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Shunt Reactor Market – Global Industry Size, Share, Trends, Opportunity, and Forecast, 2028Segmented By Form Factor of Product (Oil-Immersed Reactor and Air Core Dry Reactor), By Form Factor (Fixed Shunt Reactor and Variable Shunt Reactor), By Rated Voltage (Less than 200 kV, 200kV-400kV and Above 400kV), By End-user (Electric Utility and Renewable Energy), By Region, Competition, 2018-2028

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Abstracts

The Global Shunt Reactor Market, valued at USD 2.64 billion in 2022, experiencing a steady growth rate with a CAGR of 5.18% throughout the forecast period. This growth is primarily driven by several factors, including the rising global demand for electricity, the modernization efforts aimed at replacing aging technology in developing nations, and the expansion of high-voltage transmission lines. Developing countries are actively increasing their power generation capacity to meet the escalating energy needs driven by significant industrialization and urbanization. Notably, the Asia Pacific region, home to two of the world's fastest-growing economies, India and China, is witnessing substantial growth in this regard. Additionally, there is a growing emphasis on enhancing grid reliability and reducing energy losses during transmission. These priorities have led to the emergence and advancement of alternative technologies such as Flexible AC Transmission Systems (FACTS) and High Voltage Direct Current (HVDC) systems. While these technologies offer advantages, they also present challenges to the shunt reactor market.

Key Market Drivers

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Grid Modernization and Expansion

Grid modernization and expansion are key drivers of the global shunt reactor market. Electrical grids serve as the foundation of modern society, ensuring the dependable transmission and distribution of electricity to homes, businesses, and industries. However, many grids are aging and face challenges due to increased power demand, integration of renewable energy sources, and the need to enhance grid reliability and efficiency. Grid modernization initiatives involve comprehensive upgrades and optimization of grid infrastructure, including advanced technologies, intelligent monitoring and control systems, and crucial grid components like shunt reactors. Shunt reactors play a pivotal role in grid modernization by enhancing grid stability and voltage control. The integration of intermittent renewable energy sources like wind and solar necessitates sophisticated grid management solutions. Shunt reactors provide reactive power compensation, ensuring grid stability and facilitating seamless integration of renewable energy. As electricity demand continues to rise, expanding transmission and distribution networks becomes imperative. Shunt reactors play a crucial role in maintaining proper voltage levels, especially in lengthy transmission lines. By doing so, utilities can efficiently transmit electricity over long distances while minimizing power losses. This highlights the vital role of shunt reactors in modernizing and expanding electrical grids, ensuring their resilience, reliability, and adaptability to the evolving energy landscape.

Increasing Electrification Initiatives

These initiatives primarily aim to extend access to electricity to regions and communities that have historically been underserved, encompassing both urban and rural areas. Electrification projects often form part of broader socioeconomic development and poverty alleviation efforts. In many parts of the world, rural areas have lacked reliable electricity access. Electrification projects are extending the grid to these regions, thereby improving living conditions, enhancing economic opportunities, and driving progress. Shunt reactors play a critical role in ensuring voltage stability in newly electrified areas, safeguarding the integrity of the grid as it extends into remote locations. The relentless process of urbanization is driving increased power demand in urban centers. As cities expand and population growth continues, there is an ever-growing need for robust electrical infrastructure to meet the escalating energy requirements of urban populations. Shunt reactors are indispensable tools in enabling utilities to optimize grid performance, ensuring that urban areas receive a consistent and reliable power supply to sustain their growth and development. Industrialization and the establishment of new manufacturing facilities often entail substantial electrical power

needs. Shunt reactors play a pivotal role in enhancing grid stability, mitigating voltage fluctuations that could disrupt industrial processes. By maintaining voltage levels within the desired range, shunt reactors are instrumental in supporting industrial growth, promoting economic diversification, and fostering job creation. This emphasizes how shunt reactors are integral to electrification initiatives, enabling the expansion of electricity access to both urban and rural areas while supporting industrialization and economic development.

Integration of Renewable Energy and Energy Efficiency Goals

The global focus on renewable energy and energy efficiency is a significant driving force in the shunt reactor market. Governments, utilities, and stakeholders worldwide are setting ambitious targets for greenhouse gas emissions reduction and transitioning to cleaner energy sources. Shunt reactors play a crucial role in the integration of renewable energy sources, such as wind and solar, into the grid. These sources are inherently variable and can introduce voltage fluctuations and instability. Shunt reactors contribute to grid stabilization by compensating for reactive power imbalances, facilitating the seamless integration of renewables. Energy efficiency is a central concern for utilities and regulators. Shunt reactors contribute to energy efficiency by reducing power losses associated with reactive power. This not only minimizes energy wastage but also enables utilities to optimize power transmission and distribution, resulting in cost savings and reduced environmental impact. Grid resilience is an increasing concern, particularly in regions prone to natural disasters or cyberattacks. Shunt reactors enhance grid resilience by stabilizing voltage during disruptions, minimizing downtime, and ensuring a reliable power supply for critical infrastructure and emergency services.

Key Market Challenges

Regulatory Complexity and Standardization

One of the primary challenges faced by the global shunt reactor market is the complexity of regulatory frameworks and the necessity for standardization. The electrical power industry is governed by numerous regulations, codes, and standards that dictate the design, manufacturing, installation, and operation of grid equipment, including shunt reactors. These regulations often differ across regions and countries, creating a demanding environment for manufacturers and utilities operating in multiple markets. Each country and region has its own distinct set of standards and regulations for electrical grid equipment, encompassing technical specifications, testing procedures,

safety requirements, and documentation. This diversity poses a significant challenge for shunt reactor manufacturers who must ensure compliance with multiple sets of rules to access different markets. The interconnection of power grids across borders, although crucial for efficient energy exchange, can be intricate due to varying regulatory frameworks. Ensuring seamless compatibility between shunt reactors and grids operating under different rules and voltage levels presents a formidable challenge. Misalignment between regulatory requirements and grid interconnections can result in operational and compatibility issues. Meeting diverse regulatory requirements incurs significant costs. Manufacturers must allocate resources to extensive research, testing, and certification processes to ensure adherence to regional standards. The costs of compliance can vary substantially depending on the number of markets targeted by a manufacturer. For smaller manufacturers, the expense of compliance can serve as a barrier to entering new markets.

Rapid Technological Advancements

Technological advancements present both opportunities and challenges for the global shunt reactor market. The rapid evolution of technology can render existing products obsolete, necessitating significant investments in research and development to maintain competitiveness. The advent of advanced grid management technologies, such as smart grids and digital substations, is revolutionizing the way utilities control and optimize their grids. Seamless integration of shunt reactors with these technologies requires continuous innovation to meet evolving grid requirements. The pursuit of greater energy efficiency across all aspects of the electrical grid, including shunt reactors, demands ongoing research and development. Manufacturers face the challenge of creating reactors that can operate at higher efficiency levels without compromising grid stability. As grids become more complex and interconnected, the control systems for shunt reactors must evolve to handle larger volumes of data and make real-time adjustments. This complexity introduces challenges in the development of advanced control algorithms and systems.

Key Market Trends

Increasing Integration of Renewable Energy Sources

One of the key trends observed in the global shunt reactor market is the growing integration of renewable energy sources, such as wind and solar power, into the electrical grid. As the world moves towards cleaner and more sustainable energy systems, renewable energy sources have gained significant traction. However, these

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sources bring forth unique challenges related to grid stability, voltage control, and power quality. Specifically, wind and solar energy, being inherently variable and intermittent, can lead to power supply fluctuations and grid instability. To address these challenges, the deployment of shunt reactors has become crucial. Shunt reactors provide reactive power compensation, aiding in stabilizing voltage levels and ensuring grid stability, especially during periods of high renewable energy generation. The integration of renewable energy sources can lead to voltage fluctuations and grid imbalances. Shunt reactors play a vital role in maintaining appropriate voltage levels by absorbing or injecting reactive power as required. This ensures that voltage remains within acceptable limits, mitigating the risks of overvoltage or undervoltage that could potentially damage equipment or disrupt power supply.

Segmental Insights

Form Factor Insights

Variable Shunt Reactor segment is expected to dominate the market during the forecast period. These reactors enable the control of reactive power compensation based on real-time requirements of the electrical grid. Variable shunt reactors play a critical role in enhancing the flexibility and stability of electrical grids. They allow grid operators to adjust the level of reactive power compensation to match varying load and voltage conditions. The increasing integration of renewable energy sources, such as wind and solar, into the grid has resulted in significant fluctuations in power supply. Variable shunt reactors help mitigate voltage fluctuations caused by intermittent renewable energy generation. Manufacturers are incorporating advanced control systems and automation features into variable shunt reactors. These systems facilitate remote monitoring and control, optimizing grid performance. As grids worldwide undergo upgrades and modernization, a growing opportunity emerges for variable shunt reactors. They are well-suited to meet the dynamic and evolving needs of modern electrical grids. Ongoing research and development efforts in power electronics and grid management technologies can lead to the development of more advanced and efficient variable shunt reactors, creating new market prospects.

End-user Insights

Electric Utility segment is expected to dominate the market during the forecast period. Shunt reactors play a crucial role in mitigating power losses caused by reactive power in transmission lines. This leads to enhanced power transmission efficiency and reduced operational costs for electric utilities. Given the aging power infrastructure in many

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regions, upgrades are necessary, and shunt reactors are often incorporated to optimize grid performance and prolong the lifespan of existing assets. Electric utilities are increasingly embracing digitalization and automation technologies to enhance grid management, with shunt reactors seamlessly integrated into digitalized grids, enabling real-time monitoring and control. Electrification initiatives in urban and rural areas present opportunities for electric utilities to expand their grid networks, and shunt reactors are vital for ensuring voltage stability in newly electrified regions. Grid resilience is of utmost importance, especially in disaster-prone regions. By investing in shunt reactors and grid infrastructure improvements, electric utilities can enhance resilience and minimize downtime during disruptions. Shunt reactors are indispensable for maintaining grid stability, improving power quality, and facilitating the integration of renewable energy sources. As electric utilities continue to evolve and modernize their grids, the demand for shunt reactors is expected to remain robust, offering avenues for growth and innovation in the industry.

Regional Insights

Asia Pacific is expected to dominate the market during the forecast period. The Asia-Pacific region, with its expansive and rapidly growing power infrastructure, presents a prominent market for shunt reactors. The region's increasing electricity demand, fueled by industrialization and urbanization, has resulted in substantial investments in power transmission and distribution networks. The market for shunt reactors in Asia-Pacific has exhibited steady growth, driven by the expansion of high-voltage power grids and the imperative to enhance grid reliability and stability. Notably, the adoption of high-voltage shunt reactors has emerged as a significant trend in the region, as they are indispensable for high-capacity power transmission lines and are increasingly deployed to optimize grid performance. Several countries in Asia-Pacific, including China and India, have placed emphasis on local manufacturing of electrical equipment, including shunt reactors. This strategic focus is motivated by the pursuit of cost-effective solutions and government incentives for domestic production. Moreover, the ongoing expansion of renewable energy capacity in the region presents a compelling opportunity for shunt reactor manufacturers. These reactors play a crucial role in mitigating voltage fluctuations caused by intermittent renewable energy sources. The integration of energy storage solutions, such as batteries, with power grids is also on the rise. In this context, shunt reactors can effectively complement energy storage systems by ensuring grid stability during transitions between power sources.

Key Market Players

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Siemens AG

Hitachi ABB Power Grids

Hyosung Corporation

Trench Group

CG Power and Industrial Solutions Limited

Mitsubishi Electric Corporation

Fuji Electric Co.

TBEA Co. Ltd

Hyundai Heavy Industries Co. Ltd

Alstom SA

Report Scope:

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

Global Shunt Reactor Market, By Product:

Oil-Immersed Reactor

Air Core Dry Reactor

Global Shunt Reactor Market, By Form Factor:

Fixed Shunt Reactor

Variable Shunt Reactor

Global Shunt Reactor Market, By Rated Voltage:

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Less than 200 kV

200kV-400kV

Above 400kV

Global Shunt Reactor Market, By End-user:

Electric Utility

Renewable Energy

Global Shunt Reactor Market, By Region:

North America

Europe

South America

Middle East & Africa

Asia Pacific

Competitive Landscape

Company Profiles: Detailed analysis of the major companies present in the Global Shunt Reactor Market.

Available Customizations:

Global Shunt Reactor 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

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

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