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# Break even analysis of a briquettes production plant and density determination of rice soya husk briquettes for different composition

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**Abstract**

*This research study focused to figure out the breakeven point in planning, controlling, and in the decision-making process, in a briquettes production plant. This research study shed the light on the need of use to breakeven point. The study found, the most of the industrial companies are using break-even point for planning or decision-making process, and there is a significant relationship between the use of the break-even point and successful planning of business. It is recommended that companies may outweigh their fixed cost at least by using breakeven point as a main tool of Decision-making. The study is being carried out at a briquetting plant considering financial year of 2016-17. Bio briquettes can be a good choice as fuel in crucial scenario of global warming as it does not generate pollutants causing climatic consequences. Study determines compactness of soya rice husk briquettes. It was observed that briquette made from mixed soya bean husk and rice husk at the ratio of 1:2 and 1:1 had desirable properties as compared to other compositions*

**Keywords:** Break Even Point, Fixed cost, variable cost, Bio briquettes, Density.

## INTRODUCTION

Large amount of fossil fuels are burnt every day in power station to heat up water to produce steam which further runs the turbine to generate electricity we need to look for more and more sources of energy we could develop the technology to use the available sources of energy more efficiently and also look to new sources of energy those are not created climatic consequences. Briquettes are desirable product. It can be a proper replacement to conventional sources of fuel.

To obtain this goal briquetting plant has established which uses some of the waste and unused material to manufacture a new source of energy, named white coal which is pure

replacement of conventionally used fuel such as wood and charcoal. In this process waste products (agricultural, industrial as well) are used as a raw material and hence it is beneficial for environment.

Cost is the prominent issue for establishing such plants, procedural analysis of costing helps to entrepreneur gaining more outcomes.

A cost-benefit analysis is used to evaluate the risks and rewards of projects under consideration. It can be used to project the benefits of investment in marketing ideas,

enhancements of infrastructure, development of product, if all costs are calculated accurately and the benefits outweigh the costs, the considered investment may be a good choice.

A cost-benefit analysis is a process which helps to make business decisions. The benefits of a business-related action are added, and then the costs associated with taking that action are subtracted. Before erecting a new plant project, a cost-benefit analysis as a means of evaluating all the potential costs and yield that may be generated if the project is completed. The conclusion of the analysis will determine whether the project is financially feasible or not. Boardman (2011) defines CBA as an assessment method that quantifies in monetary terms policy impacts to all members of society. In a broad sense, CBA evaluates the cost of inputs versus the benefit from outputs to determine the project's value.

## SALIENT FEATURES OF CBA

*A) Prepare Budgets*

The information obtained during a cost-benefit analysis makes budgeting easier. If all the possible costs listed, then one can able to calculate profit margin. This consideration is useful when preparing sales projections and budgets.

Cost-benefit analysis is useful for business owners who must choose a single project among several projects. After examining profitable project for potential benefits, investments can be prioritized, choosing the project which has greatest benefit and lowest cost to invest in first.

*B) Marking Goals*

Once the benefits of possible projects are estimated, they can be used to set goals for the project. Goals can be set for various types of projects such as human resources, management, marketing including finance etc.

*C) Concept of costs*

Classification Based on Activity or Volume:

*i) Fixed Cost:* The costs which do not charge for a given period in spite of change in volume of production. This cost is independent of volume of production.
- i.e., per day, per annum, etc.
- Fixed cost does not mean that they never change. They are constant up to specific volume or range of volume.

*ii) Variable costs:* These vary directly and proportionately with output. There is a constant ratio between the variation in the cost and change in the level of output. cost of Direct material and direct labour costs are generally variable costs. Variable costs results from the utilization of law materials and direct labour in production departments.

*iii) Mixed costs:* Mixed costs are made up of fixed and variable costs. They are combination of semi-variable and semi-fixed costs. Because of fixed component; they will not change in direct proportion to output. Because of variable component, they fluctuate with volume; those cost which remain constant up to a certain level of output called as semi fixed cost after which they may become semi- variable cost is the cost which is basically variable but whose slope may change abruptly when a certain level of output is increased. Main goal is to determine break-even point of briquette production plant for year 2016-17 and find out density of soya rice husk briquettes for different mixing ratio.

*D) Break-even analysis*

It is a method that is used by most of organizations to determine, a relationship between costs, revenue, and their profits at different levels of output. This is the minimum output the firm need to produce its costs. Any output thereafter will give profit to the firm. Usage of break-even point for corporate decision making is called Break even analysis. At break-even point total revenue is equal to total cost. Profitability begins after break-even point. When

the output is less than break-even output shows losses.

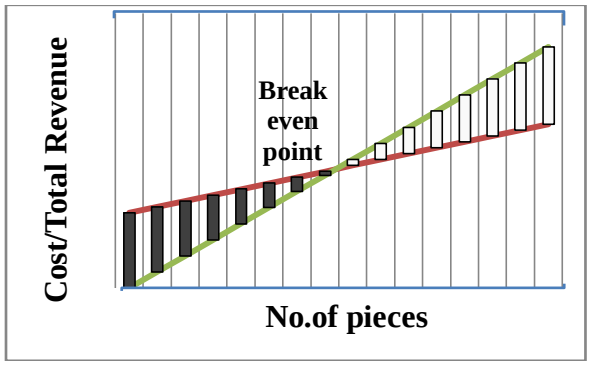


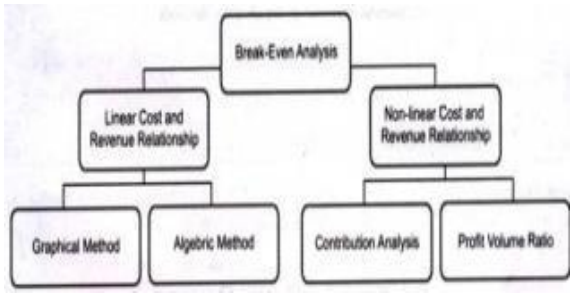

Figure 1

At Break Even Point there are no profits, so TR=TC, TC is total cost, TR total revenue.

*E) Methods of break-even analysis*

The break-even analysis is done under two conditions, which are as follows:

i. Linear cost and revenue relationship.
ii. Non-linear cost and revenue relationship.




Here considered method is linear cost and revenue relationship i.e. straight line method. Almost white coal industries in Madhya Pradesh are using soya bean husk (as it is easily available) as raw material to produce briquettes and for densifying it is mixed with rice husk.

Madhya Pradesh is the first producer of soya bean so husk of it is easily available for briquetting. It shall reduce the environmental issues as it is treated as alternative portable renewable energy. Adi coal industry is using soya bean husk. In order to upgrade the specific heating value and combustibility of the briquette, certain additives in very fine form can be added.

In this study Soya husk is mixed with rice husk to obtained adequate properties of final product. Here several samples are considered to examine density i.e. compactness. Densified briquettes are easy to use.

Table 1

| Sample | Soya husk | Rice husk |
|---|---|---|
| 1 | 1 | 2 |
| 2 | 2 | 1 |
| 3 | 1 | 1 |
| 4 | 3 | 1 |

## METHODOLOGY

1) Fixed costs Annual depreciation: There are many methods for calculating depreciation. In this study the "Straight- Line" method is used. Depreciation (D) can be determined by following equation:

$$Depreciation\ D = \frac{P - S}{L}$$

where,D=depreciation(Rs./yr),P = purchase price of machine (Rs). S = salvage value of machine (Rs), L = useful life time (yr). In this study, salvage value is assumed as 10 percents of purchase price.

2) Interest on investment: Interest on investment (I) determined by following equation:

$$Intreset\ on\ investment\ I = \frac{P+S}{2} \times i$$

where, I = interest on investment (Rs/yr), P= purchase price of machine (Rs), S = salvage value (Rs), and i = interest rate, decimal (consider 10% per years).

3).Electricity demand and machine installation cost: Electricity demand and machine installation cost (EMI) were recorded from briquette machine owner. EMI was calculated by following formula:

$$EMI = \frac{D_i(1+i)^N - D_i}{10}$$

where, EMI = electricity demand and machine installation cost (Rs/yr), Di = machine installation cost plus electric demand cost (Rs), N = machine life (yr), i = interest rate (10 %).

4) Total fixed cost (Rs/yr) calculated by following equations:
Total fixed cost (Rs/yr) = D + I + EMI

Total fixed cost = Total fixed cost/Annual use of m/c in hrs.

5) Variable cost: Total variable cost (Rs/hr) = repair and maintenance cost of screw (Rs/hr) +cost of die heater (Rs/hr) + electricity cost (Rs/hr) +labor cost (Rs/hr) + staff salary (Rs/hr) + cost of rice husk (Rs/hr).

Table 2

| Break-Even-Point or Cost-Volume-Profit Analysis | | |
|---|---|---|
| **Year** | **2016-17** | |
| Qty sold | 2430 Tonne | |
| | Total Rs.'000 | Rs. Per tonne |
| Sales | 10,206 | 4,200 |
| Variable cost | 7,906 | 3,253 |
| Contribution | | 947 |
| Fixed cost | 1,233 | |

Table 3

| Qty (Tonne) | Sales (Rs. '000) | Variable Cost (Rs. '000) | Fixed Cost (Rs. '000) | Total Cost (Rs. '000) | Contribution (Rs. '000) | Profit / (Loss) (Rs.'000) |
|---|---|---|---|---|---|---|
| | [A] | [B] | [C] | [D=B+C] | [E=A-B] | [A-D] or [E-C] |
| | Sales | Variable Cost | Fixed Cost | Total Cost | Contribution | Profit / (Loss) |
| 0 | - | - | 1,233 | 1,233 | - | (1,233) |
| 200 | 840 | 651 | 1,233 | 1,884 | 189 | (1,044) |
| 400 | 1,680 | 1,301 | 1,233 | 2,534 | 379 | (854) |
| 600 | 2,520 | 1,952 | 1,233 | 3,185 | 568 | (665) |
| 800 | 3,360 | 2,603 | 1,233 | 3,836 | 757 | (476) |
| 1000 | 4,200 | 3,253 | 1,233 | 4,486 | 947 | (286) |
| 1200 | 5,040 | 3,904 | 1,233 | 5,137 | 1,136 | (97) |
| 1400 | 5,880 | 4,555 | 1,233 | 5,788 | 1,325 | 92 |
| 1600 | 6,720 | 5,205 | 1,233 | 6,438 | 1,515 | 282 |
| 1800 | 7,560 | 5,856 | 1,233 | 7,089 | 1,704 | 471 |
| 2000 | 8,400 | 6,507 | 1,233 | 7,739 | 1,893 | 661 |
| 2200 | 9,240 | 7,157 | 1,233 | 8,390 | 2,083 | 850 |
| 2400 | 10,080 | 7,808 | 1,233 | 9,041 | 2,272 | 1,039 |
| 2600 | 10,920 | 8,459 | 1,233 | 9,691 | 2,461 | 1,229 |
| BEP (Qty) = | Fixed Costs / Contribution per tonne = | | 1,303 | Tonne | | |

6. Total production cost of soya rice husk briquette (Rs/kg): It is the sum of hourly fixed cost and variable cost i.e. Production cost (Rs/hr) = Fixed cost (Rs/hr) + Variable cost (Rs/hr).
Production cost (Rs /kg) = Production cost (Rs/hr) / production rate of briquette (kg/hr).

7. Measurement of briquette density: The cross sectional area of the samples was calculated using the following formula.

$$Cross\ sectional\ area\ A = \pi \frac{(D_o^2 - D_i^2)}{4}\ sq.cm.$$

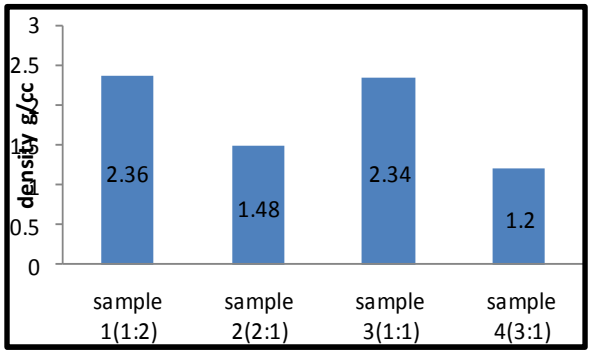
where, $D_0$ = outside diameter of briquette, cm, Di = inside diameter of briquette, cm.
The density of the briquettes calculated by using the following equation (Islam, et al. 2014).

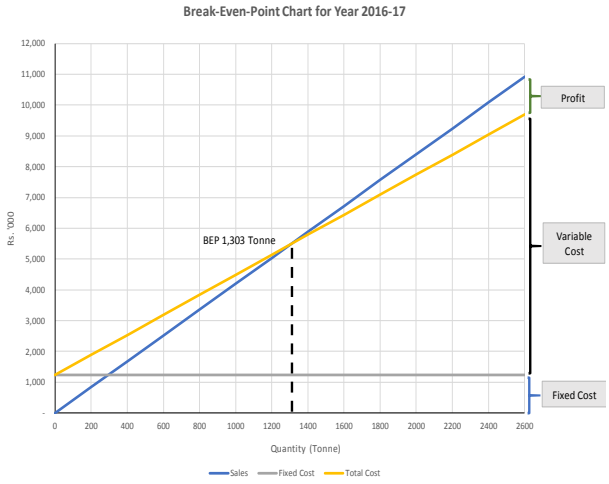
$$Density\ \rho = \frac{W}{AL}$$

where, ρ = density (g/cc), W = weight (gm), A = cross-sectional area of the briquette (cm2) and L = length (cm).

Break Even Analysis based On the Following Assumptions

1. The cost and revenue functions are linear functions. This is for the sake of simplicity.
2. The firm can estimate the cost and revenues in advance.
3. Price remains uniform at all levels of output.
4. The costs are made up of fixed and variable costs.




## CONCLUSION

Break-even point analysis shows Cost beneficial properties of project, implementing this method one can outweighs fixed cost at least and. Briquettes made up of soya rice husk with ratio 1:2 and 1:1 has more compact structure. It is easy to handle and burn as well, produces more heat. Briquettes made up of soya rice husk with ratio 1:2 and 1:1 has more compact structure.

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