**Economic assessment and sensitivity analysis using ASPEN ECONOMY**



Project profile and schedule used in the project simulation

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| --- | --- |
| PROJECT NAME: | Combine thermal plant  |
| Plant process capacity: | 1500 kg/hr |
| Plant location: | Nigeria -Africa |
| Brief description: | Pyrolysis project |
| SCHEDULE: |  |
| Start Date for Engineering | 09-Sep-19 |
| Duration of EPC Phase | 16 months |
| Completion Date for Construction | Tuesday, December 31, 2021 |
| ECONOMIC PARAMETERS |  |
| Country | Nigeria-Africa |
| Units of Measure | METRIC |
| Currency (Cost) Symbol | U.S. DOLLAR |
| System Cost Base Date | 1Q 16 |
| Project Type | Grass roots/Clear field |
| Design code | ASME |

Project summary for proposed biomass thermal process plant

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| CAPITAL COST EVALUATION BASIS |
| IF (ROR Interest Factor) |  | 1.2 |
| ECONLIFE (Economic Life of Project) | Period | 10 |
| DEPMETH (Depreciation Method) |  | Straight Line |
| DEPMETHN (Depreciation Method Id) |  | 1 |
| ESCAP (Project Capital Escalation) | Percent/period | 5 |
| ESPROD (Products Escalation) | Percent/period | 5 |
| ESRAW (Raw Material Escalation) | Percent/period | 3.5 |
| ESLAB (Operating and Maintenance Labor Escalation) | Percent/period | 3 |
| ESUT (Utilities Escalation) | Percent/period | 3 |
| START (Start Period for Plant Startup) | Period | 1 |
| PODE (Desired Payout Period (excluding EPC and Startup Phases)) | Period | 10 |
| POD (Desired Payout Period) | Period | 8 |
| DESRET (Desired Return on Project for Sales Forecasting) | Percent/Period | 10.5 |
| END (End Period for Economic Life of Project) | Period | 10 |
| GA (G and A Expenses) | Percent/Period | 8 |
| DTEP (Duration of EP Phase before Start of Construction) | Period | 0.27 |
| **INPUT PARAMETERS** |  | **Value (Million $)** |
| Capital investment cost (CIC) |  | 280.4 |
| Annual labour cost |  | 18.5 |
| Annual repair and maintenance |  | 5.5 |
| Total cost of biomass per year |  | 4.8 |
| Depreciation | (20% of CIC) | 52  |
| Interest rate | (10% CIC) | 2.8  |
| Discount rate | (10% CIC) | 2.8  |
| Salvage value | (10% CIC) | 2.8  |
| Insurance and taxes | (10% CIC) | 2.8  |

Economic analysis of thermal processes and investment summary

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| --- | --- | --- | --- | --- |
|  | **Scenario 1** | **Scenario 2** | **Scenario 3** | **Scenario 4** |
| Annual production sale of bio-products (Million $) | 125 | 128 | 110 | 130 |
| Net present value of profit (Million $) | 1,062 | 1,091 | 937 | 1,105 |
| Net present value of operation and maintenance cost (Million $) | 297 | 297 | 297 | 297 |
| Accumulated Net present value of all cost (Million $) | 669 | 669 | 669 | 669 |
| Net present value of the project (Million $) | 1,010 | 1,04 | 885 | 1,053 |
| Benefit cost ratio | 1.3 | 1.4 | 1.3 | 1.4 |
| Payback period (years) | 8.5  | 8.2 | 9.8 | 8 |
| Internal rate of return (%) | 16 | 17 | 14 | 17.2 |

|  |  |  |  |
| --- | --- | --- | --- |
| CAPITAL COST | % | OPERATING COST | % |
| Equipment | 30 | Operating labour | 32 |
| Engineering cost  | 7 | Maintenance and repair | 3 |
| Working capital cost | 12 | Supervision/admin | 15 |
| Construction overhead | 3 | Overhead | 25 |
| Materials for construction | 6 | Feedstock | 10 |
| Transport and pre-processing | 20 | Laboratory research and devt | 5 |
| Contingency and fees | 10 | Insurance and taxes | 2 |
| Insurance and tax | 2 | Utilities | 4 |
| Other expenditures | 10 | Others | 4 |