

# The use of hydrodynamic disintegration as a means to improve anaerobic digestion of activated sludge

**A Machnicka\*, K Grúbel and J Suschka**

*University of Bielsko-Biala, 43-300 Bielsko-Biala, ul Willowa 2, Poland*

## Abstract

Disintegration by hydrodynamic cavitation has a positive effect on the degree and rate of sludge anaerobic digestion. By applying hydrodynamic disintegration the lysis of cells occurs in minutes instead of days. The intracellular and extracellular components are set free and are immediately available for biological degradation which leads to an improvement of the subsequent anaerobic process. Hydrodynamic disintegration of the activated sludge results in organic matter and a polymer transfer from the solid phase to the liquid phase, and an increase in COD value of  $284 \text{ mg}\cdot\ell^{-1}$  was observed, i.e. from  $42 \text{ mg}\cdot\ell^{-1}$  to  $326 \text{ mg}\cdot\ell^{-1}$ . In addition the degree of disintegration changed from 14% after 15 min disintegration to 54% after 90 min of disintegration.

A disruption of bacterial cells by hydrodynamic cavitation has a positive effect on the degree and rate of excess sludge anaerobic digestion. The cells of the activated sludge micro-organisms rupture and addition to the digestion process leads to increased biogas production. The hydrodynamic disintegration of activated sludge leads to a higher degree of degradation and higher biogas production. Adding the disintegrated sludge (10%, 20% and 30% of volume) to fermentation processes resulted in an improvement in biogas production of about 22%, 95% and 131% respectively.

**Keywords:** anaerobic digestion, hydrodynamic disintegrations, cavitations, biogas