



ARCTIC HEALTH

*An information portal to issues affecting the health and well-being
of our planet's northernmost inhabitants*

Process considerations and economic evaluation of two-step steam pretreatment for production of fuel ethanol from softwood.

<https://arctichealth.org/en/permalink/ahliterature9373>

Author: Anders Wingren
Johanna Söderström
Mats Galbe
Guido Zacchi

Author Affiliation: Department of Chemical Engineering, Lund University, P.O. Box 124, SE-221 00 Lund, Sweden.

Source: Biotechnol Prog. 2004 Sep-Oct;20(5):1421-9

Language: English

Publication Type: Article

Keywords: Bioreactors - economics - microbiology
Computer simulation
Conservation of Energy Resources - economics - methods
Cost-Benefit Analysis - methods
Ethanol - chemistry - economics - metabolism
Industrial Microbiology - economics - methods
Models, Biological
Models, Econometric
Research Support, Non-U.S. Gov't
Saccharomyces cerevisiae - metabolism
Steam
Sweden
Technology Assessment, Biomedical - methods
Wood

Abstract: To increase the overall ethanol yield from softwood, the steam pretreatment stage can be carried out in two steps. The two-step pretreatment process was evaluated from a techno-economic standpoint and compared with the one-step pretreatment process. The production plants considered were designed to utilize spruce as raw material and have a capacity of 200,000 tons/year. The two-step process resulted in a higher ethanol yield and a lower requirement for enzymes. However, the two-step process is more capital-intensive and has a higher energy requirement. The estimated ethanol production cost was the same, 4.13 SEK/L (55.1 cent /L) for both alternatives. For the two-step process different energy-saving options were considered, such as a higher concentration of water-insoluble solids in the filter cake before the second step, and the possibility of excluding the pressure reduction between the steps. The most optimistic configuration, with 50% water-insoluble solids in the filter cake in the feed to the second pretreatment step, no pressure reduction between the pretreatment steps, and 77% overall ethanol yield (0.25 kg EtOH/kg dry wood), resulted in a production cost of 3.90 SEK/L (52.0 cent /L). This shows the potential for the two-step pretreatment process, which, however, remains to be verified in pilot trials.

PubMed ID: 15458326 [View in PubMed](#) 