PROJECT REPORT

OF

ALUM MANUFACTURING UNIT

PURPOSE OF THE DOCUMENT

This particular pre-feasibility is regarding Alum Manufacturing Unit.

The objective of the pre-feasibility report is primarily to facilitate potential entrepreneurs in project identification for investment and in order to serve his objective; the document covers various aspects of the project concept development, start-up, marketing, finance and management.

[We can modify the project capacity and project cost as per your requirement. We can also prepare project report on any subject as per your requirement.]

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PROJECT AT GLANCE

1	**Name of Proprietor/Director**	XXXXXXXX	
2	**Firm Name**	XXXXXXXX	
3	**Registered Address**	XXXXXXXX	
4	**Nature of Activity**	XXXXXXXX	
5	**Category of Applicant**	XXXXXXXX	
6	**Location of Unit**	XXXXXXXX	
7	**Cost of Project**	24.06	Rs. In Lakhs
8	**Means of Finance**		
i)	**Own Contribution**	2.41	Rs. In Lakhs
ii)	**Term Loan**	16.65	Rs. In Lakhs
iii)	**Working Capital**	5.00	Rs. In Lakhs
9	**Debt Service Coverage Ratio**	3.31	
10	**Break Even Point**	0.28	
11	**Power Requiremnet**	25	KW
12	**Employment**	9	Persons
13	**Major Raw Materials**	Bauxite, Potassium Sulphate, Concentrated Sulphuric acid, Distilled water, Flaked Glue & Black ash or borium sulphate	

14 Details of Cost of Project & Means of Finance

Cost of Project

Particulars	Amount in Lacs
Land	Owned/Leased
Building & Civil Work	Owned/Leased
Plant & Machinery	17.50
Other Misc Assets	1.00
Working Capital Requirement	5.56
Total	**24.06**

Means of Finance

Particulars	Amount
Own Contribution	2.41
Term Loan	16.65
Working capital Loan	5.00
Total	**24.06**

1. INTRODUCTION

Alums are hydrated double sulphate salt of aluminum with the general formula X $(Al_2SO_4)_2$. 12 H_2O, where "X" can be a monovalent cation such as the Potassium or the Ammonium cation. However, the tripositive ion, aluminum, are also replaced by Chromium and Iron ions. The name "Alum" is also more generally used for salts with the same chemical formula and structure, except for the fact that aluminum is replaced by other tri-positive metal ions such as Chromium (III), example being Chrome Alum which is K $Cr(SO_4)_2 \cdot 12H_2O$. Those containing Iron sulphate are termed as "Ferric Alum" while those that contain Chromium and Aluminum Sulphate are called "Non-Ferric Alum". By itself, "Alum" generally refers to Potassium Alum with the formula K $(Al_2SO_4)_2$. 12 H_2O. Other alums are named after the monovalent cation that is present in the compound such as the Sodium alum when sodium cation is present, Ammonium alum when ammonium ions are present, etc.

These Alums have been used due to their properties since the ancient ages. It was used as a mordant in the Dye Industry during the Islamic Middle ages. Some of the alums occur naturally while some need to be prepared synthetically. The most important mineral that contains Alum is "Alunite" which is hydroxylated Aluminum Potassium Sulphate mineral. Other important alums such as potassium, sodium, and ammonium alums are produced industrially.

These processes mainly involve combining aluminum sulphate and any other monovalent sulphate cation. Aluminum sulphate is obtained by treating minerals like Alum Schist, Bauxite, and Cryolite with Sulphuric Acid.

Most of the Alums are soluble in water, they have an Astringent taste, they turns Blue litmus Red, and form Octahedral shaped crystals. In the molecules of the alum, each metal atom is surrounded by six water molecules. When they are heated, then they liquefy, and if the heating is continued, the water of crystallization is driven off, the salts froth and swell and at last only an amorphous powder remains.

The cheapest grade of Alum is called "Alum Cake". Potash Alum is also known as "Alum Alumen". Though Alum can be recovered from its naturally occurring minerals like Alunite and Kalinite, but they are not much available in India. So in most of the Indian industries, Alum is prepared by co-precipitating equivalent proportions of potassium and aluminum sulphate, where the aluminum sulphate is obtained by treating aluminum ores with concentrated acid.

2. PRODUCT DESCRIPTION

2.1 PRODUCT USES

The different uses of Potash Alum can be given as follows.

- The commercial uses of the alum stem from the hydrolysis of the aluminum ions in the alum to form aluminum hydroxide which precipitates out in the medium. In the paper industries, paper is sized by depositing aluminum hydroxide from the alum in the interstices of the Cellulose fiber.

- It is used in the water treatment industries (almost 65 % of the Alum goes to the water treatment plants) as the aluminum hydroxide from the alum absorbs the suspended particles in water and thus used as a flocculating agent. For the same reason it is also added to soaps and detergents as well.

- In the Clothing industries, it is used as a mordant (binder) to fix the dyes to the cottons and other types of fabrics, rendering the dye insoluble.

- Additionally, they are used to make Pickles, in the Baking Powder, in Fire Extinguishers, as Deodorizers, and as Astringents in skincare products and pharmaceutical products.

- Potash Alum can also be used to harden the Concrete and Plaster of Paris.

- It is used in the chemical laboratories for the manufacture of a range of other compounds and other purposes.

2.2 PRODUCT RAW MATERIAL

The raw materials required for the manufacture of the Alum are:

- Bauxite (with 60% Alumina content and less than 3 % Ferric Oxide or Fe_2O_3)
- Potassium Sulphate
- Concentrated Sulphuric Acid (60 % concentration)
- Potassium Sulphate (99 % pure)
- Distilled water
- Flaked Glue
- Black Ash or Barium Sulphide

2.3 MANUFACTURING PROCESS

The manufacturing process of Potash Alum has the following steps:

- The first step consists washing the procured bauxite and the concentration of the ore. This is done in the Bauxite washing machine to get rid of all the dirt and the impurities.
- The second step involves the crushing of the bauxite ore to 1" size pieces in a Jaw Crusher. It is crushed further to 105 – 110 mesh size in a Pulverizer.
- In the next step the powdered bauxite with almost 70 – 80 % alumina content and less than 2 % Ferric Oxide content is charged into a lead-lined M.S. reactor vessel. Sulphuric acid of 60 % concentration is slowly added and the reactants are thoroughly agitated by steam. The temperature is kept in between 105 – 110 °C with the help of the steam.

$$Al_2O_3 + 3\ H_2SO_4 \xrightarrow[110^0 C]{\text{steam}} Al_2(SO_4)_3 + 3\ H_2O$$

- The bauxite is added in excess to achieve maximum conversion. It takes about 8 – 10 hours for the reaction to complete.
- When the specific gravity of the reaction mixture reaches 60 degree TW, the solution is supplied to a large settling tank. In the settling tank, Flaked glue is added to enhance the

coagulation of the suspended particles. Barium Sulphide is added in the form of Black Ash to reduce Ferric Sulphate, to obtain a clear solution of Aluminum Sulphate.

- After settling, the clear solution of Aluminum Sulphate is filtered in a clean Frame and Plate Filter Press. The pressed cake is then washed with water and the washings termed as "Spent Liquor" can be used in the next process.
- An aqueous solution of Potassium Sulphate is now added to the Aluminum Sulphate solution for the crystallization to take place in large mixing tanks
- The liquid is then drawn from the mixing tank and sent to the concentrator.
- It takes about 8 – 10 hours for the concentration process to take place when a concentrated alum solution is obtained.
- In the next step, the concentrated liquid is are transferred to Plastic molds where the liquid further cools and form crystals.
- After the Alum is formed, it is dried properly in Fluidized bed Dryers to get rid of all the moisture that is present in it.
- Finally, it is sent to the Automatic packaging machines from where required amounts of the product are filled in the bags and then sent to be stored in storage till they are finally dispatched.

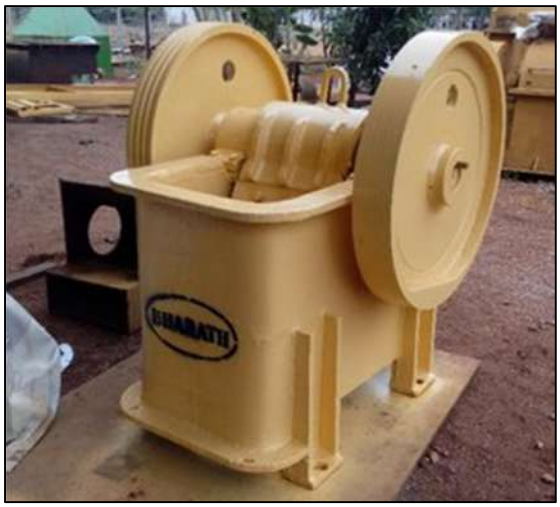
3. PROJECT COMPONENTS

3.1 Land & Building

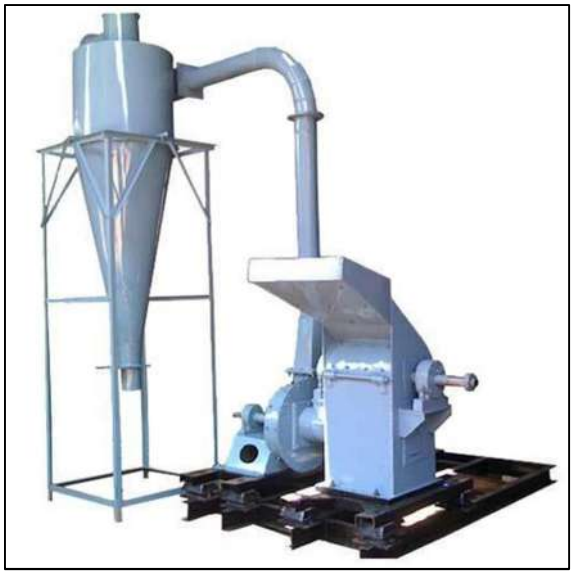
The land required for this manufacturing unit will be approx. around 4000 square feet. Land Purchase and Building Civil Work Cost have not been considered as part of the cost of project. It is expected that the premises will be on rental and approximate rentals assumed of the same will be Rs.40000 to Rs.50000 per month.

3.2 Plant & Machinery

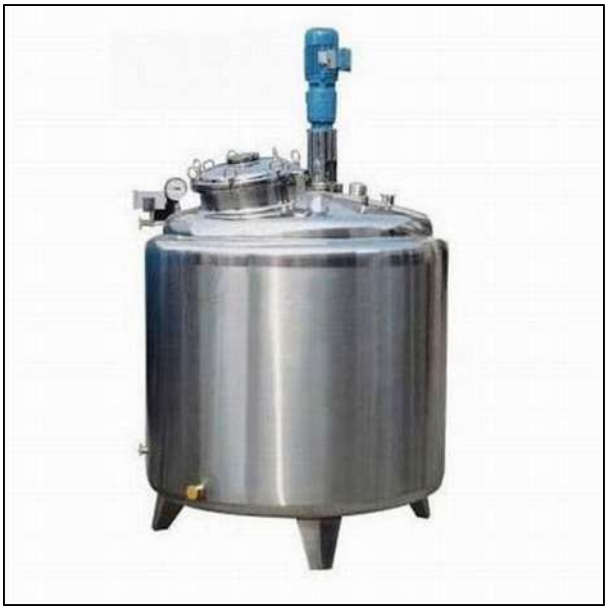
- **Jaw Crusher machine:** The first requirement is that of a Jaw Crusher machine. Single toggle type size 5” x 9” with Manganese Steel jaws and side plates and heavy duty fly wheel.



- **Mineral Pulverizer/Hammer Mill:** Used to finely ground the crushed ores. Made from mild Steel operated by a electrical motor with a power consumption of 20 – 150 HP, operated automatically and also Semi-automatically.

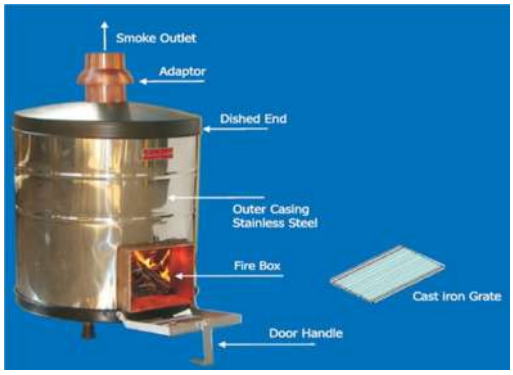


- **Reaction Digester:** The third requirement is a Reaction Digester, Mild Steel, and lead lined tank. The tank is covered with acid-proof bricks and a mechanical stirrer is fitted at the top operated with a 5 H.P. motor along with a reduction gear assembly lead bonded steam coil and discharge valves



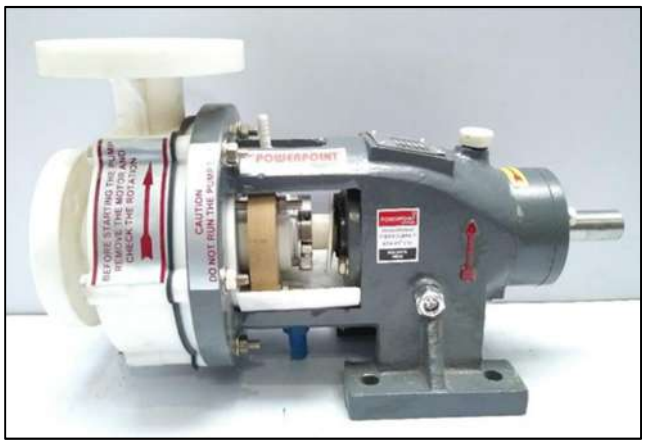
- **Evaporation tanks:** made from Mild steel, lead-bonded, operated automatically, operating on a three phase AC supply..

- **Coal-fired boilers:** Smoke tube, multi-tubular vertical working pressure of 100 psi complete with box, steam generator, water heater, motorised pump and overhead tanks, standard boiler mounting fitting, fire doors and bars, ash plate, chimney and refractory etc.

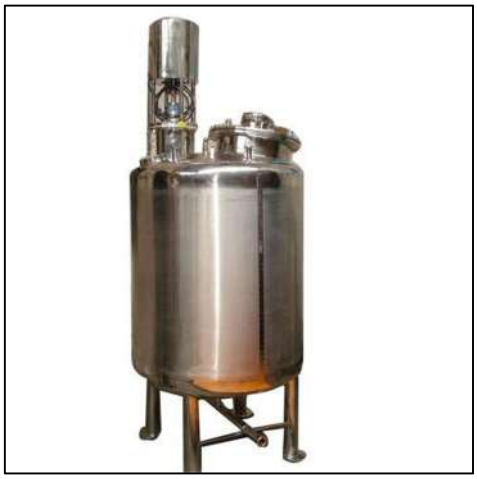


- **Water-softening plant:** Water-softening plant with inlet water hardness 250 -300 ppm. Treated water quality is < 3 ppm. Operated manually and treatment technique Ion Exchanging.

- **Acid Pump:** Acid Pump, 75 x 40 mm, completed with a 3 HP motor, capacity 40 m^3/hr at 6m head, speed 1500 rpm, operated mechanically.



- **Jacketed and Non-jacketed Mixing vessels:** Jacketed and Non-jacketed Mixing vessels for the preparation of the KOH solution and the Potassium Sulphate solutions respectively. Made from Stainless Steel and fitted with a Stirrer at the top to ensure generous mixing of the components.



- **Packaging Machine:** Jumbo bag packaging machine filling speed is of two types (major and dribble) working on a single phase AC supply, air pressure 6 Kg/cm^2

6 LICENSE & APPROVALS

Basic registration required in this project:

- MSME Udyam registration
- GST registration
- NOC for fire safety board
- NOC from Pollution Control Board
- Trade License
- Factory License
- Import/Export License
- Choice of a Brand Name of the product and secure the name with Trademark if required.

PROJECTED BALANCE SHEET **(in Lacs)**

PARTICULARS	1st year	2nd year	3rd year	4th year	5th year
Liabilities					
Capital					
Opening balance		5.36	8.06	11.16	14.18
Add:- Own Capital	2.41				
Add:- Retained Profit	5.96	8.19	10.60	13.53	17.92
Less:- Drawings	3.00	5.50	7.50	10.50	12.50
Closing Balance	**5.36**	**8.06**	**11.16**	**14.18**	**19.61**
Term Loan	14.80	11.10	7.40	3.70	-
Working Capital Limit	5.00	5.00	5.00	5.00	5.00
Sundry Creditors	1.58	1.87	2.18	2.52	2.89
Provisions & Other Liability	1.00	1.20	1.44	1.73	1.90
TOTAL :	**27.75**	**27.23**	**27.18**	**27.13**	**29.40**
Assets					
Fixed Assets (Gross)	18.50	18.50	18.50	18.50	18.50
Gross Dep.	2.78	5.13	7.14	8.84	10.29
Net Fixed Assets	**15.73**	**13.37**	**11.36**	**9.66**	**8.21**
Current Assets					
Sundry Debtors	4.09	4.98	5.82	6.72	7.70
Stock in Hand	3.67	4.32	4.99	5.73	6.51
Cash and Bank	1.76	1.56	2.51	2.03	1.48
Loans & Advances /Other Current Assets	2.50	3.00	2.50	3.00	5.50
TOTAL :	**27.75**	**27.23**	**27.18**	**27.13**	**29.40**

PROJECTED PROFITABILITY STATEMENT **(in Lacs)**

PARTICULARS	1st year	2nd year	3rd year	4th year	5th year
Capacity Utilisation %	**40%**	**45%**	**50%**	**55%**	**60%**
SALES					
Gross Sale					
Alum	81.85	99.65	116.31	134.37	153.96
Total	**81.85**	**99.65**	**116.31**	**134.37**	**153.96**
COST OF SALES					
Raw Material Consumed	47.52	56.14	65.50	75.65	86.66
Electricity Expenses	1.92	2.59	2.88	3.17	3.46
Depreciation	2.78	2.36	2.00	1.70	1.45
Wages & labour	7.20	7.92	8.71	9.58	10.06
Repair & maintenance	0.82	1.99	2.33	2.69	3.08
Packaging	2.46	2.49	2.91	3.36	3.85
Cost of Production	62.69	73.49	84.33	96.15	108.55
Add: Opening Stock	-	2.09	2.45	2.81	3.21
Less: Closing Stock	2.09	2.45	2.81	3.21	3.62
Cost of Sales	60.60	73.13	83.97	95.76	108.14
GROSS PROFIT	**21.25**	**26.52**	**32.34**	**38.61**	**45.82**
	25.96%	**26.61%**	**27.81%**	**28.74%**	**29.76%**
Salary to Staff	3.36	4.03	4.84	5.81	7.26
Interest on Term Loan	1.64	1.44	1.03	0.63	0.22
Interest on working Capital	0.55	0.55	0.55	0.55	0.55
Rent	5.40	6.48	7.78	9.33	11.20
Selling & Administrative Exp.	4.09	4.98	5.82	6.72	4.62
TOTAL	**15.04**	**17.49**	**20.01**	**23.03**	**23.84**
NET PROFIT	6.21	9.03	12.33	15.58	21.97
Taxation	0.25	0.84	1.73	2.05	4.05
PROFIT (After Tax)	5.96	8.19	10.60	13.53	17.92
	7.28%	**8.22%**	**9.11%**	**10.07%**	**11.64%**

PROJECTED CASH FLOW STATEMENT **(in Lacs)**

PARTICULARS	1st year	2nd year	3rd year	4th year	5th year
SOURCES OF FUND					
Own Margin	2.41				
Net Profit	6.21	9.03	12.33	15.58	21.97
Depreciation & Exp. W/off	2.78	2.36	2.00	1.70	1.45
Increase in Cash Credit	5.00	-	-	-	-
Increase In Term Loan	16.65	-	-	-	-
Increase in Creditors	1.58	0.29	0.31	0.34	0.37
Increase in Provisions & Oth labilities	1.00	0.20	0.24	0.29	0.17
	-				
TOTAL :	**35.63**	**11.88**	**14.88**	**17.91**	**23.96**
APPLICATION OF FUND					
Increase in Fixed Assets	18.50				
Increase in Stock	3.67	0.65	0.67	0.73	0.78
Increase in Debtors	4.09	0.89	0.83	0.90	0.98
Repayment of Term Loan	1.85	3.70	3.70	3.70	3.70
Loans & Advances /Other Current Assets	2.50	0.50	- 0.50	0.50	2.50
Drawings	3.00	5.50	7.50	10.50	12.50
Taxation	0.25	0.84	1.73	2.05	4.05
TOTAL :	**33.87**	**12.08**	**13.93**	**18.39**	**24.51**
Opening Cash & Bank Balance	-	1.76	1.56	2.51	2.03
Add : Surplus	1.76	-0.20	0.95	-0.48	-0.55
Closing Cash & Bank Balance	**1.76**	**1.56**	**2.51**	**2.03**	**1.48**

CALCULATION OF D.S.C.R

PARTICULARS	1st year	2nd year	3rd year	4th year	5th year
CASH ACCRUALS	8.73	10.55	12.61	15.23	19.37
Interest on Term Loan	1.64	1.44	1.03	0.63	0.22
Total	10.37	11.99	13.64	15.86	19.59
REPAYMENT					
Instalment of Term Loan	1.85	3.70	3.70	3.70	3.70
Interest on Term Loan	1.64	1.44	1.03	0.63	0.22
Total	3.49	5.14	4.73	4.33	3.92
DEBT SERVICE COVERAGE RATIO	**2.97**	**2.33**	**2.88**	**3.66**	**5.00**
AVERAGE D.S.C.R.					**3.31**

REPAYMENT SCHEDULE OF TERM LOAN							
					Interest		11.00%
Year	**Particulars**	**Amount**	**Addition**	**Total**	**Interest**	**Repayment**	**Closing Balance**
1st	Opening Balance						
	1st month	-	16.65	16.65	-	-	16.65
	2nd month	16.65	-	16.65	0.15	-	16.65
	3rd month	16.65	-	16.65	0.15	-	16.65
	4th month	16.65	-	16.65	0.15		16.65
	5th month	16.65	-	16.65	0.15		16.65
	6th month	16.65	-	16.65	0.15		16.65
	7th month	16.65	-	16.65	0.15	0.31	16.34
	8th month	16.34	-	16.34	0.15	0.31	16.03
	9th month	16.03	-	16.03	0.15	0.31	15.73
	10th month	15.73	-	15.73	0.14	0.31	15.42
	11th month	15.42	-	15.42	0.14	0.31	15.11
	12th month	15.11	-	15.11	0.14	0.31	14.80
					1.64	**1.85**	
2nd	Opening Balance						
	1st month	14.80	-	14.80	0.14	0.31	14.49
	2nd month	14.49	-	14.49	0.13	0.31	14.18
	3rd month	14.18	-	14.18	0.13	0.31	13.88
	4th month	13.88	-	13.88	0.13	0.31	13.57
	5th month	13.57	-	13.57	0.12	0.31	13.26
	6th month	13.26	-	13.26	0.12	0.31	12.95
	7th month	12.95	-	12.95	0.12	0.31	12.64
	8th month	12.64	-	12.64	0.12	0.31	12.33
	9th month	12.33	-	12.33	0.11	0.31	12.03
	10th month	12.03	-	12.03	0.11	0.31	11.72
	11th month	11.72	-	11.72	0.11	0.31	11.41
	12th month	11.41	-	11.41	0.10	0.31	11.10
					1.44	**3.70**	
3rd	Opening Balance						
	1st month	11.10	-	11.10	0.10	0.31	10.79
	2nd month	10.79	-	10.79	0.10	0.31	10.48
	3rd month	10.48	-	10.48	0.10	0.31	10.18
	4th month	10.18	-	10.18	0.09	0.31	9.87
	5th month	9.87	-	9.87	0.09	0.31	9.56
	6th month	9.56	-	9.56	0.09	0.31	9.25
	7th month	9.25	-	9.25	0.08	0.31	8.94
	8th month	8.94	-	8.94	0.08	0.31	8.63
	9th month	8.63	-	8.63	0.08	0.31	8.33
	10th month	8.33	-	8.33	0.08	0.31	8.02
	11th month	8.02	-	8.02	0.07	0.31	7.71
	12th month	7.71	-	7.71	0.07	0.31	7.40
					1.03	**3.70**	

4th	Opening Balance						
	1st month	7.40	-	7.40	0.07	0.31	7.09
	2nd month	7.09	-	7.09	0.07	0.31	6.78
	3rd month	6.78	-	6.78	0.06	0.31	6.47
	4th month	6.47	-	6.47	0.06	0.31	6.17
	5th month	6.17	-	6.17	0.06	0.31	5.86
	6th month	5.86	-	5.86	0.05	0.31	5.55
	7th month	5.55	-	5.55	0.05	0.31	5.24
	8th month	5.24	-	5.24	0.05	0.31	4.93
	9th month	4.93	-	4.93	0.05	0.31	4.62
	10th month	4.62	-	4.62	0.04	0.31	4.32
	11th month	4.32	-	4.32	0.04	0.31	4.01
	12th month	4.01	-	4.01	0.04	0.31	3.70
					0.63	**3.70**	
5th	Opening Balance						
	1st month	3.70	-	3.70	0.03	0.31	3.39
	2nd month	3.39	-	3.39	0.03	0.31	3.08
	3rd month	3.08	-	3.08	0.03	0.31	2.77
	4th month	2.77	-	2.77	0.03	0.31	2.47
	5th month	2.47	-	2.47	0.02	0.31	2.16
	6th month	2.16	-	2.16	0.02	0.31	1.85
	7th month	1.85	-	1.85	0.02	0.31	1.54
	8th month	1.54	-	1.54	0.01	0.31	1.23
	9th month	1.23	-	1.23	0.01	0.31	0.92
	10th month	0.92	-	0.92	0.01	0.31	0.62
	11th month	0.62	-	0.62	0.01	0.31	0.31
	12th month	0.31	-	0.31	0.00	0.31	-
					0.22	**3.70**	

DOOR TO DOOR	60	MONTHS
MORATORIUM PERIOD	6	MONTHS
REPAYMENT PERIOD	54	MONTHS

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