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Car Battery Factory

Feasibility Study

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DIGITAL REPORT

Automotive Industry · Ethiopia

A 20,000-unit-per-year lead-acid automotive battery assembly plant in Addis Ababa, Ethiopia



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1 Executive Summary

This study assesses the establishment of a plant producing 20,000 lead-acid car batteries a year in Addis Ababa. A car battery is a rechargeable battery that supplies electric energy to start a vehicle's engine and to power its lights and ignition system.

Ethiopia's requirement for car batteries is largely met through imports, supplemented by recent domestic production. The present (2012) unsatisfied demand is estimated at 76,073 batteries and is projected to reach 101,253 by 2015, 163,069 by 2020 and 197,313 by 2022.

The principal raw materials (lead, plates, separators, bitumen, plastic containers, battery caps and corks) are imported.

The total investment cost, including working capital, is Birr 14.29 million, of which Birr 1.95 million (13.6%) is required in foreign currency. The project is financially viable: the IRR is 23.9%, the NPV at a 10% discount rate is Birr 11.48 million, and the NPV remains positive at 18%. The plant will employ 43 people.

Table 1.1: Project at a glance

Item	Description
Product	12-volt lead-acid starting (SLI) batteries for cars and light vehicles
Location	Industrial zone, Addis Ababa
Plant capacity	20,000 batteries per year (300 working days)
Production programme	70%, 80% and 90% of capacity in the first three years, 100% thereafter
Main raw materials	Plates, separators, lead, plastic containers, bitumen, caps and corks
Land / built-up area	1,500 m² / 700 m²
Employment	43 persons
Total investment	Birr 14.29 million (fixed investment Birr 7.29 million)
Financing	30% equity, 70% bank loan at 10%
Price base	Constant 2012 prices, Ethiopian Birr

Table 1.2: Key financial indicators

Indicator	Value
Annual sales at full capacity	Birr 32.00 million
Annual production cost at full capacity	Birr 29.01 million
Internal rate of return (IRR)	23.9%
NPV at 10% discount rate	Birr 11.48 million
NPV at 18% discount rate	Birr 3.61 million
Payback period	About 4.1 years from start of operation
Break-even sales (full-capacity year)	41.6% of sales (20.9% on a cash basis)
Corporate income tax over project life	Birr 8.46 million

The project saves foreign exchange by substituting imports, creates forward linkages with vehicle assembly and maintenance, and generates income tax and payroll tax revenue.

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3.2 Demand Projection

Demand for car batteries is directly related to the number of vehicles in use. According to estimates by local manufacturers, demand has grown by an average of 10% a year. Applying this rate to the present unsatisfied demand gives the projection in Table 3.2.

Table 3.2: Projected unsatisfied demand for car batteries, 2013–2022 (pieces)

Year	Unsatisfied demand
2013	83,680
2014	92,048
2015	101,253
2016	111,378
2017	122,516
2018	134,767
2019	148,244
2020	163,069
2021	179,376
2022	197,313

Source: Study projections.

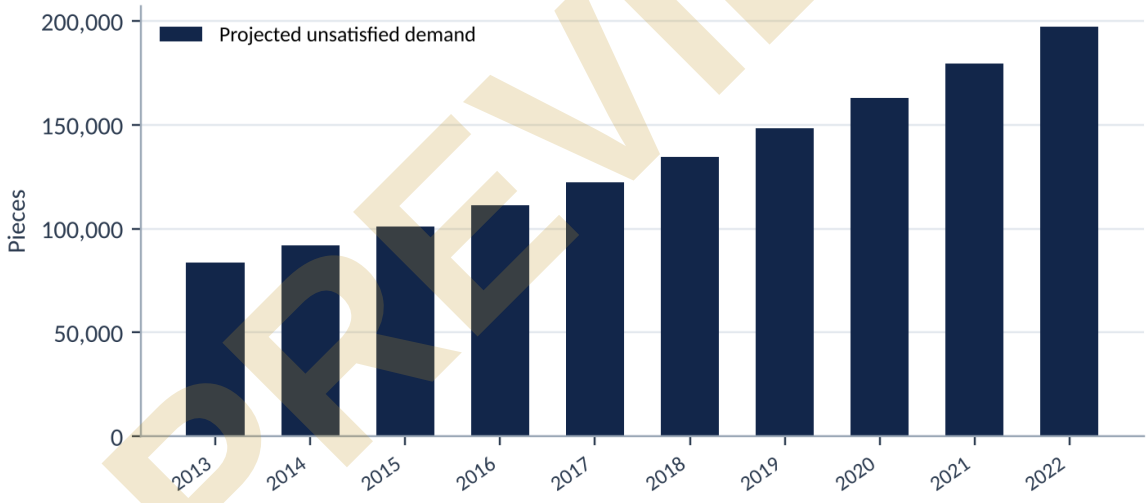


Figure 3.2: Projected unsatisfied demand for car batteries, 2013–2022

Source: Table 3.2.

3.3 Pricing and Distribution

Prices vary by brand and vehicle type. A typical 12-volt car battery currently sells for about Birr 1,750. To compete with imported products of similar quality, a factory-gate price of Birr 1,600 per battery is adopted.

As a new brand competing with established ones, the product should be sold mainly through the company's own outlets and through battery and spare-parts retailers.

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6 Technology and Engineering

6.1 Production Process

A car battery consists of a polypropylene casing divided into six cells; positive and negative lead plates; porous synthetic separators; an electrolyte of sulphuric acid and water; and lead terminals for connection to the vehicle's electrical system.

Battery plates are made by casting grids of lead or lead alloy and applying a paste of lead oxide, sulphuric acid and water. In the configuration studied here, plates and separators are purchased and the plant assembles, fills and charges the batteries (Figure 6.1):

- Lead is melted and cast into straps, inter-cell connectors and terminal posts.
- Positive and negative plates are stacked alternately with separators, which prevent short circuits while allowing current to flow.
- The plate groups are burned (welded) together to form an element; one element goes into each of the six cells of the container.
- The cells are connected with lead connectors, the terminals are welded on, and the cover is fitted and sealed with bitumen.
- The battery is filled with electrolyte and connected to a charger for many hours of formation charging, which converts the paste on the positive plates to lead dioxide and on the negative plates to spongy lead.
- Finished batteries are tested for voltage and capacity, cleaned, labelled and dispatched.

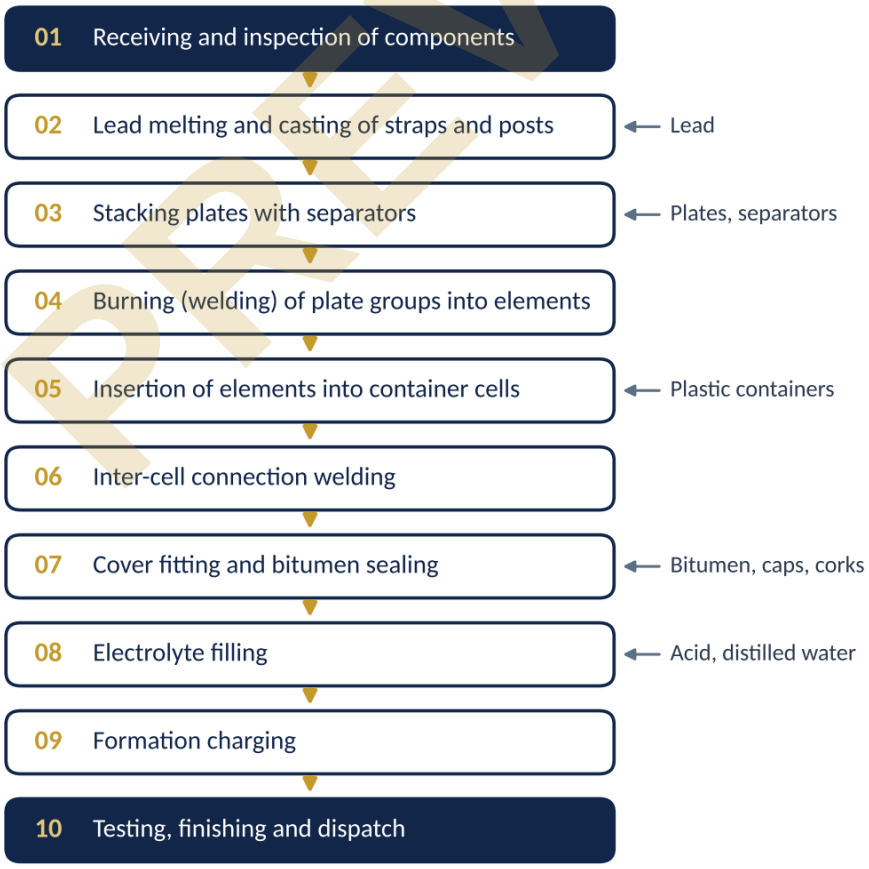


Figure 6.1: Car battery assembly process

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8.4.5 Net Present Value

Net present value (NPV) is the sum of the project's net cash flows discounted to Year 1. At the base-case discount rate of 10%, the NPV is Birr 11.48 million. Table 8.4 shows the NPV at higher discount rates, which reflect the higher cost of capital prevailing in the Ethiopian market.

Table 8.4: Net present value at alternative discount rates

Discount rate	NPV (Birr '000)	Result
10% (base case)	11,477	Positive
15%	6,047	Positive
18%	3,608	Positive

Source: Calculated from the net cash flows in Table A.5.

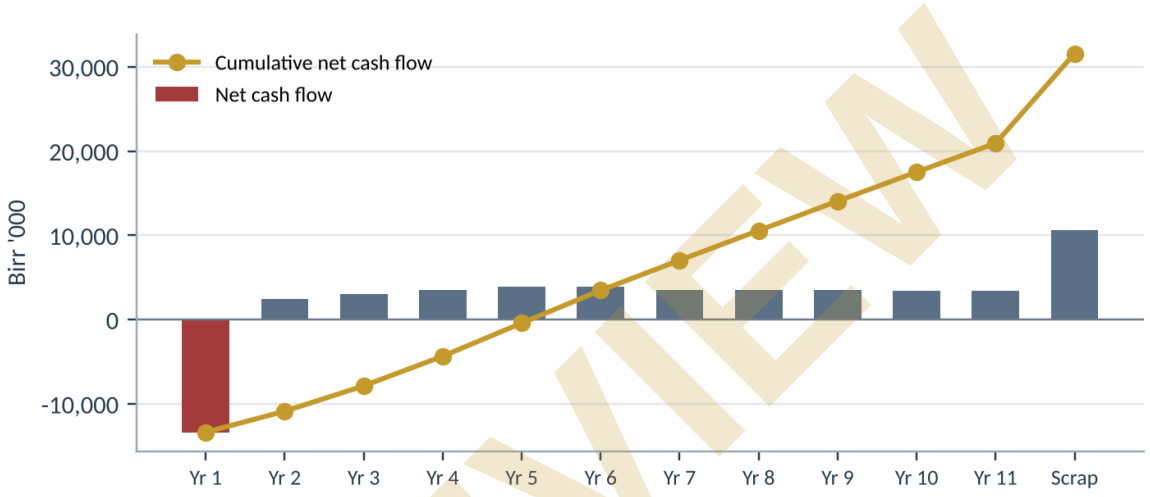


Figure 8.2: Net cash flow and cumulative net cash flow over the project life

Source: Table A.5.

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