LCAMP

Learner Centric Advanced Manufacturing Platform

Metal forming

WPN° 3 Observatory

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LCAMP partners:

TKNIKA – Basque VET Applied Research Centre, CIFP Miguel Altuna LHII, DHBW Heilbronn – Duale Hochschule, Baden-Württemberg, Curt Nicolin High School, AFM – Spanish Association of Machine Tool Industries, EARLALL – European Association of Regional & Local Authorities for Lifelong Learning, FORCAM, CMQE: Association campus des métiers et des qualifications industrie du future, MV: Mecanic Vallée, KIC: Knowledge Innovation Centre, MADE Competence Centre Industria 4.0; AFIL: Associazione Fabbrica Intelligente Lombardia, SIMUMATIK AB; Association HVC Association of Slovene Higher Vocational Colleges; TSCMB:Tehniški šolski center Maribor, KPDoNE: Kocaeli Directorate Of National Education; GEBKİM OIZ and CAMOSUN college.

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GLOSSARY AND/OR ACRONYMS

AI - Artificial Intelligence
AM - Advanced Manufacturing
Cedefop - European Centre for the Development of Vocational Training
CoVE - Centres of Vocational Excellence
EAfA - European Alliance for Apprenticeships
EC - European Commission
ECVET - European Credit System for Vocational Education and Training
EntreComp - The Entrepreneurship Competence Framework
EQAVET - European Quality Assurance in Vocational Education and Training
EQF - European Qualifications Framework
ESCO - European Skills, Competences and Occupations
ETF - European Training Foundation
EU - European Union
HE - Higher Education
HVET - Higher Vocational Education and Training
I4.0 - Industry 4.0
KET - Key Enabling Technology
OECD - Organisation for Economic Cooperation and Development
SME - Small and Medium Enterprises
SWOT - Strengths, Weaknesses, Opportunities, Threats
TVET - Technical and Vocational Education and Training
VET - Vocational Education and Training
WBL - Work Based Learning

CONTENT TABLE

EXECUTIVE SUMMARY

Advanced Manufacturing (AM) and Higher Vocational Education and Training (HVET) need to update training, implement new technologies, and get quick access to data.

The causes behind these needs are technological factors (Industry 4.0), factors conditioned by education systems and education methodologies, social factors and environmental factors (the European Green Deal with its emphasis on the greening industry).

Under the CoVE initiative, the LCAMP project aims to support regional skill ecosystems and various stakeholders in providing new skills and implementing new or updated technologies in VET centres. LCAMP will tackle this by incorporating a permanent European Platform of Vocational Excellence for Advanced Manufacturing.

By collaborating across borders, LCAMP's goal is to support and empower regional Advanced Manufacturing CoVEs to become more resilient, innovative, and better equipped to train, upskill, and reskill young and adult students, to successfully face the digital and green transitions. We will help European regions and countries grow and be more competitive through their VET systems.

Therefore, the LCAMP OBSERVATORY is one of the services in the LCAMP platform. The observatory is led by the French cluster *Mecanic Vallée* and the French VET provider *Campus des Métiers et des Qualifications d'Excellence Industrie du Futur*.

This present document details the first results of the LCAMP Observatory, through the methodology that the LCAMP consortium used to set up and run the Observatory. We had set up a process cycle for the observation consisting of 5 stages:

- Stage 1: Diagnosis and priority
- Stage 2: Search and information gathering
- Stage 3: Information Analysis
- Stage 4: Creating value. Elaboration of LCAMP reports
- Stage 5: Dissemination and communication.

1. INTRODUCTION

The LCAMP observatory is one of the services of the LCAMP platform.

The LCAMP Observatory must be a reliable and easily accessible source of information and data for trainers, VET teachers, and professionals, updated on Digital / Advanced Manufacturing / Smart Industry, delivered through a multimedia and interactive platform -LCAMP platform-, that can be customized according to individual interests (Work in progress in WP8).

This observatory must feed other Work packages (WP), for instance, WP 5 on Learner Centric Training, or Open innovation Community in the WP4.

In a first document about methodology, are set up a process cycle for the observation consisting in 5 stages:

- Stage 1: Diagnosis and priority
- Stage 2: Search and information gathering
- Stage 3: Information Analysis
- Stage 4: Create value. Elaboration of LCAMP reports
- Stage 5: Disseminate-communicate.

Following this process cycle, are detailed the main aspects of the observation methodology:

- Identify reliable sources that we can find in Europe about Advanced Manufacturing.
- Classify and filter data gathered from different sources.
- Present several ways to collect data and to analyse them.
- Define the methods for the creation of annual reports.
- Validate process for those reports.

The observatory will publish periodical reports for VET and HVET target audiences about technology trends, labour market changes, skill needs, and occupations in Advanced Manufacturing. It is expected that SMEs, industry clusters and other associations will also find valuable information in the observatory.

The publication of a yearly report is planned.

- Report 1: June 2023,
- Report 2: June 2024,
- Report 3: June 2025.

This first annual report is gathering sub-reports written by around twenty different writers, from the main partners involved in the LCAMP project. 39 Topics were determined, and 22 TOPICS were analysed and worked on during this first period.

2. TOPIC: METAL FORMING

The purpose of this chapter is to present some of the development areas related to AM.

These are topics that concern all or some of the stakeholders

- CoVEs and VETs: teachers, trainers and heads of VET schools;
- Learners: students, active workers, job seekers;
- Companies;
- Policy makers and other stakeholders.

2.1 INTRODUCTION

Metal forming is the fashioning of metal parts through various means. As part of the metalworking sector, it is essential to the manufacturing sector and thus VETs, students, and professional working in that sector.

2.1.1 CONTEXTUALISATION:

Metal forming implies a mechanical deformation through various processes: Compressive forming (rolling, extrusion, forging, etc.), tensile forming (stretching, expanding, recessing), combined forming (spinning, deep drawing, etc.)

2.2 OBJECTIVES

The goal is to understand how advanced manufacturing impacts the metal forming sector and what are the future trends that can be expected in that sector.

2.3 FINDINGS

Metal forming includes different process and machines. Today there are many metal forming machines using digital technologies. However, these are not always connected. Connected machines is the major trend that will affect the metal forming sector for the years to come.

There are many advantages to connected digital machines: it is faster, more precise, more convenient and it allows a better management of the parts, such as detecting flaws, being able

to make changes, and being able to easily reuse a part's program on a different machine. This means less material wasted due to errors or changes.

Electric rollers are a type of connected equipment that can rapidly detect flaws during the manufacturing process. It can also detect them before the process through simulation. Furthermore, the precision of the roller is also helpful to avoid flaws. Finally, as it is electric it consumes less energy than non-electric rollers. On the European market, the Italian manufacturing Davi Promau sells the CNC iRoll eXtreme for instance.[1]

Other types of connected equipment in metal forming available on the market are press brakes and their wireless foot pedals.[2]

There are two recent techniques in metal forming: Incremental forming and hydroforming.
Incremental forming is a recent technique using CAO consisting in deforming locally a sheet to gradually shape it.[3] This technique, used mostly for small series aims to reduce its cycle times, to diversify its applications and to improve the performance of the final products.[4] The cost of this manufacturing technique can vary greatly depending for instance on the size and complexity of the part. It is however usually much lower than with other techniques. For instance, a car's bonnet was made for 12 000 euros. According to the research centre Ocas, that is 2 to 3 times lower than with traditional methods.[5]
Hydroforming is another technique consisting in deforming thin parts using a fluid under high pressure.[6]

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[1] 'Dossier de Veille - Nouveautés Pour Les Métiers de La Mise En Forme Des Tôles - Euroblech 2022', Cetim, 22 November 2022, https://www.cetim.fr/mecatheque/Veille-technologique/dossier-de-veille-nouveautes-pour-les-metiers-de-la-mise-en-forme-des-toles-euroblech-2022; *Web-Conférence : Les Dernières Innovations Dans Le Domaine Du Travail Des Métaux En Feuilles*, 2022, https://www.youtube.com/watch?v=dgjdJNgAxV0.

[2] 'Dossier de Veille - Nouveautés Pour Les Métiers de La Mise En Forme Des Tôles - Euroblech 2022'. *Web-Conférence*.

[3] 'Formage Incrémental', Cetim, 7 February 2012, https://www.cetim.fr/mecatheque/Veille-technologique/Formage-incremental.

[4] 'Note de Veille - Le Découpage-Emboutissage à Esaform 2018', Cetim, 5 October 2018, https://www.cetim.fr/mecatheque/Veille-technologique/Note-de-veille-Le-decoupage-emboutissage-a-Esaform-2018.

[5] 'Le formage incrémental réalise des prototypes en acier', *L'Usine Nouvelle*, 12 October 2006, https://www.usinenouvelle.com/article/le-formage-incremental-realise-des-prototypes-en-acier.N53515.

[6] 'Procédés de Formage - Synthèse En Version Française et Anglaise', Cetim, 6 September 2017, https://www.cetim.fr/mecatheque/Resultats-d-actions-collectives/Procedes-de-formage-Synthese-en-version-francaise-et-anglaise.

3. CONCLUSION

- The development of connected metal forming equipment is the main trend of the sector
- The main advantages of these connected equipment are to manufacture at a lower cost and to recognize flaws in manufacturing faster
- Incremental forming and hydroforming are newer techniques of this sector that are expected to grow.

4. REFERENCES

Cetim. 'Dossier de Veille - Nouveautés Pour Les Métiers de La Mise En Forme Des Tôles - Euroblech 2022', 22 November 2022. https://www.cetim.fr/mecatheque/Veille-technologique/dossier-de-veille-nouveautes-pour-les-metiers-de-la-mise-en-forme-des-toles-euroblech-2022.

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