

**Total proton flux and balancing in genome-scale models: The case for the updated model of**

***Clostridium acetobutylicum* ATCC 824**

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Thesis submitted to the faculty of the  
Virginia Polytechnic Institute and State University  
in partial fulfillment for the requirements for the degree of  
Master of Science  
in  
Biological Systems Engineering

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August 5, 2011

Blacksburg, Virginia

**Keywords: genome-scale modeling, proton balancing, *Clostridium acetobutylicum*, biofuels, acidogenesis, solventogenesis, P/O ratio**

**Draft 09/01/2009**

(Questions? Concerns? Contact Gail McMillan, Director of the Digital Library and Archives at Virginia Tech's University Libraries: [gailmac@vt.edu](mailto:gailmac@vt.edu))

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