

**PROJECT PROFILE**  
**ON**  
**ALUMINIUM CHLORIDE**

**MONTH & YEAR**  
**JULY 2011**

**PREPARED BY**  
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STIFTUNG **FÜR DIE FREIHEIT**

# ALUMINIUM CHLORIDE

## A. INTRODUCTION

Aluminium chloride is used in the production of number of bulk drugs. Of the various pharmaceuticals drugs, Ibuprofen is one of the large consumers of Aluminium chloride. Aluminium chloride is used in the Friedel Craft reaction for the production of Ibuprofen.

## B. PRODUCT USES & SPECIFICATIONS

It is used as a catalyst (especially in Friedel-Crafts reaction) for the manufacture of Styrene, Anthraquinone and in other dyestuffs, pharmaceuticals and perfumes.

It is used in ion exchange resins, lubricants, wood preservatives, crude oil refining, as nucleating agent in the manufacture of Titanium dioxide pigments. etc.

Aluminium Chloride appears in Grey or yellow crystals or in powder, when it is in white we can say it is pure. Anhydrous aluminium chloride is a crystalline and deliquescent substance.

It is Odour Strong hydrochloric acid odour, due to small presence of iron chloride.

The Molecular formula for Aluminium Chloride is  $AlCl_3$

### PRODUCT SPECIFICATIONS

| Item                     | Unit        | Specification |
|--------------------------|-------------|---------------|
| $AlCl_3$                 | % by wt min | 99.50         |
| Flourine                 | % by wt max | 0.03          |
| Sublimate                | % by wt min | 99.70         |
| Water Insoluble material | % by wt max | 0.05          |
| Non volatile material    | % by wt max | 0.05          |

### **PARTICLE SIZE**

|           |                |
|-----------|----------------|
| Grade I   | 2mm            |
| Grade II  | 2mm to 9 mm    |
| Grade III | 9 mm and above |

The grain size of Aluminium chloride will be big, small or normal size which is due to inherent factors in process operations. For export market, only normal size is preferred.

In Indian market, all sizes are accepted.

### **C. MARKET POTENTIAL**

The present Indian demand for Aluminium chloride in various sector is assessed as follows.

| Sector               | Demand in tonnes per annum |
|----------------------|----------------------------|
| Pharmaceutical       | 10000                      |
| Dyestuff sector      | 30000                      |
| Pigment              | 3000                       |
| Miscellaneous sector | 3000                       |
| Exports              | 20000                      |
| Total                | 66000                      |

As the production of these sectors is increasing due to growth in these sectors the demand for the Aluminum chloride is bound to increase further.

## **D.TECHNICAL ASPECTS**

### **1. INSTALLED CAPACITY**

The production capacity of Aluminium Chloride per day is estimated at 2 tonnes on 3 shift basis and the capacity per annum works out to 600 tonnes.

### **2. PLANT & MACHINERY**

| S.No | Items  |
|------|--|
|      | Steel reactors equipped with a reflux condenser and jacket for steam heating.  |
|      | Air circulated steam heated coiled tray drier, with vacuum drying system.  |
|      | Demineralised water plant  |
|      | Storage tanks  |
|      | Filtration unit  |
|      | Pulveriser   |
|      | Laboratory equipments (Spectrophotometer, Thin layer chromatography Centrifuge, oven and other laboratory glassware and equipments |

The total value of the plant and machinery is estimated at Rs.90.00 lakhs on turnkey basis.

### **3. MANUFACTURING PROCESS**

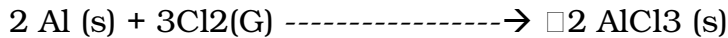
Anhydrous Aluminium Chloride can be obtained by passing dry chlorine or hydrochloric acid gas over heated aluminium powder.

Anhydrous Aluminium Chloride can also be prepared by heating a mixture of alumina and coke in a current of chlorine gas.

**Process outline**

Chlorine gas is passed through molten Aluminium powder/Bauxite in ceramic lined tube shaped reactors.

The reaction is highly exothermic



The temperature during the reaction is maintained at 670 to 850 deg.C by controlling the admission rates of chlorine and Aluminium and by cooling the reactor walls with water. The aluminium is usually replenished in the form of lumps.

The difficulty of controlling the large heat of reaction can be overcome also by dividing the process into a number of small units. The Aluminium chloride vapour leaving the reactor is passed through the ceramic lined tubes into a large air cooled chamber.

Solid Aluminium Chloride is withdrawn from the condenser walls at regular intervals, ground (ensuring exclusion of moisture) and classified by sieving.

Chloride in the off gases is removed by conventional methods such as absorption in Caustic Soda solution.

#### 4. RAW MATERIALS

Raw material required for 600  
MT

|           | Per MT  | Qty<br>MTs | Rate<br>Rs | Value<br>Rs<br>lakhs |
|-----------|---------|------------|------------|----------------------|
| Aluminium |         |            |            |                      |
| scrap     | 0.21 MT | 126        | 90000.00   | 113.40               |
| Chlorine  | 0.97 MT | 582        | 40000.00   | 232.80               |
|           |         |            |            | 346.20               |

#### 5. LAND & BUILDINGS:

Land require – one acre Cost Rs.15.00 lakhs

Building -7000 sq.ft cost Rs.56.00 lakhs

#### 6. Utilities

##### Power:

The power required is 100 HP. About 250 litres of fuel is also required per day

##### Water:

Water is required only over human consumption.

**Man power:**

| Category                         | Nos. | Monthly Salary | Total monthly Salary |
|----------------------------------|------|----------------|----------------------|
| Supervisor                       | 3    | 9000           | 27000                |
| Skilled                          | 3    | 7000           | 21000                |
| Helpers                          | 6    | 5000           | 30000                |
| Office Assistants                | 2    | 6000           | 12000                |
|                                  |      |                | <hr/>                |
|                                  |      |                | 90000                |
| Add : Benefits                   | 20%  |                | 18000                |
|                                  |      |                | <hr/>                |
| Total                            |      |                | 108000               |
|                                  |      |                | <hr/>                |
| Total wages per annum [Rs.lakhs] |      |                | Rs.12.96 lakhs       |

**7. IMPLEMENTATION SCHEDULE:**

If the finance is arranged, the project can be implemented in six months period.

**8. ASSUMPTIONS**

|                               |                                      |
|-------------------------------|--------------------------------------|
| Installed capacity per annum  | Aluminium Chloride-<br>600 MT        |
| Capacity utilization- Year -1 | 60%                                  |
| Year-2                        | 70%                                  |
| Year-3                        | 80%                                  |
| Selling price per unit        | Aluminium Chloride-<br>Rs.100 000/MT |
| Raw materials at 100%         | Rs.346.20 lakhs per<br>annum         |

|   |                           |
|---|---------------------------|
| Consumables/Packing                               | Rs.2200 per MT            |
| Power and Fuel-100% (Rs.lakhs)                    | Rs.61.04                  |
| Wages & salaries -100% (Rs.lakhs)                 | Rs.12.96                  |
| Repairs & Maintenance- p.m.                       | Rs.20000/-                |
| Depreciation                                      | Written Down value Method |
| General & administration Expenses per month       | Rs.100000/-               |
| Selling expenses                                  | 3% on Sales               |
| Interest on term loan and Working capital finance | 14% p.a.                  |
| Income tax provision                              | 34% on profit             |

#### **LIST OF MACHINERY SUPPLIERS**

| Name of the equipment | Name of the company  |
|-----------------------|--|
| Tubular reactor       | Techno Filters Pvt. Ltd.,<br>5, Business Plaza, Opp. Hotel Rosewood<br>Tulsiwadi, Tardeo, Bombay-400 034<br><br>Sachin Filtech Pvt. Ltd.,<br>Plot No.77-4, F-Road,<br>Phase - I, GIDC Estate<br>Vatva, Ahmedabad-382 445 |
| Cooler chambers       | Chem Eng. Consultant<br>Plot No.1503, Phase III<br>Near Trikampura Patia, Vatva,<br>GIDC, Ahmedabad-382 445  |



|            |   |
|------------|---|
|            | <p>Glass Tech Industries<br/> 11/C, Samarth Society,<br/> Near Karelibaug Water Tank<br/> Harni Road, Baroda-390 006</p>  |
| Pulveriser | <p>ACE Pack Machines<br/> 23, V.N. Industrial Estate<br/> Bharathi Colony, Near<br/> Athiparasakthi Temple<br/> Peelamedu, Coimbatore-641 004</p> <p>Frigmaires Engineers<br/> PO Box 16353, 8, Janata<br/> Industrial Estate<br/> Senapati Bapat Marg<br/> Opp Phoenix Mill, Lower Parel (W)<br/> Mumbai-400 013</p> |

**LIST OF RAW MATERIALS SUPPLIERS**

|                 |  |
|-----------------|--|
| Aluminium scrap | Aluminium scraps in available in market from scrap dealers.  |
| Chlorine        | <p>Chemfab Alkalies Ltd. Pondicherry<br/> SPIC Heavy Chemicals Ltd., Chennai<br/> Chemplast Ltd, Mettur<br/> DCW Ltd, Arumuganeri PO, Tirunelveli<br/> Dist.</p> |

## FINANCIAL ASPECTS

### 1. COST OF PROJECT

|                         | [Rs.lakhs] |
|-------------------------|------------|
| Land                    | 15.00      |
| Building                | 56.00      |
| Plant & Machinery       | 90.00      |
| Technical know how fees | 2.50       |
| Other Misc. assets      | 5.00       |
| Pre-Operative expenses  | 20.00      |
| Margin for WC           | 9.30       |
|                         | <hr/>      |
|                         | 197.80     |

### 2. MEANS OF FINANCE

|           |        |
|-----------|--------|
| Capital   | 76.80  |
| Term Loan | 121.00 |
|           | <hr/>  |
|           | 197.80 |

### 3. COST OF PRODUCTION & PROFITABILITY STATEMENT

|                         | [Rs.lakhs]          |                     |                     |
|-------------------------|---------------------|---------------------|---------------------|
| Years                   | 1                   | 2                   | 3                   |
| Installed Capacity (MT) | 600                 | 600                 | 600                 |
| Utilisation             | 60%                 | 70%                 | 80%                 |
| Production/Sales (MT)   | 360                 | 420                 | 480                 |
| Selling Price per MT    | Rs.100,000          |                     |                     |
| Sales Value (Rs.lakhs)  | <hr/> <b>360.00</b> | <hr/> <b>420.00</b> | <hr/> <b>480.00</b> |
| Raw Materials           | 207.72              | 242.34              | 276.96              |
| Packing materials       | 7.92                | 9.24                | 10.56               |
| Power & fuel            | 36.62               | 42.73               | 48.83               |
| Wages & Salaries        | 12.96               | 13.61               | 14.29               |
| Repairs & Maintenance   | 2.40                | 2.64                | 2.90                |

|                             |               |               |               |
|-----------------------------|---------------|---------------|---------------|
| Depreciation                | 14.38         | 12.24         | 10.43         |
| Cost of Production          | 282.00        | 322.80        | 363.97        |
| Admin. & General expenses   | 12.00         | 12.60         | 13.23         |
| Selling expenses            | 10.80         | 12.60         | 14.40         |
| Interest on Term Loan       | 16.94         | 14.82         | 10.59         |
| Interest on Working Capital | 6.21          | 6.21          | 6.21          |
| <b>Total</b>                | <b>327.95</b> | <b>369.03</b> | <b>408.40</b> |
| Profit Before Tax           | 32.05         | 50.97         | 71.60         |
| Provision for tax           | 10.90         | 17.33         | 24.34         |
| Profit After Tax            | <b>21.15</b>  | <b>33.64</b>  | <b>47.26</b>  |
| Add: Depreciation           | 14.38         | 12.24         | 10.43         |
| Cash Accruals               | 35.53         | 45.88         | 57.69         |

#### 4. WORKING CAPITAL:

|                | Months<br>Consumptions | Values | %    | Margin<br>Amount | Bank<br>Finance |
|----------------|------------------------|--------|------|------------------|-----------------|
| Raw Materials  | 1.00                   | 17.31  | 25%  | 4.33             | 12.98           |
| Finished goods | 0.25                   | 5.88   | 25%  | 1.47             | 4.41            |
| Debtors        | 1.00                   | 30.00  | 10%  | 3.00             | 27.00           |
| Expenses       | 1.00                   | 0.50   | 100% | 0.50             | 0.00            |
|                |                        | 53.69  |      | 9.30             | 44.39           |

#### 5. PROFITABILITY RATIOS BASED ON 80% UTILISATION

|                                       |   |              |     |
|---------------------------------------|---|--------------|-----|
| <u>Profit after Tax</u>               | = | <u>47.26</u> | 10% |
| Sales                                 |   | 480.00       |     |
| <u>Profit before Interest and Tax</u> | = | <u>88.40</u> | 37% |
| Total Investment                      |   | 242.19       |     |
| <u>Profit after Tax</u>               | = | <u>47.26</u> | 62% |
| Promoters Capital                     |   | 76.80        |     |

## 6. BREAK EVEN LEVEL

Fixed Cost (FC):

|                           | [Rs.lakhs] |
|---------------------------|------------|
| Wages & Salaries          | 14.29      |
| Repairs & Maintenance     | 2.90       |
| Depreciation              | 10.43      |
| Admin. & General expenses | 13.23      |
| Interest on TL            | 10.59      |
|                           | <hr/>      |
|                           | 51.44      |
|                           | <hr/>      |

Profit Before Tax (P) 71.60

$$\text{BEL} = \frac{\text{FC} \times 100}{\text{FC} + \text{P}} = \frac{51.44}{123.04} \times \frac{80}{100} \times 100$$

33% of installed capacity

