1. Entity posing the challenge:

- **TIVOLY, IBARMIA, IZAR, LANTEK, LAZPIUR, COMETEL, ONA, DIMECO**

2. Challenge statement

Improved data visualisation

3. General context

The manufacturing industry is facing a new global context meaning the model must be reconsidered in all areas. This implies a structural challenge with profound operational, technological, and cultural implications throughout the value chain.

In this new context, and mainly thanks to greater data processing and storage capacity, greater maturity, and improved applicability to industrial environments, the traditional product is moving towards connected products. Greater importance is being placed on additional services linked to this product, which is opening the door to disruptive models that evolve from the sale of the asset, to the sale of the use of this asset.

This digitalisation of the manufacturing industry opens up possibilities to improve each stage of the industrial process, generating a direct business impact and providing an opportunity to improve both productivity (cost efficiency) and to develop new products and services which increase competitiveness (added value for the customer).

AFM Cluster member companies in general, and Uptek in particular, are directly involved in the context described above. Their activities are directly related to:

- Development and commercialisation of software solutions for the M-H sector
- M-H manufacturing applied to different processes (milling and boring, electrical discharge machining, cutting, punching, bending, etc.)
- Manufacture of tooling and spare parts

In terms of products, it should be noted that these companies have a heterogeneous business model. Some of the companies focus on standard products and others on customised products and even turnkey projects.

While there is a considerable difference in the production processes of these companies, they face certain common challenges at the internal operational and product level that can be addressed through 4.0 technologies.

4. The Challenge

1. Description of the challenge:

Data sourcing is one of the big challenges facing Industry 4.0, a challenge shared by both large companies and SMEs in the MH sector, both in terms of internal process data and data generated by machines/products located at customer facilities. It should be noted, however, that most companies in the sector have advanced and digitised facilities, including production parameter collection and continuous improvement processes. Beyond the challenge of merely capturing the data, the SMEs posing this challenge are faced with the need to make the most of this data and provide their customers with different solutions to process it. This could range from mere data visualisation to applying the solutions to fields such as maintenance or to improve the customer's own processes.

In terms of data management and visualisation, the first field of action is linked to data processing and graphic representation on activity monitoring platforms. These monitoring platforms are understood as the graphical representation of the machine's operating data. This sometimes falls far from the core capabilities of machinery manufacturing companies, but it acts as the starting point for the provision of services with greater added value. Numerous process parameters are not being displayed on these monitors at present. If they were, the machine operator would have a better understanding of the process status, thus facilitating their work.

Another field of action related to data visualisation is the improvement of HMI (Human Machine Interfaces), i.e. developing HMI customisation capabilities that improve user experience. To date, self-developed HMIs have faced the challenge of covering the technical specifications required by engineers, while also being able to be used and interpreted in a simple and user-friendly way by the operators who handle them.

Furthermore, and along these lines, the challenge is to improve all human-machine interactions that can facilitate operator usability. In this sense, the aim is to create natural communication mechanisms between people and machines, making communication as intuitive and natural as possible, while avoiding artificial interaction with the machine, thus improving its usability.

Data visualisation requirements include:

- Incorporating improvements in the human-machine interaction problem.
- Applying gaming technologies and strategies to visualise industrial data.
- Improving the machine's user experience for the operator on the whole.
- Advanced representation of parameters that allow processes to be displayed on machine monitors.

2. Main impacts:

Improving the transfer of machine operation information from the machine supplier to the customer will result in a higher degree of satisfaction in terms of user experience, conveying greater credibility in terms of digital capabilities, and enabling the machine supplier to provide value-added services based on monitoring activities.

In addition, better vision/usability of HMIs will allow operators to generate reliable operations and control or monitor the machine with greater precision. Digitalising and centralising data will allow operators to view important information in graphs and digital dashboards, view and manage alarms, etc. It therefore provides the process with smart attributes.

3. Main questions to be solved:

- Would voice-based operator machine control be possible? What other technological solutions allow a new relationship to be formed with machines (e.g. eye tracking)?
- Would it be possible to graphically represent the parameters collected from machine sensors in a visual and simple way? What are the best Advanced Graphical Representation technologies to display processes on machine monitors?
- Is it possible to apply User Experience techniques and/or Gamification technologies and strategies to graphically represent industrial data?
- Are there solutions that would provide images of what is happening inside the machine and display them on the monitor?
- Would it be possible to "tabletise" HMIs, seeking to improve the user experience without losing functionality?
- Would it be possible to apply operator support technologies based on the provision of this information at machine level?

4. Expected technological solutions

The technological solutions expected to address the above challenges are:

- Advanced graphical representation.
- Gamification /UX (Visualisation engines).