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Global Bio-based Pentamethylenediamine Supply, Demand and Key Producers, 2026-2032

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Abstracts

The global Bio-based Pentamethylenediamine market size is expected to reach $ 843 million by 2032, rising at a market growth of 6.4% CAGR during the forecast period (2026-2032).

In 2025, the production volume of bio-based pentamethylenediamine was approximately 62,000 tons, with a global average market price of around $8,500 per ton. That year, global total production capacity reached 200,000 tons, and the industry's average gross profit margin stood at 35%. Bio-based pentamethylenediamine (PMDA) refers to a class of green aliphatic diamine compounds produced from renewable biomass resources using technologies such as microbial fermentation, enzymatic catalysis, or synthetic biology. With the molecular formula C?H??N?, PMDA is a key aliphatic amine basic chemical. While traditional production relies on the hydrogenation of petroleum-based adiponitrile or other petrochemical routes, bio-based PMDA is primarily derived from renewable carbon sources—such as glucose, starch-based sugars, and sugarcane—through the metabolic conversion of bio-based intermediates like L-lysine by engineered microorganisms. Offering advantages such as renewability, low carbon emissions, and green manufacturing, bio-based PMDA serves as a crucial monomer for producing high-performance bio-based polyamide materials. Its most representative application involves polymerization with bio-based dicarboxylic acids to create polyamides such as PA56, PA510, and PA512, which can serve as alternatives to certain traditional petroleum-based nylon materials.

The upstream segment of the bio-based PMDA industry chain encompasses the supply of renewable sugar sources, lysine production systems, engineered strain development, fermentation equipment, and auxiliary materials. Key raw materials include biomass resources such as corn starch, sugarcane, cassava, and wheat; these undergo

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saccharification to yield fermentation substrates like glucose, which are then used in microbial fermentation to produce L-lysine. Subsequently, engineered strains facilitate the decarboxylation of lysine to generate PMDA. Current core technologies focus on constructing high-yield engineered strains, optimizing metabolic pathways, enhancing fermentation efficiency, and refining product separation and purification processes. Compared to traditional petrochemical routes, the biomanufacturing pathway utilizes renewable carbon sources and reduces energy consumption and carbon emissions through strain optimization. The midstream segment covers PMDA fermentation, purification and refining, quality control, and the development of downstream polymer materials. During production, engineered microorganisms ferment sugar-based feedstocks to convert carbon sources into L-lysine, followed by biotransformation to yield high-purity PMDA. After undergoing separation, concentration, crystallization, and refining, the PMDA serves as a polyamide monomer for the manufacture of high-performance materials. Currently, the most significant industrialization pathway for bio-based pentamethylenediamine (PMDA) involves combining it with bio-based dicarboxylic acids to produce novel bio-based nylon materials such as PA56. These materials offer a combination of moisture absorption, wear resistance, flexibility, and sustainability, making them suitable for applications in textile fibers, engineering plastics, and lightweight automotive components. Downstream applications for bio-based PMDA primarily span bio-based polyamide materials, engineering plastics, textile fibers, and high-performance composites. PA56 represents the most prominent application to date; formed through the polymerization of bio-based PMDA and adipic acid, it boasts excellent moisture absorption, dyeability, mechanical strength, and eco-friendly properties, finding use in apparel fibers, sportswear materials, automotive interiors, and industrial textiles. Furthermore, PMDA can be used to develop bio-based nylons with varying carbon-chain structures—such as PA510 and PA512—serving as alternatives to traditional engineering plastics like PA6 and PA66. In the automotive sector, driven by the growing demand for lightweighting in new energy vehicles, bio-based polyamides are utilized for structural components, connectors, and housings for electronic parts; in the consumer goods sector, they are applied in eco-friendly textiles, sporting goods, and sustainable packaging materials. As the global plastics industry shifts toward low-carbon and circular models, bio-based PMDA is poised for increasingly widespread application in the field of high-performance bio-based materials.

Bio-based pentamethylenediamine (PMDA) serves as a crucial monomer for producing novel bio-based polyamides. Produced via the fermentation of renewable resources such as glucose and starch-derived sugars, it offers advantages over traditional petrochemical routes by reducing reliance on fossil resources, lowering carbon

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emissions, and enhancing material sustainability. In recent years, the global plastics industry has accelerated its transition toward low-carbon and circular models, driving rising demand for green engineering materials across the automotive, textile, new energy, and consumer goods sectors. Bio-based nylon materials—exemplified by PA56—are increasingly complementing traditional PA6 and PA66 due to their excellent moisture absorption, wear resistance, dyeability, and eco-friendly attributes; consequently, bio-based PMDA, as the core monomer for PA56, has gained sustained growth momentum.

Currently, the primary application of bio-based PMDA lies in the synthesis of novel bio-based nylons such as PA56, PA510, and PA512, which are utilized in textile fibers, engineering plastics, automotive components, and industrial composites. The trend toward lightweighting in new energy vehicles has boosted demand for high-strength, heat-resistant, and low-carbon engineering plastics, thereby facilitating the adoption of bio-based polyamides in structural components, electronic parts, and interior materials. Meanwhile, the growth of markets for sportswear, functional fibers, and green consumer goods has further stimulated demand for bio-based nylon fibers, providing stable downstream support for the industrialization of PMDA.

Core technologies for bio-based PMDA production currently focus on engineered strain development, metabolic pathway optimization, fermentation efficiency enhancement, and improvements in separation and purification processes. Looking ahead, continued advancements in gene editing, metabolic engineering, and intelligent fermentation technologies are expected to enable companies to increase glucose conversion rates, reduce energy consumption, and improve product stability. Furthermore, replacing traditional grain-based feedstocks with non-food biomass, agricultural waste, and low-carbon sugar sources will become a key direction for future green manufacturing. Companies possessing capabilities in strain R&D, large-scale fermentation, and the synergistic development of polymer materials will secure a stronger competitive edge in the market.

Report Scope

This report studies the global Bio-based Pentamethylenediamine production, demand, key manufacturers, and key regions.

This report is a detailed and comprehensive analysis of the world market for Bio-based Pentamethylenediamine and provides market size (US$ million) and Year-over-Year

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(YoY) Growth, considering 2025 as the base year. This report explores demand trends and competition, as well as details the characteristics of Bio-based Pentamethylenediamine that contribute to its increasing demand across many markets.

Highlights and key features of the study

Global Bio-based Pentamethylenediamine total production and demand, 2021-2032, (Tons)

Global Bio-based Pentamethylenediamine total production value, 2021-2032, (USD Million)

Global Bio-based Pentamethylenediamine production by region & country, production, value, CAGR, 2021-2032, (USD Million) & (Tons), (based on production site)

Global Bio-based Pentamethylenediamine consumption by region & country, CAGR, 2021-2032 & (Tons)

U.S. VS China: Bio-based Pentamethylenediamine domestic production, consumption, key domestic manufacturers and share

Global Bio-based Pentamethylenediamine production by manufacturer, production, price, value and market share 2021-2026, (USD Million) & (Tons)

Global Bio-based Pentamethylenediamine production by Type, production, value, CAGR, 2021-2032, (USD Million) & (Tons)

Global Bio-based Pentamethylenediamine production by Application, production, value, CAGR, 2021-2032, (USD Million) & (Tons)

This report profiles key players in the global Bio-based Pentamethylenediamine market based on the following parameters - company overview, production, value, price, gross margin, product portfolio, geographical presence, and key developments. Key companies covered as a part of this study include Cathay Biotech, Ningxia Eppen Biotech Co., Ltd, CJ BIO, Yangmei Chemical, etc.

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This report also provides key insights about market drivers, restraints, opportunities, new product launches or approvals.

Stakeholders would have ease in decision-making through various strategy matrices used in analyzing the World Bio-based Pentamethylenediamine market

Detailed Segmentation:

Each section contains quantitative market data including market by value (US$ Millions), volume (production, consumption) & (Tons) and average price (US$/Ton) by manufacturer, by Type, and by Application. Data is given for the years 2021-2032 by year with 2025 as the base year, 2026 as the estimate year, and 2027-2032 as the forecast year.

Global Bio-based Pentamethylenediamine Market, By Region:

United States

China

Europe

Japan

South Korea

ASEAN

India

Rest of World

Market Segmentation

Global Bio-based Pentamethylenediamine Market, Segmentation by

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Type:

Purity: 99.5%

Purity: 99.9%

Others

Global Bio-based Pentamethylenediamine Market, Segmentation by Raw Material Source:

Sugar-based Bio-PDA

Non-food Biomass-based PDA

Waste-derived Bio-PDA

Global Bio-based Pentamethylenediamine Market, Segmentation by Production Technology Route:

Fermentation-based PDA

Metabolic Engineering-based PDA

Biocatalytic PDA

Global Bio-based Pentamethylenediamine Market, Segmentation by Bio-based Content:

Partially Bio-based Pentamethylenediamine

Fully Bio-based Pentamethylenediamine

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Global Bio-based Pentamethylenediamine Market, Segmentation by Application:

Textiles and Apparel

Automotive

Electronics and Electrical

Consumer Goods

Others

Companies Profiled:

Cathay Biotech

Ningxia Eppen Biotech Co., Ltd

CJ BIO

Yangmei Chemical

Key Questions Answered

1. How big is the global Bio-based Pentamethylenediamine market?
2. What is the demand of the global Bio-based Pentamethylenediamine market?
3. What is the year over year growth of the global Bio-based Pentamethylenediamine market?
4. What is the total value of the global Bio-based Pentamethylenediamine market?
5. Who are the Major Players in the global Bio-based Pentamethylenediamine market?
6. What are the growth factors driving the market demand?

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Contents

1 SUPPLY SUMMARY

1.1 Bio-based Pentamethylenediamine Introduction
1.2 World Bio-based Pentamethylenediamine Supply & Forecast
  1.2.1 World Bio-based Pentamethylenediamine Production Value (2021 & 2025 & 2032)
  1.2.2 World Bio-based Pentamethylenediamine Production (2021-2032)
  1.2.3 World Bio-based Pentamethylenediamine Pricing Trends (2021-2032)
1.3 World Bio-based Pentamethylenediamine Production by Region (Based on Production Site)
  1.3.1 World Bio-based Pentamethylenediamine Production Value by Region (2021-2032)
  1.3.2 World Bio-based Pentamethylenediamine Production by Region (2021-2032)
  1.3.3 World Bio-based Pentamethylenediamine Average Price by Region (2021-2032)
  1.3.4 North America Bio-based Pentamethylenediamine Production (2021-2032)
  1.3.5 Europe Bio-based Pentamethylenediamine Production (2021-2032)
  1.3.6 China Bio-based Pentamethylenediamine Production (2021-2032)
  1.3.7 Japan Bio-based Pentamethylenediamine Production (2021-2032)
1.4 Market Drivers, Restraints and Trends
  1.4.1 Bio-based Pentamethylenediamine Market Drivers
  1.4.2 Factors Affecting Demand
  1.4.3 Bio-based Pentamethylenediamine Major Market Trends

2 DEMAND SUMMARY

2.1 World Bio-based Pentamethylenediamine Demand (2021-2032)
2.2 World Bio-based Pentamethylenediamine Consumption by Region
  2.2.1 World Bio-based Pentamethylenediamine Consumption by Region (2021-2026)
  2.2.2 World Bio-based Pentamethylenediamine Consumption Forecast by Region (2027-2032)
2.3 United States Bio-based Pentamethylenediamine Consumption (2021-2032)
2.4 China Bio-based Pentamethylenediamine Consumption (2021-2032)
2.5 Europe Bio-based Pentamethylenediamine Consumption (2021-2032)
2.6 Japan Bio-based Pentamethylenediamine Consumption (2021-2032)
2.7 South Korea Bio-based Pentamethylenediamine Consumption (2021-2032)
2.8 ASEAN Bio-based Pentamethylenediamine Consumption (2021-2032)
2.9 India Bio-based Pentamethylenediamine Consumption (2021-2032)

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3 WORLD MANUFACTURERS COMPETITIVE ANALYSIS

3.1 World Bio-based Pentamethylenediamine Production Value by Manufacturer (2021-2026)
3.2 World Bio-based Pentamethylenediamine Production by Manufacturer (2021-2026)
3.3 World Bio-based Pentamethylenediamine Average Price by Manufacturer (2021-2026)
3.4 Bio-based Pentamethylenediamine Company Evaluation Quadrant
3.5 Industry Rank and Concentration Rate (CR)
  3.5.1 Global Bio-based Pentamethylenediamine Industry Rank of Major Manufacturers
  3.5.2 Global Concentration Ratios (CR4) for Bio-based Pentamethylenediamine in 2025
  3.5.3 Global Concentration Ratios (CR8) for Bio-based Pentamethylenediamine in 2025
3.6 Bio-based Pentamethylenediamine Market: Overall Company Footprint Analysis
  3.6.1 Bio-based Pentamethylenediamine Market: Region Footprint
  3.6.2 Bio-based Pentamethylenediamine Market: Company Product Type Footprint
  3.6.3 Bio-based Pentamethylenediamine Market: Company Product Application Footprint
3.7 Competitive Environment
  3.7.1 Historical Structure of the Industry
  3.7.2 Barriers of Market Entry
  3.7.3 Factors of Competition
3.8 New Entrant and Capacity Expansion Plans
3.9 Mergers, Acquisition, Agreements, and Collaborations

4 UNITED STATES VS CHINA VS REST OF THE WORLD

4.1 United States VS China: Bio-based Pentamethylenediamine Production Value Comparison
  4.1.1 United States VS China: Bio-based Pentamethylenediamine Production Value Comparison (2021 & 2025 & 2032)
  4.1.2 United States VS China: Bio-based Pentamethylenediamine Production Value Market Share Comparison (2021 & 2025 & 2032)
4.2 United States VS China: Bio-based Pentamethylenediamine Production Comparison
  4.2.1 United States VS China: Bio-based Pentamethylenediamine Production Comparison (2021 & 2025 & 2032)
  4.2.2 United States VS China: Bio-based Pentamethylenediamine Production Market

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Share Comparison (2021 & 2025 & 2032)
4.3 United States VS China: Bio-based Pentamethylenediamine Consumption Comparison
4.3.1 United States VS China: Bio-based Pentamethylenediamine Consumption Comparison (2021 & 2025 & 2032)
4.3.2 United States VS China: Bio-based Pentamethylenediamine Consumption Market Share Comparison (2021 & 2025 & 2032)
4.4 United States Based Bio-based Pentamethylenediamine Manufacturers and Market Share, 2021-2026
4.4.1 United States Based Bio-based Pentamethylenediamine Manufacturers, Headquarters and Production Site (States, Country)
4.4.2 United States Based Manufacturers Bio-based Pentamethylenediamine Production Value (2021-2026)
4.4.3 United States Based Manufacturers Bio-based Pentamethylenediamine Production (2021-2026)
4.5 China Based Bio-based Pentamethylenediamine Manufacturers and Market Share
4.5.1 China Based Bio-based Pentamethylenediamine Manufacturers, Headquarters and Production Site (Province, Country)
4.5.2 China Based Manufacturers Bio-based Pentamethylenediamine Production Value (2021-2026)
4.5.3 China Based Manufacturers Bio-based Pentamethylenediamine Production (2021-2026)
4.6 Rest of World Based Bio-based Pentamethylenediamine Manufacturers and Market Share, 2021-2026
4.6.1 Rest of World Based Bio-based Pentamethylenediamine Manufacturers, Headquarters and Production Site (State, Country)
4.6.2 Rest of World Based Manufacturers Bio-based Pentamethylenediamine Production Value (2021-2026)
4.6.3 Rest of World Based Manufacturers Bio-based Pentamethylenediamine Production (2021-2026)

5 MARKET ANALYSIS BY TYPE

5.1 World Bio-based Pentamethylenediamine Market Size Overview by Type: 2021 VS 2025 VS 2032
5.2 Segment Introduction by Type
5.2.1 Purity: 99.5%
5.2.2 Purity: 99.9%
5.2.3 Others

+357 96 030922
info@marketpublishers.com

5.3 Market Segment by Type
5.3.1 World Bio-based Pentamethylenediamine Production by Type (2021-2032)
5.3.2 World Bio-based Pentamethylenediamine Production Value by Type (2021-2032)
5.3.3 World Bio-based Pentamethylenediamine Average Price by Type (2021-2032)

6 MARKET ANALYSIS BY RAW MATERIAL SOURCE

6.1 World Bio-based Pentamethylenediamine Market Size Overview by Raw Material Source: 2021 VS 2025 VS 2032
6.2 Segment Introduction by Raw Material Source
6.2.1 Sugar-based Bio-PDA
6.2.2 Non-food Biomass-based PDA
6.2.3 Waste-derived Bio-PDA
6.3 Market Segment by Raw Material Source
6.3.1 World Bio-based Pentamethylenediamine Production by Raw Material Source (2021-2032)
6.3.2 World Bio-based Pentamethylenediamine Production Value by Raw Material Source (2021-2032)
6.3.3 World Bio-based Pentamethylenediamine Average Price by Raw Material Source (2021-2032)

7 MARKET ANALYSIS BY PRODUCTION TECHNOLOGY ROUTE

7.1 World Bio-based Pentamethylenediamine Market Size Overview by Production Technology Route: 2021 VS 2025 VS 2032
7.2 Segment Introduction by Production Technology Route
7.2.1 Fermentation-based PDA
7.2.2 Metabolic Engineering-based PDA
7.2.3 Biocatalytic PDA
7.3 Market Segment by Production Technology Route
7.3.1 World Bio-based Pentamethylenediamine Production by Production Technology Route (2021-2032)
7.3.2 World Bio-based Pentamethylenediamine Production Value by Production Technology Route (2021-2032)
7.3.3 World Bio-based Pentamethylenediamine Average Price by Production Technology Route (2021-2032)

8 MARKET ANALYSIS BY BIO-BASED CONTENT

+357 96 030922
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8.1 World Bio-based Pentamethylenediamine Market Size Overview by Bio-based Content: 2021 VS 2025 VS 2032
8.2 Segment Introduction by Bio-based Content
8.2.1 Partially Bio-based Pentamethylenediamine
8.2.2 Fully Bio-based Pentamethylenediamine
8.3 Market Segment by Bio-based Content
8.3.1 World Bio-based Pentamethylenediamine Production by Bio-based Content (2021-2032)
8.3.2 World Bio-based Pentamethylenediamine Production Value by Bio-based Content (2021-2032)
8.3.3 World Bio-based Pentamethylenediamine Average Price by Bio-based Content (2021-2032)

9 MARKET ANALYSIS BY APPLICATION

9.1 World Bio-based Pentamethylenediamine Market Size Overview by Application: 2021 VS 2025 VS 2032
9.2 Segment Introduction by Application
9.2.1 Textiles and Apparel
9.2.2 Automotive
9.2.3 Electronics and Electrical
9.2.4 Consumer Goods
9.2.5 Others
9.3 Market Segment by Application
9.3.1 World Bio-based Pentamethylenediamine Production by Application (2021-2032)
9.3.2 World Bio-based Pentamethylenediamine Production Value by Application (2021-2032)
9.3.3 World Bio-based Pentamethylenediamine Average Price by Application (2021-2032)

10 COMPANY PROFILES

10.1 Cathay Biotech
10.1.1 Cathay Biotech Details
10.1.2 Cathay Biotech Major Business
10.1.3 Cathay Biotech Bio-based Pentamethylenediamine Product and Services
10.1.4 Cathay Biotech Bio-based Pentamethylenediamine Production, Price, Value, Gross Margin and Market Share (2021-2026)
10.1.5 Cathay Biotech Recent Developments/Updates

+357 96 030922
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10.1.6 Cathay Biotech Competitive Strengths & Weaknesses
10.2 Ningxia Eppen Biotech Co., Ltd
10.2.1 Ningxia Eppen Biotech Co., Ltd Details
10.2.2 Ningxia Eppen Biotech Co., Ltd Major Business
10.2.3 Ningxia Eppen Biotech Co., Ltd Bio-based Pentamethylenediamine Product and Services
10.2.4 Ningxia Eppen Biotech Co., Ltd Bio-based Pentamethylenediamine Production, Price, Value, Gross Margin and Market Share (2021-2026)
10.2.5 Ningxia Eppen Biotech Co., Ltd Recent Developments/Updates
10.2.6 Ningxia Eppen Biotech Co., Ltd Competitive Strengths & Weaknesses
10.3 CJ BIO
10.3.1 CJ BIO Details
10.3.2 CJ BIO Major Business
10.3.3 CJ BIO Bio-based Pentamethylenediamine Product and Services
10.3.4 CJ BIO Bio-based Pentamethylenediamine Production, Price, Value, Gross Margin and Market Share (2021-2026)
10.3.5 CJ BIO Recent Developments/Updates
10.3.6 CJ BIO Competitive Strengths & Weaknesses
10.4 Yangmei Chemical
10.4.1 Yangmei Chemical Details
10.4.2 Yangmei Chemical Major Business
10.4.3 Yangmei Chemical Bio-based Pentamethylenediamine Product and Services
10.4.4 Yangmei Chemical Bio-based Pentamethylenediamine Production, Price, Value, Gross Margin and Market Share (2021-2026)
10.4.5 Yangmei Chemical Recent Developments/Updates
10.4.6 Yangmei Chemical Competitive Strengths & Weaknesses

11 INDUSTRY CHAIN ANALYSIS

11.1 Bio-based Pentamethylenediamine Industry Chain
11.2 Bio-based Pentamethylenediamine Upstream Analysis
11.2.1 Bio-based Pentamethylenediamine Core Raw Materials
11.2.2 Main Manufacturers of Bio-based Pentamethylenediamine Core Raw Materials
11.3 Midstream Analysis
11.4 Downstream Analysis
11.5 Bio-based Pentamethylenediamine Production Mode
11.6 Bio-based Pentamethylenediamine Procurement Model
11.7 Bio-based Pentamethylenediamine Industry Sales Model and Sales Channels
11.7.1 Bio-based Pentamethylenediamine Sales Model

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11.7.2 Bio-based Pentamethylenediamine Typical Distributors

12 RESEARCH FINDINGS AND CONCLUSION

13 APPENDIX

13.1 Methodology
13.2 Research Process and Data Source
13.3 Disclaimer

+357 96 030922
info@marketpublishers.com

List Of Tables

LIST OF TABLES

Table 1. World Bio-based Pentamethylenediamine Production Value by Region (2021, 2025 and 2032) & (USD Million)
Table 2. World Bio-based Pentamethylenediamine Production Value by Region (2021-2026) & (USD Million)
Table 3. World Bio-based Pentamethylenediamine Production Value by Region (2027-2032) & (USD Million)
Table 4. World Bio-based Pentamethylenediamine Production Value Market Share by Region (2021-2026)
Table 5. World Bio-based Pentamethylenediamine Production Value Market Share by Region (2027-2032)
Table 6. World Bio-based Pentamethylenediamine Production by Region (2021-2026) & (Tons)
Table 7. World Bio-based Pentamethylenediamine Production by Region (2027-2032) & (Tons)
Table 8. World Bio-based Pentamethylenediamine Production Market Share by Region (2021-2026)
Table 9. World Bio-based Pentamethylenediamine Production Market Share by Region (2027-2032)
Table 10. World Bio-based Pentamethylenediamine Average Price by Region (2021-2026) & (US$/Ton)
Table 11. World Bio-based Pentamethylenediamine Average Price by Region (2027-2032) & (US$/Ton)
Table 12. Bio-based Pentamethylenediamine Major Market Trends
Table 13. World Bio-based Pentamethylenediamine Consumption Growth Rate Forecast by Region (2021 & 2025 & 2032) & (Tons)
Table 14. World Bio-based Pentamethylenediamine Consumption by Region (2021-2026) & (Tons)
Table 15. World Bio-based Pentamethylenediamine Consumption Forecast by Region (2027-2032) & (Tons)
Table 16. World Bio-based Pentamethylenediamine Production Value by Manufacturer (2021-2026) & (USD Million)
Table 17. Production Value Market Share of Key Bio-based Pentamethylenediamine Producers in 2025
Table 18. World Bio-based Pentamethylenediamine Production by Manufacturer (2021-2026) & (Tons)

+357 96 030922
info@marketpublishers.com

Table 19. Production Market Share of Key Bio-based Pentamethylenediamine Producers in 2025
Table 20. World Bio-based Pentamethylenediamine Average Price by Manufacturer (2021-2026) & (US$/Ton)
Table 21. Global Bio-based Pentamethylenediamine Company Evaluation Quadrant
Table 22. World Bio-based Pentamethylenediamine Industry Rank of Major Manufacturers, Based on Production Value in 2025
Table 23. Head Office and Bio-based Pentamethylenediamine Production Site of Key Manufacturer
Table 24. Bio-based Pentamethylenediamine Market: Company Product Type Footprint
Table 25. Bio-based Pentamethylenediamine Market: Company Product Application Footprint
Table 26. Bio-based Pentamethylenediamine Competitive Factors
Table 27. Bio-based Pentamethylenediamine New Entrant and Capacity Expansion Plans
Table 28. Bio-based Pentamethylenediamine Mergers & Acquisitions Activity
Table 29. United States VS China Bio-based Pentamethylenediamine Production Value Comparison, (2021 & 2025 & 2032) & (USD Million)
Table 30. United States VS China Bio-based Pentamethylenediamine Production Comparison, (2021 & 2025 & 2032) & (Tons)
Table 31. United States VS China Bio-based Pentamethylenediamine Consumption Comparison, (2021 & 2025 & 2032) & (Tons)
Table 32. United States Based Bio-based Pentamethylenediamine Manufacturers, Headquarters and Production Site (States, Country)
Table 33. United States Based Manufacturers Bio-based Pentamethylenediamine Production Value, (2021-2026) & (USD Million)
Table 34. United States Based Manufacturers Bio-based Pentamethylenediamine Production Value Market Share (2021-2026)
Table 35. United States Based Manufacturers Bio-based Pentamethylenediamine Production (2021-2026) & (Tons)
Table 36. United States Based Manufacturers Bio-based Pentamethylenediamine Production Market Share (2021-2026)
Table 37. China Based Bio-based Pentamethylenediamine Manufacturers, Headquarters and Production Site (Province, Country)
Table 38. China Based Manufacturers Bio-based Pentamethylenediamine Production Value, (2021-2026) & (USD Million)
Table 39. China Based Manufacturers Bio-based Pentamethylenediamine Production Value Market Share (2021-2026)
Table 40. China Based Manufacturers Bio-based Pentamethylenediamine Production,

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info@marketpublishers.com

(2021-2026) & (Tons)
Table 41. China Based Manufacturers Bio-based Pentamethylenediamine Production Market Share (2021-2026)
Table 42. Rest of World Based Bio-based Pentamethylenediamine Manufacturers, Headquarters and Production Site (State, Country)
Table 43. Rest of World Based Manufacturers Bio-based Pentamethylenediamine Production Value, (2021-2026) & (USD Million)
Table 44. Rest of World Based Manufacturers Bio-based Pentamethylenediamine Production Value Market Share (2021-2026)
Table 45. Rest of World Based Manufacturers Bio-based Pentamethylenediamine Production, (2021-2026) & (Tons)
Table 46. Rest of World Based Manufacturers Bio-based Pentamethylenediamine Production Market Share (2021-2026)
Table 47. World Bio-based Pentamethylenediamine Production Value by Type, (USD Million), 2021 & 2025 & 2032
Table 48. World Bio-based Pentamethylenediamine Production by Type (2021-2026) & (Tons)
Table 49. World Bio-based Pentamethylenediamine Production by Type (2027-2032) & (Tons)
Table 50. World Bio-based Pentamethylenediamine Production Value by Type (2021-2026) & (USD Million)
Table 51. World Bio-based Pentamethylenediamine Production Value by Type (2027-2032) & (USD Million)
Table 52. World Bio-based Pentamethylenediamine Average Price by Type (2021-2026) & (US$/Ton)
Table 53. World Bio-based Pentamethylenediamine Average Price by Type (2027-2032) & (US$/Ton)
Table 54. World Bio-based Pentamethylenediamine Production Value by Raw Material Source, (USD Million), 2021 & 2025 & 2032
Table 55. World Bio-based Pentamethylenediamine Production by Raw Material Source (2021-2026) & (Tons)
Table 56. World Bio-based Pentamethylenediamine Production by Raw Material Source (2027-2032) & (Tons)
Table 57. World Bio-based Pentamethylenediamine Production Value by Raw Material Source (2021-2026) & (USD Million)
Table 58. World Bio-based Pentamethylenediamine Production Value by Raw Material Source (2027-2032) & (USD Million)
Table 59. World Bio-based Pentamethylenediamine Average Price by Raw Material Source (2021-2026) & (US$/Ton)

+357 96 030922
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Table 60. World Bio-based Pentamethylenediamine Average Price by Raw Material Source (2027-2032) & (US$/Ton)
Table 61. World Bio-based Pentamethylenediamine Production Value by Production Technology Route, (USD Million), 2021 & 2025 & 2032
Table 62. World Bio-based Pentamethylenediamine Production by Production Technology Route (2021-2026) & (Tons)
Table 63. World Bio-based Pentamethylenediamine Production by Production Technology Route (2027-2032) & (Tons)
Table 64. World Bio-based Pentamethylenediamine Production Value by Production Technology Route (2021-2026) & (USD Million)
Table 65. World Bio-based Pentamethylenediamine Production Value by Production Technology Route (2027-2032) & (USD Million)
Table 66. World Bio-based Pentamethylenediamine Average Price by Production Technology Route (2021-2026) & (US$/Ton)
Table 67. World Bio-based Pentamethylenediamine Average Price by Production Technology Route (2027-2032) & (US$/Ton)
Table 68. World Bio-based Pentamethylenediamine Production Value by Bio-based Content, (USD Million), 2021 & 2025 & 2032
Table 69. World Bio-based Pentamethylenediamine Production by Bio-based Content (2021-2026) & (Tons)
Table 70. World Bio-based Pentamethylenediamine Production by Bio-based Content (2027-2032) & (Tons)
Table 71. World Bio-based Pentamethylenediamine Production Value by Bio-based Content (2021-2026) & (USD Million)
Table 72. World Bio-based Pentamethylenediamine Production Value by Bio-based Content (2027-2032) & (USD Million)
Table 73. World Bio-based Pentamethylenediamine Average Price by Bio-based Content (2021-2026) & (US$/Ton)
Table 74. World Bio-based Pentamethylenediamine Average Price by Bio-based Content (2027-2032) & (US$/Ton)
Table 75. World Bio-based Pentamethylenediamine Production Value by Application, (USD Million), 2021 & 2025 & 2032
Table 76. World Bio-based Pentamethylenediamine Production by Application (2021-2026) & (Tons)
Table 77. World Bio-based Pentamethylenediamine Production by Application (2027-2032) & (Tons)
Table 78. World Bio-based Pentamethylenediamine Production Value by Application (2021-2026) & (USD Million)
Table 79. World Bio-based Pentamethylenediamine Production Value by Application

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(2027-2032) & (USD Million)
Table 80. World Bio-based Pentamethylenediamine Average Price by Application (2021-2026) & (US$/Ton)
Table 81. World Bio-based Pentamethylenediamine Average Price by Application (2027-2032) & (US$/Ton)
Table 82. Cathay Biotech Basic Information, Manufacturing Base and Competitors
Table 83. Cathay Biotech Major Business
Table 84. Cathay Biotech Bio-based Pentamethylenediamine Product and Services
Table 85. Cathay Biotech Bio-based Pentamethylenediamine Production (Tons), Price (US$/Ton), Production Value (USD Million), Gross Margin and Market Share (2021-2026)
Table 86. Cathay Biotech Recent Developments/Updates
Table 87. Cathay Biotech Competitive Strengths & Weaknesses
Table 88. Ningxia Eppen Biotech Co., Ltd Basic Information, Manufacturing Base and Competitors
Table 89. Ningxia Eppen Biotech Co., Ltd Major Business
Table 90. Ningxia Eppen Biotech Co., Ltd Bio-based Pentamethylenediamine Product and Services
Table 91. Ningxia Eppen Biotech Co., Ltd Bio-based Pentamethylenediamine Production (Tons), Price (US$/Ton), Production Value (USD Million), Gross Margin and Market Share (2021-2026)
Table 92. Ningxia Eppen Biotech Co., Ltd Recent Developments/Updates
Table 93. Ningxia Eppen Biotech Co., Ltd Competitive Strengths & Weaknesses
Table 94. CJ BIO Basic Information, Manufacturing Base and Competitors
Table 95. CJ BIO Major Business
Table 96. CJ BIO Bio-based Pentamethylenediamine Product and Services
Table 97. CJ BIO Bio-based Pentamethylenediamine Production (Tons), Price (US$/Ton), Production Value (USD Million), Gross Margin and Market Share (2021-2026)
Table 98. CJ BIO Recent Developments/Updates
Table 99. CJ BIO Competitive Strengths & Weaknesses
Table 100. Yangmei Chemical Basic Information, Manufacturing Base and Competitors
Table 101. Yangmei Chemical Major Business
Table 102. Yangmei Chemical Bio-based Pentamethylenediamine Product and Services
Table 103. Yangmei Chemical Bio-based Pentamethylenediamine Production (Tons), Price (US$/Ton), Production Value (USD Million), Gross Margin and Market Share (2021-2026)
Table 104. Yangmei Chemical Recent Developments/Updates
Table 105. Yangmei Chemical Competitive Strengths & Weaknesses

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Table 106. Global Key Players of Bio-based Pentamethylenediamine Upstream (Raw Materials)
Table 107. Global Bio-based Pentamethylenediamine Typical Customers
Table 108. Bio-based Pentamethylenediamine Typical Distributors

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List Of Figures

LIST OF FIGURES

Figure 1. Bio-based Pentamethylenediamine Picture
Figure 2. World Bio-based Pentamethylenediamine Production Value: 2021 & 2025 & 2032, (USD Million)
Figure 3. World Bio-based Pentamethylenediamine Production Value and Forecast (2021-2032) & (USD Million)
Figure 4. World Bio-based Pentamethylenediamine Production (2021-2032) & (Tons)
Figure 5. World Bio-based Pentamethylenediamine Average Price (2021-2032) & (US$/Ton)
Figure 6. World Bio-based Pentamethylenediamine Production Value Market Share by Region (2021-2032)
Figure 7. World Bio-based Pentamethylenediamine Production Market Share by Region (2021-2032)
Figure 8. North America Bio-based Pentamethylenediamine Production (2021-2032) & (Tons)
Figure 9. Europe Bio-based Pentamethylenediamine Production (2021-2032) & (Tons)
Figure 10. China Bio-based Pentamethylenediamine Production (2021-2032) & (Tons)
Figure 11. Japan Bio-based Pentamethylenediamine Production (2021-2032) & (Tons)
Figure 12. Bio-based Pentamethylenediamine Market Drivers
Figure 13. Factors Affecting Demand
Figure 14. World Bio-based Pentamethylenediamine Consumption (2021-2032) & (Tons)
Figure 15. World Bio-based Pentamethylenediamine Consumption Market Share by Region (2021-2032)
Figure 16. United States Bio-based Pentamethylenediamine Consumption (2021-2032) & (Tons)
Figure 17. China Bio-based Pentamethylenediamine Consumption (2021-2032) & (Tons)
Figure 18. Europe Bio-based Pentamethylenediamine Consumption (2021-2032) & (Tons)
Figure 19. Japan Bio-based Pentamethylenediamine Consumption (2021-2032) & (Tons)
Figure 20. South Korea Bio-based Pentamethylenediamine Consumption (2021-2032) & (Tons)
Figure 21. ASEAN Bio-based Pentamethylenediamine Consumption (2021-2032) & (Tons)

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Figure 22. India Bio-based Pentamethylenediamine Consumption (2021-2032) & (Tons)
Figure 23. Producer Shipments of Bio-based Pentamethylenediamine by Manufacturer Revenue ($MM) and Market Share (%): 2025
Figure 24. Global Four-firm Concentration Ratios (CR4) for Bio-based Pentamethylenediamine Markets in 2025
Figure 25. Global Four-firm Concentration Ratios (CR8) for Bio-based Pentamethylenediamine Markets in 2025
Figure 26. United States VS China: Bio-based Pentamethylenediamine Production Value Market Share Comparison (2021 & 2025 & 2032)
Figure 27. United States VS China: Bio-based Pentamethylenediamine Production Market Share Comparison (2021 & 2025 & 2032)
Figure 28. United States VS China: Bio-based Pentamethylenediamine Consumption Market Share Comparison (2021 & 2025 & 2032)
Figure 29. United States Based Manufacturers Bio-based Pentamethylenediamine Production Market Share 2025
Figure 30. China Based Manufacturers Bio-based Pentamethylenediamine Production Market Share 2025
Figure 31. Rest of World Based Manufacturers Bio-based Pentamethylenediamine Production Market Share 2025
Figure 32. World Bio-based Pentamethylenediamine Production Value by Type, (USD Million), 2021 & 2025 & 2032
Figure 33. World Bio-based Pentamethylenediamine Production Value Market Share by Type in 2025
Figure 34. Purity: 99.5%
Figure 35. Purity: 99.9%
Figure 36. Others
Figure 37. World Bio-based Pentamethylenediamine Production Market Share by Type (2021-2032)
Figure 38. World Bio-based Pentamethylenediamine Production Value Market Share by Type (2021-2032)
Figure 39. World Bio-based Pentamethylenediamine Average Price by Type (2021-2032) & (US$/Ton)
Figure 40. World Bio-based Pentamethylenediamine Production Value by Raw Material Source, (USD Million), 2021 & 2025 & 2032
Figure 41. World Bio-based Pentamethylenediamine Production Value Market Share by Raw Material Source in 2025
Figure 42. Sugar-based Bio-PDA
Figure 43. Non-food Biomass-based PDA
Figure 44. Waste-derived Bio-PDA

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Figure 45. World Bio-based Pentamethylenediamine Production Market Share by Raw Material Source (2021-2032)
Figure 46. World Bio-based Pentamethylenediamine Production Value Market Share by Raw Material Source (2021-2032)
Figure 47. World Bio-based Pentamethylenediamine Average Price by Raw Material Source (2021-2032) & (US$/Ton)
Figure 48. World Bio-based Pentamethylenediamine Production Value by Production Technology Route, (USD Million), 2021 & 2025 & 2032
Figure 49. World Bio-based Pentamethylenediamine Production Value Market Share by Production Technology Route in 2025
Figure 50. Fermentation-based PDA
Figure 51. Metabolic Engineering-based PDA
Figure 52. Biocatalytic PDA
Figure 53. World Bio-based Pentamethylenediamine Production Market Share by Production Technology Route (2021-2032)
Figure 54. World Bio-based Pentamethylenediamine Production Value Market Share by Production Technology Route (2021-2032)
Figure 55. World Bio-based Pentamethylenediamine Average Price by Production Technology Route (2021-2032) & (US$/Ton)
Figure 56. World Bio-based Pentamethylenediamine Production Value by Bio-based Content, (USD Million), 2021 & 2025 & 2032
Figure 57. World Bio-based Pentamethylenediamine Production Value Market Share by Bio-based Content in 2025
Figure 58. Partially Bio-based Pentamethylenediamine
Figure 59. Fully Bio-based Pentamethylenediamine
Figure 60. World Bio-based Pentamethylenediamine Production Market Share by Bio-based Content (2021-2032)
Figure 61. World Bio-based Pentamethylenediamine Production Value Market Share by Bio-based Content (2021-2032)
Figure 62. World Bio-based Pentamethylenediamine Average Price by Bio-based Content (2021-2032) & (US$/Ton)
Figure 63. World Bio-based Pentamethylenediamine Production Value by Application, (USD Million), 2021 & 2025 & 2032
Figure 64. World Bio-based Pentamethylenediamine Production Value Market Share by Application in 2025
Figure 65. Textiles and Apparel
Figure 66. Automotive
Figure 67. Electronics and Electrical
Figure 68. Consumer Goods

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Figure 69. Others
Figure 70. World Bio-based Pentamethylenediamine Production Market Share by Application (2021-2032)
Figure 71. World Bio-based Pentamethylenediamine Production Value Market Share by Application (2021-2032)
Figure 72. World Bio-based Pentamethylenediamine Average Price by Application (2021-2032) & (US$/Ton)
Figure 73. Bio-based Pentamethylenediamine Industry Chain
Figure 74. Bio-based Pentamethylenediamine Procurement Model
Figure 75. Bio-based Pentamethylenediamine Sales Model
Figure 76. Bio-based Pentamethylenediamine Sales Channels, Direct Sales, and Distribution
Figure 77. Methodology
Figure 78. Research Process and Data Source

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