.1.Market Size Forecast

12.3.3.1.1.By Value

12.3.3.2.Market Share Forecast

12.3.3.2.1.By Product

12.3.3.2.2.By Material

12.3.3.2.3.By Application

12.3.4.South Korea Cooling Towers Market Outlook

12.3.4.1.Market Size Forecast

12.3.4.1.1.By Value

12.3.4.2.Market Share Forecast

12.3.4.2.1.By Product

12.3.4.2.2.By Material

12.3.4.2.3.By Application

12.3.5.Australia Cooling Towers Market Outlook

12.3.5.1.Market Size Forecast

12.3.5.1.1.By Value

12.3.5.2.Market Share Forecast

12.3.5.2.1.By Product

12.3.5.2.2.By Material

12.3.5.2.3.By Application

12.3.6.Indonesia Cooling Towers Market Outlook

12.3.6.1.Market Size Forecast

12.3.6.1.1.By Value

12.3.6.2.Market Share Forecast

- 12.3.6.2.1.By Product
- 12.3.6.2.2.By Material
- 12.3.6.2.3.By Application
- 12.3.7.Vietnam Cooling Towers Market Outlook
 - 12.3.7.1.Market Size Forecast
 - 12.3.7.1.1.By Value
 - 12.3.7.2.Market Share Forecast
 - 12.3.7.2.1.By Product
 - 12.3.7.2.2.By Material
 - 12.3.7.2.3.By Application

13.MARKET DYNAMICS

- 13.1.Drivers
- 13.2.Challenges

14.MARKET TRENDS AND DEVELOPMENTS

15.COMPANY PROFILES

- 15.1.Babcock Wilcox Enterprises, Inc.
 - 15.1.1.Business Overview
 - 15.1.2.Key Revenue and Financials
 - 15.1.3.Recent Developments
 - 15.1.4.Key Personnel/Key Contact Person
 - 15.1.5.Key Product/Services Offered
- 15.2.Baltimore Aircoil Company
 - 15.2.1.Business Overview
 - 15.2.2.Key Revenue and Financials
 - 15.2.3.Recent Developments
 - 15.2.4.Key Personnel/Key Contact Person
 - 15.2.5.Key Product/Services Offered
- 15.3.Cenk Industrial Plants Manufacturing and Contracting Co.
 - 15.3.1.Business Overview
 - 15.3.2.Key Revenue and Financials
 - 15.3.3.Recent Developments
 - 15.3.4.Key Personnel/Key Contact Person
 - 15.3.5.Key Product/Services Offered
- 15.4.Cooling Tower Systems, Inc.

- 15.4.1.Business Overview
- 15.4.2.Key Revenue and Financials
- 15.4.3.Recent Developments
- 15.4.4.Key Personnel/Key Contact Person
- 15.4.5.Key Product/Services Offered
- 15.5.Delta Cooling Towers Inc.
 - 15.5.1.Business Overview
 - 15.5.2.Key Revenue and Financials
 - 15.5.3.Recent Developments
 - 15.5.4.Key Personnel/Key Contact Person
 - 15.5.5.Key Product/Services Offered
- 15.6.Engie Refrigeration GmbH
 - 15.6.1.Business Overview
 - 15.6.2.Key Revenue and Financials
 - 15.6.3.Recent Developments
 - 15.6.4.Key Personnel/Key Contact Person
 - 15.6.5.Key Product/Services Offered
- 15.7.EVAPCO, Inc.
 - 15.7.1.Business Overview
 - 15.7.2.Key Revenue and Financials
 - 15.7.3.Recent Developments
 - 15.7.4.Key Personnel/Key Contact Person
 - 15.7.5.Key Product/Services Offered
- 15.8.Johnson Controls International Plc.
 - 15.8.1.Business Overview
 - 15.8.2.Key Revenue and Financials
 - 15.8.3.Recent Developments
 - 15.8.4.Key Personnel/Key Contact Person
 - 15.8.5.Key Product/Services Offered
- 15.9.Kelvion Holdings GmbH
 - 15.9.1.Business Overview
 - 15.9.2.Key Revenue and Financials
 - 15.9.3.Recent Developments
 - 15.9.4.Key Personnel/Key Contact Person
 - 15.9.5.Key Product/Services Offered
- 15.10.Liang Chi Industry Co. Ltd
 - 15.10.1.Business Overview
 - 15.10.2.Key Revenue and Financials
 - 15.10.3.Recent Developments

15.10.4.Key Personnel/Key Contact Person

15.10.5.Key Product/Services Offered

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