UNIVERSITY OF BORÅS

Process Design - Energy Carrier Production

Processdesign - Produktion av energibärare

15 credits

Ladok Code: A500TA
Version: 9.0
Established by: Committee for Education in Technology 2015-11-20
Valid from: Spring 2016

Education Cycle: Second cycle
Main Field of Study (Progressive Specialisation): Energy Technology (A1F)
Disciplinary Domain: Technology
Prerequisites: Meets the requirements for admission to the Master's programme in Resource Recovery
Subject Area: Environmental Science
Grading Scale: Seven-degree grading scale (A-F)

Content

The course gives students the opportunity to design a process to meet a specific need. The context is mainly technical energy aspects with various preconditions regarding heating needs in a district heating network and access to different types of fuels. It is partly a matter of putting together different processes that meet the underlying needs but simultaneously maintaining a reasonable price point. To achieve this, a lecture series contains a description of different parts of the processes (e.g. pumps and turbines) and how these should be integrated (specifically, this applies to energy integration with a focus on heat exchanger networks) together with methods for making cost estimates for each process's equipment and for the processes as a whole. In addition, there are also elements that review basic concepts in thermodynamics to increase students' understanding and to describe the efficiency of the process (based on both energy and exergy). In addition, a process calculation program is used to facilitate calculations of material and energy balances while enabling the handling of larger systems and the ability to carry out improvements and tests of various operating modes.

Learning Outcomes

After completing the course, the student should be able to:

1 . Knowledge and understanding
1.1 explain how the most important parts of energy technology systems work
1.2 make a cost estimate regarding investment and operating costs
1.3 present a larger project and make it understandable to a wider target audience
1.4 explain the different parts of an energy cogeneration system from a thermodynamic perspective

2. Skills and abilities
2.1 use a commercial software program to design the individual components in an energy technology system
2.2 Combine individual components into a larger system
2.3 Apply techniques to optimise and design a heat exchanger network
2.4 Plan and organise a technical energy system where there is a need for both electricity and heat
2.5 Compare and explain differences in different operating modes in an technical energy system that corresponds to different production needs

3. Evaluation ability and approach
3.1 analyse and assess a system, plant, or part of an energy recovery plant, from an economic, technical, and environmental point of view, including comparisons with other solutions.

Forms of Teaching

The teaching consists of lectures and exercises as well as project work with oral and written presentations. Teaching is conducted in English.

The language of instruction is English.

Forms of Examination

The course will be examined through the following examination elements:

Assignements, seminars
Learning outcomes:
Credits: 5
Gradingscale: Seven-degree grading scale (A-F)

Learning outcomes:
Credits: 7
Gradingscale: Seven-degree grading scale (A-F)

Examination
Learning outcomes:
Credits: 3
Gradingscale: Seven-degree grading scale (A-F)

The course is examined through the following examination components:

- Project work - Learning outcomes 1.2, 1.3, 2.1, 2.2, 2.4, 2.5, 3.1 7 Grading scale: E7
- Assignments, seminars - Learning outcomes 1.2, 1.4, 2.1, 2.2, 2.3 5 Grading scale: E7
- Examination - Learning outcomes 1.1, 1.2, 1.4, 2.3, 2.5 3 Grading scale: E7

  Grades for the exam together with the project work and the assignments determine the final grade for the course. The project work is assessed both individually and as part of the group.

Student rights and obligations at examination are in accordance with guidelines and rules for
the University of Borås.

Literature and Other Teaching Materials

Literature

The economic analysis and design of processes are based on:
Turton R.,Richards C B, Wallace B W och Shaeiwitz J A,
(2009) "Analysis, Synthesis and Design of Chemical Processes", Prentice Hall 3rd edition, ISBN 0135129664
and
Sinnott R K "Chemical Engineering design", (volume 6, 4:th edition). This volume is also available as electronic resource.
In addition, there will be distributed material.

Student Influence and Evaluation

The Dean of Faculty is responsible for ensuring that students' views on the education are systematically and regularly collected. The results of the evaluations are made available to the students and will form the basis of the course's future design.

Miscellaneous

The course is primarily intended for students in the Master's programme Resource Recovery.
The course builds upon the courses Resource Recovery, Energy Recovery Processes, and Thermal Energy Recovery.
This syllabus is a translation from the Swedish original