

DIGITAL ENGINEERING: OPTIMISATION OF HUMAN-LED ASSEMBLY AND INSPECTION



AUTOMATICALLY GENERATED ASSEMBLY SEQUENCE AND WORK INSTRUCTIONS FROM MODEL BASED DEFINITION (MBD)

The MTC have combined expertise from its metrology, data and visualisation teams to show how digital tools can be used to automatically produce work instructions for assembly operations.

THE CHALLENGE

Current design-to-manufacture methods do not allow enough manufacturing agility when introducing or modifying products, particularly in times of crisis. Key bottlenecks exist around process documentation and upskilling the workforce to adapt to new processes, while maintaining high levels of quality assurance.

The MTC's digital engineering team identified an opportunity to integrate a number of state of the art technologies to address this challenge. The internal project, Optimising Human Led Manufacturing Assembly and Inspection (OPTUMASSI), was set up to create a proof of concept, highlighting several benefits to overall process time and quality control, for application in sectors where the human workforce plays a key role in the delivery of products.

MTC'S SOLUTION

The OPTUMASSI project created a demonstrator that brought together a series of cutting edge, digital manufacturing technologies.

The functions of the system include:

- ▶ Automatic generation of work instructions for assembly and inspection processes using Artificial Intelligence (AI).
- ▶ Delivery of augmented work instructions in mixed reality (MR), to ensure right first time, consistent assembly practices.
- ▶ Automatic training of a machine learning (ML) model to verify successful assembly at each process stage.
- ▶ The ability to maintain a digital thread throughout the process using model based enterprise (MBE).

THE OUTCOME

Model Based Definition (MBD) for a box assembly was created and the assembly-specific requirements were digitally marked. The model was consumed by an MTC developed tool to assess the assembly sequence, extracting and interpreting the requirements, and turning them into work instructions. The work instructions were fed into a HoloLens MR environment, where they were displayed for the operator along with augmented visualisation of the relevant parts of the assembly. Instant feedback was provided in the form of smart tool inspection results, and each assembly stage was automatically verified.

An explainer video has been produced to further illustrate the system, helping to engage with industry to further exploit the technology. For more information, please visit www.the-mtc.org/optumassi

A second phase of this project has been planned, focusing on industrial use cases, to align the system with applications that deliver maximum benefit.

BENEFITS TO THE CLIENT

This proof of concept demonstrates the potential of such a system for industry, providing easy to follow instructions to operators, dramatically reducing the time to manufacture and integrating with the Digital Thread.

- ▶ Improved cost effectiveness and faster implementation of new component designs.
- ▶ Increased agility when deploying people, assets and processes across the supply chain.
- ▶ Reduction in cost and time when training on manual processes.
- ▶ Minimised assembly variation as instructions are shared with multiple suppliers.
- ▶ Implementation of standardised practices help achieve consistent product quality.
- ▶ An insight into potential application uses of state of the art software tools.

