Fermentative production of butyric acid from wheat straw: Economic evaluation

The economic feasibility of biochemical conversion of wheat straw to butyric acid was studied in this work. Basic process steps included physicochemical pretreatment, enzymatic hydrolysis and saccharification, fermentation with in-situ acids separation by electrodialysis and product purification. Two scenarios (S1 and S2) were examined assuming a plant with an annual capacity of 10,000 tonnes of product installed in India (due to significantly lower feedstock prices). S1 resulted in a product of 89% butyric acid mixed with acetic acid and S2 produced butyric acid of 99% purity. Unit production cost was estimated at 2.75 and 3.31 $ per kg product for S1 and S2 respectively. The main part of production cost was attributed to steam for the purification step and electricity for the in-situ acids separation. This unit production cost combined with an estimated butyric acid selling price (year 2014) at 3.50 and 3.95 $ per kg product (for S1 and S2 respectively) and a plant capacity of 10,000 tonnes indicated an internal rate of return of 14.92% and 12.42% and payback time of 4.28 and 4.70 years for S1 and S2 respectively. Sensitivity analysis showed that under the assumptions of the present study the optimum plant capacity would lie between 10,000 and 15,000 tonnes of product per year.

General information
Publication status: Published
Organisations: Department of Chemical and Biochemical Engineering, Center for BioProcess Engineering, PILOT PLANT, Aalborg University
Pages: 68-80
Publication date: 2017
Peer-reviewed: Yes

Publication information
Journal: Industrial Crops and Products
Volume: 104
ISSN (Print): 0926-6690
Ratings:
BFI (2017): BFI-level 2
Scopus rating (2017): CiteScore 4.19 SJR 1.091 SNIP 1.691
Web of Science (2017): Impact factor 3.849
Web of Science (2017): Indexed yes
Original language: English
Keywords: Butyric acid, C. tyrobutyricum, Economic analysis, Electrodialysis, Fermentation, Wheat straw
Electronic versions:
Accepted Manuscript_Fermentative_production_of_butyric_acid_from_wheat_straw.pdf. Embargo ended: 25/04/2019
DOIs:
10.1016/j.indcrop.2017.04.008
Source: FindIt
Source ID: 2358009884
Research output: Contribution to journal › Journal article – Annual report year: 2017 › Research › peer-review