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Financing for Plants, Equipment and Operations for the Establishment of a Plant for the Manufacturing of Spheroidal Graphite Iron Castings for Automobile Industries

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Abstract

The Steel sector must be developed to meet up with challenges posed by auto parts replacement by developing auto parts production industries such as Inner and outer panels of automotive bodies, wheel housings and peripheral components, fuel tanks automotive exhaust systems, automatic fuel tanks and radiators, Steel cord for reinforcement radials tyres. Steel sector is the backbone of any economic or industrial development of any nation. The industrial revolution of the Government should aim at boosting the steel industry .To is able to produce car components, the establishment of small plants must be encouraged .The raw materials to produce car parts must come from our indigenous steel industry. In the situation of the Country where spare parts and components are not readily available therefore local production and local content must be encouraged. The research paper therefore carried out an Investment analysis to analysis the establishment of a plant for the manufacturing of Spheroidal Graphite iron for the manufacturing of spare parts, components for automobile industry. The analyzed investment proved that the amount to be invested in this plant could be recouped within the stipulated period of three years. Time value of money was considered throughout the implementation of the project. The describe investment analysis present a unique way in handling the establishment of plants of this nature. The work further looked into some areas like market potential of Spheroidal Graphite Iron, its characteristics and its vital role in engineering applications, implementation schedule, technical aspects that include all the necessary details for project execution, quality control and standard, pollution and protection within the plant, the production capacity of the plant were highlighted this shows that the plant can produce about 450 metric tonnes of finished castings in a year. The financial aspects and analysis were discussed in details, revealing the amount that could be involved in floating the plant for meeting the needs and demands that may arise from automobile industry. The overall aim of the project was achieved, this indicated that within a year of the establishment of the plant, a lot of revenue could be generated as shown from the rate of return on investment and the form break – even point. Some recommendations were given to encourage the establishment for such plants in any part of the country, which will continue to meet the demand of our local industries.

Keywords: Spheroidal graphite iron; Investment; Analysis; Establishment and automobile industry

Introduction

Investment analysis, is defined as the process of evaluating an investment for profitability and risk, ultimately has the purpose of measuring how the given investment is a good fit for a portfolio. **Investment analysis** can range from a single bond in a personal portfolio, to the investment of a startup business, and even large scale corporate projects.

Investment analysis meaning

Investment analysis means the process of judging an investment for income, risk, and resale value. It is important to anyone who is considering an investment, regardless of type. *Investment analysis methods* generally evaluate 3 factors: risk, cash flows, and resale value. The first factor evaluated in any investment analysis is risk. The reason for this is simple: if the risk of the investment is too great then loss is quite likely. In this case, cash flows and resale value generally do not matter because the investment is worth nothing. To evaluate risk, one simply uses a variation of this formula:

Risk=Rate of occurrence × The impact of the event

Despite this, risk is not a definite factor. One must evaluate all the factors related to the investment: market, industry, governmental, company, and more. In this way evaluating risk is as much of an art as a science. The second factor of investment analysis is cash flows. Cash flows occur in many ways: dividends from a publicly traded stock, interest payments on a bond, or even free cash flow which can be distributed to the investors in a small business (again, in the form of dividends). Cash flows are one of the methods of repayment on an investment. Thus, an investor will want to evaluate cash flows to see if they repay the investment while also repaying the assumed value of the risk on the investment. Many methods of evaluating cash flows exist: future value of cash flows, Discounted Cash Flow Analysis, and others provide each investor with a method of analysis based in the type of investment being considered. Regardless, ignoring the analysis of cash flows is a quick path to loss of investment capital.

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The third factor of investment analysis is resale value. Profit from resale is made through a gain in the market value of the asset. When the asset is sold to another investor for a value higher than the original purchase price, profit from resale value has occurred. In the process of investment analysis, an investor will want to measure the expected rate of growth on the asset to make sure that the value of this and any associated cash flows are larger than the loss of investment and the estimated value of the risk of the investment.

All of these methods of investment analysis are applicable to any investment: stocks on the stock market, treasury bills, the purchase and growth of a business, or even currency trading. Though each has a purpose-built method for investment analysis, each requires this if the investor is to be sure that the risk is worth the reward. Though investment for real estate decisions will be different than for a stock, the basic concept is the same.

The investment analysis for the establishment of plant for the production Spheroidal Graphite for automobile industry. The present project profile envisages the production of Spheroidal Graphite Iron castings of various shapes and sizes having weight between 50 g to 12 kg. In a medium frequency induction furnace for the manufacturing of Spheroidal Graphite Iron castings to produce quality and standard castings for use by other manufacturing industries with particular reference to automobile industries. Due to the advantages of Spheroidal Graphite Iron castings which have led to its successes, that are numerous, which include versatility and high performance at lower cost; on the other hand the versatility is evident in the area of mechanical properties.

Spheroidal Graphite Iron offers the designer the option of choosing because of their, ductility, shock ,as well as wear resistance properties and easy machinability, with grades guarantying more than 18% elongation or high strength, with tensile strength exceeding 825 Mpa. In addition to cost advantage offers by all castings, Spheroidal Graphite Iron when compared to steel and malleable iron castings, also offers further cost saving.

Like most commercial cast metal, steel and malleable iron decrease in volume during solidification and as a result require attached reservoirs (Feeders or Risers) of liquid metal to offset the shrinkage defects. The formation of graphite during solidification causes an internal expansion of Spheroidal Graphite as it solidified either with feeder that is much smaller than those for malleable iron and steel [1].

Based on these characteristics of Spheroidal Graphite Iron that the establishment of this plant for manufacturing of this product became very necessary and the best way/method for analyzing this, is to use investment analysis technique to determine if the amount invested into the project could be recouped within the stipulated period of three years. The establishment of this plant was considered because of its market potential, employment and revenue generation as an impetus to the growth of economy. Some decisions were considered for the establishment of this plant for the manufacturing of Spheroidal Graphite Iron Castings. The decisions were made base on the fact that there is hope in future as based on the forecast of internal and external factors which include costs, revenues, inflation and interest rates, taxation and other numerous factors that favours its establishment. Investment analysis is the technique used to appraise this project which is known as pay back technique. (Payback technique is simply defined as the period, usually expressed in years which it takes for a project's net cash inflows to recoup the original investment) [2].

Market Potential

In order to fully utilize the capacity of the Spheroidal Graphite castings, discussions were held with Delta Steel and National Iron Ore and Mining Corporation Company, Itakpe. Explore securing orders by visiting cement factories and oil and gas companies in Port Harcourt, Onitsha, Lagos, and Kaduna with emphasis to Automobile industries [3-5]. The visits as above were completed during the months of January and February 2006.

Basis and Presumptions

1. The equipment, machineries' and other apparatus for the establishment of the plant are to be produced locally with a view of adding the local content principle.

2. The machinery and equipment for this plant will be of different make and model this is with a view to patronizing various vendors.

3. The prices of raw materials and needed items will be determined by the present market value o

4. On full capacity utilization the Break-even point was calculated to determine when the plant will be managed financially at a point of making equilibrium profit.

5. The irrecoverable melting loss was considered at 15% .The gating system which includes the runners, spurs and risers will be recycled after they are properly fettled.

6. The plant was considered to beginning to make return on revenue within a period of 3 years which include moratorium period. (Moratorium period: means temporary stopping of activities).

7. The Plant is proposed to be run a 3 shift four bridge arrangement on double shift.

8. The plant will commence with a capacity utilization of 70% as the acquired equipment, machineries will be utilized at this capacity which will be increased in the subsequent years.

9. The salaries of the engaged killed workers and other will based on the 15% increased salary.

10. The current bank rate interest for fixed and working a capital was assumed at 23.5% (e.g., Bank of Industry of Nigeria or other commercial Banks).

11. The investment was projected with a minimum of 25% [6-8].

Implementation Schedule

Table 1 shows the implementation schedule of the activity. The implementation schedule of the activity could be planned and executed within the stipulated period and some of other activities could be performed alongside the others. The implementation schedule of the activity could be planned and executed within the stipulated period and some of other activities could be performed alongside the others [9].

Serial no	Period of activity	(Duration)
(a)	Location of land and preparation	02-03 weeks
(b)	Project report preparation	06-08 weeks
(c)	Provisional registration	00-02 weeks
(d)	Financial arrangements	18-20 weeks
(e)	Purchase of machineries	18-20 weeks
(f)	Installation and electrification	10-12 weeks

Table 1: Shows the implementation schedule of the activity.

Technical Aspects

Process of manufacture

Spheroidal Graphite Cast Iron is similar to that of the grey cast iron but with 0.05 wt% of magnesium. All samples will be etched using 2% natal. The spheroidal graphite cast iron, Fe 3.2 C 2.5 Si 0.05 Mg wt% containing graphite nodules in a matrix which is pearlite. One of the nodules is surrounded by ferrite, simple because the region around the nodules is decarburized as carbon deposits on to the graphite Etchant [10].

Quality Control and Standard

Quality control is a system of quality management, integrating the efforts of quality control groups at a given plant, which exercise control over the product design, production process, machinery, products testing, inspection and acceptance of incoming materials, contract items, maintenance and repair. An improved quality control, increases service life and reliability of products which will further affect savings in raw materials, energy, rationally use labour and thus increase the effectiveness of production [11-13].

(a). As per BIS: 1865-1974- all Ferrite materials, applications for Pressure castings such as valves and pump bodies.

(b). BIS: 5789-1970 Spheroidal Graphite Cast Iron for some type of Ferrite materials, applications like machinery castings subject to shock and fatigue loading , Crankshaft s, gears and rollers.

(c) BIS: 5788-1970 Spheroidal Graphite Cast Iron for ferrite and pearlite, all pearlite and tempered martensite for applications like high strength gears, automotive, machine components, pinions, rollers and slides, Railway–couplings and Agricultural machine component [14].

Production Capacity

450 Metric tonne per annum.

Motive power

350 Kilo Watts.

Pollution Control

It is worthy to state here that foundry environment can be extremely harsh and the importance of maintaining noise control measures, controlling of atmospheric environment, minimizing the vibration effect on the workers and ear protection is crucial to continuing effective control of noise exposure. However, the subject of noise and its transmission is complex; hearing loss often goes unnoticed being confined initially to a limited frequency range, before becoming more severe and extensive. It is also penitent to make the right choices in its efforts to reduce generation of an exposure to noise and vibration from various equipment and machineries [15].

Manufacturing of spheroidal graphite iron castings

So it requires implementing and observing all the health hazard, safety and environmental protection rules and regulations as stated in Nigeria factories Acts of 1984.

Pollution Control Board

In Nigeria, the factories ACTS of 1955, came into force on 1st September 1956, the factories (Amendment) ordinance, 1458, which came into operation on 1st April, 1959 made slight changes in some section of the original Act. And again in 1984, yet more changes were made in the factories Act. The factory Act lays down in general terms the minimum standard for safety, health and welfare of factory workers to be maintained in all factories in Nigeria [16].

Energy Conservation

The energy audit is often one of the first steps to identifying potential savings in an industry. Beyond finding energy savings, it is important to estimate the maintenance savings and avoided capital costs associated with a functional industry. Also consider "secondary costs" such as "down-time," damages and emergency repair costs that may be likely if an industry is not functional. Ultimately, these "cash flows" generated from the industry helps to have better understanding and justify the economics of an industry. The need of performing energy audit is enable the plant to understand the performance of the equipment which would be used to monitor the process of saving energy, saving money that could be spent in the operational process and also to determine how the cycle of heating progresses could be maintained as standard. Saving money on energy bills is attractive to businesses, industries, and individuals alike. Customers with large energy bills have a strong motivation to initiate and continue an on-going energy cost-control program. "No-cost" or very low-cost operational changes can often save.

The energy audit is one of the first tasks to be performed in the accomplishment of an effective energy cost control program. An energy audit consists of a detailed examination of how facilities use energy, what the facilities pay for that energy, and finally, a recommended program for changes in operating practices or energy-consuming equipment that will cost-effectively save thousands of dollars on energy bills [17].

Customers or industries 10-20% on utility bills [18]. Capital cost programs with payback times of two years or less can often save an additional 20-30% [19]. In many cases these energy cost control programs will also result in both reduced energy consumption and reduced emissions of environmental pollutants.

Financial Aspects

Table 2 shows financial aspects.

Personnel

Table 3 shows personnel which include raw materials, utilities, other contingent expenses, total recurring expenses and working capital.

Financial Analysis

Table 4 shows financial analysis of cost of production per annum.

Recommendations and Conclusion

Briefly the establishment of industries like this should be encouraged by Individual, Local and Foreign investors, Banks, Financial Institutions and Governments at all levels as such industries will transform inert environments to 'intelligent Environments [20]. The Government, the stake holders in the metal industries should be encouraged to establish such cottage industries for employment generation and revenue generation. A latent feature in projects like this is the allocation and utilization of scarce resources; Men, Money, Materials and Machinery, etc. It is important because control technique forester profit maximization and cost minimization. The government should create enabling environment for such industry and cottage industries for the production of components and spare parts of

A. Fixed capital	Square meters	Cost per Square meters	Amount (N)
(i) Land and building	Square meters		
(a) Land	1,500.00	2,000.00	30,00,000.00
(b) Building	1,000	8000	80,00,000.00
(c) Office/Laboratory	300	8,000.00	24,00,000.00
(d) Shop floor Preparation	1200	5,000.00	60,00,000.00
Total			**1,94,00,000.00**
(ii) Machinery and equipment			
Serial description quantity amount	**Qty**		
1. No (1) 2000 KG medium frequency Induction	1	20,00,000.00	20,00,000.00
2. two overhead tank,	2	3,00,000.00	6,00,000.00
3. Water Softening Plant	2	80,000.00	1,60,000.00
4. Plate Type Heat Exchanger	2	80,000.00	1,60,000.00
5. Immersion Pyrometer	1	1,00,000.00	1,00,000.00
6. Air Compressor (7.5 HP)	1	2,00,000.00	2,00,000.00
7. EOT Crane (1.5 Ton Capacity)	1	5,00,000.00	5,00,000.00
8. Grinders with flexible shaft	3	80,000.00	2,40,000.00
9. Grinders with swing frame type	3	80,000.00	2,40,000.00
10. Weighing Scale for (Materials like scrap metals)	2	1,00,000.00	2,00,000.00
11. Transformer	1	15,00,000.00	15,00,000.00
12. Drum of cables	1	2,00,000	2,00,000.00
13. Cost of power installation & connection		2,00,000	2,00,000.00
14. D.G. set (60 KVA)	1	1,50,000.00	1,50,000.00
15 Moulding machine with squeezing arm, Plunger and pressure plate	1	3,50,000.00	3,50,000.00
16. Sand Mixer, 300 kg batch with 8.5 HP motor And Accessories	1	3,00,000.00	3,00,000.00
17. Furnace for Heat Treatment (3.5 meter. ×2.0 meter. × 2.0 meter.)	1	2,50,000.00	2,50,000.00
18. locally built dry oven for drying cores and moulds	1	2,00,000.00	2,00,000.00
19. Fettling devices	1	1,00,000.00	1,00,000.00
20. Mechanized Cutting Tools	1	1,00,000	1,00,000.00
21. Inverted Metallurgical Microscope for the determination of microstructures of cast metals	1	10,00,000.00	10,00,000.00
22. Vibrational sieve Analyzer with various mesh sizes electrically driven	1	2,00,000.00	2,00,000.00
23. Equipment for Material Handling	1	50,000.00	50,000.00
24. Installation , connection and Electrification of all machinery and equipment; at a fee	-	5,00,000.00	5,00,000.00
25. Cost of Moulds boxes and Foundry Tools	1	3,00,000.00	3,00,000.00
26. Patterns	1	1,00,000.00	1,00,000.00
27. Cost of Office Equipment	5	10,00,000.00	50,00,000.00
28. Pre-operative Expenses	1	3,50,000.00	3,50,000.00
Grand Total			**1,52,50,000.00**

Table 2: Shows financial aspects.

Serial no	Designation		Salary amount	Salary amount(N)
	No. (In N)	Number of personnel	(In N) per month	(In N) per Annuam
1. Metallurgist	GL 8.03	1	71,082.41	8,52,988.92
2. Smelter	GL 6.03	1	34,066.67	4,08,800.04
3. Foreman	GL 6.04	1	35,288.59	4,23,463.08
4. Chemist	GL 8.03	1	71,082.41	8,52,988.92
5. Clerk/Typist	GL5 .03	1	28,134.58	3,37,614.96
6. Store-Keeper	GL 4 .03	1	26,025.08	3,12,300.96
7. Furnace Operator	GL 6.03	2	68,133.34	8,17,600.08
8. Skilled Workers	GL7 .03	4	2,22,188.32	26,66,259.84
9. Unskilled Workers	GL 4 .03	2	52,050.16	6,24,601.92
10. Labourer	GL 2.03	1	24,181.50	2,90,178.00
11. Security Men	GL4 .03	2	52,050.16	6,24,601.92
Total			**6,84,283.22**	**82,11,398.64**
Perquisites @ 15% (Salary per annum)				12,31,709.80
Total				**94,43,108.44**

(ii) Raw materials (indigenous)	**Qty (MT)**	**N**	**N**
1. Scrap metals	30	45,000.00	13,50,000.00
2. Ferro Alloys [Fe-Si, Fe-Mg etc.]	0.5	1,50,000.00	75,000.00
3. Locally sourced Refractory Materials	1	40,000.00	40,000.00
4. Ramming Mass	0.5	5,000	2,500.00
5. Locally sourced Clay bonded sand	1	4,000	4,000.00
6. Locally sourced molding sand	2	10,000	20,000.00
7. Packaging materials	1	6,000.00	6,000.00
Total			**14,97,500.00**
Utilities			
(iii) Utilities	Unit / KW/h/ Litres	(N)	(N)
1. Power	50,000.00	9	4,50,000.00
2. Water rate	3,000.00	0.6	1,800..00
3. Furnace Oil	200	120	24,000
4. Diesel	250	145	36,250.00
Total			**5,12,050.00**
Other Contingent Expenses			
(iv) Other Contingent Expenses	Qty	(N)	(N)
1. Postage		8,000.00	80,000.00
2. Telephone		12,000.00	12,000.00
3. Consumables on some items.		1,00,000.00	1,00,000.00
4. Repair and maintenance		25,000.00	25,000.00
5. Advertisement and publicity		15,000.00	15,000.00
6. Insurance		10,000.00	10,000.00
7. Miscellaneous		10,000.00	10,000.00
Total			**2,52,000.00**
Total Recurring Exenses			
(v) Total Recurring Exenses	Qty	(N)	(N)
1. Salary and Wages		94,43,108.44	94,43,108.44
2. Raw Materials		14,97,500.00	14,97,500.00
3. Utilities		5,12,050.00	5,12,050.00
4. Other Contingent Expenses		2,52,000.00	2,52,000.00
Total			**1,17,04,658.44**
Working Capital			
(vi) Working Capital			
(c) Total Capital Investment		(N)	(N)
(i) Land and Building		1,94,00,000.00	1,94,00,000.00
(ii) Machinery and Equipment		1,52,50,000.00	1,52,50,000.00
(iii) A year Working Capital)		1,17,04,658.44	1,17,04,658.44
Total			**4,63,54,658.44**

Table 3: Represents personnel.

(1) Cost of Production (per annum) (Depreciation)	**%**	**(N)**	**(N)**
a. Total recurring expenditure			4,63,54,658.44
b. Building	6%	1,84,00,000.00	11,04,000.00
c. Machinery and equipment	8%	1,42,80,000.00	11,42,400.00
d. Furnaces	16%	20,00,000.00	3,20,000.00
e. Moulds Tools	15%	3,00,000.00	45,000.00
f. Pattern	18%	1,00,000.00	18,000.00
g. Office equipment	12%	10,00,000.00	1,20,000.00
h. Interest on total investment	15%	4,41,54,108.44	66,23,116.27
Total			**5,57,27,174.71**
(2) Total Sales (per annum)	**Qty**	**Per Metric Tonne (MT)**	**(N)**
Total Sales (per annum) by sale of Spheroidal Graphite Iron Castings 450 MT=@ 300,000 per Metric Tonne (MT) (with reference Foundry Business plan -2007)	450	3,00,000.00	13,50,00,000.00
(3) Profitability (per annum)	**Annual Sales**	**cost of production**	**Net profit**
Annual Sales - Cost of Production = Net Profit[Before Tax]	135,000,000.00	5,57,27,174.71	7,92,72,825.29

(4) Net Profit Ratio

$$\frac{\text{Net Profit}}{\text{Turnover per year}} = \frac{55,727,174.71}{135,000,000.00} \times \frac{100}{1} = 41.28\%$$

(5) Rate of Return

$$\frac{\text{Net Profit} * 100}{\text{Total investment}} = \frac{79,272,825.29}{135,000,000.00} \times \frac{100}{1} = 58.72\%$$

Fixed Cost (per annum)	Percentage	(N)	(N)
I. Total Depreciation		5,57,27,174.71	5,57,27,174.71
II. Interest on total investment	18%	4,41,54,108.44	79,47,739.52
III. Insurance		10,000.00	10,000.00
IV. Salary and wages	40%	94,43,108.44	37,77,243.38
V. Contingent and utility expenses (Excluding Insurance)	40%	2,52,000.00	1,00,800.00
Total			**6,75,62,957.61**
Break Even Point			

$$\frac{\text{Fixed Cost} * 100}{\text{Fixed Cost} + \text{Profit}} = \frac{67,562,957.61}{146,835,782.90} \times \frac{100}{1} = 46.01\%$$

Table 4: Represents Financial Analysis.

automobile industries. The establishment of such plant will continue to contribute to the growth and development of the Nigerian economy as the country is presently facing recession.

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