

FAST, FLEXIBLE AND FAULTLESS ASSEMBLY WITH PROJECTED WORK INSTRUCTIONS



TNO innovation
for life

In view of the rapidly changing nature of manufacturing, TNO, Bronkhorst High Tech, Omron and TE Connectivity have integrated an operator support system in a manual assembly workplace as part of the TKI project Flexible Assembly Cell. This system helps companies to perform fast, flexible and faultless assembly of different products.

THE WORLD IS CHANGING

The nature of production is changing in manufacturing:

- › Flexible production: different specifications, products, numbers, timing
- › High mix, low volume
- › Faultless production: first-time right, ultimate control of quality and resources
- › Shorter time-to-market
- › Shorter lifecycle of products

Developments in technology are also happening fast: more digitalisation and robotisation on the workforce. With the flexibility that is demanded, people and robots/machines will continue to cooperate. Companies need to be able to deploy wider target groups (experienced and inexperienced, young and old) quickly and flexibly in the primary process.

PROJECTED WORK INSTRUCTIONS

TNO has integrated the Light Guide System software of the American company OPS Solutions into one operator support system in a flexible manual assembly workplace. This system, in which projections help an operator to perform assembly work, has been demonstrated and tested at Bronkhorst High Tech, Omron and TE Connectivity. A pick-to-beamer enables the correct tray to be illuminated and the assembly instruction is projected onto the product or worktop. Operators quickly see which part has to be picked from which tray and how it must be assembled. Moreover, operators get direct feedback if a wrong part is taken. Navigation through the work instructions is intuitive and is (semi)automatic. Critical action can be confirmed manually with the aid of virtual buttons projected on the



worktop. The system is easy to connect to external systems, like (3D)Vision. Production data, such as assembly times and quality information, are written to a database for additional analyses.

REAL BENEFITS

TNO has performed measurements among the three companies to ascertain the effectiveness and efficiency of this system compared with digital work instructions via a monitor. The effects on the workload of the employees were examined as were their experiences of the projection system. A total of 35 operators took part and the results of this study are very promising:

- › Reduction of the total cycle time by 57%;
- › Reduction of the pick time by more than 70%;
- › No errors were recorded in picking components with the aid of pick-to-beamer support (this error percentage for digital work instructions was 8.000 ppm);
- › No errors were recorded in placing components with the aid of beamer instructions (this error percentage for digital work instructions was 80.000 ppm);
- › Compared with screen instructions, projected work instructions reduced the workload for experienced operators by 25%.



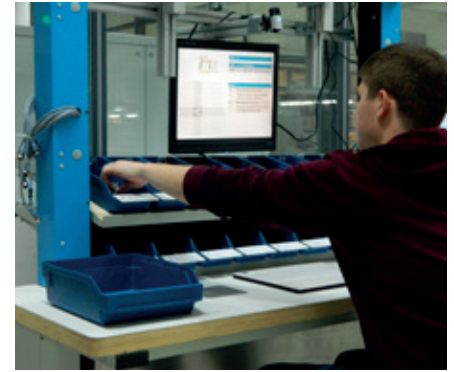
EFFECTIVE PREPARATION AND ASSEMBLY

The system can be a useful ally in working in new employees, but it is also useful for experienced operators when product variants and materials more frequently switch and change. The system has different levels, depending on the skills level of the employee.

The system will soon be equipped with a datamodel and database for modular work instructions. This link, on which TNO is currently working, means that work instructions for new assembly activities can be automatically generated from the datamodel and presented to the system. This can shorten the time needed to make new instructions and can improve the version management.

SMART INDUSTRY FIELDLAB

Results from this TKI project Flexible Assembly Cell will be used in the Flexible Manufacturing Fieldlab that is part of the Smart Industry programme Factory of the Future at Brainport Industries. Fieldlabs are real-life environments in which knowledge and education institutions, production companies, developers and suppliers jointly and specifically develop, test, implement and learn to use Smart Industry solutions.



INTERESTED?

If you are interested in the possibilities this system may offer your company, for example in the form of a proof of concept to enable you and your employees to gain experience or build a business case, then contact us.

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TNO

TNO is an independent research organisation that connects people and knowledge to create innovations that sustainably boost the competitiveness of industry and wellbeing of society. That is the mission on which we work with our partners every day.

Tim Bosch

T +31 (0)88 866 52 12
M +31 (0)6 21 13 43 63
E tim.bosch@tno.nl

Gu van Rhijn

T +31 (0)88 866 53 05
M +31 (0)6 21 13 43 62
E gu.vanrhijn@tno.nl