

MARKETS AND PROFITABILITY

Market Insights: Thermoplastic Starch (TPS) - 2022

August 2022



This Report was prepared by NexantECA, the Energy and Chemicals Advisory company ("NexantECA"). Except where specifically stated in this Report, the information contained herein is prepared on the basis of information that is publicly available, and contains no confidential third party technical information to the best knowledge and belief of NexantECA. The information has not been independently verified or otherwise examined to determine its accuracy, completeness or financial feasibility. Neither NexantECA, Subscriber nor any person acting on behalf of either shall have any liabilities for any loss or damage arising from or connected to the use of any information contained in this Report. NexantECA does not represent or warrant that any assumed conditions will come to pass.

The Report is for Subscriber's internal use only and shall be kept strictly confidential. The Report should not be otherwise reproduced, distributed or used without first obtaining prior written consent by NexantECA. Each Subscriber agrees to use reasonable effort to protect the confidential nature of the Report.

Copyright © by NexantECA (BVI) Ltd. 2022. All rights reserved.



Contents

1	Executive Summary	1
2	Introduction	7
2.1	Overview	7
2.1.1	TPS Blends	8
2.1.2	Biodegradability Standards and Certification	9
2.1.3	Thermoplastic Starch Production	10
2.2	Key End Use Markets for TPS	11
2.2.1	Flexible Packaging	12
2.2.1.1	Plastic Bags (Shopping and Garbage)	12
2.2.1.2	Flexible Food Packaging.....	12
2.2.2	Agricultural Films.....	13
2.2.3	Rigid Packaging	13
2.2.4	Consumer Goods	13
3	Market Analysis	15
3.1	Global	15
3.1.1	Market Overview	15
3.1.2	Market Drivers	16
3.1.2.1	Starch as a Renewable Resource	16
3.1.2.2	Composting	17
3.1.2.3	Marine Biodegradability	17
3.1.3	Market Constraints	18
3.1.4	Competitive landscape.....	18
3.1.5	Supply and Demand.....	20
3.1.6	Price Forecasts	21
3.2	China	25
3.2.1	Market Overview	25
3.2.2	Market Drivers	25
3.2.3	Market Constraints	25
3.2.4	Competitive Landscape.....	26
3.2.5	Supply and Demand.....	27
3.3	Asia Pacific (excluding China).....	28
3.3.1	Market Overview	28
3.3.2	Market Drivers	28
3.3.3	Market Constraints	29
3.3.4	Competitive Landscape.....	30
3.3.5	Supply and Demand.....	31
3.4	North America	32
3.4.1	Market Overview	32
3.4.2	Market Drivers	32
3.4.2.1	Composting Infrastructure.....	32
3.4.2.2	Plastic Bag Bans	33



	3.4.2.3	California Recycling and Plastics Pollution Act.....	34
	3.4.2.4	Agricultural Mulch Films.....	34
	3.4.2.5	Corporate Social Responsibility.....	34
	3.4.2.6	USDA BioPreferred Program.....	35
	3.4.2.7	Certification and Compostability Testing.....	35
	3.4.3	Market Constraints.....	36
	3.4.4	Competitive Landscape.....	36
	3.4.5	Supply and Demand.....	37
3.5		South America.....	39
	3.5.1	Market Overview.....	39
	3.5.2	Market Drivers.....	39
	3.5.3	Market Constraints.....	40
	3.5.4	Competitive Landscape.....	40
	3.5.5	Supply and Demand.....	40
3.6		Western Europe.....	42
	3.6.1	Market Overview.....	42
	3.6.2	Market Drivers.....	42
	3.6.2.1	Bioplastics Legislative Initiatives.....	42
	3.6.2.2	Plastic Bags and Biowaste.....	43
	3.6.2.3	Regional Legislation.....	43
	3.6.2.4	Taxation.....	44
	3.6.2.5	EU Taxonomy Regulation.....	44
	3.6.2.6	Corporate Sustainability Goals.....	45
	3.6.3	Market Constraints.....	45
	3.6.4	Competitive Landscape.....	47
	3.6.5	Supply and Demand.....	49
3.7		Central Europe.....	50
	3.7.1	Market Overview.....	50
	3.7.2	Market Drivers.....	50
	3.7.3	Market Constraints.....	51
	3.7.4	Competitive Landscape.....	52
	3.7.5	Supply and Demand.....	52
3.8		Eastern Europe.....	53
	3.8.1	Market Overview.....	53
	3.8.2	Market Drivers.....	53
	3.8.3	Market Constraints.....	53
	3.8.4	Competitive Landscape.....	54
	3.8.5	Supply and Demand.....	54
3.9		Middle East.....	55
	3.9.1	Market Overview.....	55
	3.9.2	Market Drivers.....	55
	3.9.3	Market Constraints.....	55
	3.9.4	Competitive Landscape.....	56
	3.9.5	Supply and Demand.....	57



3.10	Africa	58
3.10.1	Market Overview	58
3.10.2	Market Drivers	58
3.10.3	Market Constraints	58
3.10.4	Competitive Landscape.....	58
3.10.5	Supply and Demand.....	59
4	Cost Competitiveness.....	60
4.1	Cost Structure and Assumptions.....	60
4.1.1	Variable Costs	61
4.1.1.1	Feedstock Costs	61
4.1.1.2	Utility Costs	61
4.1.2	Direct Fixed Costs	62
4.1.3	Allocated Fixed Costs	63
4.1.4	Other Considerations	63
4.1.5	Delivered Cost Assumptions	63
4.1.6	Shipping Costs	63
4.1.7	Tariffs	64
4.2	Delivered Cost competitiveness.....	64
5	TPS Blend Market Summary	66

Appendices

A	Global Capacity Listing	68
----------	--------------------------------------	-----------

Figures

Figure 1	Structure of Amylose (0).....	7
Figure 2	Amylopectin Structure	8
Figure 3	TPS Production using an Extruder	10
Figure 4	Global TPS Blend Demand by End-Use, 2022-estimated	11
Figure 5	Global TPS Blend Demand by Region, 2022-estimated	15
Figure 6	Global TPS Blend Capacity by Region.....	19
Figure 7	Global TPS Blend Capacity by Producer, 2022	19
Figure 8	Global TPS Blend Supply, Demand and Trade.....	20
Figure 9	Global TPS Blend Net Exports (Imports).....	21
Figure 10	Global Pure TPS (Corn based) Pricing Forecast	22
Figure 11	Western Europe Pure TPS (Corn) Cost, Price and Margin Projections	23
Figure 12	USGC Pure TPS (Corn) Cost, Price and Margin Projections.....	23
Figure 13	NEA Pure TPS (Corn) Cost, Price and Margin Projections.....	24
Figure 14	China TPS Blend Supply, Demand and Trade.....	27
Figure 15	Asia Pacific (excluding China) TPS Blend Supply, Demand and Trade	31
Figure 16	North America TPS Blend Supply, Demand and Trade	38
Figure 17	South America TPS Blend Supply, Demand and Trade	40
Figure 18	Western Europe TPS Blend Supply, Demand and Trade	50
Figure 19	Central Europe TPS Blend Supply, Demand and Trade	52
Figure 20	Eastern Europe TPS Blend Supply, Demand and Trade	54



Figure 21	Middle East TPS Blend Supply, Demand and Trade	57
Figure 22	Africa TPS Blend Supply, Demand and Trade	59
Figure 23	Components of Delivered Cost to Market	60
Figure 24	Pure TPS (Corn) Delivered Cash Cost Competitiveness	65
Figure 25	Porter's Five Forces Analysis of TPS Blend Business	66

Tables

Table 1	Properties of TPS and Polymers Typically Blended with TPS	9
Table 2	Properties of TPS/PLA Blends and LDPE Films ⁰	12
Table 3	Global TPS Blend Demand by Region	16
Table 4	Global TPS Blend Supply, Demand and Trade.....	20
Table 5	China TPS Blend Capacity	26
Table 6	China TPS Blend Supply, Demand and Trade.....	27
Table 7	Asia Pacific (excluding China) TPS Blend Capacity	30
Table 8	Asia Pacific (excluding China) TPS Blend Supply, Demand and Trade	31
Table 9	North America TPS Blend Capacity	37
Table 10	North America TPS Blend Supply, Demand and Trade	38
Table 11	South America Supply, Demand and Trade	41
Table 12	Western Europe TPS Blend Capacity	49
Table 13	Western Europe TPS Blend Supply Demand and Trade	50
Table 14	Central Europe TPS Blend Supply, Demand and Trade.....	52
Table 15	Eastern Europe TPS Blend Supply, Demand and Trade	54
Table 16	Middle East TPS Blend Supply, Demand and Trade	57
Table 17	Africa TPS Blend Supply, Demand and Trade	59
Table 18	Feedstock Price Assumptions	61
Table 19	Utility Rates	62
Table 20	Wage Assumptions.....	62
Table 21	Capital Cost Location Factors	63
Table 22	Freights Costs to Western Europe Coast (Rotterdam)	64
Table 23	Tariffs on Imports into Western Europe (EU)	64
Table 24	Global TPS Blend Capacity	68