"Gheorghe Asachi" Technical University of Iasi, Romania

VALIDATION OF A KNOWLEDGE-BASED RISK MODEL FOR BIOLOGICAL FOAMING IN ANAEROBIC DIGESTION SIMULATION

Jordi Dalmau[1], Joaquim Comas[1], Ignasi Rodríguez-Roda[1,2]*, Eric Latrille[3], Jean-Philippe Steyer[3]

[1]*University of Girona, Faculty of Sciences, Laboratory of Chemical and Environmental Engineering (LEQUIA), Campus Montilivi s/n, 17071 Girona, Catalonia, Spain.*
[2] *Catalan Institute for Water Research (ICRA), H2O Building, Scientific and Technological Park of the University of Girona, Emili Grahit 101, E- 17003 Girona, Spain.*
[3] *French National Institute for Agricultural Research, UR050 Laboratory of Environmental Biotechnology, Avenue des Étangs, 11100 Narbonne, France.*

Abstract

Anaerobic digestion (AD) is a complex biological system which can be affected by several operational problems. Among them, biological foaming is one of the most difficult to deal with. It has many effects, such as causing gas pipe clogging and probe failures, and it can affect mixing devices, etc. Since the mechanisms involved in biological foaming development are not fully understood, it is not included in standard anaerobic digestion models. For this reason, a knowledge-based risk model to determine the suitable conditions for the development of biological foaming during AD simulation was developed. The resulting knowledge-based system, based on organic loading rate (OLR) and its daily variation, was experimentally validated using real data from a fully instrumented pilot plant (1 m^3 upflow fixed bed digester). Results show a good correlation between the knowledge-based risk model and the estimated biological foaming risk from real data.

Key words: anaerobic digestion, foaming, fuzzy logic, knowledge-based systems, validation

* Author to whom all correspondence should be addressed: email: irodriguezroda@icra.cat, Phone: (+34) 972 18 33 80, Fax: (+34) 972 18 32 48.