



OBRAZOVANJE TEMELJENO NA AKTIVNOSTI KAO NOVI PRISTUP OBRAZOVANJU

ACTIVITY BASED TRAINING AS A NEW TRAINING APPROACH

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Sažetak: Svaka proizvodnja zahtjeva dosta znanja o tehnologiji spajanja materijala koja se koristi. S tog gledišta, izobrazba osoblja za zavarivanje, tehnologa i inženjera je od krajnjeg značaja! Izobrazba u zavarivačkoj industriji je još uvijek često provedena na tradicionalni način, gdje se oblikovanje usluga poučavanja može mijenjati sa osnove sadržaja prema aktivnosti temeljenom sistemu poučavanja. Aktivnosti temeljeno obrazovanje usko slijedi industrijske proizvodne procese. Nova pedagoška metoda objedinjuje primjere iz industrijske proizvodnje, metode poučavanja temeljene na problemu gdje su teorija i praksa usko isprepletene sa novima »video« rješenjima na modernim, široko pristupačnim digitalnim pločama. Kao primjer pokazat će se poučavanje temeljeno na aktivnosti u sklopu zavarivanja polimernih materijala.

Abstract: Any production requires good knowledge of a material joining technology to be used. From this viewpoint, personnel education of welders, technicians and engineers is of utter importance. Training within welding industry is still frequently often carried out with traditional means, i. e. classroom based training. In this context, we'll look at a new approach to education, where the design of learning services may change from content based to activity based learning systems. Activity Based Training (ABT) closely follows the industrial production- and fabrication processes. The new pedagogical method mixes cases from industrial production, problem based learning methods where theory and practice are close interconnected with new video solutions on modern, widely accessible to use digital blackboards. As an example, we will look Activity Based Training within plastic welding.

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1. INTRODUCTION

The requirements for higher quality products on the one hand and reducing their prices on the other hand, require constant technological development of methods and systems to ensure quality production. It also goes for welding production and of course as part of this for the manufacture and welding of plastics.. Any production requires good knowledge of a material joining technology to be used. From this viewpoint, personnel education of welders, technicians and engineers is of utter importance.

Globalization of industrial processes requires harmonization within education of personnel both in the industry sector as well as in the VET schools, thus promoting free movement of personnel between different fabrications sites Europe. Of particular interest is certification based training following the production schedule and industrial process.

Training within welding industry is still frequently often carried out with traditional means, i. e. classroom based training. The design of learning services may change from content based to activity based learning systems. Activity Based Training (ABT) closely follows the industrial production- and fabrication processes.

2. ACTIVITY BASED TRAINING LEARNING ENVIRONMENTS

Activity Based Training follows the industrial production process, and the students always produce a product during a course. The ABT method has some key characteristics that are facilitated by:

1. Specification of a product that is delivered to the students as an order
2. A pedagogical tool that utilizes ABT to produce a produkt by following the industrial production flow of an object in such a way that theoretical training is directly connected to practice
3. Self paced on-line education, and high quality instructional video of learning material to institutes, SME and VET schools. The training method promotes the use of modern learning tools in quality assurance and quality management training.
4. Coordinated use of advanced video, other information technologies, distance learning
5. Industrial quality assurance management where students exchange their products during a course.

It is important to address a general issue within upgrading of skills in lifelong learning processes: How to efficiently transfer advanced production process knowledge to students who are looking for a profession, which to a large extent has required practical training with a minimum of theoretical education and where the students have limited knowledge of theory? This is of particular importance in the plastic welding industry where failures related to incorrect operating procedures result in complex repairs and increasing life cycle costs.

A typical mechanical industry fabrication process is often given as an order, which is divided into a number of work packages (see the boxes in Figure 1). A work package is a detailed and sequential description of the working task that is going to be done and it is normally divided into one or several activities. Delivery of the final welded product requires a number of steps from fetching the material, through cutting it into smaller pieces, which will be assembled and welded to a new product. These sequential activities will contain both theoretical and practical tasks, which also include quality assurance and quality control of the job itself. The work package contains at least the following task information in order to secure that the process meets the required quality:

- Work drawing(s) showing the structure of the final fabricated object, i.e. specific details and information for the tasks.

- Work description(s) covering how to do the job and which methods that are going to be used in the production. This includes work process description(s) containing the pre required knowledge, the working processes needed in order to produce the final product, and work package description(s) covering all the work that is going to be done.
- The quality requirements for the product to be produced and delivered. This includes quality assurance requirements for the ingoing elements, and quality assurance descriptions

Activity Based Training that follows the Production Schedule as example shows Fig. 1. Theory is grouped together in the (blue) colored boxes, while the white boxes illustrate the practical skills development within the production workflow. Coordinated use of Visual Communication and Collaboration and blended learning will be used in the colored boxes.

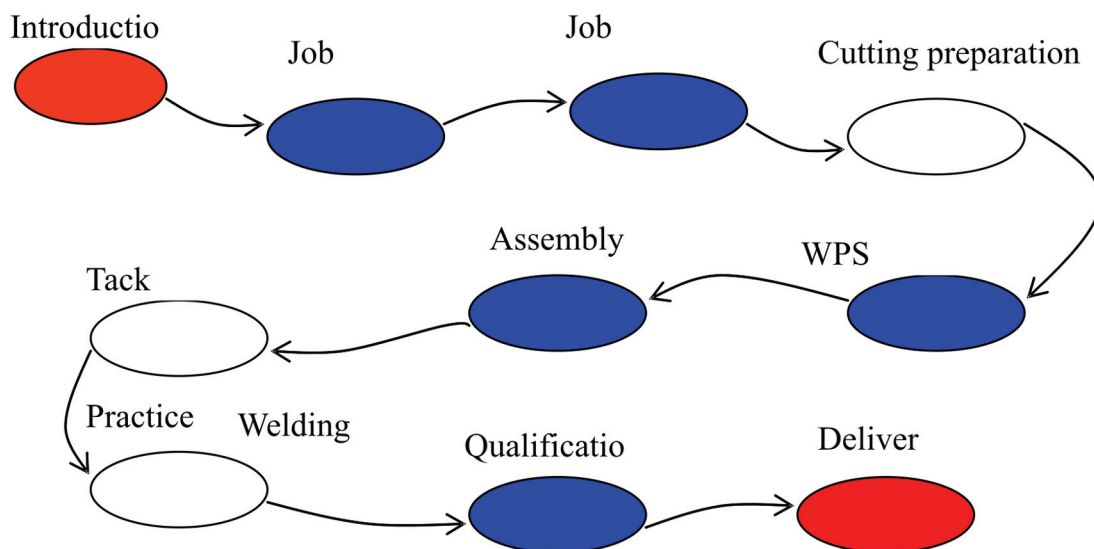


Figure 1: A graphical outline of the ABT methodology

3. ACTIVITY BASED TRAINING EXAMPLE FOR PLASTIC WELDING PERSONNEL

Plastic joining technology has been refined positively in recent years thanks to the good cooperation between the manufacturers of base materials, semi-finished products, systems, machines and devices as well as training and research establishment. This is opening up new fields of activity to the plastics processing industry.

In the field of "education and training" welding personnel, we have produced guideline for qualification of personnel involved in welding of plastics based on the so-called good teaching methods of ABT (Activity Based Training).

The work order is created on the basis of an industrial order or contract, which in detail describe the product and the delivery condition. Thus, the work order is the basis for the education and training schedules, and for the planning of the training activities. For an ABT course the work order needs to contain a minimum of relevant documents like:

- Delivery plan
- Drawings
- Welding Drawings
- Part lists and material lists
- Assembly descriptions



- Reference to International standards
- Reference to contract requirements
- Control documents
- Non-conformance documents.

As the first example we will discuss welding of a single pipeline segment from PE with multiple dividers or connected pipeline branches. So, the described segment will require at least two plastic welding procedures, e.g. welding with heated tools and/or electrofusion welding. In the implementation of this case we will take into account the requests of the European Welding Federation (EWF), stated in the directive EWF-581-01 for European plastic welders. The construction strategy for ABT training in our case would be based on eight modules.

Steps of the ABT

Module 1

Module 1 represents the introductory part in which we will introduce the ABT training method with different learning material. Thereby we will present in detail:

- Course schedule
- How to access the course content
- How to use video in the course examination.

Module 2

In this module we will study everything in the work plan, in order to get to the final product. Important for this are the following points:

- Production plan (consist work order, bill of material, work operations, control reports, non-conformance report)
- Joint types
- Welding symbols
- Introduction of thermoplastics
- Application of plastics
- How plastic are made
- Basics of PE
- Multiple choice Question.

Module 3

The next activity is implementation of thermoplastic cutting- procedures. For this we need to consider the permitted deviations and order of work at cutting. The parts shall meet the requirements in the Work Specification.

This module will also deal with the examination of different cutting procedures.

Safety precautions related to cutting must be discussed. Relevant documents.

Module 4

This module will be intended for comprehension and understanding of an important document which talks about the use of Welding Procedure Specifications (WPS). The conversation will be about the significance of using the WPS as the main document in which all of the most important parameters, tied to a specific welding technology – in our case to welding of thermoplastic, are stated. Knowledge on this document will be tested in a "Multiple choice" examination.



Module 5

In this module we will focus on product structure, in our case that of the pipeline, which will consist of single subassemblies. Again we will lay stress on acceptable deviations which we will deal with in the following modules too. There will be a "Multiple choice" examination.

Module 6

In these modules we will deal with welding procedures. We will learn about welding and its results which will be of grave importance for understanding of the welding technology. We will study in detail:

- Principles of electrofusion welding and heated tools welding
- Welding parameters
- Principles of welding.

Module 7

In this module we will focus on two important fields connected with product quality:

1. *Review, testing and verification of products*
The product has to be reviewed and verified in order to establish, if it reached the required quality level. In this module we will also discuss some of the most important verification methods.
2. *Certifying welders*
In order to reach the determined quality requirements according to the international (ISO/CEN) standards and EU directives, a welder shall reach the minimum requirements regarding knowledge, skills and qualifications. This can be confirmed or documented through an issued certificate – attestation.

There will be a "Multiple choice" examination.

Module 8

Before the product is finished, it must be documented whether it fulfils the requirements from the plan or contract. In this module we will prepare the necessary documentation and do everything needed for supervision and verification. At the end of this module we will prepare a document package about fulfilling requirements.

At the end of course the students will have to write a summary and perform an evaluation on the course.

There will be made a ppt training material with 8 modules to show how to create an educational step that means the logical steps in order to reach a result. The showed product the Pipeline system is only an example. The teacher can change the product type but he can work out a new educational material as the example. Important is show the procedure of the product manufacturing.

4. CONCLUSIONS

We expect to improve the quality of education by applying and introducing the ABT learning environment, which means that we anticipate a bigger and more production oriented practical knowledge, which is exactly what the industry needs. We also expect to reduce the educational expenses and raise the motivation of potential participants from the selection of target groups to be trained. The performance of these courses will be easier and more adaptable and the effectiveness of such education and free movement of personnel will contribute to an increase of competition in plastic industry.



Such education can be used all over Europe and for all target groups and organisations involved in training. Instead of the classical training method in classroom, training would take place in a new learning environment involving a new learning method and offering solutions for virtual learning by applying forward video technology, digital boards, and similar.

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