Minimum yield to break even

This calculations is only focusing on costs of only glucose or acetate and revenue of poly(3-hydroksybutyrate). We would not focus on capital investment costs, running costs, employments costs and all of the other costs related to functioning business.

Current price of poly(3-hydroksybutyrate) (P3HB): 6.8 USD/kg

P3HB price per ton:

6.8 USD/kg * 1000kg/1 ton = 6800 USD/ ton

We are assuming, that our maximum capabilities of production will be 2 ton/year. The selling price for 2 ton will be:

6800 USD/ton * 2 ton = 13600 USD

The amount of glucose we can buy for 13600 USD/year will be:

13600 USD : 645 USD/ton = 21.08527 ton

The amount of acetate we can buy for 13600 USD/year will be:

13600 USD : 1456 USD/ton = 9.34066 ton

Minimal yield, that we have to achieve to break even, if we bought consequently 21.08527 ton of glucose and 9.34066 of acetate to produce 2 tons of P3HB.

Minimal yield for glucose:

2 ton : 21.08527 ton = 0.094852947

Minimal yield for acetate:

2 ton : 9.34066 ton = 0.214117631

Changing the maximum yield unit to mmol/mmol:

Converting P3HB from ton unit to mmol:

2 ton = 2000000 g

2000000 g : 104.74 g/mol = 19094.90166 mol

Converting mol to mmol:

19094.90166 mol * 1000 mmol/mol = 19094901.66 mmol

2 ton of P3HB corresponds to 19094901.66 mmol.

Converting glucose from ton unit to mmol:

21.08527 ton = 21085270 g

21085270 g / 180.156 g/ mol = 117038.9551 mol

117038.9551 mol * 1000 mmol/ mol = 117038955.1 mmol

21.08527 ton of glucose corrsponds to 117038955.1 mmol

Converting acetate from ton unit to mmol:

9.34066 ton = 9340660 g

9340660 g/ 59.04 g/ mol = 158209.0108 mol

158209.0108 mol * 1000 mmol/ mol = 158209010.8 mmol

9.34066 ton of glucose corrsponds to 158209010.8 mmol

Calculating the minimum yield in mmol/mmol

For glucose:

19094901.66 mmol / 117038955.1 mmol = 0.16315

For acetate:

19094901.66 mmol/ 158209010.8 mmol = 0.120694

In conclusion the minimum yield for break even in glucose is 0.16315 mmol P3HB/ mmol glucose and the minimum yield for break even in acetate is 0.120694 mmol P3HB/ mmol acetate.