

Procesveiligheid: reactortechnologie, intrinsieke gevaren en gevarenanalyse voor procesveiligheid (E073770)

Cursusomvang (nominale waarden; effectieve waarden kunnen verschillen per opleiding)

Studiepunten 3.0

Studietijd 90 u

Aanbodsessies in academiejaar 2024-2025

A (semester 1)

Engels

Gent

Lesgevers in academiejaar 2024-2025

Van Steenberge, Paul

TW11

Verantwoordelijk lesgever

Edeleva, Mariya

TW11

Medelesgever

Aangeboden in onderstaande opleidingen in 2024-2025

stptn

aanbodsessie

Onderwijstalen

Engels

Trefwoorden

Reactor technology, chemical process safety, hazard analysis, intrinsic hazards, scaling-up, runaway

Situering

Historic and recent incidents in the (petro) chemical and pharmaceutical industry indicate that awareness and knowledge of chemical process safety should be raised. This specialized course offers an in-depth treatise of chemical process safety to the student, both for a batch process as for a continuous process. This summer course aims to complement the existing obligatory course Safety, Health and Environmental Management with a more profound treatment of chemical process safety in particular. This course illustrates the multidisciplinary nature of chemical process safety, combining theory and application, illustrated by some milestone industrial case studies.

This summer course is organized in collaboration with essenscia, the Belgian umbrella organization for the chemical and life sciences industry. This course is limited to 15 UGent students and 15 attendants from chemical industry, aimed at acquiring hands-on experience in specifically tackling design problems related to intrinsic chemical reactivity measurement, scaling-up and safe reactor/process design/operation.

Hazard and operability analysis is the cornerstone of reliable operations, process safety engineering and process safety management. This course elaborates on the theoretical foundations and insights coupled with practical applications and hazard exercises of different types of reactors and related chemicals.

During the first day we focus on the characterization of the hazardous products and insight in the reactions proceeded by an introduction on HAZOP and ending with the important features of P&ID's. Processes and scaling up are part of the subject matter.

The second day introduces reactor modelling on isothermal and non-isothermal ideal reactors followed by the implementation of the HAZOP methodology in the process safety management of a major chemical company. A practical insight and exercise on pre-reactor installations is part of the afternoon sessions.

The third day applies the reactor concepts of the second day to industrial cases involving run-away, ignition, extinction, multiplicity and hot-spots followed by a practical illustration of the use of a HAZOP study on an industrial batch reactor.

The fourth day starts with a practical illustration of the use of a HAZOP study on an

industrial continuous reactor followed by a HAZOP workshop exercise on a industrial continuous reactor.

Inhoud

Day 1: Intrinsic hazards of molecules and introduction to HAZOP, P&ID

1. Welcome speech: Why to start with hazard analysis? (MSc. Geert Boogaerts, essenscia)
2. Introduction to HAZOP: Essential features of the most important technique (MSc. Geert Boogaerts, essenscia)
3. Introduction to reactive chemistry: Essential insights (PhD. Wim Dermaut, AGFA-Gevaert)
4. Reactive chemistry and process hazard analysis: Design in function of the desired and undesired reaction (Phd. Wim Dermaut)

Day 2: Theoretical foundations of reactors and HAZOP analysis

1. HAZOP and the practical implication in our industry: Integration of HAZOP in the PHA and PSM (MSc. Olivier De Waele, Eastman)
2. HAZOP/ WHAT-IF on the pre-reactor installations: Practical explanation and exercise (MSc. Geert Vercruysse, BASF)

Day 3: Theoretical foundations of batch reactors and HAZOP analysis

1. Piping and instrumentation diagrams: Essential features of the most important tool (Prof. Eveline Volcke, UGent)
2. HAZOP and safeguarding of a batch reactor: A practical illustration (by MSc. Koen Gerard, Covestro)
3. From HAZOP to LOPA: the ultimate goal: Layer Of Protection Analysis (MSc. Nico Hertoghe, Exxon)
4. HAZOP and batch reactors: Principles and exercise (PhD. Peter Heffer)
5. A demonstrator case for mechanical recycling of polyolefins (MSc. Bart Van Den Bossche, INEOS & PhD. MSc. Thomas Pintelon, Polinivo)

Day 4: HAZOP on continuous reactors

1. HAZOP and continuous reactors: A real life example (Maarten Bekaert, Borealis)
2. HAZOP and continuous reactors: An exercise in real time (MSc. Geert Vercruysse, BASF)

Begincompetenties

Basic knowledge of the design and operation of chemical reactors and plants/processes.

Eindcompetenties

- 1 Understanding the importance of P&IDs and knowing the essential elements and symbols of P&IDs.
- 2 Identifying and measuring/characterizing the intrinsic reactivity hazards of reactive molecules (towards upscaling of reactive chemistry): testing equipment, methodology and important quantities.
- 3 Conducting a Hazard and Operability study for the most frequent reactor and process types.
- 4 Synthesizing elements of chemical process safety related to HAZOP
- 5 Understanding the relation and implications of the different types of chemical reactors (batch, semi-continuous, continuous reactor, pre-reactor,) & processes on HAZOP studies.
- 6 Identifying and understanding strengths and weaknesses of HAZOP studies in the chemical process industry.
- 7 Predicting the effect of changes in operating conditions on the operation of (catalytic) chemical reactors.

Creditcontractvoorwaarde

Toelating tot dit opleidingsonderdeel via creditcontract is mogelijk na gunstige beoordeling van de competenties

Examencontractvoorwaarde

Dit opleidingsonderdeel kan niet via examencontract gevolgd worden

Didactische werkvormen

Hoorcollege

Toelichtingen bij de didactische werkvormen

Lectures are organised in one of the first weeks of September.

Students need to enrol for this summer course in their curriculum of the following

academic year (e.g. course is followed in September 2020, enrolment for the course in AY 2020-2021).

The course is limited to 15 UGent students. Students who wish to register for this course, are required to contact the lecturer before the end of the summer recess (check the academic calendar online at <https://www.ugent.be/current-students/en/class-exam-exchange-intern/class-exam/academiccalendar>)

Studiemateriaal

Type: Slides

Naam: Slides gebruikt tijdens hoorcolleges

Richtprijs: Gratis of betaald door opleiding

Optioneel: nee

Taal : Engels

Aantal slides : 300

Oudst bruikbare editie : AJ 2023-2024

Beschikbaar op Ufora : Nee

Online beschikbaar : Nee

Beschikbaar in de bibliotheek : Nee

Beschikbaar via studentenvereniging : Nee

Bijkomende info: Slides worden uitgedeeld tijdens de zomerschool

Referenties

Vakinhoudelijke studiebegeleiding

Evaluatiemomenten

niet-periodegebonden evaluatie

Evaluatievormen bij periodegebonden evaluatie in de eerste examenperiode

Evaluatievormen bij periodegebonden evaluatie in de tweede examenperiode

Evaluatievormen bij niet-periodegebonden evaluatie

Mondelinge evaluatie, Participatie, Schriftelijke evaluatie, Werkstuk

Tweede examenkans in geval van niet-periodegebonden evaluatie

Examen in de tweede examenperiode is niet mogelijk

Toelichtingen bij de evaluatievormen

Written examination, retake is not possible.

Eindscoreberekening

Theorie 100% waarvan

Werkstuk/verslag: 50%

Mondeling examen: 50%