

# Table of Contents

|                                     |             |
|-------------------------------------|-------------|
| <i>Abstract</i>                     | <i>i</i>    |
| <i>Revision Control</i>             | <i>ii</i>   |
| <i>Preamble</i>                     | <i>iv</i>   |
| <i>Table of Contents</i>            | <i>ix</i>   |
| <i>List of Figures</i>              | <i>xiii</i> |
| <i>List of Tables</i>               | <i>xv</i>   |
| <i>Acronyms &amp; Abbreviations</i> | <i>xvii</i> |

## Chapters

|                                  |     |
|----------------------------------|-----|
| Executive Summary                | 1.1 |
| About Succinic Acid              | 1.1 |
| Succinic Acid Production Process | 1.2 |
| Economic Analysis                | 1.3 |
| About Succinic Acid              | 2.1 |
| Commercial Forms & Applications  | 2.2 |
| Succinic Acid Production Routes  | 2.3 |
| Process Overview                 | 3.1 |
| Technology Maturity Assessment   | 3.1 |
| Product(s) Description           | 3.3 |
| Inputs Description               | 3.3 |

|                                           |      |
|-------------------------------------------|------|
| Industrial Site Configuration             | 4.1  |
| Process Unit                              | 5.1  |
| Block Flow Diagram                        | 5.2  |
| Description                               | 5.4  |
| Site Infrastructure                       | 6.1  |
| Assumptions                               | 6.1  |
| Description                               | 6.2  |
| Process Consumptions & Labor Requirements | 7.1  |
| Key Input & Output Figures                | 7.1  |
| Labor Requirements                        | 7.2  |
| Capital Costs Summary - United States     | 8.1  |
| Assumptions                               | 8.2  |
| Total Capital Investment                  | 8.3  |
| Operating Costs Summary - United States   | 9.1  |
| Assumptions                               | 9.2  |
| Operating Variable Costs                  | 9.3  |
| Total Operating Cost                      | 9.3  |
| Product Value Summary - United States     | 10.1 |
| Production Costs Summary - United States  | 11.1 |
| Succinic Acid Production Cost Datasheet   | 11.1 |
| Economic Remarks                          | 11.1 |
| Analysis Methodology Summary              | 12.1 |
| References                                | 13.1 |
| Methodology References                    | 13.1 |
| Analysis References                       | 13.2 |

## Appendixes

|                                                                                            |      |
|--------------------------------------------------------------------------------------------|------|
| Utilities Consumption Details * Only in Detailed & Premium Editions *                      | A.1  |
| Materials & Utilities Pricing Data - United States * Only in Detailed & Premium Editions * | B.1  |
| Analysis Pricing Basis                                                                     | B.1  |
| Historical Prices                                                                          | B.1  |
| Capital Costs Details - United States * Only in Detailed & Premium Editions *              | C.1  |
| Fixed Capital Cost Details                                                                 | C.1  |
| Working Capital Details                                                                    | C.3  |
| Additional Capital Requirements Details                                                    | C.4  |
| Operating Costs Details - United States * Only in Detailed & Premium Editions *            | D.1  |
| Utilities Costs Details                                                                    | D.1  |
| Operating Fixed Costs Details                                                              | D.2  |
| Depreciation                                                                               | D.3  |
| Product Value Details - United States * Only in Detailed & Premium Editions *              | E.1  |
| Corporate Overhead Costs Details                                                           | E.1  |
| Return on Capital Employed (ROCE)                                                          | E.1  |
| Plant Cost Breakdowns * Only in Premium Edition *                                          | F.1  |
| ISBL Construction Cost Breakdown                                                           | F.1  |
| OSBL Construction Cost Breakdown                                                           | F.3  |
| Plant Cost Breakdown per Discipline                                                        | F.14 |
| Plant Capacity Assessment - United States * Only in Premium Edition *                      | G.1  |
| Capital Cost for Different Capacities                                                      | G.1  |
| Operating Cost for Different Capacities                                                    | G.3  |
| Project Implementation & Construction Schedule * Only in Premium Edition *                 | H.1  |
| Process Flow Diagrams & Equipment List * Only in Premium Edition *                         | I.1  |
| About Intratec                                                                             | J.1  |

|                            |     |
|----------------------------|-----|
| Our Business               | J.1 |
| Our Products               | J.2 |
| General Terms & Conditions | K.1 |
| Report Use Restrictions    | L.1 |

## List of Figures

|      |                                                                     |
|------|---------------------------------------------------------------------|
| 1.1  | Process Schematic Diagram                                           |
| 2.1  | Succinic Acid                                                       |
| 2.2  | Succinic Acid Production Routes Diagram                             |
| 4.1  | Industrial Site Configuration                                       |
| 5.1  | Block Flow Diagram - Manufacturing Process                          |
| 6.1  | Area 90 - Storage Installations                                     |
| 6.2  | Area 91 - Utilities Facilities                                      |
| 6.3  | Area 92 - Support & Auxiliary Buildings                             |
| 8.1  | Capital Investment Composition                                      |
| 8.2  | Capital Investment Summary                                          |
| 9.1  | Operating Costs Composition                                         |
| 9.2  | Operating Costs Summary                                             |
| 10.1 | Product Value Composition                                           |
| 10.2 | Product Value Summary                                               |
| 12.1 | Intratec Commodity Production Costs Reports Development Methodology |
| B.1  | Historical Prices                                                   |
| C.1  | Plant Cost Summary                                                  |
| D.1  | Cost Distribution of Utility Consumption                            |
| F.1  | Process Unit (ISBL) Construction Cost by Functional Unit            |
| F.2  | Site Infrastructure (OSBL) Construction Cost by Area                |
| F.3  | Storage Installations Construction Cost per Piece of Equipment      |

|     |                                                                        |
|-----|------------------------------------------------------------------------|
| F.4 | Utilities Facilities Construction Cost per Piece of Equipment          |
| F.5 | Support & Auxiliary Buildings Construction Cost per Piece of Equipment |
| F.6 | Plant Construction Cost Summary                                        |
| F.7 | Direct Construction Costs by Discipline                                |
| F.8 | Indirect Costs Summary                                                 |
| G.1 | Capital Investment Versus Plant Capacity                               |
| G.2 | Operating Cost Versus Plant Capacity                                   |
| H.1 | Implementation & Construction Schedule                                 |
| I.1 | Convention for Process Equipment Tags                                  |
| I.2 | Symbols for Lines                                                      |
| I.3 | Equipment Symbols - Reactors & Vessels                                 |
| I.4 | Equipment Symbols - Heat Exchangers                                    |
| I.5 | Equipment Symbols - Compressors & Pumps                                |
| I.6 | Equipment Symbols - Columns                                            |
| I.7 | Equipment Symbols - Solids Processing                                  |
| I.8 | Process Flow Diagram                                                   |

## List of Tables

|      |                                                                 |
|------|-----------------------------------------------------------------|
| 1.1  | Succinic Acid Production Cost Summary                           |
| 3.1  | Process Technology Maturity Scale                               |
| 7.1  | Raw Materials Consumption                                       |
| 7.2  | Products Generation                                             |
| 7.3  | Labor Requirements                                              |
| 8.1  | Capital Investment Summary                                      |
| 9.1  | Operating Variable Costs                                        |
| 9.2  | Operating Costs Summary                                         |
| 10.1 | Product Value Composition                                       |
| 11.1 | Succinic Acid Production Cost Datasheet                         |
| 12.1 | Production Cost Datasheet Template                              |
| A.1  | Net Utility Consumption Rates (per metric ton of Succinic Acid) |
| A.2  | Net Utility Generation Rates (per metric ton of Succinic Acid)  |
| B.1  | Materials & Utilities Prices (United States, XXXX)              |
| C.1  | Plant Cost Estimate Accuracy Range (USD Million)                |
| C.2  | Owner's Cost Details                                            |
| C.3  | Fixed Capital                                                   |
| C.4  | Working Capital Details                                         |
| C.5  | Additional Capital Requirements Details                         |
| D.1  | Net Utilities Details                                           |
| D.2  | Operating Fixed Costs Details                                   |

|     |                                                                        |
|-----|------------------------------------------------------------------------|
| E.1 | Corporate Overhead Costs Details                                       |
| F.1 | Process Unit (ISBL) Construction Cost by Functional Unit               |
| F.2 | Area 90 - Storage Installations: Scope Description                     |
| F.3 | Area 91 - Utilities Facilities: Scope Description                      |
| F.4 | Area 92 - Support & Auxiliary Buildings: Scope Description             |
| F.5 | Site Infrastructure (OSBL) Construction Cost by Piece of Equipment     |
| F.6 | Plant Construction Cost by Discipline                                  |
| G.1 | Capital Investment Analysis for Different Capacities (USD Million)     |
| G.2 | Operating Cost & Product Value Analysis for Different Capacities (/mt) |
| H.1 | Project Phases Schedule                                                |
| I.1 | Diagram Legend - Utilities                                             |
| I.2 | Diagram Legend - Equipment Type                                        |