

## Sample of English Editing Level 2

**Field: Water management and microbiology**

**Topic: Community dynamics of Methanomicrobials,  
Methanosarcinales and Methanobacteriales associated with  
different loading rates**

### 1. Introduction

~~In~~ During anaerobic digestion, crude organic matters ~~are~~ is converted to ~~their monomers~~, short chained volatile fatty acids (VFAs) ~~and~~ along with hydrogen ~~and~~ and carbon dioxide. These substrates can then be converted to methane ~~by~~ through the activity of a complex microbial consortium consisting of hydrolytic/fermentative acidogenic bacteria, acid-oxidizing bacteria and methanogenic archaea (Schink, 1988). Due to their different growth requirement and kinetics, a two-stage anaerobic digestion (AD) process has been proposed ~~for an enhanced performance~~ to improve performance by providing different operational conditions ~~for each~~ in two reactors; one for acidogens and the other for methanogens (Ghosh et al., 1987; Demirer and Chen, 2005). ~~No matter~~ Regardless of what the types of AD process, ~~however~~, methanogens play a key role ~~in an overall process~~ since the final methanogenic step affects the ~~final~~ stabilization of organic matters (Mladenovska et al., 2003). Methanogens are also of great interest to researchers due to their unique physiological characteristics (e.g., low growth rate, high

susceptibility to external conditions and limited substrate utilization range), which ~~make-render~~ the whole process sensitive to environmental changes (Hori et al., 2006; Lee et al., 2009b). Variations of operational conditions such as hydraulic retention time (HRT), substrate composition and concentration ~~would-can~~ result in ~~variance-variability~~ in composition of trophic levels ~~and~~; thus influence ~~the-entire~~ methanogenic community ~~structure-and-population~~ dynamics. Therefore, ~~the-an~~ understanding of the ~~methanogens'~~ community structure and population dynamics ~~of~~ ~~methanogens~~ in anaerobic processes ~~is~~ an important requirement for effective operation and reliable control of anaerobic reactors.

**Comment [JN1]:** CHECK: By 'population', do you mean 'population levels'?

In a continuous mode of bioreactor operation, microbial growth is affected by HRT ~~or-given~~ (~~the inverse of the flow rate~~), ~~Tand-he~~ different microbial growth stages (~~i.e.~~, lag, exponential, stationary, and decay ~~stages~~) can be correlated with different HRTs (Shuler and Kargi, 2002). The growth stage of methanogens, for example, is likely to be in ~~the~~ decay phase at long HRTs, where the residual substrate concentration is low. When HRT ~~consecutively~~ decreases, growth rates of microorganisms increases and shows ~~ai~~s maximum ~~near-at~~ close to the washout point (Shuler and Kargi, 2002; Madigan et al., 2003). ~~Consequently,~~ ~~This shows that the~~ diversity of methanogens in ~~the-a~~ bioreactor ~~would-greatly-be~~ would be greatly affected by HRT change because anaerobic digestion usually involves many different

**Comment [JN2]:** CHECK: Please ensure this edit retains your intended meaning: 'the inverse of the flow rate' as an alternate explanation for HRT.

methanogenic species with different ~~ee~~ growth kinetic properties (Yu et al., 2002; Lee et al., 2009a).

Flow rate also affects the loading rates of substrate and as well as other components in the wastewater to the microbial growth microorganisms, ~~and t~~ This would affect microbial diversity based depending on their positive ~~and~~ or negative effects of the chemicals on the target microorganisms. ~~Loading increase~~ Increasing the concentrations of bio-energetically favorable ~~edable~~ substrates, such as acetic acid, ~~for example~~, would be beneficial for methanogenic growth up to a certain level. ~~However~~, On the other hand increased loading ~~increase~~ of ammonia may be inhibitory due to its toxicity (Hansen et al., 1998; Fujishima et al., 2000).

**Comment [BK3]:** CHECK: Please check that this phrase is correct. Did you mean '...other components in the wastewater which in turn affects microbial growth'?