



Jyvaskyla Summer School 2013

Sponsored by FP7 VALORGAS project www.VALORGAS.soton.ac.uk

RE1: Biogas Technology for Renewable Energy Production and Environmental Benefit

Programme Overview

	Monday	Tuesday	Wednesday	Thursday	Friday
09:00-10:00	Introduction	Lecture 5	Lecture 8	Lecture 13	Lecture 18
10:00-11:00	Lecture 1	Lecture 6	Lecture 9	Lecture 14	Lecture 19
11:00-11:30	Coffee	Coffee	Coffee	Coffee	Coffee
11:30-12:30	Lecture 2	Lecture 7	Lecture 10	Lecture 15	Examination
12:30-13:30	Lunch	Lunch	Lunch	Lunch	
13:30-14:30	Lecture 3	Visit to Kalmari farm	Lecture 11	Lecture 16	
14:30-14:45	Coffee		Coffee	Coffee	
14:45-15:45	Lecture 4		Lecture 12	Lecture 17	
15:45-16:00	Discussion		Discussion	Discussion	

Detailed programme, lecturers and syllabus

Monday Aug 12th

Introduction to anaerobic digestion

Introduction to the course, Dr Prasad Kaparaju

Lecture 1 - Anaerobic digestion fundamentals I, Cristina Cavinato (1)

Syllabus: fundamentals of microbiology, biochemistry, steps of AD

Lecture 2 - Anaerobic digestion fundamentals II, Yue Zhang (1)

Syllabus: thermodynamics of AD, theoretical biogas production, Buswell formula, energy units etc.....

Lecture 3 - Monitoring and lab analysis - assays, David Bolzonella (1)

Syllabus: stability parameters (pH, alkalinity, VFA, biogas production and composition...), BMP assays

Lecture 4 - Introduction to AD engineering I, Michael Chesshire (1) and Reinhold Waltenberger (1)

Syllabus: reactors sizing, reactors types, plants components, mixing, heating ...

Student introductions

Tuesday Aug 13th

Introduction to anaerobic digestion

Lecture 5 - Introduction to AD engineering II, Michael Chesshire (2)





Syllabus: gas storage, energy conversion and internalization of energy through CHP or direct heat; mass and energy balances ...

Anaerobic digestion of energy crops

Lecture 6 - Energy crops anaerobic digestion: crops, ensiling and pre-treatment, Reinhold Waltenberger (2)

Syllabus: crops types, crops production, ensiling techniques, crops pre-treatments ...

Lecture 7 - Anaerobic digestion of energy crops: European case studies I, Cristina Cavinato (2)

Syllabus: different case studies from Italy, Austria, UK ... the effect of subsidies as "drivers", different crops, different reactors and CHP units characteristics, co-treatment with manure

Visit to Kalmari farm (all lecturers present)

Wednesday Aug 14th

Anaerobic digestion of waste

Lecture 8 - Matching process design to feedstock characteristics, Cristina Cavinato(3)

Syllabus: Influence of collection schemes on biowaste characteristics and pre-treatment technologies and machines (shredding, sieving, wet/dry refining) From simple direct feed source segregated feedstocks to complex 'dirty' materials reclamation facilities (MRF) for OFMSW recovery prior to adding to the digester. Design of MRF and equipment selection and function.

Lecture 9 - AD of food waste: from pilot to demo to full scale; Michael Chesshire (3)

Syllabus: anaerobic digestion of food waste, material characteristics and preparation, results from previous studies up to the full scale realization

Lecture 10 - Supporting research for successful food waste AD, Yue Zhang (2)

Syllabus: results from research on trace elements addition and ammonia removal in AD of FW

Lecture 11 - Mechanical pre-treatment processes for residual wastes, David Bolzonella (2)

Syllabus: Types of pre-treatment, screens, mills drums, magnetic and eddy current separators, de-packaging equipment etc

Lecture 12 - Examples in Europe of 'wet' and 'dry' anaerobic digestion processes for residual wastes, Reinhold Waltenberger (3)

Syllabus: Wet and Dry AD systems, process descriptions, case studies including mass and energy balances

Thursday Aug 15th

End uses, economics, and life cycle assessment

Lecture 13 - Energy balances from anaerobic digestion, Yue Zhang (3)



Syllabus: energy balances and system boundaries

Lecture 14 - Economics of anaerobic digestion, Michael Chesshire (4)

Syllabus: analysis of the economic aspects of AD

Lecture 15 - Biogas upgrading, Prasad Kaparaju (1)

Syllabus: biogas up-grade for different uses

Lecture 16 - Digestate quality, standards and nutrient recovery potential, Cristina Cavinato (4)

Syllabus: overview on digestate quality depending on feed characteristics, regulations in different European Countries, brief overview of technologies for nutrients recovery, biological nitrogen removal

Lecture 17 - Biogas - An industrial perspective, Reinhold Waltenberger (4)

Syllabus: practical issues in building, commissioning and running AD plants: perspectives from a professional

Friday Aug 16th

Lecture 18 - Life cycle assessment, Yue Zhang (4)

Syllabus: principles and review of life cycles assessment applicable to AD

Lecture 19 - Biogas - A world overview, David Bolzonella (4)

Syllabus: panoramic overview of AD with photos from AD from all over the world, analysis of different market drivers

Examination

A multiple choice test consisting of about 60 questions based on the content of the lectures