

# Bioethylene by Ethanol Dehydration

PEP Report 29L

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## Contacts

### **Girish Ballal**

Director, Fuel and Chemical Processes  
girish.ballal@ihsmarkit.com

### **Michael Arné**

Vice President, Process Economics Program  
michael.arne@ihsmarkit.com

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**Girish Ballal**, Director, Fuel and Chemical Processes

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### Abstract

The growing concerns about environmental carbon emissions and the resulting climate change issues have effected a concerted effort to reduce these emissions from the production of industrial chemicals and fuels. There is also an impetus to reduce the carbon emissions in a broader sense, including carbon emissions related to the production of feedstock, the so-called life-cycle carbon emissions. The use of bio-based feedstocks often results in lower carbon emissions than the use of petroleum-based feedstocks. Consequently, the use of bio-based processes is receiving increasing attention as a contributor to the decarbonization efforts in the industrial sector.

Ethylene is the cornerstone of the modern petrochemical industry. It has myriad end uses such as polyethylene (PE), polyvinyl chloride (PVC), ethylene glycol (EG), and others. Almost all ethylene is currently produced by thermal steam cracking of fossil-based feedstock such as naphtha, ethane, or propane. Bioethylene is produced from bio-based feedstock and is chemically identical to fossil-based ethylene. This report presents a techno-economic analysis of three current industrial processes to produce bioethylene by ethanol dehydration. These processes are

- Ethanol dehydration process by Braskem
- ATol™ process by Axens
- Hummingbird™ process by TechnipFMC

All three processes result in significant reductions in carbon emissions compared with conventional industrial ethylene production. The most carbon-efficient bioethylene process leads to a reduction of more than 70%, relative to conventional light naphtha cracking.

The production economics assessment in this report is based on a US Gulf Coast location. However, an iPEP Navigator module (an Excel®-based computer costing model developed by IHS Markit) is attached with this report to allow a quick calculation of the process economics for three other major regions: Germany, Japan, and mainland China. The module also allows production economics to be reported in English or metric units in each region.

This technological and economic assessment is PEP's independent interpretation of the companies' commercial processes. It is based on information presented in open literature, such as patents or technical articles, and may not reflect in whole or in part of the actual plant configuration.

# Contents

<b>1</b>	<b>Introduction</b>	<b>7</b>
<b>2</b>	<b>Executive summary</b>	<b>9</b>
	Industry review	9
	Environmental, social, and governance	9
	Supply and demand	9
	Technology review	10
	Renewable feedstocks	10
	Production technology	11
	Process economics	12
	Capital costs	14
	Production costs	15
	Environmental footprint	16
	Summary and conclusions	20
<b>3</b>	<b>Industry review</b>	<b>22</b>
	Environmental, social, and governance	22
	Supply and demand	23
	Feedstock and product prices	26
<b>4</b>	<b>Technology review</b>	<b>29</b>
	Renewable feedstocks	29
	Reaction chemistry	30
	Reactions	30
	Catalyst	31
	Industrial considerations	32
	Commercial processes	33
	Ethanol dehydration process by Braskem	33
	ATOL™ process by Axens/Total	34
	Hummingbird™ process by TechnipFMC/BP	35
	Ethanol-to-ethylene process by Petron Scientific	36
	Patents overview	37
<b>5</b>	<b>Bioethylene process by Braskem</b>	<b>42</b>
	Process description	42
	Section 100—Pretreatment and dehydration	42
	Section 200—Product recovery	42
	Section 300—Refrigeration	43
	Process discussion	46
	Feedstock	46
	By-products	47
	Reaction and product recovery	47
	Catalyst	47
	Process waste effluents	48
	Materials of construction	48
	Cost estimates	51
	Fixed capital costs	52
	Production costs	52
	Environmental footprint	60
<b>6</b>	<b>ATOL™ process by Axens</b>	<b>62</b>
	Process description	62
	Section 100—Pretreatment and dehydration	62
	Section 200—Product recovery	62

Section 300—Product recovery	63
<b>Process discussion</b>	<b>67</b>
Feedstock	67
By-products	67
Reaction and product recovery	67
Catalyst	68
Process waste effluents	68
Materials of construction	68
<b>Cost estimates</b>	<b>71</b>
Fixed capital costs	71
Production costs	72
<b>Environmental footprint</b>	<b>79</b>
<b>7 Hummingbird™ process by TechnipFMC</b>	<b>81</b>
<b>Process description</b>	<b>81</b>
Section 100—Pretreatment and dehydration	81
Section 200—Product recovery	81
Section 300—Refrigeration	82
<b>Process discussion</b>	<b>85</b>
Feedstock	85
By-products	86
Reaction and product recovery	86
Catalyst	86
Process waste effluents	87
Materials of construction	87
<b>Cost estimates</b>	<b>90</b>
Fixed capital costs	90
Production costs	91
<b>Environmental footprint</b>	<b>99</b>
<b>Appendix A—Cited references</b>	<b>101</b>
<b>Appendix B—Patent summaries</b>	<b>105</b>
<b>Appendix C—Design and cost basis</b>	<b>110</b>
<b>Appendix D—Process flow diagrams</b>	<b>114</b>

## Tables

Table 2.1 Production costs (metric units) comparison	14
Table 2.2 Comparison of environmental footprints	17
Table 3.1 Top bioethylene producers	26
Table 5.1 Design basis and assumptions	44
Table 5.2 Stream summary	45
Table 5.3 Major equipment	49
Table 5.4 Utilities summary	51
Table 5.5 Total capital investment	53
Table 5.6 Capital investment by section	54
Table 5.7 Variable costs	55
Table 5.8 Production costs	56
Table 5.9 Production costs metric units	57
Table 5.10 Environmental performance factors	60
Table 6.1 Design basis and assumptions	64
Table 6.2 Stream summary	65
Table 6.3 Major equipment	69
Table 6.4 Utilities summary	70
Table 6.5 Total capital investment	72
Table 6.6 Capital investment by section	73
Table 6.7 Variable costs	74
Table 6.8 Production costs	75
Table 6.9 Production costs metric units	76
Table 6.10 Environmental performance factors	79
Table 7.1 Design basis and assumptions	83
Table 7.2 Stream summary	84
Table 7.3 Major equipment	88
Table 7.4 Utilities summary	90
Table 7.5 Total capital investment	92
Table 7.6 Capital investment by section	93
Table 7.7 Variable costs	94
Table 7.8 Production costs	95
Table 7.9 Production costs metric units	96
Table 7.10 Environmental performance factors	99

## Figures

Figure 2.1 Bioethylene capacity by regions	10
Figure 2.2 Bioethylene by ethanol dehydration	12
Figure 2.3 Comparison of capital costs	15
Figure 2.4 Comparison of production costs	16
Figure 2.5 Comparison of CO <sub>2</sub> emissions	17
Figure 2.6 Comparison of water usage requirement	18
Figure 2.7 Comparison of wastewater generation	18
Figure 2.8 Comparison of carbon footprint with conventional technology	19
Figure 2.9 Comparison of water footprint with conventional technology	20
Figure 3.1 Life-cycle carbon emission for Braskem bio polyethylene	23
Figure 3.2 Ethanol production capacity by location	24
Figure 3.3 Global ethylene production capacity	24
Figure 3.4 Global bioethylene production capacity	25
Figure 3.5 Bioethylene capacity by location	26
Figure 3.6 Ethanol prices by location	27

Figure 3.7 Ethanol prices by location	28
Figure 4.1 Ethanol dehydration mechanism	31
Figure 4.2 Ethanol dehydration process by Braskem	33
Figure 4.3 Simplified ATol™ process flow diagram	34
Figure 4.4 Hummingbird™ process by TechnipFMC/BP	35
Figure 4.5 Hummingbird™ process operating conditions	36
Figure 5.1 Effect of plant capacity on capital costs	58
Figure 5.2 Effect of plant capacity on production costs	59
Figure 5.3 Effect of feedstock price on production costs	60
Figure 6.1 Effect of plant capacity on capital costs	77
Figure 6.2 Effect of plant capacity on production costs	78
Figure 6.3 Effect of feedstock price on production costs	79
Figure 7.1 Effect of plant capacity on capital costs	97
Figure 7.2 Effect of plant capacity on production costs	98
Figure 7.3 Effect of feedstock price on production costs	99

## Appendix D Figures

Figure 5.1A Ethanol Dehydration process by Braskem	115
Figure 5.2A Ethanol Dehydration Process by Braskem (Refrigeration System)	116
Figure 6.1A ATol™ Process by Axens	117
Figure 7.1A Hummingbird™ Process by TechnipFMC	118

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## IHS Markit Customer Care:

CustomerCare@ihsmarkit.com

### **Asia and the Pacific Rim**

Japan: +813 6262 1887

Asia Pacific: +604 291 3600

**Europe, Middle East, and Africa:** +44 1344 328 300

**Americas:** +1 800 447 2273

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