

GUIDE FOR INSTRUCTIONAL VIDEO

Forming, heat treatment and testing aluminium products

1 Introduction

This guide is intended for the needs of teachers when working with instructional videos from real workplace.

2 Description of workplace and work process

At the described workplace, aluminium workpieces are machined, annealed and tested for their further assembly. These are mainly products for the construction industry such as anchors, carabiners, pulleys, etc. See OSHA documents for more on understanding occupational safety and health standards of Machinery and Machine Guarding¹. See CCOHS documents for more on understating heat-treating². You can watch a video from this real workplace in the link [HERE](#).

2.1 Description of physical environment

There are three workplaces that are shown in the instructional video. The first is the workplace where aluminium workpieces are forged. In the second workplace are aluminium products tempered by solution heat treating. Product testing is taking place at the third workplace. All workplaces have access for pedestrian workers as well as manually guided handling carts.

2.2 Description of manufacturing process

The first step is preheating the workpieces to a forging temperature of approx. 450-500°C in preheating two-chambers oven for approx. 30 minutes. The second step is to manually place the workpiece in the die using pliers, spraying with a special adhesive mixture and forging on the ŽDAS 250 forging press. The operator starts the forging with the foot controller. After forging the product, the operator moves it again with pliers into the prepared box. For more information about the device, see the ŽDAS manufacturer information³. The third step is treatment of cooled products by solution heat treating in a horizontal chamber furnace with forced circulation. The products are heated to a temperature of approx. 550°C for 1.5 - 2.5 hours, depending on the type of aluminium material. Subsequently, the products are immediately cooled in a tempering bath, in which there is ordinary water at room temperature. The last step in the instructional video is the destructive and non-destructive testing of the finished products.

3 Activity overview

Here is an overview of the learning activities.

¹<https://www.osha.gov/laws-regs/regulations/standardnumber/1910/1910.218>

²https://www.ccohs.ca/oshanswers/safety_haz/metalworking/heat_treating.html

³<https://www.zdas.com/production/open-die-forging-equipment/>

3.1 Hazard hunting

Identify as many hazards as possible on the entire video recording or its sequence. Create competitive groups. Use various risk identification techniques, e.g. Brainstorming, Structured What-if technique, FMEA, Scenario analysis, etc. according to EN IEC 31 010.

Guiding question: What can endanger the worker?

3.2 Register of legal and other health and safety regulations

Create lists/registers of national and international health and safety regulations that set obligations and requirements for machinery and machine guarding. In the registers, also include the requirements of other OSH regulations, e.g. technical standards, principles of good practice of professional organizations.

Guiding question: What documents establish obligations for machinery and machine guarding?

3.3 Scenario development

Watch the instructional video. Stop the video at any point and develop a risky event scenario. Discuss in groups different scenarios of one event. Consider both the most likely scenario and the scenario with the most serious consequences.

Guiding question: What could possibly happen if...?

3.4 Analysis and assessment of specified risk

Perform an analysis and risk assessment according to ISO 31000 for the selected risk or group of risks. Discuss and choose the appropriate or different techniques for risk analysis and assessment according to EN IEC 31 010, e.g. ETA, FTA, Risk indices, Risk matrices.

Guiding question: How often and with what consequences does the risk occur? How serious is the risk?

3.5 Cost and Benefit analysis of measures to treat a specific risk

For the selected risk, establish measures for its treatment. Use CBA (Cost and Benefit Analysis) to decide whether to treat the risk and the best way to treat the risk.

Guiding question: How do you convince me to invest time and money in treating this risk?

3.6 Assessment of risk factors of working conditions and working environment

Stop the video in a certain work activity of the worker and develop musculoskeletal disorders (MSD) resulting from handling loads, bending and twisting, repetitive or forceful movements, awkward and static postures etc.

Guiding question: Which diseases can a worker develop over time?

3.7 General principles of prevention

For the most serious risks, apply the General principles of risk prevention according to Article 6, paragraph 2 of Council Directive 89/391/EEC of 12 June 1989 on the introduction of

measures to encourage improvements in the safety and health of workers at work, for example: combating the risks at source, adapting to technical progress, giving collective protective measures priority over individual protective measures etc.

Guiding question: Which principle plays the most important role in the assessed work activity?

3.8 Workflow design

Design, develop and discuss a workflow for one of the work activities shown.

Guiding question: How can the correct sequence of partial work activities affect work safety?

3.9 Health and safety training

Design, process and implement employee health and safety training.

Guiding question: In a given case, is safety instruction or practical training more important for employee training?

3.10 Personal protective equipment

Design and process a list of PPE for the work activity.

Guiding question: What PPE must be provided to the worker?