UNIVERSITY OF BORÅS

Process Design - Energy Carrier Production

Processdesign - Produktion av energibärare

15 credits
15 högskolepoäng

Ladok Code: A500TA
Version: 5.0
Established by: Utskottet för utbildningar inom teknik 2015-11-20
Valid from: Spring 2016

Education Cycle: Second cycle
Main Field of Study (Progressive Specialisation): Energy Technology (A1F)
Disciplinary Domain: Technology
Prerequisites: Fulfills the demand for admission to the master program Resource Recovery.
Subject Area: Environmental Science
Grading Scale: Seven-degree grading scale (A-F)

Content

This course will give the students a possibility to design a heat and power process to fulfill a specific purpose. Primarily, energy aspects with different needs considering heat demand in a heating network and access to different fuels are considered. The task is to perform the design of several sub processes to meet the demands and at the same time keep a reasonable price level. To achieve this task, there will be a series of lectures that contains description of different operations (e.g. pumps, filtration and turbines) and how they could be integrated (specifically this concerns energy integration with a focus on heat exchanger network) together with methods for cost estimations of specific process parts and the whole process. In addition, there will be lectures in fundamental aspects of thermodynamics as a base to discuss and to determine the process efficiency from an energy and exergy point of view. Process simulation software is used to facilitate the heat and mass balance calculations in larger systems and to investigate different operating conditions to improve the initial design.

Learning Outcomes

After completing this course, students must be able to:
1. Knowledge and understanding
1.1. Describe the most important parts in heat and power systems
1.2. Perform a cost estimation of a designed heat and power process regarding investment and running cost
1.3. Present a larger project and make it understandable for a wider audience
1.4. Explain the different parts in a heat and power system from a thermodynamic perspective
2. Skill and ability
2.1. Apply a commercial flowsheeting software to design separate components in a heat and power system
2.2. Combine individual components to a larger system
2.3. Design and optimize a heat exchanger network
2.4. Plan and organize a heat and power system to meet a specific demand
2.5. Compare and explain differences in operating conditions within a heat and power system corresponding to different production demands
3. Assessment and attitude
3.1. Analyze and assess a full system, a process plant or a combination of several components considering a heat and power need from economic, technical and environmental perspective which includes comparisons with other solutions

Forms of Teaching

The teaching will be in the form of lectures and exercises together with hand-in assignments and project work with oral and written presentations.

The language of instruction is English.

Forms of Examination

Examination of the course occurs through:

- 7 Gradingscale: E7
- Assignements, seminars 5 Gradingscale: E7
- Examination 3 Gradingscale: E7

The course is examined by the following examination
• Project work – learning outcomes 1.2, 1.3, 2.1, 2.2, 2.4, 2.5 and 3.1.- 7 hec Grading Scale (A-F)
• Hand-in assignments and seminars – Learning outcomes 1.2, 1.4, 2.1, 2.2 and 2.3 - 5 hec Grading Scale (A-F)
• Written exam – Goals 1.1, 1.2, 1.4, 2.3, 2.5 - 3 hec Grading Scale (A-F)
The grade on the exam together with the grades on the assignments and project work will determine the final grade of the full course. The project work is graded both individual and as a part in a group.

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

Literature and Other Teaching Methods

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 and the course coordinator are responsible that the evaluation is performed in line with the above description.
The course evaluation report is given to the participants and will be the basis for future course developments.

Miscellaneous

The course is included in the Master program Resource Recovery and is based on the courses: Resource recovery, Energy Recovery Processer and Thermal Energy Recovery.
This syllabus is a translation from the Swedish original