

HYDROGEN SULFIDE REMOVAL FROM BIOGAS

Part 1D: Partial Budget Analysis

November 2017

Before investing in a system to remove H₂S from a biogas stream, it is recommended that a “Partial Budget Analysis” (PBA) of the proposed system change be performed.

A PBA is a tool used to examine the financial implications of a proposed change to some aspect of business operations. It should be emphasized that a PBA does not determine the overall profitability of an operation, rather the effect of the system change under analysis, on the overall business profitability.

FORMAT

Generally, a PBA is broken down into five main parts:

- | | |
|-------------------------|-------------------|
| 1. Increases in Income | Economic Benefits |
| 2. Decreases in Cost(s) | |
| 3. Decreases in Income | Economic Costs |
| 4. Increases in Cost(s) | |
| 5. Summary | |

Typically when data is not available, (which is often the case) best estimates are used. Not all parts of the PBA may be relevant to a particular analysis.

Typically, costs/benefits are determined on a yearly basis. Depending on the situation, a PBA may be determined over different time periods; however, it is important that the basis is consistent, i.e. if the benefits are a yearly increase in output due to purchasing a new machine, the cost of the new machine needs to be spread out over the expected lifetime of the machine, and expressed as a yearly cost of ownership.

Each of the five parts of a PBA are briefly discussed below.

Increases in Income

Increase in income are due to such factors as additional or increased revenue streams, greater yield, higher prices etc. If the income due to the new operation is expected to increase, it should be accounted for in this part.

Decreases in Cost

If the proposed operation reduces the cost of doing business, then these factors should be included in this part. Examples could be savings due to reduced maintenance/labor, reduced utility usage/cost, etc.

Decreases in Income

Decreases in income could be due to reduced yield (such as less electricity available due to parasitic usage of a biogas scrubber), losses due to downtime of a piece of equipment, etc.

Increases in Cost

If the new process incurs additional cost(s), these cost(s) should be accounted for in this part of the PBA. Examples include increased utility usage, capital purchase of equipment, increased labor, etc.

Summary

In the summary portion of the PBA, sums of the economic costs (parts three and four) are subtracted from sums of the economic benefits (parts one and two). If the result is positive, then the proposed change is expected to add to the profitability of the operation, and if negative, to reduce whole farm income. An additional operation that is often performed is to divide the benefits by the cost to get the benefit/cost ratio. A value greater than one, indicates the proposed investment will likely contribute to overall farm profitability. The larger the ratio, the better.

ANNUAL EQUIPMENT COSTS

To perform a PBA involving the purchase of capital equipment, it is necessary to be able to express the cost of owning the equipment on an annual basis, by taking into account the expected lifetime of the equipment. Working on a yearly basis facilitates the analysis of complex systems that may be made up of multiple components with different expected lifetimes.

Factors to consider when analyzing a single component are outlined in the table below.

Component Name:		
a.	Initial Capital Investment	\$0.00
b.	Installation Cost	\$0.00
c.	Useful Life, Years	0
d.	Salvage Value	\$0.00
e.	Lost Opportunity Cost	0.05
f.	Average Investment $(a+b+d)/2$	\$0.00
g.	Annual Interest Charge $(e \times f)$	\$0.00
h.	Annual Depreciation, linear	\$0.00
i.	Annual Preventative Maintenance	\$0.00
j.	Annual Repairs Over Useful Life	\$0.00
k.	Annual Utility Cost	\$0.00
l.	Annual Labor Hours	0.0
m.	Labor Rate, all costs	0
n.	Annual Labor Costs $(l \times m)$	\$0.00
Total Annual Cost for Component: (g+h+i+j+k+n)		\$0.00

Initial Capital Investment: The purchase price of the equipment which may include shipping, engineering services or any other costs associated with procurement.

Installation cost: The cost to install the equipment (labor of installation, rental of specialized equipment for installation, etc.)

Useful life: An estimate of the service life of the equipment. The useful life can be determined from past experience with similar equipment, industry practice, or manufacturer recommendations. Typically equipment has a useful life of between 3 to 20 years.

Salvage value: The expected amount of money that could be realized from selling the equipment at the end of the service life. Scrap or other value.

Interest on investment: The cost of borrowing to pay for the equipment, i.e. the cost of capital.

Annual Depreciation, linear: The value of the asset divided by the useful life. From the table at the left it is the value of the asset (a + b) less the salvage value (d) divided by the useful life (c).

Annual preventive Maintenance: Costs of maintaining the equipment (labor and parts) over the course of a year.

Annual Repairs over Useful Life: An estimate of the cost of major repairs (not routine maintenance) expected during the lifetime of the equipment, divided by the useful life.

Annual Utility cost: Cost of providing utilities to the equipment over the year (electricity, fuel, etc.).

Annual Labor Costs: Costs associated with operating the equipment (not including maintenance/repair).

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