

Process Analytical Technology Market: Opportunities and Challenges in a Rapidly Evolving Industry

Discover key market drivers, challenges, and product insights shaping the future of the PAT market

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/EINPresswire.com/ -- The global

[Process Analytical Technology \(PAT\)](#)

[market](#) size was USD 3.18 Billion in

2022 and is expected to register a rapid

revenue CAGR of 12.6 % during the

forecast period. The global

pharmaceutical industry is

experiencing significant growth in the

adoption of Process Analytical

Technology (PAT), a key factor driving market revenue. PAT is increasingly essential for measuring the effectiveness of Active Pharmaceutical Ingredients (APIs), ensuring compliance with quality standards set by the U.S. Food and Drug Administration (FDA) and the European Medicines Agency (EMA).



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Essential Role of PAT in Quality Control

PAT is crucial in maintaining high standards in pharmaceutical manufacturing processes, particularly through techniques like Statistical Process Control (SPC), Continuous Process Verification (CPV), and Quality by Design (QbD). These methods are mandated by global regulatory bodies to ensure the quality and performance of pharmaceutical products post-manufacture.

Market Drivers: Cell and Gene Therapy, Infectious Diseases

The deployment of PAT in cell and gene therapy, particularly through Multivariate Data Analysis (MVDA), is a significant market driver. Clinical laboratories worldwide rely on PAT to analyze

treatments for diseases such as cancer, infections, heart disease, and diabetes. According to the World Health Organization (WHO), cancer led to nearly 10 million deaths in 2020, highlighting the critical need for advanced analytical technologies.

Additionally, the prevalence of infectious diseases drives the demand for PAT. The Centers for Disease Control and Prevention (CDC) reported significant flu impacts in 2021-2022, with 9 million cases and 100,000 hospitalizations, emphasizing the need for effective vaccine development and clinical trials facilitated by PAT.

Innovations in PAT Technology

Emerging innovations are enhancing PAT's capabilities. In October 2023, Telescope Innovations Corp launched Direct Inject Liquid Chromatography (DILC), automating chemical reaction analysis. Such advancements are pivotal in maintaining the purity, efficacy, and selectivity of pharmaceutical products.

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Market Challenges: Cost and Skilled Workforce Shortages

However, the high cost of deploying PAT systems poses a challenge. Pharmaceutical manufacturers often hesitate to invest in expensive software and instruments, seeking to reduce operational expenses. Furthermore, a lack of skilled professionals in the industry exacerbates the issue. According to the International Monetary Fund (IMF), a substantial portion of the global youth population faces a skills deficit.

Product Insights: Analyzers Lead the Market

The PAT market is segmented into analyzers, sensors and probes, samplers, and software and services. Analyzers dominate the market, largely due to their widespread use in real-time parameter analysis, such as temperature and pressure monitoring. Regulatory requirements further boost their adoption by laboratories and contract organizations.

Sensors and Probes Show Moderate Growth

The sensors and probes segment is also growing, driven by the need to capture accurate data in pharmaceutical manufacturing. The World Health Organization (WHO) reports that cardiovascular diseases cause 17.9 million deaths annually, underscoring the importance of precise data in medical treatments.

Technique Insights: Spectroscopy and Chromatography

Among PAT techniques, spectroscopy holds a significant market share. Innovations like trinamiX's NIR spectrometer, launched in October 2023, demonstrate the technology's critical role in cancer detection and other medical applications. Chromatography is also vital, ensuring the safety of pharmaceuticals by analyzing compounds for contaminants and aiding in vaccine development.

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Process Analytical Technology (PAT) Top Companies and Competitive Landscape

The global PAT market is fairly fragmented with many large and medium-sized players accounting for majority of market revenue. Major players are deploying various strategies, entering into mergers & acquisitions, strategic agreements & contracts, developing, evaluating, and introducing PAT solutions in the market.

Thermo Fisher Scientific Inc.

Agilent Technologies

Danaher Corporation

Waters Corporation

Bruker

PerkinElmer Inc

ZEISS Group

Mettler Toledo

SHIMADZU CORPORATION

Sartorius AG

Process Insights, Inc

Merck KGaA

Verum Analytics, LLC

Hamilton Company

Emerson Electric Co.

Bio-Techne Corporation

InProcess-LSP

Hovione

NECI

Cornerstone Controls, Inc.

Endress+Hauser Group Services AG

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Process Analytical Technology (PAT) Latest Industry News

On 24 October 2023, LumaCyte launched new PAT instrument Radiance. The state-of-the-art real-time platform Radiance employs a label-free, single-cell methodology for quantitatively characterizing innate cellular responses. The new PAT technology utilizes Laser Force Cytology (LFC), which accurately measures nuanced phenotypic changes solely based on the inherent biophysical and biochemical properties of cells in response to their environment or treatment.

On 21 June 2021, Thermo Fisher Scientific completed the acquisition of MarqMetrix to enhance its Analytical Technology (PAT) product portfolio. MarqMetrix offers advanced and purposeful in-line Process Analytical Technology (PAT), providing customers with a streamlined approach to achieving precise and accurate measurements across various manufacturing processes.

On 17 June 2022, Merck Life Science and Agilent Technologies joined forces to introduce recent development in PAT, such as real time monitoring and automated process control, of Critical Process Parameters (CPPs) and Critical Quality Attributes (CQAs).

Process Analytical Technology (PAT) Market Segment Analysis

For the purpose of this report, Emergen Research has segmented the global PAT market on the basis of product, techniques, monitoring, end-use, and region:

Product Outlook (Revenue, USD Billion; 2019-2032)

Analyzers

Sensors and Probes

Samplers

Software and Services

Technique Outlook (Revenue, USD Billion; 2019-2032)

Spectroscopy

Chromatography

Particle Size Analysis

Electrophoresis

Others

Monitoring Outlook (Revenue, USD Billion; 2019-2032)

On line

In line

At line

Off line

End-Use Outlook (Revenue, USD Billion; 2019-2032)

Pharmaceutical and Biotechnology

Contract Research Organization (CRO)

Contract Manufacturing Organizations (CMOs)

Contract Development and Manufacturing Organizations (CDMOs)

Regional Outlook (Revenue, USD Billion; 2019–2032)

North America

U.S.

Canada

Europe

Germany

France

UK

Italy

Spain

Benelux

Russia

Rest of Europe

Asia Pacific

China

Japan

South Korea

India

ASEAN Countries

Oceania

Rest of APAC

Latin America

Brazil

Mexico

Rest of LATAM

Middle East & Africa

GCC Countries

Israel

Turkey

South Africa

Rest of Middle East & Africa

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