

## Accepted Manuscript

Title: Dynamic behaviour of stirred tank bioreactors based on structured and unstructured kinetic models. A comparative study

Author: Wojciech S. Stryjewski Bolesław Tabiś Dominika Boroń



PII: S0263-8762(15)00370-6  
DOI: <http://dx.doi.org/doi:10.1016/j.cherd.2015.09.018>  
Reference: CHERD 2029

To appear in:

Received date: 29-4-2015  
Revised date: 9-9-2015  
Accepted date: 23-9-2015

Please cite this article as: Stryjewski, W.S., Tabiś, B., Boroń, D., Dynamic behaviour of stirred tank bioreactors based on structured and unstructured kinetic models. A comparative study, *Chemical Engineering Research and Design* (2015), <http://dx.doi.org/10.1016/j.cherd.2015.09.018>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

DYNAMIC BEHAVIOUR OF STIRRED TANK BIOREACTORS BASED ON  
STRUCTURED AND UNSTRUCTURED KINETIC MODELS.  
A COMPARATIVE STUDY

Wojciech S. Stryjewski\*, Bolesław Tabiś and Dominika Boroń

Department of Chemical and Process Engineering, Cracow University of Technology,  
ul. Warszawska 24, 31-155 Kraków, Poland

**Highlights**

- Dynamic responses of CSTBR based on different kinetic models are compared.
- Effect of shock loading, linear and sinusoidal disruptions are analysed.
- Driving force of microorganism adaptation process is modelled.
- Evolution of stiffness ratio of the system is visualised and assessed.

**Abstract**

A one-parameter structured kinetic model was applied to a description of continuous stirred tank bioreactor (CSTBR) dynamics. A qualitative comparative analysis of the dynamic responses of the CSTBR to changes of carbonaceous substrate concentration and mean residence time of the liquid phase was conducted. Step change, linear and sinusoidal functions were used as external forcing both for structured and unstructured (Monod and Haldane) kinetics. A method which describes the physiological state of microorganisms was proposed for determining the adaptation time of microorganisms based on the time dependencies of intercellular compound concentrations. The thesis that microorganism adaptation time can be determined based on the numerical properties of CSTBRs mathematical models was put forward.

**Keywords**

stirred tank bioreactor, dynamic behaviour, structured kinetics, adaptation process, stiffness ratio

---

\* Author to whom correspondence should be addressed. E-mail: wstryjew@gmail.com

Download English Version:

<https://daneshyari.com/en/article/7007201>

Download Persian Version:

<https://daneshyari.com/article/7007201>

[Daneshyari.com](https://daneshyari.com)