Ferro Vanadium Production Business.

Ferrovanadium Market is expected to Expand at a CAGR of 5.0% between 2018 and 2028.

Ferro Alloys Industry
Introduction

Ferro Vanadium is an alloy which is formed by combining iron and vanadium with a vanadium content range of 35%-85%. Ferro Vanadium is a universal hardener, strengthener and anti-corrosive additive for steels like high-strength low-alloy (HSLA) steel, tool steels, as well as other ferrous-based products.

Ferro vanadium belongs to the category of ferroalloy. Ferro vanadium is an alloy which is formed by combining iron and vanadium. Ferrovanadium contains 35% to 85% of vanadium depending on applications of the product in end-use industry. Ferro vanadium is an alloy material that is used in manufacturing of steel. It imparts desirable properties such as abrasion resistance, high temperature and hardenability.
Ferro vanadium used for manufacturing of steel offers the end product with high stability against alkalis as well as acids such as sulphuric and hydrochloric acids. In addition, products containing ferro vanadium are at reduced risk to be susceptible to corrosion. Ferro vanadium also helps in reducing the overall weight of the material as well as increasing the overall tensile strength of the end product. In addition, it helps in promoting fine grain size and increasing hardenability through precipitation of nitrides and carbides. Ferro vanadium is manufactured using an electric arc furnace in which scrap iron is melted initially and then it is combined with the mixture of aluminum as well as flux such as calcium fluoride and calcium oxide. It is usually supplied in pallet boxes or in shrink wrapped in super bags.
Ferro Vanadium is produced from Vanadium Sludge & usually available in the range with V: 50-85%. Ferro Vanadium acts as universal hardener, strengthener and anti-corrosive additive for steels like high-strength low-alloy (HSLA) steel, tool steels, as well as other ferrous-based products. Origin of Ferro Vanadium is mainly India and China.

Vanadium is applied for alloying titanium, niobium, and chromium-based alloys widely used in aviation, rocket and space engineering. Pure metallic vanadium is used in the nuclear industry and in the manufacture of electronic devices.
Ferrovanadium increases hardenability and resistance to tempering. It is used to enhance toughness, resistance of steel to alternating loads. Ferrovanadium is also used to obtain fine-grained structure of steel.

Ferro Vanadium was primarily recovered from titanium-bearing magnetite ore processed to produce pig iron. The process produces a slag containing 20% to 24% vanadium pentoxide, which can be further processed to ferrovanadium containing 40% to 50% vanadium. 84% came from ferrovanadium and nearly all of it (99%) went into steel manufacturing. The Ferro Vanadium is used as an alloying agent for the metals iron and steel and also aerospace.
Application

The most important use of vanadium is as an additive for steel. It is used for the production of rust resistant, spring and high speed tool steels. It is also added to steels to stabilize carbides. Vanadium foil is also used to bond titanium to steel. Due to its low fission neutron cross section vanadium is also used in nuclear applications. The Ferro Vanadium is used as an alloying agent for the metals iron & steel and also aero.

Ferro Vanadium is used primarily as an alloying agent for iron and steel and, with the exception of the steel industry, the aerospace market is the primary user of the metal. It is found in deposits of titaniferous magnetite, phosphate rock and uraniumiferous sandstone and siltstone.
Significant amounts are also present in bauxite and carboniferous materials such as crude oil, coal, oil shale and tar sands. Vanadium is usually recovered as a by-product or co-product, and thus world resources of the element are not fully indicative of available supplies. Vanadium is also useful in the production of aerospace titanium alloys and as a catalyst in producing maleic anhydride and sulfuric acid.

Most of the ferro vanadium manufactured is utilized in the alloying process used to manufacture hardened steel. Hardened steel further finds application in the manufacturing of axles, bicycles frames, crankshafts and other highly critical steel components. Thus, the growing steel industry is expected to boost the overall growth in the demand for the ferro vanadium market.
Market Outlook

The steel industry accounts for around 92% of vanadium consumption. Tool, high speed and high alloy steels contain around 20% vanadium, and high strength low alloy (HSLA) steel contains less than 0.5% vanadium. Around 4% of annual vanadium production is as a titanium alloy for aerospace and industrial purposes. This alloy Ti6-4 (4% vanadium) is the workhorse titanium alloy used in aerospace applications. The main demand drivers for ferro-vanadium are global steel production rates and the vanadium consumption rate used within the steel industry.

The main vanadium raw material is referred to as vanadium pentoxide. Vanadium can either be derived from mined ore, from steelmaking slags, or from petroleum residues. The leading vanadium-producing nations remained China, Russia, and South Africa.
Japan and the United States were thought to be the only countries to recover significant quantities of vanadium from petroleum residues.

The major consumption of the ferro vanadium that is being manufactured is used in the process of alloying that is used in the manufacturing of the hardened steel. Hardened steel is used in the applications such as in the manufacturing of bicycles frames, axles, crankshafts, and other very critical components of steel. Thus, the industrial progress of the steel industry will trigger the growth of the ferro vanadium market. In the manufacturing of the high carbon steel alloy, ferro vanadium is used widely. This high carbon steel is used in the production of the medical tools. When vanadium is used in the alloys of titanium they can be used for manufacturing of the high-speed airframes and in jet engines. The overall weight of the steel is reduced by using ferro vanadium; hence, it is used in the manufacturing of the automobiles that are light in weight.
Ferrovanadium is an alloy used to strengthen steel. It is a combination of iron and vanadium in which vanadium content varies from 35%–80%. It is used as an additive to enhance the quality of ferroalloys. When added to steel, the products are light in weight with extremely high tensile strength. The market for ferrovanadium is primarily driven by increasing demand for high strength steel and high strength low alloy steel from the construction and automotive and transportation industries. The growth of these industries will be the key contributor responsible for the growth of the market of ferrovanadium during the forecast period. As these industries are most prominent industries consuming majority of the steel consumption across the globe.
The global ferrovanadium market has been segmented as FeV40, FeV50, FeV60, FeV80 and nitride ferrovanadium. On the basis of production method, the ferrovanadium market is segmented into aluminothermy reduction and silicon reduction. On the basis of end use, the global ferrovanadium market is segmented into aerospace, automotive & transportation, construction, oil & gas industrial equipment and others. In the others segment of end use industries.

The growth of the region will be supplemented by the growing construction and automotive sector. In addition, the Chinese ferrovanadium market is anticipated to witness additional demand for ferrovanadium in the coming years, mainly due to revised standards by the Chinese government for increasing the tensile strength of rebar products.
Ferrovanadium is the most commonly and widely used alloy for enhancing the strength of reinforcing bars used in buildings, bridges and tunnels. The global ferrovanadium market is expected to register a CAGR of 5.0% over the forecast period (2018-2028) in value terms. The estimated volume of ferrovanadium market in 2018 is 90,033 MT, and it is expected to grow at a CAGR of 3.4% to reach 125,698 MT by the end of 2028.
Consumption of Ferrovanadium, During 2013-14 to 2015-16 (By Industries)

<table>
<thead>
<tr>
<th>Industry</th>
<th>2013-14</th>
<th>2014-15 (R)</th>
<th>2015-16 (P)</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Industries</td>
<td>1110</td>
<td>1131</td>
<td>1106</td>
</tr>
<tr>
<td>Alloy steel</td>
<td>26</td>
<td>43</td>
<td>80</td>
</tr>
<tr>
<td>Electrode</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Foundry</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Iron &amp; steel</td>
<td>1079</td>
<td>1083</td>
<td>1020</td>
</tr>
</tbody>
</table>
The Indian alumina plants, which are mostly based on East Coast bauxite and that which have to meet the internal demand. On the other hand, with growth of Automobile and Casting Sectors, demand for ferrovanadium is expected to increase and this will have to be met by imports. The accelerated growth in the Forging Industry and increased demand for die steels and tool steel too, have paved way for increased vanadium consumption.
### Exports of Ferrovanadium (By Countries)

<table>
<thead>
<tr>
<th>Country</th>
<th>Qty (t)</th>
<th>Value (₹'000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Countries</td>
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<td>493144</td>
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<tr>
<td>Bahrain</td>
<td>20</td>
<td>25609</td>
</tr>
<tr>
<td>Belgium</td>
<td>170</td>
<td>177534</td>
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<tr>
<td>Israel</td>
<td>++</td>
<td>144</td>
</tr>
<tr>
<td>Kuwait</td>
<td>30</td>
<td>27676</td>
</tr>
<tr>
<td>Malasiya</td>
<td>++</td>
<td>808</td>
</tr>
<tr>
<td>Mauritius</td>
<td>5</td>
<td>5186</td>
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<tr>
<td>Netherlands</td>
<td>180</td>
<td>198865</td>
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<tr>
<td>Oman</td>
<td>10</td>
<td>9936</td>
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<td>Pakistan</td>
<td>++</td>
<td>594</td>
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<td>South Africa</td>
<td>++</td>
<td>143</td>
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<td>Turky</td>
<td>++</td>
<td>984</td>
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<tr>
<td>UAE</td>
<td>20</td>
<td>20298</td>
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<tr>
<td>USA</td>
<td>22</td>
<td>25046</td>
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<tr>
<td>Other Countries</td>
<td>++</td>
<td>321</td>
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</table>
Machinery Photographs

Ball Mill

Hopper
## Project at a Glance

### PROJECT AT A GLANCE

### COST OF PROJECT

<table>
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<tr>
<th>Particulars</th>
<th>Existing</th>
<th>Proposed</th>
<th>Total</th>
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<td>Plant &amp; Machineries</td>
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<tr>
<td>Motor Vehicles</td>
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<tr>
<td>Office Automation Equipments</td>
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<td>Technical Knowhow Fees &amp; Exp.</td>
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<td>Franchise &amp; Other Deposits</td>
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<td>Preliminary &amp; Pre-operative Exp.</td>
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<td>Provision for Contingencies</td>
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<td>Margin Money - Working Capital</td>
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<td><strong>TOTAL</strong></td>
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<td><strong>659.03</strong></td>
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### MEANS OF FINANCE

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<td>Other Type Share</td>
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<tr>
<td>Capital</td>
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<td>0.00</td>
<td>0.00</td>
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<tr>
<td>Reserves &amp; Surplus</td>
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<td>Cash Subsidy</td>
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<td>Internal Cash Accruals</td>
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<td>Long/ Medium Term Borrowings</td>
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<td>Loans / Deposits</td>
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<td>0.00</td>
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<tr>
<td><strong>TOTAL</strong></td>
<td>0.00</td>
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<tr>
<td>Year</td>
<td>Annualised Book Value</td>
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<td>Per Share</td>
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<td>1-2</td>
<td>5.73</td>
<td>8.42</td>
<td>15.73</td>
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<td>2-3</td>
<td>9.41</td>
<td>11.78</td>
<td>25.15</td>
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<td>3-4</td>
<td>13.18</td>
<td>15.27</td>
<td>38.32</td>
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<td>4-5</td>
<td>16.85</td>
<td>18.71</td>
<td>55.17</td>
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<td>5-6</td>
<td>20.42</td>
<td>22.07</td>
<td>75.59</td>
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## Project at a Glance

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<th>Year</th>
<th>D. S. C. R.</th>
<th>Debt / Equity as-Deposits Debt</th>
<th>Total Net Worth</th>
<th>Return on Net Worth</th>
<th>Profitability Ratio</th>
<th>Asset Turnover Ratio</th>
<th>Current Ratio</th>
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<tbody>
<tr>
<td></td>
<td>Individually</td>
<td>Cumulative Overall (Number of times)</td>
<td>(Number of times)</td>
<td>%</td>
<td>%</td>
<td>%</td>
<td>%</td>
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<tr>
<td><strong>Initial</strong></td>
<td>3.00</td>
<td>3.00</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>1-2</td>
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<td>1.26</td>
<td>1.53</td>
<td>1.53</td>
<td>5.83</td>
<td>3.67%</td>
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<td>2-3</td>
<td>1.67</td>
<td>1.46</td>
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<td>0.72</td>
<td>3.82</td>
<td>4.29%</td>
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<td>3-4</td>
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<td>1.68</td>
<td>2.17</td>
<td>0.31</td>
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<td>4-5</td>
<td>2.77</td>
<td>1.91</td>
<td>0.11</td>
<td>0.11</td>
<td>1.92</td>
<td>5.03%</td>
<td>3.63%</td>
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<td>5-6</td>
<td>3.49</td>
<td>2.17</td>
<td>0.00</td>
<td>0.00</td>
<td>1.47</td>
<td>5.26%</td>
<td>3.96%</td>
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## Project at a Glance

<table>
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<th>BEP</th>
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<tr>
<td>BEP - Maximum Utilisation Year</td>
<td>5</td>
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<tr>
<td>Cash BEP (% of Installed Capacity)</td>
<td>67.20%</td>
</tr>
<tr>
<td>Total BEP (% of Installed Capacity)</td>
<td>68.79%</td>
</tr>
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</table>

### IRR, PAYBACK and FACR

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>Internal Rate of Return .. ( In %age )</td>
<td>31.34%</td>
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<tr>
<td>Payback Period of the Project is ( In Years )</td>
<td>2 Years 3 Months</td>
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<tr>
<td>Fixed Assets Coverage Ratio ( No. of times )</td>
<td>44.093</td>
</tr>
</tbody>
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Major Queries/Questions Answered in the Report?

1. What is Ferro Vanadium Manufacturing industry?

2. How has the Ferro Vanadium Manufacturing industry performed so far and how will it perform in the coming years?

3. What is the Project Feasibility of Ferro Vanadium Manufacturing Plant?

4. What are the requirements of Working Capital for setting up Ferro Vanadium Manufacturing plant?
5. What is the structure of the Ferro Vanadium Manufacturing Business and who are the key/major players?

6. What is the total project cost for setting up Ferro Vanadium Manufacturing Business?

7. What are the operating costs for setting up Ferro Vanadium Manufacturing plant?

8. What are the machinery and equipment requirements for setting up Ferro Vanadium Manufacturing plant?
9. Who are the Suppliers and Manufacturers of Plant & Machinery for setting up Ferro Vanadium Manufacturing plant?

10. What are the requirements of raw material for setting up Ferro Vanadium Manufacturing plant?

11. Who are the Suppliers and Manufacturers of Raw materials for setting up Ferro Vanadium Manufacturing Business?

12. What is the Manufacturing Process of Ferro Vanadium?
13. What is the total size of land required for setting up Ferro Vanadium Manufacturing plant?

14. What will be the income and expenditures for Ferro Vanadium Manufacturing Business?

15. What are the Projected Balance Sheets of Ferro Vanadium Manufacturing plant?

16. What are the requirement of utilities and overheads for setting up Ferro Vanadium Manufacturing plant?

17. What is the Built up Area Requirement and cost for setting up Ferro Vanadium Manufacturing Business?
18. What are the Personnel (Manpower) Requirements for setting up Ferro Vanadium Manufacturing Business?

19. What are Statistics of Import & Export for Ferro Vanadium?

20. What is the time required to break-even of Ferro Vanadium Manufacturing Business?

21. What is the Break-Even Analysis of Ferro Vanadium Manufacturing plant?

22. What are the Project financials of Ferro Vanadium Manufacturing Business?
23. What are the Profitability Ratios of Ferro Vanadium Manufacturing Project?

24. What is the Sensitivity Analysis-Price/Volume of Ferro Vanadium Manufacturing plant?

25. What are the Projected Pay-Back Period and IRR of Ferro Vanadium Manufacturing plant?

26. What is the Process Flow Sheet Diagram of Ferro Vanadium Manufacturing project?
27. What are the Market Opportunities for setting up Ferro Vanadium Manufacturing plant?

28. What is the Market Study and Assessment for setting up Ferro Vanadium Manufacturing Business?

29. What is the Plant Layout for setting up Ferro Vanadium Manufacturing Business?
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  1.1.2. Physical Characteristics
  1.1.3. Climate and Rainfall
  1.1.4. Map
  1.1.5. Economy and Industry
  1.1.6. Transport

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5. SPECIFICATIONS & PROPERTIES
  5.1. SPECIFICATIONS
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  6.1. OVERVIEW
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  6.7. FERRO-VANADIUM
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7.1. EXPORT: ALL COUNTRIES
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8.1. ABOUT FINANCIAL STATEMENTS OF CMIE DATABASE
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8.3. TOTAL LIABILITIES
8.4. TOTAL ASSETS
8.5. NET CASH FLOW FROM OPERATING ACTIVITIES
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8.6.1. Name of Company with Contact Details
8.6.2. Name of Director(S)
8.6.3. Plant Capacity
8.6.4. Credit Ratings
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8.7.2. Cash Flow
8.7.3. Cost as % Ge of Sales
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8.7.5. Growth in Income & Expenditure
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10. EXPORT & IMPORT: STATISTICS DATA OF INDIA
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10.2. IMPORT: STATISTICS DATA FOR FERRO VANADIUM

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12. RAW MATERIALS

13. MANUFACTURING PROCESS

14. PROCESS FLOW DIAGRAM

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16. SUPPLIERS OF RAW MATERIAL

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17.2. RAW MATERIAL PHOTOGRAPHS
17.3. PRODUCT PHOTOGRAPHS

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• Land & Building ........................................................................4

Factory Land & Building
Site Development Expenses
- **Plant & Machinery**
  - Indigenous Machineries
  - Other Machineries (Miscellaneous, Laboratory etc.)

- **Other Fixed Assets**
  - Furniture & Fixtures
  - Pre-operative and Preliminary Expenses
  - Technical Knowhow
  - Provision of Contingencies

- **Working Capital Requirement Per Month**
  - Raw Material
  - Packing Material
  - Lab & ETP Chemical Cost
  - Consumable Store
• Overheads Required Per Month and Per Annum

• Utilities & Overheads (Power, Water and Fuel Expenses etc.)

• Royalty and Other Charges

• Selling and Distribution Expenses

• Salary and Wages

• Turnover Per Annum

• Share Capital

Equity Capital
Preference Share Capital
• Annexure 1 :: Cost of Project and Means of Finance

• Annexure 2 :: Profitability and Net Cash Accruals

- Revenue/Income/Realisation
- Expenses/Cost of Products/Services/Items
- Gross Profit
- Financial Charges
- Total Cost of Sales
- Net Profit After Taxes
- Net Cash Accruals
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  - Gross Working Capital
  - Current Liabilities
  - Net Working Capital
  - Working Note for Calculation of Work-in-process

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  - ROI (Average of Fixed Assets)
  - RONW (Average of Share Capital)
  - ROI (Average of Total Assets)

• Annexure 6 :: Profitability Ratios
  - D.S.C.R
  - Earnings Per Share (EPS)
  - Debt Equity Ratio
Annexure 7 :: Break-Even Analysis

- Variable Cost & Expenses
- Semi-Variable/Semi-Fixed Expenses
- Profit Volume Ratio (PVR)
- Fixed Expenses / Cost
- B.E.P
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• Annexure 34 :: Tax on Profits
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Scope of the Report

The report titled “Market Survey cum Detailed Techno Economic Feasibility Report on Ferro Vanadium.” provides an insight into Ferro Vanadium market in India with focus on uses and applications, Manufacturing Process, Process Flow Sheets, Plant Layout and Project Financials of Ferro Vanadium project. The report assesses the market sizing and growth of the Indian Ferro Vanadium Industry. While expanding a current business or while venturing into new business, entrepreneurs are often faced with the dilemma of zeroing in on a suitable product/line. And before diversifying/venturing into any product, they wish to study the following aspects of the identified product:
• Good Present/Future Demand
• Export-Import Market Potential
• Raw Material & Manpower Availability
• Project Costs and Payback Period

We at NPCS, through our reliable expertise in the project consultancy and market research field, have demystified the situation by putting forward the emerging business opportunity in the Ferro Vanadium sector in India along with its business prospects. Through this report we have identified Ferro Vanadium project as a lucrative investment avenue.
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- Economic feasibility study of the Project
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