

CELL-OS – Robotic Cell Operative System

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Project Details and Motivation

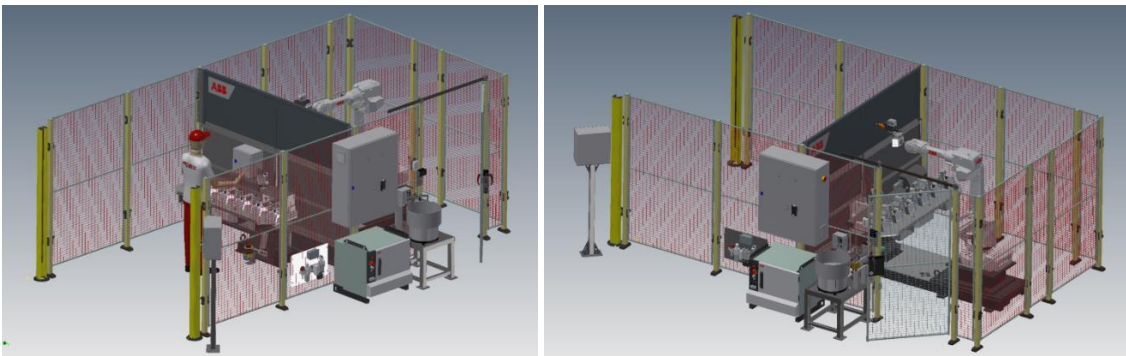
Robotic cells are designed for very specific tasks. Their communication with the manufacturing line is usually very limited. However, they have the potential to improve quality, interoperability, and intelligence in factories.

CELL-OS aims to enhance robotic cells with AI and analytics with new features, to perform predictive maintenance and quality prediction, so the cell performance can be assessed in real-time, obtaining zero-defect processes with maximum reliability for high-demand environments.

CELL-OS hence aims to

- 1) Validate ZDMP platform and components.
- 2) Add new functionalities to robotic cells, providing a new generation of self-controlled and self-assessed units.

Therefore, this project will be specifically deployed in a real cell from a real customer in which a riveting process will be performed. The cell will be similar to the one shown in the following pictures:



Hence, in this cell 3 main tasks will be performed:

- Robot's predictive maintenance
- Riveting gun's predictive maintenance
- Quality control of the rivets

To perform the aforementioned tasks, some components of the ZDMP platform are needed and will be described hereafter.

ZDMP Fit

The ZDMP components will be key to develop the robot's and riveting's gun predictive maintenance, as well as the quality control of the rivets. Therefore, the components used in this project are the following:

- The ZDMP Portal component is needed because it allows access to ZDMP components, as well as acting as a bridge between security components and other ZDMP components.
- The Secure Authorisation & Authentication component is an access process and management system to ensure other ZDMP components are secure.
- The Secure Communication component will be used since it is an additional service to ensure other ZDMP components can securely exchange data.
- The Application Runtime component is another ZDMP key component needed to run some other ZDMP components. In our case, it is necessary to run almost all the other components which will be used. Thus, this component acts as enabler of a baseline functionality to the hosted components of the ZDMP system.

- The Service & Message Bus is necessary to enable a communication interface to exchange messages and data.
- The Monitoring and Alerting component will be used to display any possible alert in case a parameter value is out of defined limits.
- The cell's data will be obtained using the Data Acquisition component. Hence, data will be obtained from the cell on a local PC which will be afterwards stored and used to train the AI models to perform robot's and riveting gun's predictive maintenance and the rivet's quality control.
- Data obtained using the Data Acquisition component will be stored in the Storage component before being used to train AI models in the AI Analytics Designer. Once these models have been trained, they will be also stored in the Storage component before being run in the AI Analytics Runtime. Once the models have been run in the AI Analytics Runtime component, these models will be also stored in Storage to use them afterwards in the Prediction and Optimisation Runtime component.
- In the AI Analytics Designer component, prediction models will be trained until obtaining reliable AI models to be run in the AI Analytics Runtime component.
- In the AI Analytics Runtime component, trained AI models will be run, making possible their visualisation and management.
- The Prediction and Optimisation Runtime component will be used together with the AI Analytics Runtime to identify data processing problems, maintain process quality, as well as predicting future trends of the riveting process.
- The Product Assurance Runtime component will perform actions to ensure the quality of the rivets, evaluating thus if they have the quality level required by PROBOTEC'S customer.
- The Process Assurance Runtime component, together with the Prediction and Optimisation Runtime component, will control the right predictive maintenance of the robot and of the riveting gun.
- Finally, the Digital Twin component will be used to perform a digital representation of the riveting process, helping to improve the process by making the quality control of the rivets and the predictive maintenance of the machinery more efficient.

Results to Date

At this moment, the project is completely defined, having designed a detailed scenario, the pilot cell and the process which will be performed, which is a riveting process. In addition, project requirements in terms of HW and SW are defined, as well as KPIs and the HW-SW architecture with all the involved ZDMP components which, at this stage of the project, they are thought to be necessary to perform it successfully.

Participant Details

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Environment

The ZDMP – Zero Defects Manufacturing Platform – is a project funded by the H2020 Framework Programme of the European Commission under Grant Agreement 825631 and conducted from January 2019 until December 2022. It engages 31 partners (Users, Technology Providers, Consultants and Research Institutes) with a mission to “Provide the platform, components, services, and marketplace to achieve the right product, at the right time, with the right conditions using the right resources.”. Further information can be found at www.zdmp.eu. ZDMP channels 3.2M€ of SME orientated funding to subprojects, such as this one to both facilitate SMEs with their innovations and increase the value of the ZDMP ecosystem,

Links

• Primary Partner:	mrodriguez@probotec.es
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• Secondary Partner:	gema.antequera@ctag.com
• Sub project website/blog	https://ctag.com/en/cell-os-robotic-cell-operative-system/ https://probotec.es/cell-os-robotic-cell-operative-system/
• Architecture Component/App(s)	Portal, Secure Authorisation & Authentication, Application Runtime, Data acquisition, Service & Message Bus, Monitoring & Alerting, Secure Communication, Storage, AI Analytics Designer, AI Analytics Runtime, Prediction and Optimisation Runtime, Product Assurance Runtime, Process Assurance Runtime, Digital Twin