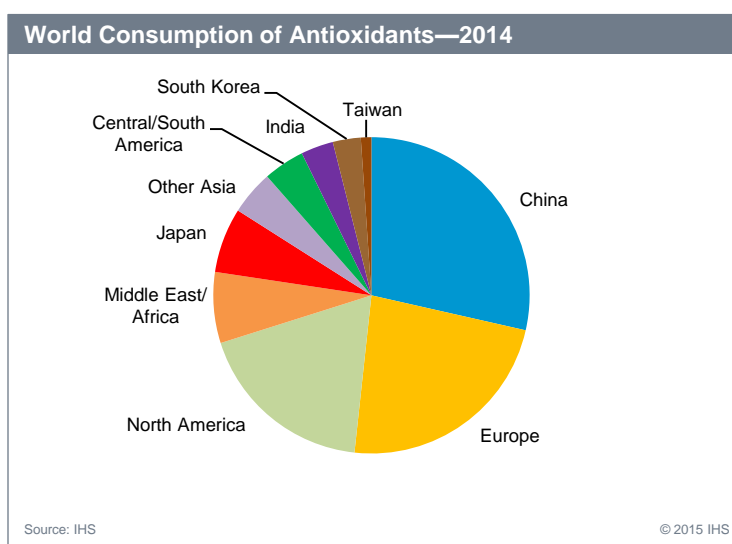


ANTIOXIDANTS

The rubber-processing industry, the plastics industry, the food and feed industry, and the fuel and lubricants industry are major consumers of antioxidants. Antioxidants are part of a company's broader portfolio of additive products designed to serve specific end-use industries. Therefore, antioxidants do not really represent an industry but characterize one component of the larger chemical additives industry.

The principal chemical classes of antioxidants are amines, hindered phenols, phosphites, thioesters, and various natural or natural-based compounds. These chemicals are used primarily to inhibit the oxidative degradation of unsaturated organic materials, such as elastomers, plastics, petroleum-based fuels, and food or animal feed.

The following pie chart shows world consumption of antioxidants:



Antioxidant producers have been facing a significant shift of their customer base to Asia Pacific, particularly to China. Meanwhile, market competition from China is growing rapidly. To serve the growing global customer base, major antioxidant producers have been partnering with local companies to expand local production bases. The Asia Pacific region reportedly accounts for about 50% of the global production of antioxidants.

US and European antioxidant producers are participating in the manufacturing shift to Asia, which is quickly emerging as a base of operations for a number of major customers. Asia now accounts for an estimated 50–60% of global antioxidant production, mostly in China, but also in India, Taiwan, and South Korea, as well as Japan. A sizable amount of excess antioxidant production in the region is exported to Europe and North America.

In 2015, there are some uncertainties concerning the future direction of the world's economies. Included in these uncertainties are the resolution of the eurozone's and other countries' debt and financial challenges; the persistent, relatively high unemployment rate; and sluggish economic growth rates in the United States. In addition, the Chinese economy, which had been growing briskly, is slowing, casting doubt on its future course. While no one is willing to predict when the world's economies will return to historical growth patterns, for the purposes of this report, the authors have assumed that the current eurozone problems will be resolved over time without significantly hurting the region's economy

and that the other regions' economies will begin or continue to slowly return to historical growth patterns. Individual economies are not expected to return to their historical growth patterns until 2016–17. Additional factors in this report's forecasts include the migration of manufacturing from developed to developing economies and the uncertainty in energy prices. Each region's economic conditions are reflected in the consumption forecasts for that region.

In 2014, rubber and latex applications accounted for 55% of total antioxidant consumption in the major regions, followed by plastics (34%), food and feed (6%), and petroleum fuels (3%) on a volume basis. Amines accounted for 54% of total antioxidant consumption volume, followed by hindered phenols (28%), phosphites (12%), natural based (4%), and thioesters (2%). Substantial differences in end-use distribution and product type are apparent among the major regions, as discussed in the regional sections of this report.

The five-year consumption growth rate through 2019 is projected to be between 2% and 4% per year. India (5–7% per year) is expected to grow the fastest, followed by China (4.5–5.5% per year). The remaining countries/regions are expected to grow more slowly over the period.

Table of contents

Abbreviations.....	8
Summary	9
Introduction.....	13
Overview of the antioxidant industry.....	14
Company profiles	14
ADEKA Corporation.....	14
Overview	14
Products and markets	14
Marketing approach	14
Technology position.....	15
Strategy and future direction.....	16
Addivant™	16
BASF SE.....	16
Eastman	17
Jiangsu Sinorgchem Technology Co., Ltd.....	18
Overview	18
Products and markets	18
Marketing approach	18
LANXESS AG	18
NOCIL Limited	19
Seiko Chemical Co., Ltd.....	20
Overview	20
Products and markets	20
Marketing approach	20
Technology position.....	21
Strategy and future direction.....	21
Shandong Linyi Sunny Wealth Chemicals Co., Ltd.....	21
Overview	21
Products and markets	22
Marketing approach	22
SI Group, Inc.	22
Songwon Industrial Co., Ltd.....	22
Sumitomo Chemical Co., Ltd.....	24
Overview	24
Products and markets	24
Marketing approach	25
Technology position.....	25
Strategy and future direction.....	25
North America.....	26
Structure of the industry	29
Rubber industry.....	34
Plastics industry	35
Food and feed industry.....	37
Petroleum industry	38
Cosmetics and toiletries	40

Barriers to entry/exit	40
Company profiles.....	41
Operating characteristics	41
Research and development.....	41
Manufacturing.....	42
Marketing.....	43
Profitability/cost structure.....	45
Government regulations.....	47
Critical factors for success.....	47
Trends and opportunities	48
Europe	49
Structure of the industry	52
Market participants	52
Corporate activities	54
Market segmentation.....	55
Rubber and latex industry	56
Plastics industry	57
Food and feed industries	58
Fuels and lubricants industry	59
Company profiles.....	60
Operating characteristics	60
Research and development.....	60
New product introductions and applications.....	62
Manufacturing.....	62
Marketing.....	63
Profitability and cost structure	64
Government regulations.....	65
Critical factors for success.....	68
Trends and opportunities	69
Japan.....	70
Structure of the industry	70
Company profiles.....	72
Operating characteristics	72
Research and development.....	72
Manufacturing.....	73
Marketing.....	74
Profitability and cost structure	74
Government regulations.....	76
Critical factors for success.....	77
Trends and opportunities	78
China	78
Structure of the industry	80
Rubber industry.....	82
Plastics industry	83
Food and feed industry.....	84
Petroleum industry	84
Research and development	85
Marketing.....	85
India.....	85
Structure of the industry	85

Rubber industry.....	86
Plastics industry.....	87
Company profiles.....	87
Government regulations.....	87
Antioxidant product types.....	89
Amines.....	89
Hindered phenols.....	90
Phosphites.....	91
Thioesters.....	92
Natural-based antioxidants.....	92
Other antioxidants.....	93
Regional summary.....	94
North America.....	94
Summary.....	94
Amines.....	95
Consumption and markets.....	95
Market participants.....	98
Prices.....	98
Future trends and strategic issues.....	99
Hindered phenols.....	99
Consumption and markets.....	99
Market participants.....	102
Prices.....	103
Future trends and strategic issues.....	103
Phosphites.....	103
Consumption and markets.....	103
Prices.....	106
Future trends and strategic issues.....	107
Thioesters.....	107
Consumption and markets.....	107
Market participants.....	107
Prices.....	108
Future trends and strategic issues.....	109
Natural-based antioxidants.....	109
Consumption and markets.....	109
Market participants.....	111
Prices.....	112
Future trends and strategic issues.....	112
Central and South America.....	113
Europe.....	115
Summary.....	115
Rubber and latex.....	116
Plastics.....	118
Food and feed.....	120
Fuels and lubricants.....	122
Other.....	124
Amines.....	125
Consumption and markets.....	125

Market participants	126
Prices.....	126
Future trends and strategic issues.....	127
Hindered phenols	127
Consumption and markets.....	127
Market participants	130
Prices.....	131
Future trends and strategic issues.....	132
Phosphites	132
Consumption and markets.....	132
Market participants	134
Prices.....	134
Future trends and strategic issues.....	134
Thioesters.....	134
Consumption and markets.....	134
Market participants	135
Prices.....	135
Future trends and strategic issues.....	136
Natural-based antioxidants	136
Consumption and markets.....	136
Market participants	137
Prices.....	138
Future trends and strategic issues.....	138
Middle East and Africa.....	139
Market participants	140
Japan.....	141
Summary.....	141
Amines.....	142
Consumption and markets.....	142
Market participants	144
Prices.....	144
Future trends and strategic issues.....	145
Hindered phenols	145
Consumption and markets.....	145
Market participants	147
Prices.....	148
Future trends and strategic issues.....	149
Phosphites	150
Consumption and markets.....	150
Market participants	151
Prices.....	152
Future trends and strategic issues.....	153
Thioesters.....	153
Consumption and markets.....	153
Market participants	154
Prices.....	155
Future trends and strategic issues.....	155
Natural-based antioxidants	156
Consumption and markets.....	156
Market participants	158

Prices.....	158
Future trends and strategic issues.....	159
China	159
Summary.....	159
Amines.....	160
Consumption and markets.....	160
Market participants	161
Prices.....	161
Future trends and strategic issues.....	162
Hindered phenols	162
Consumption and markets.....	162
Market participants	163
Prices.....	164
Future trends and strategic issues.....	165
Phosphites	165
Consumption and markets.....	165
Market participants	166
Prices.....	166
Future trends and strategic issues.....	167
Thioesters.....	167
Consumption and markets.....	167
Market participants	168
Prices.....	168
Natural-based antioxidants	169
Consumption and markets.....	169
Market participants	169
Prices.....	170
Future trends and strategic issues.....	170
India.....	171
South Korea.....	172
Taiwan.....	174
Other Asian countries.....	176