

# NON FERRIC ALUM

## 1. INTRODUCTION:

Alum are represented by the general formula  $R \frac{1}{2} SO_4, R''(SO_4)_3 \cdot 24H_2O$ . Where R and R'' are respectively mono valent and trivalent radicals. They are usually the double salts of ammonium, potassium or sodium sulphate with aluminum. Chromium or iron sulphate, and are readily prepared by concentrating and cooling a solution containing molecular proportions of the Component Sulphate. Ferric and Non Ferric Alum is marketed in various grades. The cheapest grade called "alum cake". Potash alum also known as alum alumen. Ferric alumin is aluminum sulphate containing iron obtained from the bauxite ore. Potash alum is prepared from its naturally occurring minerals such as alunite, and Retinitis, but in India these do not occur in appreciable quantities. Alum was formerly prepared from alum shales by roasting them in year and leaching it out with water. Alum is now produced in India by crystallizing together equivalent proportion of potassium sulphate and aluminum sulphate. The solution is concentrated and the crystals are separated out are melted to yield lump alum or re-crystallized to obtain large crystals. Potash alum is prepared from its naturally occurring minerals such as alunite and kalinite, but in India these do not occur in appreciable quantities. Alum is now produced in India by crystallizing together equivalent proportion of potassium sulphate and aluminum sulphate. It is an important salt as it is used in large quantities in a number of industries. Alums which are used for water treatment in dyeing are replaced by aluminum sulphate, which has greater alumina equivalent per unit weight. The major single use of it is clarifying water 65% of total amount manufactured being consumed. Aluminum Sulphate is known more as alum. Successful attempts are being made to export aluminum sulphate from India. Demand in future is estimated on the basis of trend line analysis. According to trend line analysis, demand for aluminum sulphate will increase in future. There is very good scope of the product at present and in coming future. The new comer can well venture into this filed. Alum is a generic name for double salts of Aluminum Sulphate, Sodium Sulphate

or Ammonium Sulphate. In the commercial line Aluminum Sulphate is also known as Alum. It is white in color. The principal raw material for manufacturing of Alum is Bauxite and Sulphuric Acid.

## **2. PRODUCT & ITS APPLICATION:**

There are two broad categories of Alum as follows: Ferric Alum which is generally made from Bauxite and Iron free Alum (non Ferric Alum), generally made from Alumina. Commercially, hydrated Aluminum Sulphate is called Alum and is sold under such names as Filler Alum, Commercial Alum, and Paper Maker's Alum etc. Technical grade Aluminum Sulphate is provided in two forms: a partially dehydrated solid and an aqueous solution of this material containing about 27%  $Al_2(SO_4)_3 \cdot 18H_2O$ . The reagent grade  $Al_2(SO_4)_3 \cdot 18H_2O$  is slightly, odorless, colorless monoclinic crystals, having a specific gravity of 1.69. The solid material, 'Dry Alum' is partially crystalline and may be discolored to a brownish-green owing to impurities (chiefly iron) in the ores from which it is made. The solution form, 'liquid Alum' may exhibit a similar discoloration. The major area of use for Alum is in water treatment and clarification. Its clarifying action is attributed to Aluminum hydroxide formation by hydrolysis. This, in turn, carries down all the colloidal impurities and forms a slimy layer at the bottom. Sizing of Paper the other major areas of use is in sizing of paper. It reacts with sodium resinate to give insoluble Aluminum resinate. For sizing of paper, Alum should be free from Ferric ions or else the paper will be discolored. Ferrous ions do not harm since they form a soluble colorless resinate which, however, would represent a loss of resinate. Alum imparts certain degree of resistance to penetration by liquids during sizing of paper. Alum is also required in various other industries like Dyes, Food, Petroleum, Pharmaceuticals, fire-proofing, tanning etc.

## **3. DESIRED QUALIFICATIONS FOR PROMOTER:**

Graduate in chemistry science, with detailed knowledge of business.

#### **4. INDUSTRY LOOK OUT AND TRENDS**

Potash alum is prepared from its naturally occurring minerals such as alunite and kalinite, but in India these do not occur in appreciable quantities. Alum is now produced in India by crystallizing together equivalent proportion of potassium sulphate and aluminum sulphate. It is an important salt as it is used in large quantities in a number of industries. Alums which are used for water treatment in dyeing are replaced by aluminum sulphate, which has greater alumina equivalent per unit weight. The major single use of it is clarifying water 65% of total amount manufactured being consumed. Aluminum Sulphate is known more as alum. Successful attempts are being made to export aluminum sulphate from India. Demand in future is estimated on the basis of trend line analysis. According to trend line analysis, demand for aluminum sulphate will increase in future. There is very good scope of the product at present and in coming future. The new comer can well venture into this field.

#### **5. MARKET POTENTIAL AND MARKETING ISSUES, IF ANY:**

Indian Installed capacity around 2,70,000 tons per annum Alum Imported from different country , like Japan, Singapore, UK, USA, etc. Present import level is around 50 tons per annum. Present Export level in India is 10000 tons per annum. The current price is Rs. 10000 per ton for non-ferric alum. The estimated demand of Aluminum sulphate in the country is around 2, 80,000 tons per annum. The estimated growth rate in demand is 6 to 7% per annum.

#### **6. RAW MATERIAL REQUIREMENTS:**

Raw material requirement on Basis of 10 tons per Alum will be as under.

Bauxite containing 60% (Al <sub>2</sub> O <sub>3</sub> ) and Ferric oxide (Fe <sub>2</sub> O <sub>3</sub> ) less than 3%	4.0 tons
Sulphuric acid 98% concentration	5.5 tons
Water at 30 deg.C inclusive of cleaning water	60,000
liters	

Fuel	480 liters
Air at 30 Psig pressure	20 M3 per hour
Flaked glue	20000 gms.
Black ash (Barium sulphide) per ton	90 Kgs
Power units	249240

There are more than one hundred units producing Sulphuric acid in the country, at various capacity Levels The total installed capacity for Sulphuric acid in the country is around 6.5 million tons per annum. Bauxite is also indigenously available from Mines in Rajasthan

## **7. MANUFACTURING PROCESS:**

Production of Aluminum sulphate in India starts from bauxite. Bauxite from Jamnagar (Gujarat) which contains high percentage of Alumina and low Iron content continues to be the best source for the manufacture of this heavy chemical. Technology and process There is batch process as well as continuous process for the manufacture of Alum. The batch process is adopted in the country. Bauxite ore containing preferably less than 3% Iron is transported to the plant site and crushed to a size of 50 to 75 mm. The crushed ore is further powdered by using a pulveriser. It is often seen that finer the size of bauxite, quicker would be the reaction rate. Usually ground bauxite of size 100 to 140 mesh is used in the process. It is essential that the Ferric oxide content shall be less than 3% in the ore, to obtain a satisfactory product containing less than 0.1% Iron. Prepared Ore is subjected to reaction with Sulphuric acid in open lead lined digester at a temperature of around 105 deg.C. The desired strength of Sulphuric acid in open lead lined digester is 52 deg. Be. The total reaction time is around 12 to 16 hrs. The reacted solution is taken to a settling tank. After settling, the sludge is removed and discarded. The clear solution is concentrated in open pan evaporators.

The concentrated solution is poured into large wooden vats, where it solidifies. This block is broken down into smaller pieces and sold. Where powdered form is required, it is subjected to pulverization.

## 8. MANPOWER REQUIREMENT:

The enterprise requires 11 employees as detailed below:

Sr. No.	Designation of Employees	Salary Per Person	Monthly Salary ₹	Number of employees required				
				Year-1	Year-2	Year-3	Year-4	Year-5
1	Machine Operators	12,000	24000.00	2	2	2	2	2
2	Helpers	8,000	32000.00	4	5	5	6	6
3	Production supervisor	15,000	15000.00	1	1	1	1	1
4	Accounts/Stores Asst	12,500	12500.00	1	1	1	1	1
5	Office Boy	9,000	9000.00	1	1	1	1	1
	<b>Total</b>		92500.00	9	10	10	11	11

## 9. IMPLEMENTATION SCHEDULE:

The project can be implemented in 5 months' time as detailed below:

Sr. No.	Activity	Time Required (in months)
1	Acquisition of premises	1.00
2	Construction (if applicable)	1.00
3	Procurement & installation of Plant & Machinery	3.00
4	Arrangement of Finance	2.00
5	Recruitment of required manpower	1.00
	Total time required (some activities shall run concurrently)	5.00

## 10. COST OF PROJECT:

The project shall cost ₹ 168.00 lacs as detailed below:

Sr. No.	Particulars	₹ in Lacs
1	Land	7.50
2	Building	15.00
3	Plant & Machinery	85.00
4	Furniture, Electrical Installations	10.00
5	Other Assets including Preliminary / Pre-operative expenses	8.50
6	Working Capital	42.00
	<b>Total</b>	<b>168.00</b>

### 11. MEANS OF FINANCE:

Bank term loans are assumed @ 75 % of fixed assets.

Sr. No.	Particulars	₹ in Lacs
1	Promoter's contribution	42.00
2	Bank Finance	126.00
	<b>Total</b>	<b>168.00</b>

### 12. WORKING CAPITAL CALCULATION:

The project requires working capital of ₹ 42.00 lacs as detailed below:

Sr. No.	Particulars	Gross Amt	Margin %	Margin Amt	Bank Finance
1	Inventories	21.00	0.25	5.25	15.75
2	Receivables	10.50	0.25	2.63	7.88
3	Overheads	10.50	100%	10.50	0.00
4	Creditors	-		0.00	0.00
	<b>Total</b>	42.00		18.38	23.63

### 13. LIST OF MACHINERY REQUIRED:

A detail of important machinery is given below: Power Requirement: 85 HP

Sr. No.	Particulars	UOM	Qty	Rate (₹)	Value (₹ in Lacs)
	<b>Plant &amp; Machinery / equipments</b>				
a)	<b>Main Machinery</b>				

i.	Jaw Crusher, Single toggle	NOS.	3	240000	7.20
ii.	Pulveriser, Swing Hammer	Nos	2	420000	8.20
iii.	Digester M.S. Lead tank,	Nos	4	400000	16.00
<b>IV</b>	Settling Tank	Nos	5	100000	5.00
V	Evaporation Tanks	Nos	5	100,000	5.00
VI	Boiler Coal Fired, Water Softening plant, MOULD, WEIGHING BALANCE, TANKS, ELECTR. & INSTALLATION	NOS.	1	21000	48.60
	<i>sub-total Plant &amp; Machinery</i>				<b>85.00</b>
	<b>Furniture / Electrical installations</b>				
a)	Office furniture	LS	1	100000	1.00
b)	Stores Almira	LS	1	350,000	3.50
c)	Computer & Printer	L. S.	1	10000	5.50
	<i>sub total</i>				<b>10.00</b>
	<b>Other Assets</b>				
a)	preliminary and preoperative				8.50
	<i>sub-total Other Assets</i>				8.50
	<b>Total</b>				<b>103.50</b>

All the machines and equipment are available from local manufacturers. The entrepreneur needs to ensure proper selection of product mix and proper type of machines and tooling to have modern and flexible designs. It may be worthwhile to look at reconditioned imported machines, dies and tooling. Some of the machinery and dies and tooling suppliers are listed here below:

- Kamdhenu Agro Machinery  
Plot No. 6, Near Power House,  
Wathoda Road, Wathoda  
Nagpur - 440035  
Maharashtra, India
- Future Industries Private Limited  
Shed No. 15, Ambica Estate,  
Corporation Municipal Plot,  
Opposite Sadvichar Hospital,  
Naroda, Ahmedabad - 382330,

Gujarat, India

- The Global Pharma Equipments  
Star Industrial Estate,  
D-32, Naik Pada,  
Near Hanuman Mandir,  
Opposite Dwarka Industrial Estate,  
Vasai East, Vasai - 401208,  
Maharashtra, India

#### 14. PROFITABILITY CALCULATIONS:

Sr. No.	Particulars	UOM	Year-1	Year-2	Year-3	Year-4	Year-5
1	Capacity Utilization	%	60%	70%	80%	90%	100%
2	Sales	₹. In Lacs	126.00	147.00	168.00	189.00	210.00
3	Raw Materials & Other direct inputs	₹. In Lacs	74.54	86.97	99.39	111.82	124.24
4	Gross Margin	₹. In Lacs	51.46	60.03	68.61	77.18	85.76
5	Overheads except interest	₹. In Lacs	10.70	11.37	12.71	13.11	13.38
6	Interest	₹. In Lacs	12.60	12.60	8.40	6.30	5.04
7	Depreciation	₹. In Lacs	59.50	42.50	29.75	21.25	19.13
8	<b>Net Profit before tax</b>	₹. In Lacs	<b>-31.35</b>	<b>-6.44</b>	<b>17.75</b>	<b>36.52</b>	<b>48.21</b>

The basis of profitability calculation:

The growth of selling capacity will be increased 10% per year. (This is assumed by various analysis and study; it can be increased according to the selling strategy.)



Energy Costs are considered at Rs 7 per Kwh and fuel cost is considered at Rs. 65 per litre. The depreciation of plant is taken at 10-12 % and Interest costs are taken at 14 -15 % depending on type of industry.

## 15. BREAKEVEN ANALYSIS:

The project shall reach cash break-even at 21.48 % of projected capacity as detailed below:

Sr. No.	Particulars	UOM	Value
1	Sales at full capacity	₹. In Lacs	210.00
2	Variable costs	₹. In Lacs	124.24
3	Fixed costs incl. interest	₹. In Lacs	18.42
4	BEP = $FC/(SR-VC) \times 100$ =	% of capacity	21.48%

## 16. STATUTORY / GOVERNMENT APPROVALS

As per the allocation of business rules under the Constitution, labour is in the concurrent list of subjects. It is dealt with by the MOLE at the Central and Departments of Labour under State Governments in respective States / UTs. The MOLE has enacted workplace safety and health statutes concerning workers in the manufacturing sector, mines, ports and docks and in construction sectors.

Further, other Ministries of the Government of India have also enacted certain statutes relating to safety aspects of substances, equipment, operations etc. Some of the statutes applicable in the manufacturing sector are discussed below:

### **The Static and Mobile Pressure Vessels (Unfired) Rules, 1981**

These (SMPV) Rules are notified under the Explosives Act, 1884. These rules regulate storage, handling and transport of compressed gases. These rules stipulate requirements regarding construction and fitments, periodic testing, location, fire protection, loading and unloading facilities, transfer operations etc. in respect of pressure vessels whose water capacity exceeds one thousand litres.

These rules are enforced by the Chief Controller of Explosives under the Ministry of Industry and Commerce, Govt. of India (PESO).

### **The Manufacture, Storage and Import of Hazardous Chemicals Rules (MSIHC), 1989**

These MSIHC Rules are notified under the Environment (Protection) Act, 1986. These rules are aimed at regulating and handling of certain specified hazardous chemicals. The rules stipulate requirements regarding notification of site, identification of major hazards, taking necessary steps to control major accident, notification of major accident, preparation of safety report and on-site emergency plan; prevention and control of major accident, dissemination of information etc. These rules are notified by the Ministry of Environment and Forests (MOEF) but enforced by the Inspectorates of Factories of respective States / UTs in the manufacturing sector.

### **The Factories Act, 1948 and State Factories Rules**

The Factories Act, 1948 is very comprehensive legislation dealing with the matters of safety, health and welfare of workers in factories. The Act places duties on the occupier to ensure safety, health and welfare of workers at work. Some of the salient provisions of the Act include:

- Guarding of machinery
- Hoists and Lifts; Lifting Machines and Appliances
- Revolving Machinery
- Pressure Plant
- Excessive Weight
- Protection of Eyes
- Precautions against dangerous fumes, gases etc.
- Explosive or inflammable dust, gas etc.
- Precautions in case of fire

- Safety of buildings and machinery
- Permissible limits of exposure of chemical and toxic substances
- Entrepreneur may contact State Pollution Control Board where ever it is applicable.

## **17. BACKWARD AND FORWARD INTEGRATIONS**

Chemical companies often become integrated and undergo other activities outside the chemical industry. Increased competition prompts many companies to reduce supply chain costs by looking outside the chemical sector at suppliers and customers. While most companies within the chemicals sector primarily produce chemicals, some companies also conduct other manufacturing activities. The exact proportion of chemicals sector companies that are integrated with other sector activities is unknown, but many companies actively seek vertical integration. Many manufacturers pursue vertical integration to secure suppliers and customers for their products.

Mergers and acquisitions are a common way for companies to undertake new chemical ventures. By purchasing their chemical suppliers, some manufacturers secure future chemical feedstock for their products or other chemicals that they use in manufacturing. The company making the purchase obtains valuable expertise and equipment. Some mining and petrochemical production is more cost-effective when integrated within a chemical company.

Energy and feedstock costs are often a significant expense for chemical companies. Integrating chemical production with activities that secure supplies of chemical feedstock and energy is relatively common as chemical companies grow. Chemical companies are located near mines, oil fields, ammonia factories and water supplies. This reduces transportation costs and increases the reliability of supplies by reducing the distance between feedstock and the factory.

Some companies, such as Sino-Coking Coal and Coke Chemical Industries Incorporated, own their mines. BHP Billiton operates a broad range of mines and is primarily a mining company. It does, however, also produce petrochemical feedstock for the chemical industry and therefore operates within the chemical industry as well. These companies technically operate within both the chemical and mining industries in their normal business operations.

Integrating a chemical company with other activities provides several direct benefits for the company and is becoming increasingly common. High energy costs necessitate greater control of energy resources and minimal reliance on expensive transportation. Chemical companies experience volatile profitability due to fluctuations in feedstock and energy expenses. Some companies control this volatility through careful supply chain management and by charging supply surcharges. Actively researching and developing alternative feedstock and energy supplies helps the company reduce costs.

Vertical integration supports these activities by eliminating redundant activities at multiple companies and increasing efficiency. By consolidating activity among multiple, similar operations, chemical companies achieve cost savings that contribute to higher profitability. End products are often very profitable, and some chemical companies purchase their former customers to take advantage of the marked-up prices of products further along in the supply chain.

Integration may become more common for many chemical companies as competition strengthens and traditional feedstock becomes more expensive. Market demand for chemical feedstock increases as emerging market economies grow and result in increased consumer spending around the world.

## 18. TRAINING CENTERS AND COURSES

There is no such training required to start this business but, basic chemical bachelor's degree is plus point for enterpriser. Promoter may train their employees in such specialized institutions to grow up the business. There are few specialised Institutes provide degree certification in chemical Technology, few most famous and authenticate Institutions are as follows:

1. Department of chemical LD college of engineering  
No.120, Circular Road, University Area, Navrangpura,  
Opposite Gujarat University, Ahmedabad, Gujarat 380015
2. MIT College of chemical Engineering, Pune  
Gate.No.140, Raj Baugh Educational Complex,  
Pune Solapur Highway,  
Loni Kalbhor, Pune - 412201  
Maharashtra, India

Udyamimitra portal ( link : [www.udyamimitra.in](http://www.udyamimitra.in) ) can also be accessed for handholding services viz. application filling / project report preparation, EDP, financial Training, Skill Development, mentoring etc.

Entrepreneurship program helps to run business successfully is also available from Institutes like Entrepreneurship Development Institute of India (EDII) and its affiliates.

### **Disclaimer:**

Only few machine manufacturers are mentioned in the profile, although many machine manufacturers are available in the market. The addresses given for machinery manufacturers have been taken from reliable sources, to the best of

knowledge and contacts. However, no responsibility is admitted, in case any inadvertent error or incorrectness is noticed therein. Further the same have been given by way of information only and do not carry any recommendation.

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