

NexantThinking™

Strategic Business Analysis

Ammonia and Urea 2016

Ammonium Nitrates Supplement
June 2016



This Report was prepared by Nexant, Inc. ("Nexant") and is part of the NexantThinking™ suite. Except where specifically stated otherwise 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 of Nexant. Aforesaid information has not been independently verified or otherwise examined to determine its accuracy, completeness or financial feasibility. Neither Nexant, Subscriber nor any person acting on behalf of either assumes any liabilities with respect to the use of or for damages resulting from the use of any information contained in this Report. Nexant does not represent or warrant that any assumed conditions will come to pass.

The Report is submitted on the understanding that the Subscriber will maintain the contents confidential except for the Subscriber's internal use. The Report should not be reproduced, distributed or used without first obtaining prior written consent by Nexant. Each Subscriber agrees to use reasonable effort to protect the confidential nature of the Report.

Copyright © by Nexant Inc. 2016. All rights reserved.

Contents

Section	Page
1 Executive Summary	1-1
1.1 REPORT SECTION 2: INTRODUCTION	1-2
1.2 REPORT SECTION 3: MARKET DYNAMICS	1-3
1.3 REPORT SECTION 4: PROFITABILITY AND PRICING	1-7
1.4 REPORT SECTION 5: DELIVERED COST COMPETITIVENESS	1-9
2 Introduction.....	2-1
2.1 BACKGROUND.....	2-1
2.2 VALUE CHAIN	2-2
2.3 CURRENT USE OF AMMONIUM NITRATES	2-3
2.4 FEEDSTOCK AND UPSTREAM PROCESSES	2-4
3 Market Dynamics.....	3-1
3.1 INTRODUCTION.....	3-1
3.2 MARKET DYNAMICS FORECASTING METHODOLOGY.....	3-2
3.2.1 Capacity Availability and Forecasting	3-2
3.2.2 End-Use Consumption Forecasting	3-2
3.2.3 Production and Trade Forecasting.....	3-3
3.3 DEMAND.....	3-4
3.3.1 Primary Drivers.....	3-4
3.3.2 Demand by End-Use.....	3-6
3.3.3 Demand by Region	3-15
3.4 SUPPLY	3-19
3.4.1 Ammonium Nitrate	3-19
3.4.2 Calcium Ammonium Nitrate	3-20
3.4.3 Urea Ammonium Nitrate.....	3-20
3.5 SUPPLY, DEMAND AND TRADE.....	3-21
3.5.1 Global	3-21
3.5.2 North America	3-27
3.5.3 South America.....	3-29
3.5.4 Western Europe	3-31
3.5.5 Central and Eastern Europe.....	3-33
3.5.6 China	3-35
3.5.7 India.....	3-37

	3.5.8 Asia Pacific Excluding China and India.....	3-38
	3.5.9 Middle East.....	3-40
	3.5.10 Africa	3-42
4	Pricing and Profitability.....	4-1
4.1	NEXANT'S GENERAL PROFITABILITY FORECAST METHODOLOGY	4-1
	4.1.1 Introduction.....	4-1
	4.1.2 Price Influences.....	4-1
	4.1.3 Experience Curve & Cost Reduction	4-3
	4.1.4 Driving Forces for Profitability	4-3
	4.1.5 Cyclicity of the Petrochemical Industry	4-5
4.2	FEEDSTOCK ASSUMPTIONS	4-6
	4.2.1 Introduction.....	4-6
	4.2.2 Ammonia	4-6
	4.2.3 Nitric Acid	4-8
	4.2.4 Urea.....	4-9
4.3	AMMONIUM NITRATE	4-10
	4.3.1 Pricing Influences	4-10
	4.3.2 Ammonium Nitrate Price History	4-11
	4.3.3 Historical Profitability Analysis	4-12
	4.3.4 Ammonium Nitrate Profitability Projections.....	4-13
	4.3.5 Ammonium Nitrate Price Forecasts	4-15
	4.3.6 Ammonium Nitrate Price Forecasts Under Nexant's Three Oil Price Scenarios	4-16
4.4	CALCIUM AMMONIUM NITRATE	4-17
	4.4.1 Pricing Influences	4-17
	4.4.2 Calcium Ammonium Nitrate Price History.....	4-18
	4.4.3 Historical Profitability Analysis	4-19
	4.4.4 Calcium Ammonium Nitrate Profitability Projections.....	4-20
	4.4.5 Calcium Ammonium Nitrate Price Forecasts	4-21
	4.4.6 Calcium Ammonium Nitrate Price Forecasts under Nexant's Three Oil Price Scenarios	4-22
4.5	UREA AMMONIUM NITRATE	4-23
	4.5.1 Pricing Influences	4-23
	4.5.2 Urea Ammonium Nitrate Price History	4-24
	4.5.3 Historical Profitability Analysis	4-25
	4.5.4 Urea Ammonium Nitrate Profitability Projections.....	4-26
	4.5.5 Urea Ammonium Nitrate Price Forecasts	4-27

4.5.6	Urea Ammonium Nitrate Price Forecasts under Nexant's Three Oil Price Scenarios	4-29
5	Delivered Cost Competitiveness	5-1
5.1	INTRODUCTION.....	5-1
5.1.1	Cost of Production Terminology.....	5-1
5.1.2	Location Factors.....	5-2
5.1.3	Other Cost Elements.....	5-3
5.2	BASIS AND COVERAGE.....	5-3
5.2.1	Analysis Year	5-3
5.2.2	Location and Market Coverage	5-3
5.3	ASSUMPTIONS	5-4
5.3.1	Fertilizer Plants Modelled.....	5-4
5.3.2	Feedstock Costs	5-4
5.3.3	Shipping Costs	5-7
5.3.4	Tariffs	5-11
5.4	CASH COST AND DELIVERED CASH COST COMPETITIVENESS.....	5-12
5.4.1	Ammonia Cash Cost of Production	5-12
5.4.2	Urea Cash Cost of Production	5-13
5.4.3	Nitric Acid Cash Cost of Production	5-14
5.4.4	Ammonium Nitrate	5-15
5.4.5	Calcium Ammonium Nitrate Models.....	5-20
5.4.6	Urea Ammonium Nitrate Models	5-23
Appendix		Page
A	Macro-Economic Assumptions.....	A-1
B	Capacity Tables.....	B-1
C	Supply, Demand and Trade Tables	C-1
D	Profitability and Pricing.....	D-1

Figure	Page
2.1 Ammonium Nitrate Value Chain and Production Overview	2-2
3.1 End-Use Consumption Drivers (Major Economies)	3-2
3.2 Trade Considerations	3-4
3.3 Global Population Growth, by Region	3-5
3.4 Global Distribution of GDP, Population and Agricultural Land, 2014.....	3-6
3.5 Value Chain of Main Ammonia and Urea Derived Fertilizers.....	3-7
3.6 End-Use of Ammonia and Its Derivatives	3-7
3.7 Global Ammonia Consumption by Application.....	3-8
3.8 Global Ammonia Consumption by Application.....	3-9
3.9 Ammonium Nitrate Derivatives.....	3-9
3.10 Ammonium Nitrate Value Chain and Production Overview	3-10
3.11 Global Total Ammonium Nitrate Production by Region (Excluding Consumption of AN in the Production of CAN)	3-10
3.12 FGAN for Direct Application vs. AN of Other Applications Production	3-12
3.13 Global Calcium Ammonium Nitrate Production by Region	3-13
3.14 Global Urea Ammonium Nitrate Production by Region.....	3-14
3.15 Global Total Ammonium Nitrate Consumption by Region (excl. CAN).....	3-16
3.16 Global Total Ammonium Nitrate Consumption by Region (excl. CAN).....	3-17
3.17 Global Calcium Ammonium Nitrate Consumption by Region	3-18
3.18 Global Calcium Ammonium Nitrate Consumption by Region	3-18
3.19 Global Urea Ammonium Nitrate Consumption by Region.....	3-19
3.20 Global Urea Ammonium Nitrate Consumption by Region.....	3-19
3.21 Global Ammonium Nitrate Capacity by Region.....	3-20
3.22 Global Urea Ammonium Nitrate Capacity by Region.....	3-21
3.23 Global Ammonium Nitrate Supply/Demand	3-22
3.24 Global Calcium Ammonium Nitrate Supply/Demand	3-23
3.25 Global Urea Ammonium Nitrate Supply/Demand	3-23
3.26 Global Ammonium Nitrate Net Trade	3-24
3.27 Global Ammonium Nitrate Net Trade Flow Pattern.....	3-25
3.28 Global Calcium Ammonium Nitrate Net Trade.....	3-25
3.29 Global Calcium Ammonium Nitrate Net Trade Flow Pattern	3-26
3.30 Global Urea Ammonium Nitrate Net Trade	3-26
3.31 Global Urea Ammonium Nitrate Net Trade Flow Pattern.....	3-27
3.32 Ammonium Nitrate Supply/Demand – North America.....	3-28
3.33 Calcium Ammonium Nitrate Supply/Demand – North America.....	3-28

3.34	Urea Ammonium Nitrate Supply/Demand – North America.....	3-29
3.35	Ammonium Nitrate Supply/Demand – South America.....	3-30
3.36	Calcium Ammonium Nitrate Supply/Demand – South America.....	3-30
3.37	Urea Ammonium Nitrate Supply/Demand – South America.....	3-31
3.38	Ammonium Nitrate Supply/Demand – Western Europe.....	3-32
3.39	Calcium Ammonium Nitrate Supply/Demand – Western Europe.....	3-32
3.40	Urea Ammonium Nitrate Supply/Demand – Western Europe.....	3-33
3.41	Ammonium Nitrate Supply/Demand – Central & Eastern Europe.....	3-34
3.42	Calcium Ammonium Nitrate Supply/Demand – Central & Eastern Europe.....	3-34
3.43	Urea Ammonium Nitrate Supply/Demand – Central & Eastern Europe.....	3-35
3.44	Ammonium Nitrate Supply/Demand – China.....	3-36
3.45	Calcium Ammonium Nitrate Supply/Demand – China.....	3-36
3.46	Urea Ammonium Nitrate Supply/Demand – China.....	3-37
3.47	Ammonium Nitrate Supply/Demand – India.....	3-38
3.48	Calcium Ammonium Nitrate Supply/Demand – India.....	3-38
3.49	Ammonium Nitrate Supply/Demand – Asia Pacific Excluding China and India.....	3-39
3.50	Calcium Ammonium Nitrate Supply/Demand – Asia Pacific Excluding China and India.....	3-39
3.51	Urea Ammonium Nitrate Supply/Demand – Asia Pacific Excluding China and India.....	3-40
3.52	Ammonium Nitrate Supply/Demand – Middle East.....	3-41
3.53	Calcium Ammonium Nitrate Supply/Demand – Middle East.....	3-41
3.54	Urea Ammonium Nitrate Supply/Demand – Middle East.....	3-42
3.55	Ammonium Nitrate Supply/Demand – Africa.....	3-43
3.56	Calcium Ammonium Nitrate Supply/Demand – Africa.....	3-43
3.57	Urea Ammonium Nitrate Supply/Demand – Africa.....	3-44
4.1	Simulator Forecast Methodology.....	4-1
4.2	Petrochemical Price Influences.....	4-2
4.3	Price Influences in the Cost Curve.....	4-4
4.4	Ammonia Cash Cost of Production for a Leading Producer in Western Europe.....	4-7
4.5	Ammonia Price Forecasts for Western Europe.....	4-7
4.6	Nitric Acid Cash Cost of Production for a Leading Producer in Western Europe.....	4-8
4.7	Western Europe Nitric Acid Price Forecasts.....	4-9
4.8	Urea Cash Cost of Production for a Leading Producer in Western Europe.....	4-10
4.9	Western Europe Urea Price Forecasts.....	4-10
4.10	Global Ammonium Nitrate Price History.....	4-12
4.11	Historical Ammonium Nitrate Variable and Cash Cost Margins.....	4-13
4.12	Ammonium Nitrate Return on Investment in Western Europe.....	4-13

4.13	Ammonium Nitrate Historic and Forecast Variable and Cash Cost Margins for Western Europe	4-14
4.14	Ammonium Nitrate Return on Investment in Western Europe	4-14
4.15	Ammonium Nitrate Price Forecast	4-15
4.16	Ammonium Nitrate Price Forecast for Western Europe	4-16
4.17	Ammonium Nitrate Price Forecast for Western Europe	4-17
4.18	Global Calcium Ammonium Nitrate Price History	4-18
4.19	Historical Calcium Ammonium Nitrate Variable and Cash Cost Margins	4-19
4.20	Calcium Ammonium Nitrate Return on Investment in Western Europe	4-20
4.21	Calcium Ammonium Nitrate Historic and Forecast Variable and Cash Cost Margins	4-20
4.22	Calcium Ammonium Nitrate Return on Investment in Western Europe	4-21
4.23	Calcium Ammonium Nitrate Price Forecast	4-21
4.24	Calcium Ammonium Nitrate Price Forecast for Western Europe	4-22
4.25	Calcium Ammonium Nitrate Price Forecast for Western Europe	4-23
4.26	UAN sales price in Western Europe versus raw material costs if purchased on the merchant market	4-24
4.27	Global Urea Ammonium Nitrate Price History	4-25
4.28	Historical Urea Ammonium Nitrate Variable and Cash Cost Margins	4-26
4.29	Urea Ammonium Nitrate Return on Investment in Western Europe	4-26
4.30	Urea Ammonium Nitrate Historic and Forecast Variable and Cash Cost Margins for Western Europe	4-27
4.31	Urea Ammonium Nitrate Return on Investment in Western Europe	4-27
4.32	UAN Sales Price in Western Europe versus Raw Material Costs if Purchased on the Merchant Market	4-28
4.33	Urea Ammonium Nitrate Price Forecast	4-28
4.34	Urea Ammonium Nitrate Price Forecast for Western Europe	4-29
4.35	Urea Ammonium Nitrate Price Forecast for Western Europe	4-30
5.1	Components of Cost Delivered to Market	5-2
5.2	Ammonia Cash Cost of Production, 2015	5-13
5.3	Urea Cash Cost of Production, 2015	5-14
5.4	Nitric Acid Cash Cost of Production, 2015	5-14
5.5	Ammonium Nitrate Cash Cost of Production, 2015	5-15
5.6	Ammonium Nitrate Delivered Cost to Western Europe (Rotterdam), 2015	5-16
5.7	Ammonium Nitrate Delivered Cost to North America (Houston), 2015	5-17
5.8	Ammonium Nitrate Delivered Cost to South America (Rio de Janeiro), 2015	5-17
5.9	Ammonium Nitrate Delivered Cost to Central Europe (Rijeka), 2015	5-18
5.10	Ammonium Nitrate Delivered Cost to Africa (Agadir), 2015	5-18

5.11	Ammonium Nitrate Delivered Cost to South East Asia (Port Kelang), 2015.....	5-19
5.12	Ammonium Nitrate Delivered Cost to Middle East (Istanbul), 2015.....	5-19
5.13	Calcium Ammonium Nitrate Cash Cost of Production, 2015	5-20
5.14	Calcium Ammonium Nitrate Delivered Cost to Western Europe (Rotterdam), 2015	5-21
5.15	Calcium Ammonium Nitrate Delivered Cost to Central Europe (Rijeka), 2015.....	5-21
5.16	Calcium Ammonium Nitrate Delivered Cost to South America (Rio de Janeiro), 2015	5-22
5.17	Calcium Ammonium Nitrate Delivered Cost to North America (Houston), 2015.....	5-22
5.18	Calcium Ammonium Nitrate Delivered Cost to Africa (Durban), 2015	5-23
5.19	Urea Ammonium Nitrate Cash Cost of Production, 2015	5-24
5.20	Urea Ammonium Nitrate Delivered Cost to Western Europe (Rotterdam), 2015	5-25
5.21	Urea Ammonium Nitrate Delivered Cost to North America (Houston), 2015.....	5-25
5.22	Urea Ammonium Nitrate Delivered Cost to South America (Rio de Janeiro), 2015	5-26
5.23	Urea Ammonium Nitrate Delivered Cost to Asia Pacific (Port Kelang), 2015.....	5-26

Table	Page
3.1 Nitrogen Contents of Various Nitrogenous Fertilizers	3-15
5.1 Location Factors	5-2
5.2 Archetype Fertilizer Plants Modelled.....	5-4
5.3 2015 Producer Typical Gas Prices.....	5-6
5.4 Key Parameters for AN, CAN and UAN Solution Shipping.....	5-9
5.5 Total Freight Costs of AN	5-10
5.6 Total Freight Costs of CAN	5-10
5.7 Total Freight Costs of UAN	5-10
5.8 Tariffs on Ammonium Nitrate Imports	5-11
5.9 Tariffs on Calcium Ammonium Nitrate Imports	5-11
5.10 Tariffs on Urea Ammonium Nitrate Imports.....	5-12