

Medical Device Cleaning Market - Global Industry Size, Share, Trends, Opportunity & Forecast, Segmented By Device (Non-critical, Semi-critical, Critical), By Technique (Cleaning, Disinfection, Sterilization), By EPA Classification (High Level, Intermediate Level, Low Level), By Region, & Competition, 2019-2029F

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Abstracts

Global Medical Device Cleaning Market was valued at USD 21.25 Billion in 2023 and is anticipated to project robust growth in the forecast period with a CAGR of 10.15% through 2029. The Global Medical Device Cleaning Market is witnessing robust growth, propelled by the rising demand for effective sanitation and sterilization in healthcare facilities worldwide. As patient safety takes center stage and healthcare-associated infections (HAIs) become a focal point for prevention, the cleaning of medical devices has become integral to hospital operations and regulatory compliance.

Key Market Drivers

Rising Incidence of Healthcare-Associated Infections (HAIs)

The rising incidence of healthcare-associated infections (HAIs) plays a crucial role in driving the growth of the Global Medical Device Cleaning Market. HAIs, which are infections patients acquire while receiving treatment in healthcare facilities, represent a significant challenge to healthcare systems worldwide. They are directly linked to increased patient morbidity, extended hospital stays, and a higher financial burden for both hospitals and patients.

Healthcare-associated infections are one of the primary reasons for implementing

stringent infection control practices in hospitals, clinics, and other healthcare settings. Medical devices that are reused between patients, such as surgical instruments, endoscopes, and diagnostic tools, pose a significant risk if not properly cleaned and sterilized. The cleaning process is essential in preventing the transmission of infectious agents, which could otherwise lead to HAIs. To reduce the incidence of HAIs, healthcare providers are increasingly adopting advanced cleaning protocols and technologies that ensure devices are disinfected or sterilized effectively before being reused. This creates a substantial and sustained demand for cleaning agents, disinfectants, automated washers, and other specialized medical device cleaning equipment. As the prevalence of HAIs has garnered more attention, regulatory authorities such as the U.S. Food and Drug Administration (FDA), Centers for Disease Control and Prevention (CDC), and European Medicines Agency (EMA) have imposed strict guidelines for the cleaning, disinfection, and sterilization of medical devices. Hospitals and healthcare providers must meet these regulations to avoid penalties and maintain accreditation. In response to these regulatory demands, healthcare institutions must invest in high-quality cleaning products and solutions that comply with the latest standards. This regulatory pressure directly stimulates market growth, as healthcare providers are mandated to follow rigorous cleaning protocols that drive the need for advanced cleaning technologies and disinfectants.

The financial repercussions of HAIs are significant for hospitals, as they lead to increased treatment costs, prolonged hospital stays, and in some cases, legal liabilities. Additionally, healthcare payers, such as insurance companies and government programs, are less likely to reimburse hospitals for the treatment of infections that are preventable or result from poor hygiene practices. These economic pressures have incentivized healthcare facilities to invest heavily in infection control measures, including the thorough cleaning of medical devices. The financial stakes involved in preventing HAIs are high, as hospitals look to avoid penalties, additional treatment costs, and potential damage to their reputation. As a result, the market for medical device cleaning products continues to expand as healthcare providers seek the best solutions to reduce infection rates and improve patient outcomes. With growing public awareness about the risks of HAIs, patients are becoming more informed and concerned about the cleanliness of medical devices used during their care. This awareness has led to higher expectations for safety and hygiene within healthcare settings. Patients are now more likely to choose hospitals or healthcare providers with a strong track record of infection prevention, which puts additional pressure on facilities to adhere to strict cleaning protocols. In response, healthcare providers are increasingly focused on implementing robust cleaning and sterilization processes for medical devices. The growing patient demand for safety, coupled with a focus on transparency in healthcare quality metrics,

is further driving the adoption of advanced cleaning technologies and solutions, contributing to the overall market growth.

The cleaning of medical devices is particularly critical for surgical instruments and devices used in invasive procedures. These procedures carry a high risk of introducing bacteria or pathogens into the body, making infection control paramount. Instruments used in surgeries, such as scalpels, forceps, and endoscopes, need to be thoroughly cleaned and sterilized to prevent HAIs. Given the volume of surgeries conducted globally and the growing prevalence of complex, invasive procedures, the demand for reliable and efficient medical device cleaning systems is rising. Healthcare facilities cannot afford the risks associated with unclean instruments, which can lead to serious patient infections, prolonged recovery times, or even death. This has driven the need for cutting-edge cleaning technologies, such as ultrasonic cleaners and automated washer-disinfectors, which ensure thorough cleaning of intricate and reusable devices. Preventing infections has become a priority for healthcare providers, and addressing the cleaning of reusable medical devices is a key component of this preventive strategy. The costs and health impacts associated with treating HAIs are significant, which has shifted the focus toward preventing these infections through better hygiene and cleaning practices. Investing in medical device cleaning solutions has become a strategic priority for hospitals seeking to minimize infection risks and avoid the long-term financial and reputational consequences of HAIs. This shift in focus toward prevention rather than treatment has directly increased the demand for advanced cleaning products and systems.

Increasing Number of Surgical Procedures and Medical Interventions

The increasing number of surgical procedures and medical interventions is a significant driver of growth in the Global Medical Device Cleaning Market. As the global healthcare landscape evolves, the demand for more medical interventions, particularly those involving reusable medical instruments, continues to surge. This growth is closely linked to several interconnected trends, such as aging populations, advances in surgical techniques, and rising access to healthcare services, which together amplify the need for effective and efficient medical device cleaning solutions. The number of surgical procedures worldwide is on the rise, driven by several factors, including the growing prevalence of chronic diseases, an aging population, and increasing access to healthcare in emerging markets. Procedures such as orthopedic surgeries, cardiovascular interventions, and cancer-related operations are becoming more common due to the increasing incidence of lifestyle-related and age-associated health issues.

These surgeries require specialized instruments and devices, many of which are reusable. Each of these instruments needs to be properly cleaned, disinfected, and sterilized to avoid post-operative infections. The high volume of surgeries creates a constant and growing demand for cleaning agents, disinfectants, and advanced cleaning systems, which can handle the increased workload efficiently while ensuring compliance with infection control standards. The rise in hip and knee replacement surgeries—a result of aging populations and the increasing incidence of obesity—requires the use of specialized orthopedic tools. The cleaning and reprocessing of these tools become critical, not just for ensuring surgical success but also for maintaining patient safety. Modern surgical procedures are becoming more complex, and the tools used in these interventions have become increasingly sophisticated. Instruments such as minimally invasive surgical tools, robotic surgery systems, and specialized scopes have intricate designs and delicate components. These instruments require highly effective, tailored cleaning processes to ensure that all parts, including hard-to-reach areas, are thoroughly cleaned and sterilized. As the complexity of medical devices increases, so does the demand for advanced cleaning technologies that can meet the unique requirements of these devices. The introduction of automated washer-disinfectors, ultrasonic cleaning systems, and enzymatic detergents specifically designed for complex instruments is directly tied to the growing volume and complexity of surgeries. Hospitals and surgical centers must invest in these advanced cleaning solutions to maintain the integrity of these high-value instruments and prevent infections.

Minimally invasive surgeries (MIS), which include laparoscopic, endoscopic, and robotic-assisted procedures, are increasingly favored due to their numerous advantages, such as reduced recovery time, lower risk of complications, and smaller incisions. However, these procedures often involve the use of specialized instruments that must be meticulously cleaned after each use to prevent contamination and ensure sterility. Endoscopes, for instance, are complex devices with multiple channels that make cleaning especially challenging. Inadequate cleaning of such devices has been linked to infections, highlighting the critical importance of thorough and effective cleaning protocols. As MIS procedures become more common, the need for cleaning systems and products that are capable of handling the specific demands of these devices grows, fueling market expansion. Additionally, robotic surgery systems, which involve sophisticated instruments and high-precision tools, are becoming more prevalent in operating rooms. These robotic instruments require specialized cleaning solutions to protect their intricate design and ensure they remain sterile for subsequent procedures. The rising popularity of such systems further contributes to the demand for advanced medical device cleaning technologies.

Many surgical procedures rely on reusable instruments due to their cost-effectiveness and durability. Reusable medical devices, such as forceps, scissors, retractors, and other surgical tools, must undergo strict cleaning, disinfection, and sterilization processes between uses to prevent infections. The reliance on reusable instruments, particularly in high-demand settings such as operating rooms, directly drives the need for cleaning solutions that ensure these tools are free from contaminants after every use. Given that reusable devices offer long-term cost savings compared to disposable alternatives, many healthcare institutions opt for them despite the additional cleaning requirements. As a result, the market for medical device cleaning products, including detergents, disinfectants, and sterilization equipment, is closely linked to the volume of surgical procedures performed with these reusable instruments. Healthcare providers are continuously seeking more efficient, reliable, and scalable cleaning solutions to manage the high turnover of instruments in busy surgical environments. There is a global trend toward the decentralization of healthcare, with an increasing number of surgical procedures being performed in ambulatory surgical centers (ASCs) and outpatient settings. These facilities are designed to offer cost-effective care without the need for overnight hospitalization. As the number of procedures performed in these settings grows, so does the demand for efficient medical device cleaning solutions. ASCs typically handle a high volume of procedures each day, often reusing surgical instruments within short timeframes. This creates an urgent need for rapid, effective cleaning and sterilization processes that can handle the quick turnover of instruments while maintaining high safety standards. The growth of these outpatient facilities is directly driving demand for cleaning products and technologies that are efficient, safe, and cost-effective.

Advancements in Cleaning Technology

Advancements in cleaning technology have become a key driver in the expansion of the Global Medical Device Cleaning Market. As healthcare providers face growing demands for precision, efficiency, and compliance with stringent regulatory standards, innovative cleaning solutions are essential to ensure medical devices are thoroughly cleaned, disinfected, and sterilized.

One of the most significant advancements driving market growth is the development of automated cleaning systems, such as washer-disinfectors and automated endoscope reprocessors (AERs). These machines offer consistent, reliable cleaning processes with minimal manual intervention, ensuring that medical devices are cleaned and disinfected uniformly. This reduces the margin for human error, which can be a significant risk

factor in infection control. Automated systems are particularly valuable in high-volume healthcare settings like hospitals and surgical centers, where rapid turnaround times for cleaning reusable devices are critical. By automating the cleaning process, hospitals can handle larger volumes of devices with greater efficiency and accuracy, reducing operational downtime and increasing overall productivity. This technological shift is fueling the adoption of advanced cleaning systems in healthcare facilities, thereby driving market growth. Ultrasonic cleaning technology has emerged as a game-changer in the medical device cleaning industry, particularly for complex or delicate instruments. Ultrasonic cleaners use high-frequency sound waves to create microscopic bubbles that effectively remove contaminants from hard-to-reach surfaces of medical devices, including intricate components like joints, hinges, and lumens. This technology is especially beneficial for cleaning reusable devices such as surgical instruments, dental tools, and endoscopes, which require precise and thorough cleaning to ensure safety and compliance. Ultrasonic cleaning offers several advantages over traditional manual cleaning methods, including enhanced cleaning efficiency, reduced labor costs, and minimized risk of device damage. As healthcare facilities adopt ultrasonic technology to meet the growing complexity of medical instruments, it is driving increased demand for these systems and supporting market growth.

The development of enzymatic detergents has significantly improved the cleaning efficiency of medical devices. These specialized cleaning agents are formulated to break down organic materials such as blood, tissue, and other biological matter that can adhere to the surfaces of medical instruments. Traditional detergents may not effectively remove such contaminants, especially in hard-to-reach areas or on devices with complex designs. Enzymatic detergents work by catalyzing chemical reactions that dissolve organic residues, ensuring a higher level of cleanliness than was previously possible. Their ability to degrade biofilms, which can harbor bacteria and other pathogens, is crucial for preventing infections. As the complexity of medical devices increases, particularly in minimally invasive and robotic surgery, enzymatic detergents have become indispensable, driving their adoption and contributing to the market's growth. The shift toward eco-friendly and sustainable cleaning technologies is another factor driving the growth of the medical device cleaning market. Traditional cleaning agents often contain harsh chemicals that can be harmful to the environment and pose risks to healthcare workers who are exposed to them regularly. In response, manufacturers have developed biodegradable cleaning agents and disinfectants that are just as effective at removing contaminants but are safer for the environment and human health. These eco-friendly products align with the growing trend of sustainability in healthcare, as hospitals and medical centers seek to reduce their environmental footprint. In addition to reducing toxic waste and harmful emissions, these green

cleaning solutions help healthcare institutions comply with environmental regulations, making them an attractive choice. As a result, the demand for sustainable cleaning products is increasing, contributing to the overall growth of the market.

Sterilization is a critical component of medical device cleaning, particularly for devices that are inserted into sterile body areas or come into contact with blood and other bodily fluids. Recent advances in sterilization technologies, such as low-temperature hydrogen peroxide sterilization and plasma sterilization, have enhanced the effectiveness and speed of sterilizing medical instruments without damaging sensitive materials. These innovations allow for the safe sterilization of heat- and moisture-sensitive devices, which are increasingly common in modern surgical and diagnostic procedures. Low-temperature sterilization methods also shorten the turnaround time for device reprocessing, enabling hospitals and clinics to increase the availability of reusable instruments. This technological progress has expanded the range of devices that can be safely reprocessed, further driving demand for advanced cleaning and sterilization systems in the market. The integration of digital monitoring systems into medical device cleaning processes represents another major advancement. Modern cleaning systems now incorporate digital technology that allows for real-time monitoring of cleaning parameters such as temperature, pressure, and cycle duration, ensuring that all steps meet regulatory and hospital-specific standards. This level of precision helps to eliminate potential errors and improves overall cleaning efficacy. Additionally, traceability systems enable healthcare providers to track the cleaning and sterilization history of each device, ensuring that every instrument has undergone the proper reprocessing steps before being used on a patient. This is especially important in the context of audits, quality control, and regulatory compliance. The ability to maintain detailed records of cleaning processes provides healthcare facilities with greater transparency and accountability, driving the adoption of such technologies and contributing to market growth.

Key Market Challenges

Stringent and Evolving Regulatory Requirements

One of the most significant challenges faced by the medical device cleaning market is the stringent and evolving regulatory landscape. Governments and healthcare regulatory bodies, such as the U.S. Food and Drug Administration (FDA), European Medicines Agency (EMA), and ISO standards, have implemented complex guidelines that govern the cleaning, disinfection, and sterilization of medical devices. These regulations are constantly being updated to address emerging risks, such as healthcare-

associated infections (HAIs) and device contamination, adding layers of complexity to compliance.

Compliance with these regulations requires ongoing investment in updated equipment, cleaning agents, and personnel training. Manufacturers of cleaning products and technologies must continually modify their offerings to meet new standards, often requiring significant research and development expenses. Similarly, healthcare facilities must invest in compliance infrastructure, from documentation to auditing, which can strain financial resources. The lengthy approval processes required by regulatory bodies slow down the introduction of new cleaning products and technologies to the market. This delay restricts innovation, as companies must wait for regulatory approval before they can commercialize their products. For smaller manufacturers, these hurdles can be particularly challenging, limiting their ability to compete with larger players. Regulatory standards vary significantly across regions, making it difficult for global companies to standardize their cleaning protocols. For example, the FDA's guidelines for device reprocessing differ from those in Europe and Asia. This creates additional challenges for multinational healthcare facilities and manufacturers, as they must tailor their cleaning practices to meet the requirements of each region. These regulatory pressures increase operational costs, delay product launches, and create uncertainty in the market, all of which restrict its overall growth potential.

High Initial Costs and Investment in Advanced Cleaning Technologies

Another significant barrier to market growth is the high cost of advanced cleaning technologies and infrastructure. While automated cleaning systems, ultrasonic cleaners, and enzymatic detergents have revolutionized medical device cleaning, their implementation comes with a high upfront investment. This presents several challenges for healthcare facilities, especially smaller hospitals, clinics, and outpatient centers.

Cost-Prohibitive for Smaller Healthcare Providers: Many advanced cleaning technologies are expensive to purchase, install, and maintain. Automated systems, for example, require not only the initial investment but also ongoing expenses such as consumables, maintenance, and software updates. Smaller healthcare providers may struggle to justify these investments, especially when balancing other capital expenditures. As a result, they often continue to rely on manual or less effective cleaning methods, which may not meet modern standards. Advanced cleaning technologies often require specialized training for staff to ensure proper use. This includes educating staff on the operation of new automated systems, compliance with regulatory standards, and understanding complex disinfection protocols. In addition to

equipment costs, healthcare facilities must invest in training programs, which increases operational costs. Smaller healthcare providers may face difficulty in covering these expenses, slowing the adoption of modern cleaning solutions.

In developing regions, the adoption of advanced medical device cleaning technologies is further hindered by financial constraints. Emerging markets may have less access to capital for investing in high-end cleaning systems, even as the need for effective infection control grows. This limits market penetration in regions where healthcare infrastructure is still maturing, restricting global market growth.

Key Market Trends

Rising Adoption of AI and IoT in Cleaning Processes

The integration of Artificial Intelligence (AI) and the Internet of Things (IoT) into medical device cleaning processes is a transformative trend that is set to drive significant growth in the market. These technologies offer the potential to revolutionize the way medical devices are cleaned, monitored, and tracked, increasing efficiency, reducing errors, and ensuring compliance with stringent safety standards.

AI algorithms are being increasingly integrated into automated cleaning systems to optimize cleaning cycles, ensuring that devices are thoroughly cleaned without wasting resources. AI-driven systems can adjust the cleaning parameters—such as cycle time, temperature, and chemical concentration—based on the specific characteristics of the devices being cleaned. This results in more efficient use of cleaning agents and energy while maintaining a high standard of cleanliness. AI is also being utilized to monitor the performance of cleaning systems in real time. Predictive maintenance technology can detect potential malfunctions or inefficiencies before they cause breakdowns, allowing healthcare facilities to perform preventive repairs. This minimizes downtime and reduces the risk of compromised cleaning processes, ensuring that instruments are always available for use in critical procedures. IoT-enabled cleaning systems allow healthcare facilities to remotely monitor and control their cleaning equipment, ensuring that each device undergoes the necessary cleaning and disinfection protocols. IoT sensors can track every stage of the cleaning process, providing real-time data on parameters such as temperature, chemical usage, and cycle completion. This level of monitoring enhances transparency and accountability, helping hospitals and clinics maintain consistent cleaning standards.

Segmental Insights

Device Insights

Based on the category of Device, the Semi-critical segment emerged as the dominant in the global market for Medical Device Cleaning in 2023. Semi-critical devices pose a significant risk for healthcare-associated infections (HAIs) due to their direct contact with mucous membranes. This concern drives the need for stringent cleaning, disinfection, and sterilization protocols to ensure patient safety. The following factors contribute to the heightened focus on cleaning in this segment: The rising awareness of HAIs and their impact on patient outcomes has made infection control a top priority in healthcare settings. As semi-critical devices are frequently used in procedures where there is potential exposure to pathogens, the need for effective cleaning and disinfection processes becomes paramount. Healthcare facilities are investing in advanced cleaning technologies and protocols to mitigate these risks. Regulatory bodies, such as the FDA and European Medicines Agency (EMA), have established strict guidelines for cleaning and reprocessing semi-critical devices. Compliance with these regulations is essential for healthcare facilities to ensure that they are providing safe and effective care. This regulatory pressure drives the adoption of specialized cleaning products and systems tailored to meet the unique needs of semi-critical devices, further solidifying this segment's dominance in the market. The increasing prevalence of endoscopic procedures significantly contributes to the dominance of the semi-critical segment. Endoscopy is widely used for diagnostic and therapeutic purposes in various medical fields, including gastroenterology, pulmonology, and urology. The shift toward minimally invasive surgical techniques has resulted in a higher volume of endoscopic procedures. As these procedures become more common, the demand for effective cleaning solutions for endoscopes and other semi-critical devices increases. This trend is driving investments in advanced cleaning technologies specifically designed for complex devices, reinforcing the market position of the semi-critical segment. Ongoing innovations in endoscopy equipment have led to the development of more complex devices with intricate designs that require specialized cleaning methods. The introduction of new materials and technologies in endoscope manufacturing necessitates the use of effective cleaning agents and systems to ensure optimal performance and longevity of the devices. As healthcare providers increasingly adopt these advanced endoscopic technologies, the cleaning market for semi-critical devices is expected to expand.

The development of specialized cleaning agents, such as enzymatic detergents and disinfectants formulated specifically for semi-critical devices, is enhancing cleaning efficacy. These agents are designed to break down organic contaminants, ensuring

thorough cleaning of devices that come into contact with mucous membranes. The availability of effective cleaning products tailored for this segment is driving their widespread adoption in healthcare facilities. The establishment of robust cleaning protocols is essential for maintaining the safety and efficacy of semi-critical devices. Healthcare facilities are increasingly implementing standardized protocols that adhere to best practices and regulatory guidelines, ensuring consistent cleaning outcomes. This focus on adherence to protocols and best practices is driving demand for specialized cleaning products and services tailored to semi-critical devices. Considering the global emphasis on infection control, the semi-critical segment is positioned for growth as healthcare providers prioritize the effective cleaning and disinfection of devices used in procedures that pose a risk of infection. Many healthcare institutions are implementing comprehensive infection control programs that focus on improving the cleaning and reprocessing of semi-critical devices. These programs often involve the integration of advanced cleaning technologies, staff training, and compliance monitoring to ensure high standards of cleanliness. The emphasis on infection control drives demand for products and services that cater specifically to the semi-critical segment. Events such as the COVID-19 pandemic have highlighted the importance of stringent infection control measures in healthcare settings. As a result, there is a renewed focus on effective cleaning protocols for semi-critical devices, as healthcare facilities seek to minimize the risk of virus transmission. This heightened awareness and commitment to infection prevention strategies will continue to support the growth of the semi-critical segment in the medical device cleaning market.

Regional Insights

North America emerged as the dominant in the global Medical Device Cleaning market in 2023, holding the largest market share in terms of value. The region is home to numerous leading medical device manufacturers and cleaning solution companies, fostering a culture of innovation and investment in advanced cleaning technologies. Healthcare providers are continuously seeking the latest cleaning systems and products to maintain high standards of hygiene and patient safety. North America hosts a diverse range of healthcare facilities, including hospitals, outpatient centers, and specialized clinics, each with unique cleaning needs. The varied landscape encourages the development and adoption of specialized cleaning protocols tailored to different types of medical devices, particularly those classified as semi-critical and critical, thereby driving the demand for cleaning solutions.

The North American market is governed by rigorous regulatory standards, which significantly influence the medical device cleaning landscape. Regulatory bodies such

as the U.S. Food and Drug Administration (FDA) and the Canadian Standards Association (CSA) impose strict guidelines on the cleaning, disinfection, and sterilization of medical devices. These regulations ensure that healthcare providers adhere to best practices, thereby elevating the importance of effective cleaning solutions. The stringent regulatory environment promotes a culture of quality and safety within the healthcare sector. Hospitals and clinics are mandated to implement comprehensive cleaning protocols to minimize the risk of healthcare-associated infections (HAIs). This regulatory pressure drives investments in advanced cleaning technologies and agents, propelling the market forward.

Key Market Players

Ecolab

Getinge AB

Advanced Sterilization Products, Inc (ASP India Private Ltd.)

The Ruhof Corporation

Sklar Surgical Instruments

Sterigenics U.S., LLC

Biotrol Laboratories Pvt. Ltd.

Metrex Research, LLC.

3M

Medivators Inc. (Cantel Medical Group of Companies UK)

Report Scope:

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

Medical Device Cleaning Market, By Device:

Non-critical

Semi-critical

Critical

Medical Device Cleaning Market, By Technique:

Cleaning

Disinfection

Sterilization

Medical Device Cleaning Market, By EPA Classification:

High Level

Intermediate Level

Low Level

Medical Device Cleaning Market, By Region:

North America

United States

Canada

Mexico

Europe

France

United Kingdom

Italy

Germany

Spain

Asia-Pacific

China

India

Japan

Australia

South Korea

South America

Brazil

Argentina

Colombia

Middle East & Africa

South Africa

Saudi Arabia

UAE

Competitive Landscape

Company Profiles: Detailed analysis of the major companies present in the Global

Medical Device Cleaning Market - Global Industry Size, Share, Trends, Opportunity & Forecast, Segmented By Dev...

Medical Device Cleaning Market.

Available Customizations:

Global Medical Device C

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. Key Industry Partners
- 2.4. Major Association and Secondary Sources
- 2.5. Forecasting Methodology
- 2.6. Data Triangulation & Validation
- 2.7. Assumptions and Limitations

3. EXECUTIVE SUMMARY

- 3.1. Overview of the Market
- 3.2. Overview of Key Market Segmentations
- 3.3. Overview of Key Market Players
- 3.4. Overview of Key Regions/Countries
- 3.5. Overview of Market Drivers, Challenges, Trends

4. VOICE OF CUSTOMER

5. MEDICAL DEVICE CLEANING MARKET OUTLOOK

- 5.1. Market Size & Forecast
 - 5.1.1. By Value
- 5.2. Market Share & Forecast
 - 5.2.1. By Device (Non-critical, Semi-critical, Critical)
 - 5.2.2. By Technique (Cleaning, Disinfection, Sterilization)
 - 5.2.3. By EPA Classification (High Level, Intermediate Level, Low Level)
 - 5.2.4. By Region

- 5.2.5. By Company (2023)
- 5.3. Market Map

6. NORTH AMERICA MEDICAL DEVICE CLEANING MARKET OUTLOOK

- 6.1. Market Size & Forecast
 - 6.1.1. By Value
- 6.2. Market Share & Forecast
 - 6.2.1. By Device
 - 6.2.2. By Technique
 - 6.2.3. By EPA Classification
 - 6.2.4. By Country
- 6.3. North America: Country Analysis
 - 6.3.1. United States Medical Device Cleaning Market Outlook
 - 6.3.1.1. Market Size & Forecast
 - 6.3.1.1.1. By Value
 - 6.3.1.2. Market Share & Forecast
 - 6.3.1.2.1. By Device
 - 6.3.1.2.2. By Technique
 - 6.3.1.2.3. By EPA Classification
 - 6.3.2. Canada Medical Device Cleaning Market Outlook
 - 6.3.2.1. Market Size & Forecast
 - 6.3.2.1.1. By Value
 - 6.3.2.2. Market Share & Forecast
 - 6.3.2.2.1. By Device
 - 6.3.2.2.2. By Technique
 - 6.3.2.2.3. By EPA Classification
 - 6.3.3. Mexico Medical Device Cleaning Market Outlook
 - 6.3.3.1. Market Size & Forecast
 - 6.3.3.1.1. By Value
 - 6.3.3.2. Market Share & Forecast
 - 6.3.3.2.1. By Device
 - 6.3.3.2.2. By Technique
 - 6.3.3.2.3. By EPA Classification

7. EUROPE MEDICAL DEVICE CLEANING MARKET OUTLOOK

- 7.1. Market Size & Forecast
 - 7.1.1. By Value

7.2. Market Share & Forecast

7.2.1. By Device

7.2.2. By Technique

7.2.3. By EPA Classification

7.2.4. By Country

7.3. Europe: Country Analysis

7.3.1. Germany Medical Device Cleaning Market Outlook

7.3.1.1. Market Size & Forecast

7.3.1.1.1. By Value

7.3.1.2. Market Share & Forecast

7.3.1.2.1. By Device

7.3.1.2.2. By Technique

7.3.1.2.3. By EPA Classification

7.3.2. United Kingdom Medical Device Cleaning Market Outlook

7.3.2.1. Market Size & Forecast

7.3.2.1.1. By Value

7.3.2.2. Market Share & Forecast

7.3.2.2.1. By Device

7.3.2.2.2. By Technique

7.3.2.2.3. By EPA Classification

7.3.3. Italy Medical Device Cleaning Market Outlook

7.3.3.1. Market Size & Forecast

7.3.3.1.1. By Value

7.3.3.2. Market Share & Forecast

7.3.3.2.1. By Device

7.3.3.2.2. By Technique

7.3.3.2.3. By EPA Classification

7.3.4. France Medical Device Cleaning Market Outlook

7.3.4.1. Market Size & Forecast

7.3.4.1.1. By Value

7.3.4.2. Market Share & Forecast

7.3.4.2.1. By Device

7.3.4.2.2. By Technique

7.3.4.2.3. By EPA Classification

7.3.5. Spain Medical Device Cleaning Market Outlook

7.3.5.1. Market Size & Forecast

7.3.5.1.1. By Value

7.3.5.2. Market Share & Forecast

7.3.5.2.1. By Device

- 7.3.5.2.2. By Technique
- 7.3.5.2.3. By EPA Classification

8. ASIA-PACIFIC MEDICAL DEVICE CLEANING MARKET OUTLOOK

- 8.1. Market Size & Forecast
 - 8.1.1. By Value
- 8.2. Market Share & Forecast
 - 8.2.1. By Device
 - 8.2.2. By Technique
 - 8.2.3. By EPA Classification
 - 8.2.4. By Country
- 8.3. Asia-Pacific: Country Analysis
 - 8.3.1. China Medical Device Cleaning 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 Device
 - 8.3.1.2.2. By Technique
 - 8.3.1.2.3. By EPA Classification
 - 8.3.2. India Medical Device Cleaning 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 Device
 - 8.3.2.2.2. By Technique
 - 8.3.2.2.3. By EPA Classification
 - 8.3.3. Japan Medical Device Cleaning 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 Device
 - 8.3.3.2.2. By Technique
 - 8.3.3.2.3. By EPA Classification
 - 8.3.4. South Korea Medical Device Cleaning Market Outlook
 - 8.3.4.1. Market Size & Forecast
 - 8.3.4.1.1. By Value
 - 8.3.4.2. Market Share & Forecast
 - 8.3.4.2.1. By Device

- 8.3.4.2.2. By Technique
- 8.3.4.2.3. By EPA Classification
- 8.3.5. Australia Medical Device Cleaning Market Outlook
 - 8.3.5.1. Market Size & Forecast
 - 8.3.5.1.1. By Value
 - 8.3.5.2. Market Share & Forecast
 - 8.3.5.2.1. By Device
 - 8.3.5.2.2. By Technique
 - 8.3.5.2.3. By EPA Classification

9. SOUTH AMERICA MEDICAL DEVICE CLEANING MARKET OUTLOOK

- 9.1. Market Size & Forecast
 - 9.1.1. By Value
- 9.2. Market Share & Forecast
 - 9.2.1. By Device
 - 9.2.2. By Technique
 - 9.2.3. By EPA Classification
 - 9.2.4. By Country
- 9.3. South America: Country Analysis
 - 9.3.1. Brazil Medical Device Cleaning 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 Device
 - 9.3.1.2.2. By Technique
 - 9.3.1.2.3. By EPA Classification
 - 9.3.2. Argentina Medical Device Cleaning 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 Device
 - 9.3.2.2.2. By Technique
 - 9.3.2.2.3. By EPA Classification
 - 9.3.3. Colombia Medical Device Cleaning 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 Device

- 9.3.3.2.2. By Technique
- 9.3.3.2.3. By EPA Classification

10. MIDDLE EAST AND AFRICA MEDICAL DEVICE CLEANING MARKET OUTLOOK

- 10.1. Market Size & Forecast
 - 10.1.1. By Value
- 10.2. Market Share & Forecast
 - 10.2.1. By Device
 - 10.2.2. By Technique
 - 10.2.3. By EPA Classification
 - 10.2.4. By Country
- 10.3. MEA: Country Analysis
 - 10.3.1. South Africa Medical Device Cleaning 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 Device
 - 10.3.1.2.2. By Technique
 - 10.3.1.2.3. By EPA Classification
 - 10.3.2. Saudi Arabia Medical Device Cleaning 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 Device
 - 10.3.2.2.2. By Technique
 - 10.3.2.2.3. By EPA Classification
 - 10.3.3. UAE Medical Device Cleaning 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 Device
 - 10.3.3.2.2. By Technique
 - 10.3.3.2.3. By EPA Classification

11. MARKET DYNAMICS

- 11.1. Drivers

11.2. Challenges

12. MARKET TRENDS & DEVELOPMENTS

12.1. Recent Developments

12.2. Product Launches

12.3. Mergers & Acquisitions

13. GLOBAL MEDICAL DEVICE CLEANING MARKET: SWOT ANALYSIS

14. COMPETITIVE LANDSCAPE

14.1. Ecolab

14.1.1. Business Overview

14.1.2. Product & Service Offerings

14.1.3. Recent Developments

14.1.4. Financials (If Listed)

14.1.5. Key Personnel

14.1.6. SWOT Analysis

14.2. Getinge AB

14.3. Advanced Sterilization Products, Inc (ASP India Private Ltd.)

14.4. The Ruhof Corporation

14.5. Sklar Surgical Instruments

14.6. Sterigenics U.S., LLC

14.7. Biotrol Laboratories Pvt. Ltd.

14.8. Metrex Research, LLC.

14.9. 3M

14.10. Medivators Inc. (Cantel Medical Group of Companies UK)

15. STRATEGIC RECOMMENDATIONS

16. ABOUT US & DISCLAIMER

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