

iQVet-D3.1

Interactive Exchange Workshop for VET Professional Teacher Training Program

Interactive workshop Weld on Sweden

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**Wednesday 5th June 2024, 09:00-12:00
Hotel Residence Balaton, Siófok - Hungary**



Co-funded by the
Erasmus+ Programme
of the European Union

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Interactive workshop - Weld on Sweden Programme

- **WoS company presentation**
- **Developing training program for industry**
- **Pilot course SK2-WfD**

Design of fatigue loaded welded structures

- **Quality Standard acc. to Volvo Construction Equipment**
- **Analysis and optimization Apps for fatigue loaded joints**
- **Hand-on training: Competence units needed for Root Cause Analysis**



Vision

Contribute to industrial growth

Mission

Be a resource for competence development in welding

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Short term (up to 4 days) training courses in the field of

Welding production

- Productivity
- Quality Assurance
- Materials Technology
- Welding Technology

Design of welded structures – Basic to advanced levels

- Mathematics and strength of materials
- Design of welded products
- Weld evaluation using FEM
- Fatigue design of welded structures
- Advanced design of welded structures

IIW Approved Training Body for diploma training program for International Welded Structures Designer, IWSD

- International Welded Structures Designer at standard level, IWSD-S (12 days)
- International Welded Structures Designer at comprehensive level, IWSD-C (+9 days)



Implementation of R&D projects in collaboration with the welding industry

- On-line quality monitoring and of robotic welding
- Optimization of welding production and robotic welding process



University courses in welding technology for ordinary students

- 5 Credits, 7 weeks x 8 teaching hours (2 h in the morning, 2 h afternoon day 1 + 4 h day 3 each week)
- Project work, 20 hours
Time consuming and required a lot of communication between the teacher and the industry to find suitable project work as well as to supervise students.
- Laboratories: 12 hours practical try on welding incl. robotic welding and demonstrations
- Staff: 1 teacher and 1 laboratory instructor
- Number of students: 5-8

Industrial innovation process – Heavy Vehicles

Technology and competence development in cooperation with competitor manufacturers of Heavy Vehicles e.g. construction machinery, forest machinery, lift trucks...

Volvo CE
Kalmar Industries
Gremo
Dynapac
Atlas Copco Rock Drills
Rottne Industry
Svetruck
Ljungby Maskin
SP Maskiner
KoneCranes Lifftrucks



Benchmarking workshops at university for heavy vehicles - Cabins

- Exchange of experiences, good and bad solutions
- Specify subject and content of the knowledge needed to improve design, quality and productivity for welded products.



Benchmarking workshops at university for heavy vehicles - Chassis

- Exchange of experiences, good and bad solutions
- Specify subject and content of the knowledge needed to improve quality and productivity for design and production of welded products.



Dissemination of industrial project results to other companies

- Seminars, courses and implementation of consulting projects



Industrial projects, dissemination activities and teaching experiences resulted in

Understanding for industry's needs, requirements and conditions for competence development within welding.



Industry-adapted university courses in Welding Technology

- 7.5 Credits, 7 weeks x topic day (CU)
 - **Welding and cutting methods**, 2 days
 - **Materials and weld metallurgy**, 1 day
 - **Design of welded products**, 2 days
 - **Quality management and quality system for welding**, 1 day
 - **Robotic welding**, 1 day
- **Mixing students with industry participants**

Adaption of schedule to industry, one day a week during the course period to ease it for employees from industry to participate.
- **Project work**, 20 hours

Demands to industry participants to have a project suggestion from their own works for students and perform it together.

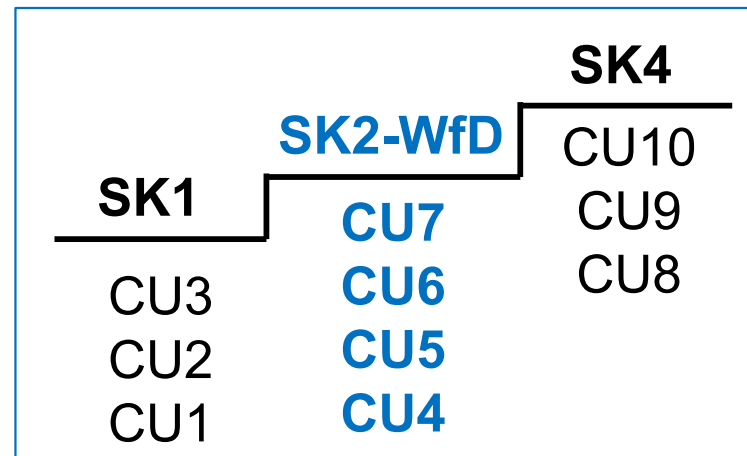
Many project work presented by participating companies and carried out by students.
- **Laboratories**: 12 hours practical try on welding incl. robotic welding and demonstrations
- **Stuff**: 5 teachers and 1 laboratory instructor
- **Number of participants**: 7-15 students and 10-30 from industry

Why are welding design competence needed?

70% of the costly corrective actions during the manufacturing processes comes from the design phase!

Basic courses for weld designers and calculation engineers

- **SK1:** Mathematic and the theory of strength of materials for welding designer
- **SK2-WfD:** Design of welded products with Welding for designers
- **SK4:** Weld evaluation using FEM for fatigue loaded structures



Competence units for welding design courses, 1 day each

- CU1: Mathematics for designers
- CU2: Basic of Strength of materials for designers
- CU3: Basic design theory
- **CU4: Welding for designers**
- **CU5: Basic of industrial design of welded products**
- **CU6: Design of static loaded welded products**
- **CU7: Design of welded products subjected to fatigue loads**
- CU8: Fatigue of welded structures
- CU9: Evaluation methods and comparison between different Design Codes.
- CU10: Fatigue life assessment, multiaxial stresses, and tutorial

Design of welded structures with Welding for designers, SK2-WfD

Based on Eurocodes and IIW recommendations

Target audience: Mechanical Designers and Calculation Engineers.

Duration: 2x2 days gatherings, with one/two weeks between gatherings.

Location: Weld on Sweden, Framtidsvägen 14, Växjö and TEAMS.

Teachers: M.Sc. Claes Olsson, Techstrat of Sweden and
M.Sc./IWE Ali Bahrami, WoS

Objective: To give the participants basic knowledge of modern methods to estimate the strength of welded joints subjected for both static and fatigue loads.

Prerequisites: Active mechanical designers with prior knowledge corresponding to at least 3-year upper secondary school level and basic knowledge in strength of materials.

Course literature: Design Handbook for welded steel products, Claes Olsson 2017 (ISBN-978-91-981529-1-3) and digital OH material (PDF).

Price: € 1 000 / CU

Design of welded structures with Welding for designers, SK2-WfD

Program

First meeting/gathering

Day 1: Welding for designers, WfD



Common welding methods (MMA, MIG / MAG, TIG, Submerged Arc Welding).
Choice of welding method. Materials and filler material for welding. Welding designations on drawing with exercise. Welding classes and inspection methods for welding. Design for automated welding.

Day 2: Basic design strategies for welded products.

Basic aspects on welded structures regarding material strength. Tips and suggestions for functional welded products. Design against corrosion. Examples.

Design of welded structures with Welding for designers, SK2-WfD

Program



Second meeting/gathering



Day 3: Design of welded structures subjected to static loads.

Residual stresses and weld deformations. Brittle fracture. Lamellar tearing. Design against static loads. Short about the instability of slender structures. Examples.

Day 4: Design of welded structures subjected to fatigue.

Background. The fatigue phenomenon in welded structures. Tips and suggestions. Design against fatigue. Examples.

Design of welded structures with Welding for designers, SK2-WfD

Public course with standard content or customized for company internal

- **Administration** of the course and communication with all involved persons is managed centrally by VET School (WoS)
- **Target students** are small groups of mechanical engineers and designers with very limited time for any other activities than their own daily business.
- **Planning and scheduling** together with teachers depending on market needs for standard course and with customers for company internal courses
- **Publication** of the course on school website and LinkedIn
- **Information and invitation** to the customers and target group by e-mail
- **Enrollment** of participants to the course is made by e-mail, phone calls or school website

Former participants who are managers nowadays often enroll their employees / new colleagues

Design of welded structures with Welding for designers, SK2-WfD

Public course with standard content or customized for company internal

- **Confirmation of registration** sends to participants by e-mail
- **A questionnaire** for assessing participants' prior knowledge and their design questions is attached with confirmation of registration
- **Assessment of the participants' prior knowledge** and review the students' questions together with the teachers to determine if the answer is found in the teaching material, or it can be prepared as an exercise or as a discussion question during the course.
- **Making digital teaching material available for students** by distribution of authorization to the course website.
- **Recommendation to self-study**/previewing the course material and recorded short welding videos.
- **Distribution of course book** to distance participants

Design of welded structures with Welding for designers, SK2-WfD

Public course with standard content or customized for company internal

- Implementation of the course**
- Evaluation of the course by students**
- Completion of course evaluations by school and assessment of the result together with the teachers to improve both the course and teaching material if needed.**
- Dissemination of course evaluation among participants and stakeholders**

Every student who actively participates in lessons and discussions is assumed to achieve the expected result for the CU and receive a course certificate.

- **What's your education?**
- **What's your position at the work?**
- **What's your work experiences in the field of welding and design of welded structures?**
- **How long have you been working in the field of welding and design of welded structures?**
- **Do you have any practical experience of welding?**
- **Do you have any question / related issues about design of welded structures that you want to get an answer to it during the course?**

Please answer following questions!

**1. What is your opinion about the course material? (Textbooks, transparencies, handouts, etc.):
... / 10**

Comments:

2. What is your opinion about the teachers? (Subject knowledge, pedagogy ...) : ... / 10

Comments:

3. What is your opinion about the teaching method/lessons?

Comments:

4. Is there any section of the course that should get more time next time the course is given?

5. What is your opinion about the course in its entirety? (level, content, scope, structure, and implementation)

Comments:

6. (How) has this course helped to develop your ability for design solutions that include welding?

7. The best part of the course was ...

8. If I could change the course, I would ...

9. Was your prior knowledge sufficient to follow the course?

10 Other comments:

7 modules, 25 hours each

Block 1: WELDING FOR DESIGNERS

Module 1: WELDING TECHNOLOGY

Module 7: FABRICATION, COSTS, QUALITY AND INSPECTION

Block 2: DESIGN SPECIALISATION

Module 2: STRENGTH OF MATERIALS

Module 3: DESIGN OF WELDED STRUCTURES

Block 3: DESIGNER ENGINEERING SPECIALISATION

Module 4: DESIGN OF WELDED JOINTS

Module 5: DESIGN OF WELDED PLATE STRUCTURES

Module 6: DESIGN FOR PURPOSE OF WELDED STRUCTURES

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