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IQSIM2

New Innovative Simulator Tools for Quality Capacity Environmental Production Process Training in Education of Migrants

Erasmus+
Cooperation partnerships in adult education
Agreement no.: 2021-1-NO01-KA220-ADU-000033720

D5.1 Checklist of Teacher knowledge and competence

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Summary

EU directives, harmonized standards and guidelines targeting the expanding fabrication industry, create a strong demand for using efficient new learning technologies within the European mechanical industry environment that takes place.
Introduction of new technologies combined with highly automated processes and integration of IT technology, creates a new environment for the people in this business.
Outsourcing has helped companies in Europe to turn around their processes and become more competitive in the world markets. Manufacturing is the 2nd largest sector in outsourcing, with 150b Euros worth of contracts worldwide. In this environment, companies do not only sell products, but also know-how and processes. In the context of the virtual and modular enterprise, large companies need to transfer their internally developed know how to SMEs that are recipients of outsourcing contracts.
The need for understanding the processes and production flow becomes more and more important. The need to understand the national characteristics and the environment where the product are being used becomes vital.

However, the list of failures is long:

I) One of the largest bridges in Europe was recently produced at multiple fabrication sites through an outsourced production process. The surface treatment was clearly specified by the contractor according to given standards. However the humidity requirements were not fully understood in one of the sites, whereby the expected maintenance and renewal cycle of 30 years, actually was reduced to 5 years. Additional costs for the fabricator: 1.5 mill euro every 5 year.

EU directives, harmonized standards, and educational guidelines targeting the interplay with the expanding SME fabrication industry promote new production systems where knowledge-based production is frequently used as a convenient and necessary tool together with Product Based Learning (PBL).

Target audience.

This document is written for the participants in the project as a part of the project plan. The target audience in this project is people with background from mechanical engineering and with extensive experience from welding technology and industrial production.
This means the document contains a number of “trade specific” words and expressions that might be unknown for a casual reader.
It has been written however also with the background that people without any knowledge of this type of industry and production technology should be able to get a reasonable overview of the tasks.

The teachers role and status.

A general problem for the VET schools and course providers are that the local teachers have little time to develop new courses, or Competence Units (CUs) by themselves. Additionally the courses that are based on PBL and modeled according the production flow, or fabrication flow, also requires that the teachers have a broad knowledge of that topic.

Unfortunately a number of teachers do not have the broad background which is required for following all the topics that can be raised through such courses.
The courses which contains a number of Competence Units, CUs, and these units follows the development of a product, from initial order phase through the different production steps until a product delivery to a client.

Teachers checklist.

The teachers checklist that follows in this documents lists a number of problem areas and topics that will pop-up through a PBL based course following the fabrication process.
The idea behind the checklist is that the teacher can evaluate the topics and problem areas and see if he/she has a sound background for teaching the course.
At a later project a guide for the different topics and problem areas may be developed.

Semantic Interoperability

The project has developed a course which will be used in different countries spanning a range of different languages. The project language will be English and the courses will be developed in that language. However the target user audience will require that the learning material must be in their native language, which consequently require the teacher or the course provider to translate the course material, either partly or in full.
A direct word-for word translation will be easy although time consuming. However such a translation will reflect the knowledge level of the translator and the personnel giving the translation their consent. The translator will have a different reference background and a different knowledge level than the target student group and this may lead to a differentiation in the textual context that may give the phrases different content or meaning of the content.
It is assumed that this is a minor problem for ordinary text, but text related to welding will often describe technical items and relations that are related to different technological levels and experience. This experience and technological levels may often use the same words and phrases that others with different background also are using.

What does an acceptable joint mean? In the above picture we see that the welder has inserted a piece of the welding rod in order to compensate for wrong fit-up and dimensional control, Buttering would be the natural solution for such a joint.

The knowledge space and the competence are crucial factor in defining the content of the word and the sentences. In welding, like in many related technical areas a number of technical phrases have been used over decades without any change and this may very well create problems within the education itself. A number of examples can be given, like:

“good workmanship” A phrase that defines the quality of the work and a phrase that frequently are used in contracts as well. The content and technical implication of the phrase will vary significantly over time and in which context it is used. The phrase will have quite different meanings for example in shipbuilding for fishing vessels than for production in the nuclear industry sector. The differences in the content will imply drastically quality differences as well as costs consequences as well. In shipbuilding the phrase will not cover topics like quality control with different non-destructive methods for the welds, there will be no requirements for 24 hours rules to be used before inspection, there will be no requirements for the surface finish of the cut plates or requirements of the with detailed description of the weld surface. The follow up and requirements of the education of the welders will be minimum compared to the rules and regulations in the nuclear industry or in the offshore industry

Acceptable quality Again an expression that covers a wide variety of practical results. The phrase will contain quite different elements if you are coming from the shipbuilding industry compared with offshore industry. The expression do not say anything that can be used for identifying the quality or which standards or definitions that shall be implied in the expression.

The other dimension in this discussion is the vocabulary has changed over the years with new words describing new methods and new technology, which is quite naturally. However the older vocabulary has partly changed content because of knowledge and competence obtained by the stakeholders involved in the development of the fabrication process itself. This is a continuous process following the development of the industry in the different countries. The results of this development is that the "volume of content" in a word or a phrase will grow and also, from time to time, that the original content may slip away.
The result of such process may have a dramatic effect on the communication between the partners involved in this process. The sender will utilize a word or a phrase with a certain content where the knowledge and competence of the sender implicit defines the volume of the content and the receiver will have a different perception of the word or phrase received because the level of knowledge and competence may vary.

The additional element that also must be considered is the effect of the content based on pure knowledge versus the effect on the content based on competence. When knowledge is the sole element for the content volume, then we must assume that the content volume is different when its being defined based on competence.

Checklist for verification of teacher knowledge and competence

The list are planned to be used as a checklist to verify if the teacher has the necessary background to to act as a teacher for the work-based courses where the course are following the production process.

Green column: The item is verified and is 100% in accordance with the requirements
Red column: The item verified do not meet the minimum requirement.
White columns: The item verified do to a certain extent meet the requirements, however non-conformance has been issued and corrective action must take place in order to reach full compliance.

NOTE: The following checklist follows a Quality Plan structure and contains elements that is not required for a standard welders course. However it turns out that the teachers also from time to time have courses for other welding personnel involved in quality assurance and quality control or inspection. Then the current checklist can be used as it is.
However for welding courses in general and specifically for the pilot course in this project, we have marked which items relates to the different CUs.

Ref CU	*Statement to be verified. Do you know the topic or statement*	*Description of your competence in this field*	*My competence level*				
			1	*2*	*3*	*4*	*5*
	Contract review						
	Are the contract requirements and the design data provided by the purchaser (or in-house data for construction designed by the manufacturer) reviewed by competent staff, to ensure that all information necessary to carry out the						

Ref CU	*Statement to be verified. Do you know the topic or statement*	*Description of your competence in this field*	*My competence level*				
	fabrication operations is available prior to the commencement of the work?						
	Does the manufacturer declare his capability to meet all welding contract requirements and ensure adequate planning of all quality related activities?						
	Does the manufacturer have to verify that the contract is within his capability to perform that sufficient resources are available to achieve delivery schedules and that documentation is clear and unambiguous?						
	Does the manufacturer have to ensure any variations between the contract and previous tender documentation are identified and the purchaser notified of any programme, cost or engineering changes that may result?						
CU-3	Does the manufacturer have to consider the following contractual requirements:						
	* application standard and any supplementary requirements?						
CU-3	* post weld heat treatment requirements?						
CU-3	* inspection and testing requirements?						
CU-3	* technical requirements to be met by the specification of welding procedure, non destructive testing procedures and heat treatment procedures?						
CU-3	* the approach to be used for welding procedure approval?						
CU-3	* the approval of personnel?						
CU-3	* selection, identification and/or traceability (e.g. materials, welders, welds)?						
CU-3	* quality control arrangements, including any involvement of an independent inspection body?						
CU-3	* other welding requirements (e.g. batch testing of consumables, ferrite content of weld metal, ageing, hydrogen content)?						
CU-3	* environmental conditions relevant to welding on site (e.g. very low temperature ambient conditions or any necessity to provide protection against adverse weather conditions)?						
	* sub-contracting?						

Ref CU	*Statement to be verified. Do you know the topic or statement*	*Description of your competence in this field*	*My competence level*				
	* handling of non-conformances?						
	* further contractual requirements?						
	Design review						
CU-3	Does the manufacturer have to consider the following design requirements:						
CU-3	* location, accessibility and sequence of all welds?						
CU-3	* surface finish and weld profile?						
CU-3	* parent metal(s) specification and welded joint properties?						
CU-3	* permanent backing?						
CU-3	* welds which are to be made in the workshop, or elsewhere?						
CU-3	* dimensions and details of joint preparation and completed joint?						
CU-3	* use of special methods (e.g. to achieve full penetration without backing when welded from one side only)?						
CU-3	* quality and acceptance requirements for welds?						
CU-3	* other special requirements (e.g. Acceptability of peening, heat treatment)?						
	Has the manufacturer written procedures which:						
	Describe how he reviews the contract (whether already signed or not) and the design requirements to ensure that all the above mentioned points are considered?						
	Specify that the welding coordination for these activities is carried out according to ISO 3834-1:2021?						
	SUB-CONTRACTING						
	Does the manufacturer sub-contract some activities (e.g. welding, inspection, non-destructive testing, heat treatment)?						

Ref CU	*Statement to be verified. Do you know the topic or statement*	*Description of your competence in this field*	*My competence level*				
	Are sub-contractors given all requirements necessary for carrying out the defined activities (including those concerning the contract and design review)?						
	Does the manufacturer require records and documentation of the sub-contractors' work?						
	Does the manufacturer ensure that all the activities transferred to sub-contractors are carried out in conformity with the relevant requirements of the ISO 3834-2:2021?						
	Does the manufacture makes sure that the sub-contractor can comply with the quality requirements of the contract?						
	If the design of the product is sub-contracted are supplementary requirements (if any and when necessary) specified to the subcontractors?						
	Has the manufacturer a written procedure which describes how the sub-contracted activities comply will the requirements of the contract/design specifications?						
	Do this procedure define the tasks and responsibilities of the welding coordinator?						
	WELDING PERSONNEL						
CU-6	Can the manufacturer show that he employs sufficient and competent personnel for the planning, performing and supervising of the welding production according to the specified requirements?						
	Welders						
CU-2	Are all welders and welding operators approved by an appropriate test according to the appropriate part of EN ISO 9606-1 or ISO 14732 or other equivalent code/standard?						
CU-2	Are all records of approval maintained up to date?						
CU-2	Are the tests performed by qualified laboratories?						

Ref CU	*Statement to be verified. Do you know the topic or statement*	*Description of your competence in this field*	*My competence level*				
CU-2	Do you have access to and understanding of ISO 6520?						
	Welding coordination personnel						
	Has the manufacturer at his disposal appropriate welding coordination personnel according to ISO 3834?						
	Has the manufacturer access to any qualified professional figures according to the IIW/EWF qualification scheme /I/EWE,I/EWT,I/EWS and I/EWP)?						
CU-2	Does the welding coordination personnel supply the welding personnel with WPS or work instructions, so as to ensure that all activities can be properly performed and controlled?						
	Has the authorized welding coordinator(s) sufficient authority to take necessary action for ensuring and maintaining the product quality according to the requirements specified?						
	Have the duties, inter-relationships and limits of responsibility of the welding coordination personnel been clearly defined by the manufacturer?						
	INSPECTION, TESTING AND EXAMINATION PERSONNEL						
CU-7	Has the manufacturer at his disposal sufficient and competent personnel for planning and performing, supervising, inspecting, testing and examining the welding production according to the specified requirements?						
	Has the manufacturer and professional inspector according to the IIW/EWF qualification scheme ?						
	Non-destructive testing personnel						
	Are the non-destructive testing personnel approved according to EN 473 or other equivalent code/standard?						
	EQUIPMENT						
CU-5	Are the following items of equipment available, when necessary:						
CU-5	Welding power sources and other machines?						

Ref CU	*Statement to be verified. Do you know the topic or statement*	*Description of your competence in this field*	*My competence level*				
CU-5	Equipment for joint preparation and cutting, including thermal cutting?						
CU-3	Equipment for preheating and post-weld heat treatment, including temperature indicators?						
CU-3	Jigs and fixtures?						
CU-3	Cranes and handling equipment used for welding production?						
CU-4	Personnel protective equipment and other safety equipment, directly associated with welding? (* To be checked only in the absence of national statutory requirement.)						
	Ovens and quivers, etc. used for treatment of welding consumables?						
	Cleaning facilities?						
	Destructive and non-destructive testing facilities?						
CU-5	Has the manufacturer a written procedure for identification, control, maintenance and calibration (where relevant) of all production equipment?						
CU-5	Does this procedure include the designated responsible individuals?						
CU-5	Does this procedure include arrangements to prevent production use of defective equipment?						
	Description of facilities						
	Has the manufacturer an updated list identifying the essential equipment, used for welding production that provides an evaluation of the capacity and capability of the workshop and other production areas?						
	Are the following (minimum) entries indicated (where relevant):						
	Capacity of the largest cranes?						
	Size of components the workshop is able to handle?						
	Mechanized or automatic welding equipment capability?						
	Dimensions and maximum temperature of furnaces for post-weld heat treatment?						
	Capacities of rolling, bending and						

Ref CU	*Statement to be verified. Do you know the topic or statement*	*Description of your competence in this field*	*My competence level*				
	cutting equipment?						
CU-5	Number of welding power sources for each welding process?						
	Other essential facilities?						
	Suitability of equipment						
CU-6	Is the equipment used adequate for the application concerned?						
CU-6	If specified in the contract is the welding and heating equipment subject to approval?						
	New equipment						
	Does the manufacturer carry out approval tests in accordance with appropriate standards whenever relevant, after installation of new (or refurbished) equipment?						
	Are records of the tests kept?						
	Maintenance						
CU-4	Has the manufacturer documented plans for the maintenance of equipment, ensuring checks of those items which control essential variables in the welding procedure specification, eg:						
CU-4	Condition of guides in equipment for thermal cutting, mechanized welding fixtures, etc.?						
CU-4	Condition of ampere meters, voltmeters and flow meters used for the operation of the welding machines?						
CU-4	Condition of cable, hoses, connectors, etc.?						
CU-4	Condition of control system in mechanized and or automatic welding equipment?						
CU-4	Condition of thermocouples and other temperature measurement instruments?						
CU-4	Condition of wire feeders and conduits?						
CU-4	Action to be taken to avoid the use of defective equipment?						

Ref CU	*Statement to be verified. Do you know the topic or statement*	*Description of your competence in this field*	*My competence level*				
	WELDING ACTIVITIES						
CU-6	Does the manufacturer carry out an adequate production plan compatible with the production and testing facilities to be used in the manufacture of the product?						
CU-6	Does such a plan include at least the following points as relevant:						
CU-6	Specification of the sequence by which the product shall be manufactured (e.g. as a single parts of sub-assemblies and the sequence of subsequent final assembly)?						
CU-6	Identification of the individual processes required?						
CU-6	Reference to the appropriate specifications for welding and allied processes?						
CU-6	Sequence in which the welds are to be made, if applicable?						
CU-6	Order and timing in which the individual processes are to be performed?						
CU-6	Specifications for inspection and testing, including the involvement of any independent inspection body?						
CU-6	Provision for protection from environment conditions (e.g. protection from wind and rain)?						
CU-6	Item identification by batches, components or parts?						
	Welding procedure specification (WPS)						
CU-2	Does the manufacturer prepare WPS in accordance with the appropriate part of ISO 15614-2005 or contract specification?						
CU-2	Are there arrangements to ensure that the WPS's are correctly used in production?						
	Welding procedure approval						
CU-7	Are the WPS approved prior to any production welding?						
CU-7	Are the tests performed by qualified laboratories?						

Ref CU	*Statement to be verified. Do you know the topic or statement*	*Description of your competence in this field*	*My competence level*				
CU-7	Is the method of approval in accordance with the relevant application standards or as stated in the contract?						
	Are other procedures (e.g. procedure for heat treatment) approved if required in the relevant application standard and/or in the contract?						
	Work instruction						
CU-7	Does the manufacturer use the WPS,or dedicated work instructions, directly in the workshop?						
CU-7	Are the dedicated work instructions prepared from an approved WPS?						
	Documentation						
	Does the manufacturer establish and maintain procedures for the control of the relevant quality documents (e.g. WPS, WPAR, welder approval certificate)?						
	WELDING CONSUMABLES						
CU-5	Has the manufacturer specified responsibilities and procedures for the control of welding consumables?						
CU-5	Batch testing						
CU-5	If required in the contract, is batch testing of welding consumables carried out?						
CU-5	Storage and handling						
CU-5	Does the manufacturer implement procedures for storage, handling and use of consumables which avoid moisture pick-up, oxidation, damage, etc.?						
CU-5	Are these procedures in accordance with the supplier's recommendations, if any?						
	STORAGE OF PARENT MATERIALS						
	Are parent materials stored so that they will not be adversely affected before use?						
	Is the identification maintained during storage?						

Ref CU	*Statement to be verified. Do you know the topic or statement*	*Description of your competence in this field*	*My competence level*				
	Has the manufacturer written procedures for storing parent materials including bought in items and products provided by the purchaser?						
	POST-WELD HEAT TREATMENTS						
	Where required, are post-weld heat treatment procedures compatible with the parent material, welded joint, construction, etc. and in accordance with the application standard and/or specified requirements?						
	Does the manufacturer issue adequate records, made during the process, of the post weld heat treatment?						
	Do such records demonstrate that the post weld heat treatment procedure has been followed?						
	Do such records demonstrate that the post weld heat treatment procedure has been followed?						
	WELDING RELATED INSPECTION AND TESTING						
	Is there an inspection schedule as plan for implementing inspection and testing at appropriate stages of the manufacturing process, to assure conformity with the contract requirements?						
	Inspection and testing before welding						
	Are the following items checked before the start of welding, when necessary:						
CU-3	suitability and validity of welders approval certificates (see appropriate part of ISO 9606 or ISO 14732 or other equivalent code/standard)?						
CU-7	Is the cut surfaces according specifications, ISO 9013						
CU-7	Suitability of WPS (see appropriate part of ISO 9606 or other equivalent code/standard)?						
CU-7	Identity of parent material?						
CU-7	Identity of welding consumables?						

Ref CU	*Statement to be verified. Do you know the topic or statement*	*Description of your competence in this field*	*My competence level*				
CU-7	Joint preparation (e.g. shape and dimensions) see EN 29692 or equivalent code/standards)?						
CU-7	Fit-up, jigging and tacking?						
	Any special welding requirements in WPS (e.g.: preheat, prevention of distortion)?						
	Arrangements for any production tests?						
CU-4	Suitability of working and environmental conditions for welding?						
CU-4	Suitability and condition of equipment?						
	Inspection and testing during welding						
CU-8	Are the following items checked, during welding, when necessary, as required by the inspection plan and procedures:						
CU-8	Essential welding parameters (e.g. welding current, arc voltage, travel speed)?						
CU-8	Preheating/interpass temperature (see ISO 13916 or other equivalent code/standard)?						
CU-8	Cleaning and shape of runs and layers of weld metal?						
CU-8	Back gouging?						
CU-8	Welding sequence?						
CU-8	Correct use and handling control of consumables?						
CU-8	Control of distortion?						
CU-8	Any intermediate examination (e.g. Checking dimensions)?						
	Inspection and testing after welding						
CU-8	Are the following inspections carried out, after welding, when necessary, in accordance with the contract requirements:						
CU-8	Visual inspection?						
CU-8	Other non-destructive testing?						
CU-8	Destructive testing?						
CU-8	Evaluation of the form, shape and dimensions of the welded construction?						

Ref CU	*Statement to be verified. Do you know the topic or statement*	*Description of your competence in this field*	*My competence level*				
CU-8	Evaluation of the results and records of post weld operations (e.g. grinding, post-weld heat treatment, ageing)?						
	Inspection and test status						
CU-9	Are measures taken as appropriate to indicate the status of inspection and test of the product during manufacturing?						
	Inspection and test techniques						
CU-9	Positive technique?						
CU-9	Negative testing technique?						
	NON-CONFORMING AND CORRECTIVE ACTION						
CU-9	Are measures implemented for controlling components or items which do not conform to specified requirements, in order to prevent their inadvertent use?						
CU-9	When repair and/or rectification is undertaken by the manufacturer are appropriate procedures available at repair workstations?						
CU-9	When repair and/or rectification is carried out are the items reinspected, tested and examined in accordance with the original requirements?						
CU-9	Does the manufacture have procedures or arrangements to identify and remedy any conditions that could adversely affect the quality of the product or production processes?						
	CALIBRATION						

Ref CU	*Statement to be verified. Do you know the topic or statement*	*Description of your competence in this field*	*My competence level*				
	Does all measuring equipment for process control, inspection and testing been calibrated to ensure that it is capable of the accuracy and repeatability of the accuracy and repeatability of measurement required for the measurements the equipment is called upon to make? Note: Calibration of the welding equipment is required where the quality/consistency of the weld depends upon accurate and repeatable setting of parameters such as current, voltage, travel speed, gas flow, pulse characteristics, etc. In general, calibration is only required For automatic welding machines, temperature recorders for heat treatment, NDT equipments, etc.						
	IDENTIFICATION AND TRACEABILITY						
CU-9	Where appropriate, is identification maintained throughout the manufacturing process?						
CU-9	Where appropriate, is traceability maintained throughout the manufacturing process?						
	Whenever the identification and/or traceability are required, do the arrangements include (when necessary):						
	Production plans?						
	Routing card?						
	Records of weld locations in constructions?						
	Weld marking, stamping, labels, etc.?						
	Traceability (for fully mechanized and automatic weld-equipment including welder and welding operator) to specific welds?						
	Welder and procedure approvals?						
	Non-destructive testing procedures and personnel?						
	Welding consumables (e.g. type, batch or cast numbers)?						
	Parent materials (e.g. type, batch)?						

Ref CU	*Statement to be verified. Do you know the topic or statement*	*Description of your competence in this field*	*My competence level*				
	Location of repairs?						
	Does the manufacturer use a written procedure for identification and/or traceability when this is required by contract requirements? Note: When traceability of consumables is required, it may be assumed that it is not necessary to record the location of various batches of consumables within multi-run joints, provided such batches of consumables are accepted by review of suppliers' documentation before use.						
	QUALITY RECORDS						
CU-10	Do the quality records include, according to the contract requirements and/or when necessary, the following:						
CU-10	Contract/design review?						
CU-10	Materials certificates?						
CU-10	Consumables certificates?						
CU-10	WPS?						
CU-10	WPAR?						
CU-10	Welder or welding operator approval certificates?						
CU-10	Non-destructive testing personnel certificates?						
CU-10	Heat treatments and procedure specification?						
CU-10	Non-destructive and destructive testing procedures and reports?						
CU-10	Dimensional reports?						
CU-10	Repairs and non-conformity reports?						
	Are quality records retained for a minimum period of 5 years in absence of any other specified requirements?						
	Complaints						

Ref CU	*Statement to be verified. Do you know the topic or statement*	*Description of your competence in this field*	*My competence level*				
	Does the manufacturer keep record of the client's complaints?						
	Does the manufacturer take and document appropriate corrective and preventive actions for the above complaints?						
	Does the manufacturer assess the effectiveness of those actions?						
	Organization						
	Is the organization working as a joint group?						
	Does the formen have access to all relevant documents for the order?						
	Does the shop floor organization work as a group with the rest of the organization?						
	Do the organization has informal decision groups for this project?						
	Do the organization has informal decision groups for this project?						
	Do they use sub-supliers with the same organization as themselves?						
	Language skills						
	Does all key personnel have language skills sufficient for the contract?						
	Does the work leaders, formen, have the language skills to read the specification documents?						
	Can operators and fabrication personnel communicate in the project language?						
	Cooperation capabilities						
	Is the vertical cooperation within the company working ok?						
	Can the organization cooperate with our organization at all levels?						
	Do the company have experience from contracts with the same requirements that we have?						
	Feedback ability						

Ref CU	***Statement to be verified. Do you know the topic or statement***	***Description of your competence in this field***	***My competence level***				
	Do the company have any feedback mechanism or routines?						
	How will feedback from shop floor be communicated back to the project?						
	Do they have regular production meetings with minutes of meeting						
	Are people on shop floor allowed to give negative feedback?						

Utdanning av Internasjonal Sveiser
KILSVEIS

TVERFAGLIG INNHOLD:

Kurset beskriver rollene som internasjonal Kilsveiser vil ha i forbindelse med arbeid og oppgaver som faller under PED, CPD og standarden ISO 3834. Dette omfatter å kjenne til og forstå grunnprinsippene for behandling av sveiseutstyr, ha forståelse for HMS, å kunne arbeide etter en WPS, samt å vurdere kvaliteten av eget arbeid og dokumentere dette.

Kurset gir deltagerne kunnskap om hvordan å utarbeide planer, planlegge, gjennomføre og dokumentere eget arbeid. Dette inkluderer å foreta vurderinger av omfanget av hvilke WPS som skal benyttes til de forskjellige oppgaver, hvilke prøver som skal gjennomføres på konstruksjonen, samt korrigerende tiltak der hvor det er nødvendig. Kurset omfatter fagområdene sveising, montasje, HMS og dokumentasjon.

KVALIFIKASJONER:

Elevene får Diplom som Internasjonal Kilsveiser

OPPTAKSKRAV:

Elevene må inneha bakgrunn som beskrevet av European Welding Federation Guidelines for International Welder og ha generell god fysisk form.

OMFANG

Kurset er organisert i 10 kompetansemoduler (Competence Units, CUs) som vil dekke kravene innenfor EWFs Guidelines for International Welder.

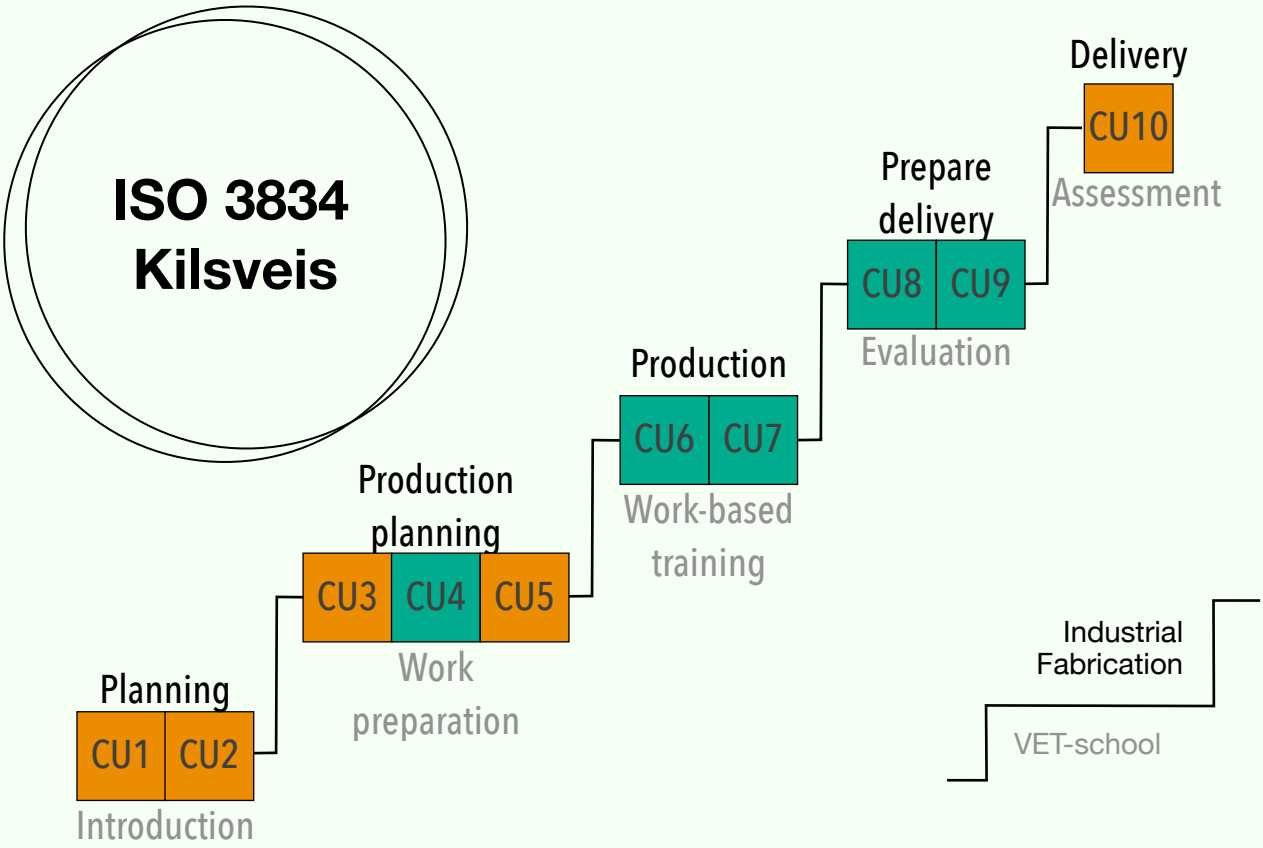
Kurset er utviklet i nært samarbeid med industrien i Sverige, Romania og Ungarn. Undervisningen følger produksjonsforløpet i en bedrift og er praksisnær, slik at det følger produktets utvikling fra ide til ferdig produkt.

ORGANISERING:

Som fleksibel videreutdanning for ansatte i full jobb, eller som et sammenhengende kurs på 10 dager inklusive praksisarbeid. Kursmodulene (CUene) kan ved behov tas enkeltvis og tilpasses bedriftens behov.

KONTAKT: Erik Engh, Quality Management Software AS, erik.qmsoft@gmail.com

NETTADRESSE: Mer info se https://stimuli2.no/



Arbeidsrelevant opplæring: Kurset er organisert i 10 uavhengige kompetansemoduler (CUs). De 5 gule inneholder teoriopplæring, mens de 5 grønne enhetene anvender praksisnær opplæring hvor opplæringen følger produksjonsprosessen til stålkonstruksjonen. Hver enkelt kompetansemodul retter seg mot de ulike stegene i produksjonsprosessen.

Hva er nytt? : Den tverrfaglige tilnærmingen er helt nytt for denne sammensatte utdanningen, og passer for leverandører i bransjen som må forholde seg til CPD, PED og ISO 3834. Det er en nyhet å dele kurset opp i uavhengige kompetansemoduler som inneholder generelle og spesifikke læremål, samt minste krav til opparbeidet kompetanse etter endt kurs. Hver enkelt CU kan tas som mikrolæring.

- CU1 - Introduksjon til å benytte moderne dataverktøy for kommunikasjon mellom elev og lærer og mellom elever.
- CU2 - Vurdering av innkomne forespørsler. Vurdere omfang og type inspeksjon på bakgrunn av forespørselen
- CU3 - Planlegging for start av produksjon
- CU4 - Verifisering av HMS før produksjonsstart
- CU5 - Tilrettelegging og forberedelse av sveiseutstyr og tilsett materialer
- CU6 - Montasje og heftsveis
- CU7 - Sveising i stillingene PA, PB og PG
- CU8 - Sveising i stilling PD og rør til plate i stilling PB og PH
- CU9 - Visuell kontroll og dokumentasjon av utført arbeid, dokumentasjon før levering
- CU10 - Avsluttende eksaminering

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

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IQSIM2

New Innovative Simulator Tools for Quality Capacity Environmental Production Process Training in Education of Migrants

Erasmus+
Cooperation partnerships in adult education
Agreement no.: 2021-1-NO01-KA220-ADU-000033720

D5.1-1 Course program---Train the Trainer

Version: **Final**

Date: **20.01.2023**

Train the trainer course with Its Learning as LMS

Content.
This course will focus on how a teacher can use and administrate courses that use Its Learning as the LMS system. The course will present a general overview of Its Learning and go through some of the possibilities the teacher has for storing content, making content available for the students, set up discussions forums and add multiple choice questions or other tasks for the students.
Additionally, the course will go through how to create new courses and how to enroll students to the course.

Preconditions.
It is assumed that the teacher has a broad experience in teaching technics courses with preferably, work based content and Process based structure of the courses

General Learning outcomes
* Learn the general concept of Its Learning
* Be able to navigate through the menu structure
* Get an overview of the reporting structure
* Be able to develop new Competence Units, CU, based on existing ones
* Be able to implement Competence Units, CU
* Be able to develop new courses

Specific Learning Outcomes.
* Know the basics teacher tools in Its Learning
* Identify/use the tools for communicating with the students
* Understand how to use the calendar function for structuring the course schedule
* Usage of document camera and other relevant tools/software
* Know how to add students to a course

Competence.
* The teacher will be able to use the LMS system for planning of a CU or Course.
* The teacher should be able to create new CUs or courses and modify, delete or add content.
* The teacher should be able to communicate with the students through the LMS system

NOTE: The program is based on a mixture of self-testing and experiencing and face to face training-- or if more relevant, it could run it as a set of Zoom sessions mixed with own tasks and group work. It is expected that you define a test course where the teachers can experiment with the use of the LMS system as well as the content in the course itself.

Day 1.

09.00 – 10.00	Log in as a teacher. Your settings, Edit profile, your students, messages, your notifications, view as...
10.15 – 11.15	Reports, 360-degree reports, status and follow up
11.30 – 12.30	Plans and resources
12.30 – 13.15	Lunch
13.15 – 14.15	Use of calendar in a course
14.30 - 15.30	Develop, add and delete content in a CU
15.45 – 16.45	Administration of a CU, alter resources and activities. How do we organize practical work?

Day 2.

09.00 – 10.00	Administration of a CU
10.15 – 11.15	Create new course
11.30 – 12.30	Create discussion forums
12.30 – 13.15	Lunch
13.15 – 14.15	Check access conditions, add/delete students to a course
14.30 - 15.30	Use document camera and other relevant tools/software and add Zoom sessions to a course
15.45 – 16.45	Summary of the course

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IQSIM2

New Innovative Simulator Tools for Quality Capacity Environmental Production Process Training in Education of Migrants

Erasmus+
Cooperation partnerships in adult education
Agreement no.: 2021-1-NO01-KA220-ADU-000033720

D5.1-2 Course program---IQSIM in future education

Version: **Final**

Date: **25.03.2024**

D5.1-2 IQSIM and education

Table of Contents

Background

The intention of this document is to:
a) Try to identify how IQSIM can be used in education and training at the different EQF levels
b) Try to identify how IQSIM can be used in education and training at different EQF levels under the condition that a new IOSIM version, version IQSIM3, has the functionalities that are specified.
c) Identify thew responsibilities given after education and training at the different EQF levels

Target user groups-education and training.

It is foreseen the following user groups:

EQF 6
Welding Designer and Engineers or Welding Inspector with diploma from EWF and with education following the EWF Guidelines.
Responsibilities according the EWF Guidelines.
* Investigate welding related issues to improve product performance and increase productivity

*Design welded parts, assemblies, and structures such as buildings, pressure vessels, and pipelines

*Develop repair procedures and assess flaws to determine the fitness-for-service of structure

*Develop standards, materials, weld joint design, and welding processes

*Develop welding process procedure qualification, supplier qualification, and product testing

*Troubleshoot welding problems and provide corrective solutions

EQF5
Welding Technologist with diploma from EWF and with education following the EWF Guidelines.
Responsibilities according the EWF Guidelines.
*Set-up and operate welding and joining processes for lab tests, and perform welding experiments

*Work in cross-functional engineering teams to develop and test new products

*Conduct training programs and field service activities for clients

*Support related manufacturing requirements

*Interpret welding related requirements and troubleshoot welding problems

EQF 4
Welding Specialist with diploma from EWF and with education following the EWF Guidelines.
Responsibilities according the EWF Guidelines.

EQF3
Welder or International Welder with diploma from EWF and with education following the EWF Guidelines.
Applicants must possess sufficient knowledge of, or education in, metalworking to follow the course. They must also have a level of health, and physical and mental capability, to undergo the training for which they are applying.

Use of IQSIM at the different EQF levels

Education and training for EQF level 6.

Background.
Historical data implies that approximately 60-70 % of the cost of a product is already decided when a design has been created at the engineering level. However, the production engineering and the manufacturing operation also will have a great influence on the product costs if they can determine the production process at an early stage of the design. A close cooperation between design and production engineering is essential to minimise the total product costs.

However, in an environment with outsourced production the close cooperation between Design and Production Engineering is very often missing. Design produces detailed drawings and deliver these to the client for execution. In large companies the “distance” between design and Product Engineering may face the same problem.

The education of Design Engineers is focused on the theoretical content and as a result a limited amount of practical experience are in their curricula.

IQSIM 2 education and training for EQF level 6 allows the participants to run simulation as a designer and add data for production which allow them to compare their simulation results and bring those up as a discussion topic during the education.
Typical discussion might be for an arbitrary weld length:
1. What will happen if they recommend different welding technologies?
2. What type of welded joints can be selected and what is the consequence of the selection?
3. Why have the fillet welds different a-dimensions and what consequences does this have?
4. Why are the material quality been selected in the design and could another material be selected?
5. Why has the extent of inspection been selected and what are the consequences of altering that?

By selecting a set of cost factors then the total cost can be calculated.

A new IQSIM3 will allow the following problems to be addressed in addition:

1. Selecting a Design Class evaluate different welding technologies and the consequences for the total costs
2. Selecting a Quality class and Inspection to evaluate the total costs for a design.
3. Select Cost Calculation in order to evaluate the carbon footprint for the selected welding process
4. Select Store and Retrieve allows the designer to store the current simulation and retrieve it later. This allows a designer to compare different design alternatives for a product and to create design variations.
5. Fatigue design and allow the designer to evaluate both static and dynamic load conditions in order to optimize the design.
6. Simulation of the life cycle costs including life cycle costs based on possibility for repair at different levels
7. What considerations has been given to the green footprint of the production methods selected?

Education and training for the EQF level 5.

At the EQF level 5 the training will focus on the practical welding itself, the welding technology, and the production planning. At EQF level 5 you will be at an operative level in production with a daily responsibility of following up the day-to-day production and the quality of the production. This means mentoring of operators at EQF level 4 as well as planning and reporting of actual results of the production.
At EQF level 5 you will get first-hand information of the development of the production itself and the quality aspects of the production and the selected production methods and technologies.
EQF level 5 will carry out education and training towards EQF level 4 specifically regarding the consequences of selecting the correct process parameters and its influence on the costs as well as the green consequences of the welding process. Another important variable which will be extensively used in education and training is how the material fits together and if the assembly of the material is according to specification. If deviations occur, then the consequences of this

deviation will be highlighted. And--- it will focus on the responsibility of the EQF level 4 operator in reporting deviations.

However, in many companies a production engineering level will be absent. In such cases the EQF level 5 will directly be able to report back to EQF level 6 with relevant production data and production experience. Feedback loops with information may be established and a two-way communication will be created at the education level.

IQSIM 2 education and training for EQF level 5 allows the participants to run simulation as a designer and add data for production which allow them to compare their simulation results and bring those up as a discussion topic during the education.
Typical discussion might be for an arbitrary weld length:
1. What will happen if they recommend different welding technologies?
2. What type of welded joints can be selected and what is the consequence of the selection?
3. Why have the fillet welds different a-dimensions and what consequences does this have?
4. Why are the material quality been selected in the design and could another material be selected?
5. Why has the extent of inspection been selected and what are the consequences of altering that?
6. What will be the consequences of a bad fit-up?

A new IQSIM3 will allow the following problems to be addressed in addition:

1. Selecting a Design Class evaluate different welding technologies and the consequences for the total costs
2. Selecting a Quality class and Inspection to evaluate the total costs for a design.
3. Select Cost Calculation to evaluate the carbon footprint for the selected welding process
4. Create defect evaluation based on the different welding procedure data.
5. Create pWPS and document these
6. Fatigue design and allow the designer to evaluate both static and dynamic load conditions in order to optimize the design.
7. Simulation of the life cycle costs including life cycle costs based on possibility for repair at different levels
8. Evaluate the influence of gas concentration as well as fume concentration
9. Evaluate welding sequences and heat deformation

Education and training for the EQF level 4

At the EQF level 4 you will be a welding specialist. It is assumed that your technical background and mathematical understanding or interest, is limited.
It will be personal at EQF level 5 that will introduce the system for you and ask the questions that will be relevant for your education and training.

IQSIM 2 education and training for EQF level 4 allows the participants to run simulation as a designer and add data for production which allow them to compare their simulation results and bring those up as a discussion topic during the education.
Typical discussion might be for an arbitrary weld length:
1. What will happen if they recommend different welding technologies?
2. What type of welded joints can be selected and what is the consequence of the selection?
3. Why have the fillet welds different a-dimensions and what consequences does this have?
4. Why are the material quality been selected in the design and could another material be selected?

A new IQSIM3 will allow the following problems to be addressed in addition:

1. Select Cost Calculation in order to evaluate the carbon footprint for the selected welding process
2. Create defect evaluation based on the different welding procedure data.
3. Create pWPS and document these
4. Evaluate the influence of gas concentration as well as fume concentration
5. Evaluate welding sequences and heat deformation

Education and training for the EQF level 3

At the EQF level 3 you will be an International Welder and will be responsible for carrying out the welding tasks

IQSIM 2 education and training for EQF level 4 allows the participants to run simulation as a designer and add data for production which allow them to compare their simulation results and bring those up as a discussion topic during the education.
Typical discussion might be for an arbitrary weld length:
1. What will happen if they recommend different welding technologies?
2. What type of welded joints can be selected and what is the consequence of the selection?
3. Why have the fillet welds different a-dimensions and what consequences does this have?
4. What will the consequences be if the fit up and tack welding has not been according to specification?

A new IQSIM3 will allow the following problems to be addressed in addition:

1. Select Cost Calculation in order to evaluate the carbon footprint for the selected welding process
2. Create defect evaluation based on the different welding procedure data.
3. Create pWPS and document these
4. Evaluate the influence of gas concentration as well as fume concentration
5. Evaluate welding sequences and heat deformation

Other education groups.

IQSIM2 has tools and possibilities that allows other groups to use the system for educational purpose:

Purchasing
Purchasing of material is an important task. However, the material composition may vary quite extensively even within the same material group. To evaluate exactly the consequences of selecting a new material supplier, a simulation with the material chemical composition is very important. If the material composition is wrong, then the welding might not be possible or give results that are not acceptable. Education and training of purchasing personnel will easily evaluate this through the system.

Inspection
Most welds must be inspected by a non-destructive inspection method. The extent of inspection will result in several repair welds. IQSIM2 has tools for evaluation of repair and calculation of repair costs as well.
Through the evaluation between the different welding methods, welding parameters and the repair rate then the extent of inspection can be decided. This evaluation can be a two-way communication between EQF level 5 and 6 and also to EQF level 4. Different training scenarios can be developed for this purpose.

A welding operator at EQF level 4 will always have a mentor at EQF level 5 or higher. The operator will have access to the system in such a way that the consequences of the choices can be seen.
Most choices the operator will see will be:
* welding technology items, process parameters and its results on the technical performance
* welding technology and its influence on costs
* welding technology and its green influence
* fit-up of material and its influence on welding technology and total costs

List of functionalities envisaged for a new IQSIM3:

Function	List of functions envisaged	Output	Target EQF level
1	Select application	Select between several predefined applications or functionalities which will insert the application specific rules, materials. Default value is General Purpose.	3-4-5-6
2	Selecting design classes and evaluate the welding process that are most technically suitable	Recommendation for welding process for the selected design Creating a list, weighted, for different welding processes. Note. Maybe the recommendation	6

		of filler also could be incorporated here??	
3	Selecting the quality class and se influence on quality class versus welding method	Recommendation for welding process related to quality class	5-6
4	Cost calculation Calculating the cost for a selected process utilizing the essential variables for the selected process	Cost for a given welding length and in addition the energy consumption and carbon footprint for that production	5-6
5	Cost comparison Comparing the output of different cost calculations graphically	A graphical report that dynamically can be altered if some of the background parameters are altered. The variables are compared graphically	5-6
6	Environmental impact Compare the selected welding methods both numerically and graphically for the total job that is going to be processed. Maybe also type of equipment might be an alternative for each process as well--has to be evaluated.	Calculate the environmental impact of the welding methods selected. Calculate use of energy and carbon footprint. This calculation might cover both the process itself but maybe also the consequential results of selecting the energy method if applicable.	5-6
7	Defect analysis Analysing the probability of creating defects versus welding process and technically settings for a process	Probability of defect range and defect type	3-4-5
8	Technical analysis Analysing technical data based on material classes and material groups. Different material groups to be added and these should be selectable. To cover mild and high strength steels as well as aluminium	Different essential values to be simulated like hardness, tensile, preheat requirements and so forth	5-6
9	Documentation Documentation of simulation results mentioned above	Different types of standardized documents and reports to be generated, like: pWPS with welding data, material classes, heat treatment, welding position, drawings etc, and Work Instruction based on WPQR data input complemented with simulation data Cost reports and cost analysis, Design report for recommended	3-4-5

		design solution	
10	Fatigue design--Simulate static load	Either start with given joint configuration and simulate the load or run it reverse-- define the load and simulate to find the optimum joint configuration. Use IIW reference	5-6
11	Fatigue design--Simulate dynamic load	Either start with given joint configuration and simulate the load or run it reverse-- define the load and simulate to find the optimum joint configuration. Use IIW reference	5-6
12	Cost calculation for a product	Allow the user to build up a cost calculation model for the product and create simulations around that model	3-4-5-6
13	Feedback level	A system or tool that allows the user to submit feedback including technical details from own calculations, added with comments, to another user of the system	3-4-5-6
14	Education levels	A set of user interfaces that are tailored to different educational groups	3-4-5-6
15	Life Cycle costs	Allow a user to simulate the life cycle costs for a defined product	4-5-6
16	Consequence analysis	Add an analysing tool allowing the user to analyse the long-term effect of an occurrence. Ex If a repair % increase, then what will be the result in repair and reclamation. If the defect rate of a certain defect increase-what impact might this have on the maintenance costs ?	5-6
17	Green Welding covering IIW level, "Green Welding Technologies, Sustainable Development"	Today, there have had state-of-the-art life cycle assessment (LCA) methods that for example can accurately determine the ecological footprint of a welded product. With appropriate	4-5-6

		modeling and software capabilities, case studies on welding can be compiled to show exactly which "greener" technology (including yield material, protective gas, preparation work, energy using, etc.). We see an opportunity to connect with this topic from the University of Miskolc. We have LCA expert who usually analyses in a number of fields (e.g., building material developments, plastic development), and now we would like to start a common thread on the welding line as well.	
18	Fume and gas concentration	Calculate and evaluate the amount of fumes and gases for different processes	3-4-5
19	Welding sequences and deformation in a design	Evaluation of the welding sequences and its consequences for distortion. Consequences for the cost of a product as well as for the quality aspects	5

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IQSIM2

New Innovative Simulator Tools for Quality Capacity Environmental Production Process Training in Education of Migrants

Erasmus+
Cooperation partnerships in adult education
Agreement no.: 2021-1-NO01-KA220-ADU-000033720

D5.2 Best practice guideline for using the IQSIM welding simulator

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Version:
Date: **20.03.2024**

Table of Contents

Introduction

The introduction of this document is to summarize the best practice for using WS in education and training at the different EQF levels.

Before we started to integrate the simulation tool developed in the frame of the IQSIM program, we needed to have a clear idea of what we wanted your students to learn and how we will measure their progress. Learning objectives with statements that describe the specific outcomes and criteria of the simulation have been introduced. They were aligned with the course goals, curriculum standards, and assessment methods. The developed learning objectives were tailored so as to help focus the students on the simulation, so as to address the most relevant and meaningful tasks and scenarios for our students.

We have sought to take the online learning to a new level with engaging simulations, so as to make them appealing and to create an immersive experience with high-quality graphics and realistic scenarios.

Fidelity and Realism: High-fidelity, realistic simulations, possibly through VR or advanced computer-based systems, are essential for mimicking clinical scenarios accurately.

Interactivity and Feedback: The tool offered interactivity with immediate feedback on decisions and actions, aiding in the learning process.

Customizability: Flexibility in tailoring different scenarios, to various learning objectives and complexity levels was also used, to address the needs of learners, at different stages.

After we have created the simulation topics, we needed to test and evaluate it to ensure its quality, usability, and effectiveness. We conducted both formative and summative evaluation of our simulation. Formative evaluation is the process of collecting feedback and data from the students during the development and implementation of the simulation. It helps to identify and fix any issues or errors in the simulation, as well as to improve its design and functionality. Summative evaluation is

the process of measuring the impact and outcomes of the simulation on the student learning and satisfaction. It helped us to evaluate the achievement of our learning objectives.

Based on the pilot courses two types of WS were used, IQSIM welding simulator for discussions of "what happens if.." we are altering the key parameters for the welding process in order to see the results for a given welding length.
This document focuses only on the different scenarios that can be used for future courses based on the current experience from the pilot courses.

A separate document has been developed for the practical welding simulator that were used in CU6, CU7 and CU8.

In order to create a set of practical scenarios, we have decided to first define the different EQF levels and their job activities and their possible use of the IQSIM tool and then highlighted a number of simulation scenarios that will be realistic for that job function.
The detailed example to be used will be dependent on the product that the students will produce during the course and in the specific CUs. We have therefore decided just to highlight some of the problem areas that will be typical for the EQF levels.
The practical real cases can therefore differ, but the problem space will be the same.

Background

The intention of this document is to:
a) Try to identify how IQSIM can be used in education and training at the different EQF levels
b) Try to identify how a new IQSIM can be used in education and training at different EQF levels under the condition that IQSIM has the functionalities that are specified.
c) Identify thew responsibilities given after education and training at the different EQF levels

Target user groups-education and training.

It is a pre-condition that the teachers are experienced teachers with relevant industry background as well as relevant welding background as well.

It is foreseen the following user groups:

EQF8
Welding Coordinator, according ISO 14731.

EQF 7
Welding Engineer for Design.

EQF 6

Welding Designer and Engineers or Welding Inspector with diploma from EWF and with education following the EWF Guidelines.
Responsibilities according the EWF Guidelines.
* Investigate welding related issues to improve product performance and increase productivity

*Design welded parts, assemblies, and structures such as buildings, pressure vessels, and pipelines

*Develop repair procedures and assess flaws to determine the fitness-for-service of structure

*Develop standards, materials, weld joint design, and welding processes

*Develop welding process procedure qualification, supplier qualification, and product testing

*Troubleshoot welding problems and provide corrective solutions

EQF5
Welding Technologist with diploma from EWF and with education following the EWF Guidelines or welding foreman.
Responsibilities according the EWF Guidelines.
*Set-up and operate welding and joining processes for lab tests, and perform welding experiments

*Work in cross-functional engineering teams to develop and test new products

*Conduct training programs and field service activities for clients

*Support related manufacturing requirements

*Interpret welding related requirements and troubleshoot welding problems

EQF 4
Welding Specialist with diploma from EWF and with education following the EWF Guidelines.
Responsibilities according the EWF Guidelines.
Welding team leader.

EQF3
Welder or International Welder with diploma from EWF and with education following the EWF Guidelines. Qualified/skilled welder with ISO 9606 certificate or similar.
Applicants must possess sufficient knowledge of, or education in, metalworking to follow the course. They must also have a level of health, and physical and mental capability, to undergo the training for which they are applying.

Use of IQSIM at the different EQF levels

Education and training for EQF level 6.

Background.
Historical data implies that approximately 60-70 % of the cost of a product is already decided when a design has been created at the engineering level. However, the production engineering and the manufacturing operation also will have a great influence on the product costs if they can determine the production process at an early stage of the design. A close cooperation between design and production engineering is essential to minimise the total product costs.

However, in an environment with outsourced production the close cooperation between Design and Production Engineering is very often missing. Design produces detailed drawings and deliver these to the client for execution. In large companies the “distance” between design and Product Engineering may face the same problem.
The education of Design Engineers is focused on the theoretical content and as a result a limited amount of practical experience are in their curricula.

IQSIM 2 education and training for EQF level 6 allows the participants to run simulation as a designer and add data for production which allow them to compare their simulation results and bring those up as a discussion topic during the education.
Typical discussion might be for an arbitrary weld length:
1. What will happen if they recommend different welding technologies?
2. What type of welded joints can be selected and what is the consequence of the selection?
3. Why have the fillet welds different a-dimensions and what consequences does this have?
4. Why are the material quality been selected in the design and could another material be selected?
5. Why has the extent of inspection been selected and what are the consequences of altering that?

By selecting a set of cost factors then the total cost can be calculated.

A new IQSIM version will allow the following problems to be addressed in addition:

1. Selecting a Design Class evaluate different welding technologies and the consequences for the total costs
2. Selecting a Quality class and Inspection in order to evaluate the total costs for a design.
3. Select Cost Calculation in order to evaluate the carbon footprint for the selected welding process
4. Select Store and Retrieve allows the designer to store the current simulation and retrieve it later. This allows a designer to compare different design alternatives for a product and to create design variations.
5. Fatigue design and allow the designer to evaluate both static and dynamic load conditions in order top optimize the design.
6. Simulation of the life cycle costs including life cycle costs based on possibility for repair at different levels
7. What considerations has been given to the green footprint of the production methods selected?

Education and training for the EQF level 5.

At the EQF level 5 the training will focus on the practical welding itself, the welding technology and the production planning. At EQF level 5 you will be at an operative level in production with a daily responsibility of following up the day-to-day production and the quality of the production.

This means mentoring of operators at EQF level 4 as well as planning and reporting of actual results of the production.
At EQF level 5 you will get first-hand information of the development of the production itself and the quality aspects of the production and the selected production methods and technologies.
EQF level 5 will carry out education and training towards EQF level 4 specifically regarding the consequences of selecting the correct process parameters and its influence on the costs as well as the green consequences of the welding process. Another important variable which will be extensively used in education and training is how the material fits together and if the assembly of the material is according specification. If deviations occur then the consequences of this deviation will be highlighted. And--- it will focus on the responsibility of the EQF level 4 operator in reporting deviations.

However, in many companies a production engineering level will be absent. In such cases the EQF level 5 will directly be able to report back to EQF level 6 with relevant production data and production experience. Feedback loops with information may be established and a two-way communication will be created at the education level.

IQSIM 2 education and training for EQF level 5 allows the participants to run simulation as a designer and add data for production which allow them to compare their simulation results and bring those up as a discussion topic during the education.
Typical discussion might be for an arbitrary weld length:
1. What will happen if they recommend different welding technologies?
2. What type of welded joints can be selected and what is the consequence of the selection?
3. Why have the fillet welds different a-dimensions and what consequences does this have?
4. Why are the material quality been selected in the design and could another material be selected?
5. Why has the extent of inspection been selected and what are the consequences of altering that?
6. What will be the consequences of a bad fit-up?

IQSIM will allow the following problems to be addressed in addition in a revised version:

1. Selecting a Design Class evaluate different welding technologies and the consequences for the total costs
2. Selecting a Quality class and Inspection to evaluate the total costs for a design.
3. Select Cost Calculation to evaluate the carbon footprint for the selected welding process
4. Create defect evaluation based on the different welding procedure data.
5. Create pWPS and document these
6. Fatigue design and allow the designer to evaluate both static and dynamic load conditions in order top optimize the design.
7. Simulation of the life cycle costs including life cycle costs based on possibility for repair at different levels
8. Evaluate the influence of gas concentration as well as fume concentration
9. Evaluate welding sequences and heat deformation

Education and training for the EQF level 4

At the EQF level 4 you will be a welding specialist. It is assumed that your technical background and mathematical understanding or interest, is limited.
It will be personal at EQF level 5 that will introduce the system for you and ask the questions that will be relevant for your education and training.

IQSIM 2 education and training for EQF level 4 allows the participants to run simulation as a designer and add data for production which allow them to compare their simulation results and bring those up as a discussion topic during the education.
Typical discussion might be for an arbitrary weld length:
1. What will happen if they recommend different welding technologies?
2. What type of welded joints can be selected and what is the consequence of the selection?
3. Why have the fillet welds different a-dimensions and what consequences does this have?
4. Why are the material quality been selected in the design and could another material be selected?

IQSIM will allow the following problems to be addressed in addition in a revised version:

1. Select Cost Calculation in order to evaluate the carbon footprint for the selected welding process
2. Create defect evaluation based on the different welding procedure data.
3. Create pWPS and document these
4. Evaluate the influence of gas concentration as well as fume concentration
5. Evaluate welding sequences and heat deformation

Education and training for the EQF level 3

At the EQF level 3 you will be an International Welder and will be responsible for carrying out the welding tasks

IQSIM 2 education and training for EQF level 4 allows the participants to run simulation as a designer and add data for production which allow them to compare their simulation results and bring those up as a discussion topic during the education.
Typical discussion might be for an arbitrary weld length:
1. What will happen if they recommend different welding technologies?
2. What type of welded joints can be selected and what is the consequence of the selection?
3. Why have the fillet welds different a-dimensions and what consequences does this have?
4. What will the consequences be if the fit up and tack welding has not been according to specification?

IQSIM will allow the following problems to be addressed in addition in a revised version:

1. Select Cost Calculation to evaluate the carbon footprint for the selected welding process
2. Create defect evaluation based on the different welding procedure data.
3. Create pWPS and document these
4. Evaluate the influence of gas concentration as well as fume concentration
5. Evaluate welding sequences and heat deformation

Other education groups.

IQSIM2 has tools and possibilities that allows other groups to use the system for educational purpose:

Purchasing
Purchasing of material is an important task. However, the material composition may vary quite extensively even within the same material group. In order to evaluate exactly the consequences of selecting a new material supplier, a simulation with the material chemical composition is very important. If the material composition is wrong, then the welding might not be possible or give results that are not acceptable. Education and training of purchasing personnel will easily evaluate this through the system.

Inspection
Most welds must be inspected by a non-destructive inspection method. The extent of inspection will result in a number of repair welds. IQSIM2 has tools for evaluation of repair and calculation of repair costs as well.
Through the evaluation between the different welding methods, welding parameters and the repair rate then the extent of inspection can be decided. This evaluation can be a two-way communication between EQF level 5 and 6 and also to EQF level 4. Different training scenarios can be developed for this purpose.

A welding operator at EQF level 4 will always have a mentor at EQF level 5 or higher. The operator will have access to the system in such a way that the consequences of the choices can be seen.
Most choices the operator will see will be:
* welding technology items, process parameters and its results on the technical performance
* welding technology and its influence on costs
* welding technology and its green influence
* fit-up of material and its influence on welding technology and total costs

List of functionalities envisaged for a revised IQSIM:

Function	List of functions envisaged	Output	Target EQF level
1	Select application	Select between a number of predefined applications or functionalities which will insert the application specific rules, materials. Default value is General Purpose.	3-4-5-6

2	Selecting design classes and evaluate the welding process that are most technically suitable	Recommendation for welding process for the selected design Creating a list, weighted, for different welding processes. Note. Maybe the recommendation of filler also could be incorporated here??	6
3	Selecting the quality class and se influence on quality class versus welding method	Recommendation for welding process related to quality class	5-6
4	Cost calculation Calculating the cost for a selected process utilizing the essential variables for the selected process	Cost for a given welding length and in addition the energy consumption and carbon footprint for that production	5-6
5	Cost comparison Comparing the output of different cost calculations graphically	A graphical report that dynamically can be altered if some of the background parameters are altered. The variables are compared graphically	5-6
6	Environmental impact Compare the selected welding methods both numerically and graphically for the total job that is going to be processed. Maybe also type of equipment might be an alternative for each process as well--has to be evaluated.	Calculate the environmental impact of the welding methods selected. Calculate use of energy and carbon footprint. This calculation might cover both the process itself but maybe also the consequential results of selecting the energy method if applicable.	5-6
7	Defect analysis Analysing the probability of creating defects versus welding process and technically settings for a process	Probability of defect range and defect type	3-4-5
8	Technical analysis Analysing technical data based on material classes and material groups. Different material groups to be added and these should be selectable. To cover mild and high strength steels as well as aluminium	Different essential values to be simulated like hardness, tensile, preheat requirements and so forth	5-6
9	Documentation Documentation of simulation results mentioned above	Different types of standardized documents and reports to be generated, like: pWPS with welding data, material classes, heat treatment, welding position, drawings etc, and Work	3-4-5

		Instruction based on WPQR data input complemented with simulation data Cost reports and cost analysis, Design report for recommended design solution	
10	Fatigue design--Simulate static load	Either start with given joint configuration and simulate the load or run it reverse-- define the load and simulate to find the optimum joint configuration. Use IIW reference	5-6
11	Fatigue design--Simulate dynamic load	Either start with given joint configuration and simulate the load or run it reverse-- define the load and simulate to find the optimum joint configuration. Use IIW reference	5-6
12	Cost calculation for a product	Allow the user to build up a cost calculation model for the product and create simulations around that model	3-4-5-6
13	Feedback level	A system or tool that allows the user to submit feedback including technical details from own calculations, added with comments, to another user of the system	3-4-5-6
14	Education levels	A set of user interfaces that are tailored to different educational groups	3-4-5-6
15	Life Cycle costs	Allow a user to simulate the life cycle costs for a defined product	4-5-6
16	Consequence analysis	Add an analysing tool allowing the user to analyse the long-term effect of an occurrence. Ex If a repair % increase, then what will be the result in repair and reclamation. If the defect rate of a certain defect increase-what impact might this have on the maintenance costs?	5-6

17	Green Welding covering IIW level, "Green Welding Technologies, Sustainable Development"	Today, there have had state-of-the-art life cycle assessment (LCA) methods that for example can accurately determine the ecological footprint of a welded product. With appropriate modeling and software capabilities, case studies on welding can be compiled to show exactly which "greener" technology (including yield material, protective gas, preparation work, energy using, etc.). We see an opportunity to connect with this topic from the University of Miskolc. We have LCA expert who usually analyses in a number of fields (e.g. building material developments, plastic development), and now we would like to start a common thread on the welding line as well.	4-5-6
18	Fume and gas concentration	Calculate and evaluate the number of fumes and gases for different processes	3-4-5
19	Welding sequences and deformation in a design	Evaluation of the welding sequences and its consequences for distortion. Consequences for the cost of a product as well as for the quality aspects	5