PREFEASIBILITY STUDY
ON SETTING UP ALUMINUM POWDER PLANT IN NIGERIA

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ACKNOWLEDGMENT

Startup Business Foundation is thankful to all organizations and individuals who have helped in several ways in preparation of this prefeasibility study.

We also wish to extend our gratitude to all those who reviewed the content and provided valuable inputs for improving the quality, coherence, and content presentation of this prefeasibility study.

ABOUT THIS REPORT

This prefeasibility study is designed to provide potential and startups entrepreneurs' valuable information on setting up Aluminum Powder processing in the manufacturing industry of Nigeria's market; aimed at encouraging and facilitating industrial activities across the country. It is our realization that industrialization is at the heart of economic development and that every effort has to be made to bring about industrial growth and encourage our people to be part of it.

Aluminum Powder business show over 80% local content in terms of availability of raw material, equipment and machinery, manpower and other requirements.

The key areas covered in this report include:

i) Technical and economic analysis of the production, marketing and profitability of the project.

ii) Recommendations in respect of procurement of equipments and associated problems.

iii) Recommendation on suitable agronomic management practices to ensure efficient running of the projects.

iv) Detailed financial analysis including project cash flows for the projects.

This prefeasibility report provides a comprehensive and detailed coverage of the above terms of reference and is designed to facilitate investment decisions.

The implementation of this project will also impact positively on the economy of the immediate community where the project is located. This is in terms of employment-direct and indirect, skilled and unskilled. Government also stands to benefit from internal revenue from taxation.

In view of the result of the analysis using some economic indicators as stated in the proposed project, it is hereby recommended that the project is viable.

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APPENIDIES

PART I

1.1 EXECUTIVE SUMMARY

This prefeasibility report is for setting up of Aluminum powder processing facility in the most suitable part of Nigeria.

Aluminum powder is a fine granular powder made from aluminum which has several applications. It is used in the manufacturing of slurry explosives, detonators for specialized applications such as rails, crackers, sparkles and other pyrotechnic products. It provides a quantitative insect repellent market analysis of the current aluminum powder market trends, dynamics of the global and domestic prevailing market opportunities, human resource requirement, financial projections and profitability.

The industrial location of this project should be in consideration to accessibility of raw material and cheap labour.

The project installed production capacity is 300,000 kgs per annum at 60% capacity utilization, working 312 days yearly.

1.1 SUMMARY OF TOTAL PROJECT COST

S/N	DESCRIPTION	COST INCURRED	COST TO BE INCURRED	TOTAL
1	Land & building	-	500,000	500,000
2	Machinery & equipment	-	2,327,600	2,327,600
3	Utility equipment	-	1,650,000	1,650,000
4	Office equipment	-	150,000	150,000
	Total cost of capital	**-**	**4,527,600**	**4,527,600**
5	Working capital	-	1,200,000	1,200,000
6	10% Contingencies & preliminary expenses	-	272,760	272,760
	Total project cost	-	**6,00,360**	**6,00,360**

1.2 FINANCIAL ACCOUNTING RATIOS ANALYSIS

PERFORMANCE RATIOS AVERAGES

(a) Return on Sales =26%
(b) Return on Equity = 201
(c) Return on Investment =67%
(d) Positive NPV = ₦13,976,480
(e) IRR =47%
(f) ARR =67%
(g) Payback Period = 2 years and 1 month

PART II
MARKET ANALYSIS

2.1 INTRODUCTION

Production of aluminum powders of various grades and products, such as aluminum paste is not well established in the country. The aluminum powder industry is still relatively small sized. With the introduction of a plant to make military hardware, the market for aluminum powder is bound to increase. There is also a market for export of aluminum powder and paste.

2.2 MARKET OVERVIEW

Aluminum powder is obtained by finely grinding the aluminum metal. This powder is light in weight, odourless, highly flammable and silvery-white to grey in colour. Its property to undergo vigorous exothermic reactions when it gets oxidized encourages its applications in the production of various explosives and fireworks. Aluminum powder is also used in the making of many paints and sealants, sparkles and glitters, aerated autoclave concrete, reflective roof coating and printing inks. It is generally available in four forms- atomized aluminum powder, aluminum flake powder, aluminum paste and aluminum pigment powder. Over the last few years, the aluminum powder industry has evolved extensively with the advancement in technology and growth in the global economy. According to IMARC Group, the global aluminum powder market reached a volume of 629,583 tons in 2019.

China accounts for the largest market shares. Key leading players operating in this market include Alcoa Corporation, Aluminium Corporation of China Limited (CHALCO), China Hongqiao Group Ltd., China Power Investment Corp. (CPI), East Hope Group Company Limited, Emirates Global Aluminum PJSC, Norsk Hydro ASA, Rio Tinto Alcan Inc., United Company RUSAL Plc., and Xinfa Group Co., Ltd.

2.3 DOMESTIC DEMAND ANALYSIS

The domestic has been ignited due to massive urbanization, growth in income of people living in urban areas, and rapid industrial development. In addition, continuous advancements in construction industry and ongoing R&D activities to develop innovative, more effective, and cheaper aluminum products fuel the growth of the market in Nigeria. There are several companies that import aluminum powder product from oversea companies mostly from China for onward production of different subsidiary products due to demand supply gap.

2.4 TARGET MARKET ANALYSIS

The aluminum powder industry is of a remarkable size. There is a growing market for export of aluminum powder and paste. Good opportunities exist in the field of setting up new units in small scale sectors with proven technology and appropriate quality orientation.

As the product is the major raw material in the manufacturing of slurry explosives, detonators for specialized applications such as rails, crackers, sparkles and other pyrotechnic products. Therefore, the entrepreneur should identify different industrialist in these areas.

Conversely, the product demand, far stripes it supply as there are few specialized producers of aluminum powder in the country to compare to its demand.

PART III
TECHNICAL ANALYSIS

3.1 PRODUCT DESCRIPTION

Aluminum powder (uncoated) is also known as aluminum powder, aluminum, aluminum flake, aluminum metal, metana. Aluminum powder is a light, silvery-white to gray, odourless powder. It is a reactive flammable material.

Aluminum powder is a fine granular powder made from Aluminum. In form of powders, Aluminum is used for several applications such as manufacture of slurry, explosive and detonators, thermit process used for manufacture of ferro alloys and for specialized welding applications such as rails, pyrotechnic to manufacture crackers, sparkles and other pyrotechnic products; manufacture of aluminum paste, paints and several powder components used in automobiles.

3.2 SUITABLE LOCATION

This project can be sited in any part of the cities in Nigeria with especially consideration to availability of electricity, road network and proximity to source of raw materials.

3.3 PRODUCTION TECHNOLOGY

The technological requirement for the proposed investment is a matter of choice by the potential entrepreneur. This is because; there are foreign and locally made machines. Though, the locally fabricated equipment/machines might have limited but efficient enough when well managed.

3.4 PRODUCTION PROCESS

Aluminum metal is melted in a furnace with the temperature maintained around 7200-7600C. By inducing an air jet in the molten aluminum, small particles of atomized aluminum are produced. A jet of hot air under pressure is passed through annular opening, near the top, drawn by suction through orifice. This leads to the formation of small particles of aluminum. These particles are drawn by suction, through a collecting duct placed above the nozzle, and finally get into a cyclone collecting system. The process of sieving segregates different sizes of aluminum powder.

3.5 PRODUCTION CAPACITY

It is projected that at 961 kgs of alumimum powder will be produced on daily basis which translates to 299,988kg annually at 60% production capacity.

3.6 SOURCES OF FUNDS

The project can be funded through a number of sources which include but not limited to the following; Agric-Business, Small & Medium Scale Investment Scheme (AGSMEIS), grants etc., though the conditions and criteria for accessing the loans and grants varies.

PART I
FINANCIAL ANALYSIS

Basically, the financial section of this prefeasibility study consists of three financial statements: Income statement, Balance sheet, Cash flow projection. This section determines whether or not the project is viable using some economic indicators such as Net Present Value (NPV), Internal Rate of Return (IRR), and payback period as are detailed in the appendices below.

ASSUMPTIONS

1. Assuming that the project will last for the period of five years and the salvage value at the end of the project life ignored.
2. The Machineries, Equipments and Utility Equipment have uniform depreciation of 20%.
3. Production costs assumed are for312 days per year with daily capacity of 961 kgs
4. The proposed capacity utilization are 60% in the first year of commercial production, 70%, 80% in the 2nd and 3rd year respectively and 90% in the 4th and 5th years.
5. Raw materials will be sourced locally and Market for the product is readily available.
6. Staff and labour cost will increase by 10% yearly.
7. Prices and unit costs are assumed unchanged in the five years of projection.
8. The valuation currency used is Naira.

4.2 ACCOUNTING /FINANCIAL ANALYSIS

4.2.1 NET PROFIT

The projected Annual Trading Profit and Loss Account is proposed to make the following Net Profit after tax during the corresponding projected periods – all things being equal.

4.2.2 NET PRESENT VALUE (NPV)

NPV is one of the four methods of discounted cash flows techniques which state that money that is immediately available for use, has a greater value than same amount receivables in future date.

Using this method however, all net cash inflows will be discounted to present value using the estimated interest rate of 60% discount factor. At **12%** discount factor the project produced a positive **NPV NGN 13,976,480**

4.2.3 INTERNAL RATE OF RETURN (IRR)

This is the discount rate which gives zero NPV or the rate which equates the present value of cash inflows with present value of cash outflows of the project.

The cash flow of this project was discounted systematically until the NPV of the project finally become zero. The project produces the **IRR** of **46.9 %.** Thus, the project accepted as being viable. This is because **IRR** is more than the cost of capital.

4.2.4 ACCOUNTING RATE OF RETURN (ARR)

ARR uses accounting information as revealed by financial statements (Income Statement) to measure profitability of the project under consideration. The forecast **ARR** of the project is 66.9%**.**

4.2.5 PROFITABILITY INDEX (PI)

This is the present value of future cash flows over the present value of cash outlays. The project PI further confirm the viability of the project , because as the rules of the accepting and rejecting hold, a project should be accepted if the PI is equal or greater than one (1). Consequently, the PI of this project is **1.72** and thus recommended as being viable to be accepted for financing.

APPENDIX I
TOTAL PROJECT COST

S/N	DESCRIPTION	QTY	UNIT PRICE	AMOUNT
	LAND & BUILDING			
1	Renting of office space	1	500,000	500,000
	Sub total	**1**	**500,000**	**500,000**
	MACHINERY & EQUIPMENT			
2	Oil fired furnace		720,000	720,000
3	Ball mill		211,600	211,600
4	Thermo compressor		256,000	256,000
5	Hot air chamber		300,000	300,000
6	Powder collecting dust complete section		520,000	520,000
7	Water cooling pump		320,000	320,000
	Sub total		**2,327,600**	**2,327,600**
	UTILITY EQUIPMENT			
8	Generating set	1	1,150,000	1,150,000
9	Auxiliary equipments		500,000	500,000
	Sub total		**1,650,000**	**1,650,000**
	OFFICE EQUIPMENT			
10	Furniture & fittings	set	150,000	150,000
	Sub total		**150,000**	**150,000**
	Total Cost of capital		**4,527,600**	**4,527,600**
11	Working capital		1,200,000	1,200,000
12	10% Contingencies & preliminary expenses		272,760	272,760
	Total project cost		**6,000,360**	**6,000,360**

APPENDIX II
ESTIMATION OF WORKING CAPITAL REQUIREMENT

N'000

Year of Commercial Operation	2 weeks	Year 2	Year 3	Year 4	Year 5
% Capacity Utilization (Inventory)	60%	70%	80%	90%	90%
1 week stock of raw material	850	8,194	11,713	15,530	15,530
1 Day stock of finished products	300	3,443	4,887	5,376	5,376
Work in Progress	50	1,071	1,098	1,169	1,169
Bank/ Cash (5% sales of the products)	-	2,287	2,516	2,768	2,768
Working capital	**1,200**	**11,248**	**13,192**	**15,419**	**15,419**

APPENDIX III
FINANCING PLAN

DESCRIPTION	EXISTING	PROPOSED	TOTAL
Equity	2,000,360	-	2,000,360
Term loan from	-	4,000,000	4,000,000
Total project cost	**2,000,360**	**4,00,000**	**6,000,360**
% Contribution			

APPENDIX IV
TERM LOAN REPAYMENT SCHEDULE

LOAN AMOUNT: 4,000,000 (Four Million Naira)
TYPE : ANY LOCAL AVAILABLE SME FUND
INTEREST RATE USED: 12%
REPAYMENT: 5 YEARS EQUAL INSTALLMENT (Annually)

YEAR	OPENING BALANCE	REPAYMENT	INTEREST DUE	TOTAL YEAR INTEREST
1	4,000,000	800,000	480,000	1,280,000
2	3,200,000	800,000	384,000	1,184,000
3	2,400,000	800,000	288,000	1,088,000
4	1,6000,000	800,000	192,000	992,000
5	800,000	800,000	96,000	896,000
Total		**4,000,000**	**1,440,000**	**5,440,000**

APPENDIX V
FORECAST STAFFING SCHEDULE (1ST OPERATIONAL YEAR)
N'000

POSITION	No	Unit Scale	Scale/ Month	Scale / Year
DIRECT LABOUR				
Factory Manager	1	70	70	840
Unskilled labour	4	25	100	600
Sub total	**3**	**120**	**170**	**1440**
INDIRECT LABOUR				
Accounts/ Admin	1	40	40	480
Marketing Officer	1	40	40	480
Sub total	**2**	**100**	**100**	**960**
Total on staff (1st year)	**5**	**220**	**270**	**2,400**

APPENDIX VI
ESTIMATE OF ANNUAL DEPRECIATION ALLOWANCE
N'

ITEMS	INITIAL VALUE	DEPRECIATION (20%)
Machinery & equipment	2,327,600	465,520
Utility Equipments	1,650,000	330,000
Office equipment	150,000	30,000
TOTAL	**4,127,600**	**825,520**

APPENDIX VII
ESTIMATE OF ADMINISTRATIVE / OVERHEAD EXPENSES
N'

COST ITEM	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5
Diesel	1,904,400	1,999,620	2,094,840	2,199,582	2,199,582
Repairs & maintenance	900,000	945,000	990,000	1,039,500	1,039,500
Selling and Distribution	226,800	238,140	249,480	261,954	261,954
TOTAL	**3,031,200**	**3,182,760**	**3,334,320**	**3,501,036**	**3,501,036**

APPENDIX VIII
ESTIMATION OF PRODUCTION AND OPERATION COST

Cost Item	Units	Unit Cost	Qty/ day	Pdn cost/ day	Pdn cost/ mth	Pdn cost/ yr
Direct Costs						
Aluminum metal	kgs	39	32	1,200	32,400	390,000
Mineral spirit	ltrs	15,900	0.1	1,590	41,340	496,200
Coating material	kgs	2,400	1.6	3,840	99,840	1,198,200
Packaging material	ltrs	210	1.6	336	8,736	104,700
Sub-total		**18,549**		**6,966**	**182,316**	**2,189,100**

APPENDIX IX
ESTIMATION OF RAW MATERIAL/PRODUCTION COST AND SALES

Year of Commercial Production	Year 1	Year 2	Year 3	Year 4	Year 5
% Capacity Utilization	**60%**	**70%**	**80%**	**90%**	**90%**
1. Output					
Aluminum	299,988	329,987	359,986	395,984	395,984
Total output	**299,988**	**329,987**	**359,986**	**395,984**	**395,984**
2. Cost of Production	**N'000**	**N'000**	**N'000**	**N'000**	**N'000**
Aluminum powder @N7.3 (kgs)	2,189,100	2,408,010	2,626,920	2,889,612	2,889,612
Total cost of production	**2,189,100**	**2,408,010**	**2,626,920**	**2,889,612**	**2,889,612**
3. SALES					
Aluminum powder @ N45 (kgs)	11,999,520	13,199,480	14,399,440	15,839,360	15,839,360
TOTAL SALES/ TURNOVER	**11,999,520**	**13,199,480**	**14,399,440**	**15,839,360**	**15,839,360**

APPENDIX X

FORECAST INCOME STATEMENT (PROFIT & LOSS ACCOUNT)

Year of commercial operation	Year 1	Year 2	Year 3	Year 4	Year 5
% Capacity Utilization	**60%**	**70%**	**80%**	**90%**	**90%**
1. SALES	**N'**	**N'**	**N'**	**N'**	**N'**
Gross Sales	13,499,460	14,849,415	16,199,370	17,819,280	17,819,280
VAT @ 5%	674,973	742,470.75	809,968.5	890,964	890,964
Net Revenue	**12,824,487**	**14,106,944.3**	**15,389,401.5**	**16,928,316**	**16,928,316**
2. OPERATION COST					
Cost of Raw materials consumed	2,189,100	2,408,010	2,626,920	2,889,612	2,889,612
Staff and labour	2,400,000	2,640,000	2,880,000	3,168,000	3,168,000
Admin. & Overhead Expenses	3,031,200	3,182,760	3,334,320	3,501,036	3,501,036
Depreciation	825,520	825,520	825,520	825,520	825,520
Total Operating Cost	**8,445,820**	**9,056,290**	**9,666,760**	**10,384,168**	**10,384,168**
3. OTHER COSTS					
Interest on Term Loan (12%)	480,000	384,000	288,000	192,000	96,000
Loan Repayment	800,000	800,000	800,000	800,000	800,000
Total (Other Costs)	**9,725,820**	**10,240,290**	**10,754,760**	**11,376,168**	**11,280,168**
Profit Before Tax	**3,098,667**	**3,866,654**	**4,634,642**	**5,552,148**	**5,648,148**
Corporate Tax (12%)	371,840	463,999	556,157	666,258	677,778
Profit after tax (NET PROFIT)	**2,726,827**	**3,402,656**	**4,078,485**	**4,885,890**	**4,970,370**
% Return on Sales	0.212626595	0.24120432	0.265019078	0.28862233	0.293612785
% Return on Equity	1.36316813	1.701021816	2.038875502	2.442505349	2.484737747
% Return on Investment	0.4544439	0.56707530	0.679706718	0.814266144	0.828345299

APPENDIX XI

FORECAST HIGH RATE AND LOW RATE COMPUTATION

Year	C/F	DF 12%	NPV
	N'		N'
0	(6,000,360)	1	(6,000,360)
1	2,726,827	0.893	2435056.511
2	3,402,656	0.797	2711916.832
3	4,078,485	0.712	2903881.32
4	4,885,890	0.636	3107426.04
5	4,970,370	0.567	2818199.79
Total Profit	**20,064,228**		**13,976,480**
Average Profit	**4,012,845.6**		

Year	C/F	DF 60%	NPV
	N'		N'
0	(6,000,360)	1	(6,000,360)
1	2,726,827	0.625	1704266.875
2	3,402,656	0.3906	1329077.434
3	4,078,485	0.2441	995558.1885
4	4,885,890	0.1526	745586.814
5	4,970,370	0.0954	474173.298
Total Profit	**20,064,228**		**5,248,663**
Average Profit	**4,012,845.6**		

APPENDIX XII
FORECAST IRR AND ARR COMPUTATION

$$IRR = a + \frac{(A)}{A+B} * (b-a)$$

Where

a = 12%

b= 60%

A = 13,976,480

B= 5,248,663

$$12\% + \frac{13,976,480}{13,976,480 + 5,248,663} (60-12)$$

$$12\% + 34.9$$

$$47\%$$

$$ARR = \frac{\text{Estimated Average Profit}}{\text{Estimated initial investment}} * 100$$

$$ARR = \frac{4,012,845.6}{6,000,360} * 100$$

67%

APPENDIX XVI
CASH FLOW PROJECTION

Year of Comm. Production	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
% Capacity Utilization		60%	70%	80%	90%	90%
A) CASH RECEIPTS	**N'**	**N'**	**N'**	**N'**	**N'**	**N'**
Equity Capital	**2,000,360**	-	-	-	-	-
Term Loan	4,000,000	-	-	-	-	-
Gross Revenue		12,824,487	14,106,944.3	15,389,401.5	16,928,316	16,928,316
Total Receipts	**6,000,360**	**12,824,487**	**14,106,944.3**	**15,389,401.5**	**16,928,316**	**16,928,316**
B) CASH PAYMENTS						
Capital Payment						
Machinery & Equipments	2,327,600	-	-	-	-	-
Utility Equipment	1,650,000	-	-	-	-	-
Office equipments	150,000	-	-	-	-	-
TOTAL	**4,127,600**	-	-	-	-	-
(ii) Operating Expenses						
Depreciation	-	825,520	825,520	825,520	825,520	825,520
Change in working capital	1,872,760	7,620,300	8,230,770	8,841,240	9,558,648	9,558,648
Sub total	**1,872,760**	**8,445,820**	**9,056,290**	**9,666,760**	**10,384,168**	**10,384,168**
(iii) Financial Expenses						
Repayment of Term Loan	-	800,000	800,000	800,000	800,000	800,000
Interest on Term Loan	-	480,000	384,000	288,000	192,000	96,000
Value Added Tax	-	674,973	742,470.75	809,968.5	890,964	890,964
Corporate Tax	-	371,840	463,999	556,157	666,258	677,778
Sub total	-	2,326,813	2,390,470	2,454,126	2,549,222	2,464,742
Total cash payment (ii)-(iii)	**1,872,760**	**6,119,007**	**6,665,820**	**7,212,635**	**7,834,946**	**7,919,426**
Net cash flow c/f	1,872,760	6,119,007	6,665,820	7,212,635	7,834,946	7,919,426

APPENDIX XVII
BALANCE SHEET PROJECTION

Year of comm. Operation	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
ASSETS	**N'000**	**N'000**	**N'000**	**N'000**	**N'000**	**N'000**
(i) FIXED ASSETS						
Machinery and Equipments	2,327,600	-	-	-	-	-
Utility equipment	1,650,000	-	-	-	-	-
Office Equipment	150,000	-	-	-	-	-
Value at Acquisition	-	4,127,600	4,127,600	4,127,600	4,127,600	4,127,600
Less Cumulated Depreciation	-	825520	1651040	2476560	3302080	4127600
Net fixed assets	**4,127,600**	**3,302,080**	**2,476,560**	**1,651,040**	**825,520**	**0**
(ii)CURRENT ASSETS/ LIABILITY						
Stock of Raw Materials	1,200,000	7,889,001	12,118,991	14,681,963	17,000,895	21,239,594
Debtors /prepayment	-	11,453,000	12,098,000	13,308,000	14,139,000	15,653,000
Bank and Cash Balances	672,760	4,150,024	5,160,031	6,170,539	7,180,674	7,180,741
Creditor / accruals	-	(14,074,000)	(16,039,000)	(18,947,000)	(21,013,000)	(25,785,000)
Company Tax	-	(3,992,918)	(4,484,739)	(4,983,041)	(5,568,354)	(5,631,715)
Net current assets	**1,872,760**	**5,425,107**	**8,853,283**	**10,230,461**	**11,739,215**	**12,656,620**
TOTAL NET ASSETS	**6,000,360**	**8,727,187**	**11,329,843**	**11,881,501**	**12,564,735**	**12,656,620**
(ii) FINANCED BY						
Equity Capital	2,000,360	2,000,360	2,000,360	2,000,360	2,000,360	2,000,360
P&L	-	2,726,827	3,402,656	4,078,485	4,885,890	4,970,370
Retained Profit	-	-	2,726,827	3,402,656	4,078,485	4,885,890
SHAREHOLDERS FUND	**2,000,360**	**4,727,187**	**8,129,843**	**9,481,501**	**10,964,735**	**11,856,620**
Long Term Loan	4,000,000	4,000,000	3,200,000	2,400,000	1,600,000	800,000
TOTAL EQUITY & LIABILITY	**6,000,360**	**8,727,187**	**11,329,843**	**11,881,501**	**12,564,735**	**12,656,620**