

Industry 4.0 (predictive and preventive maintenance & prognosis) in the automotive industry

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Some questions for you

- Are your suppliers optimizing their processes parameters to increase the performance you are achieving with the parts that they are sending?
- Are you able to certify that the last part manufactured meets the quality requirements without performing a quality check?
- Are you replacing your machine tools at the most optimal moment based on their performance and not based on the number of parts that have been manufactured?
- Are your machines always configured with the best optimal parameters?
- Are your machines alerting you when a maintenance action or a tool replacement must be performed before producing bad parts?

Introduction

In modern factories, control systems help to improve the response capacity, efficiency, and quality of the final product and also to reduce material wastage and energy costs, to rise productivity, and to ensure an environmentally friendly economy amongst other competitive advantages.

This concept has been generalized to what is known today as "Industry 4.0". These systems include the internet of things, cloud computing, Big Data and machine learning amongst other technologies.

The automotive industry is aware of this trend although it faces a great challenge which is the high cost of establishing in practice the techniques found in literature. Thus, industry and science face a great challenge: Discover how to identify the appropriate tools, in an accessible, cheap and real-time way, to monitor and improve the automotive manufacturing process.



In this context, the implementation of predictive techniques or prognosis, helps to anticipate production and quality problems making it possible to schedule the required tasks to reduce scrap rates and improve productivity. In addition, to create and design tools that help the transition from defect detection to defect prediction whilst ensuring collaboration in the value chain.

What will ZDMP achieve

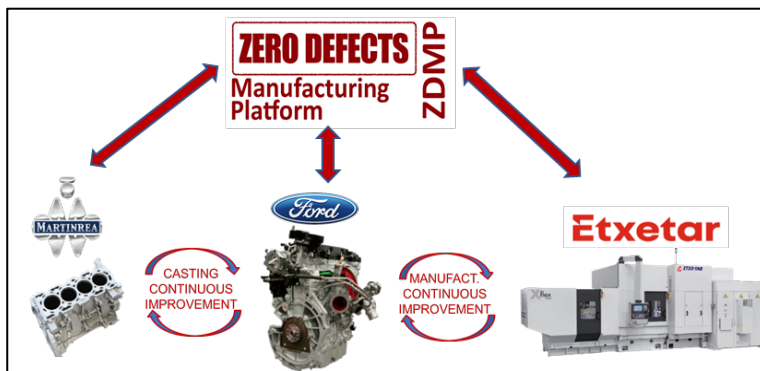
The Zero Defects Manufacturing Platform (ZDMP) allows the exchange of quality and performance data between key industrial partners in the engine manufacturing process, by enabling the development of casting and manufacturing continuous improvement loops.



Concretely, ZDMP allows the integration of data collection for key parameters regarding machinery and materials and the experience and technology coming from the participants involved. It will explore improvements on the following areas:

- Defects detection & prediction in Aluminium injection operations
- Defects detection & prediction in Machining operations
- Defects reduction by an optimal Machining configuration

An anomaly detection algorithm will be developed to predict the quality result of the last manufactured part and to improve the performance of the machinery, by storing machining parameters combined with relevant variables during the manufacturing process. The algorithm will raise an alert when it detects that the manufacturing equipment is losing its performance and before a quality problem appears.

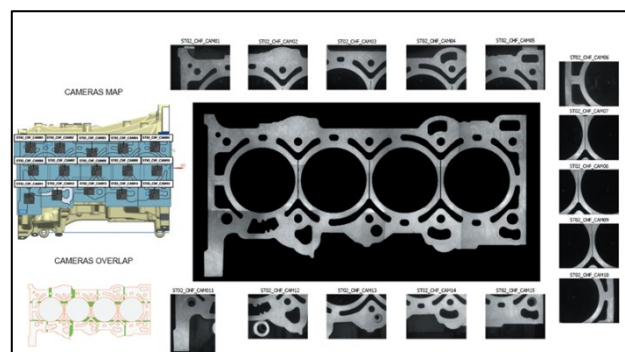


Additionally, to restore the equipment to normal conditions, it recommends corrective actions such as implementing maintenance activities, modifying the process parameters, or proposing a tool change.

All the actions previously described, lead to increased machine availability, first time through, and reduced operative costs. Algorithms will be developed to improve aspects of quality or productivity and to find working parameters that will offer optimum quality ratios.

For this purpose, in this joint experience of the value chain, different technologies, such as computer vision, ultrasound or metrology, will be combined for monitoring the production processes of automotive engines industry, inspecting the 100% of pieces.

The technology developed will apply to a wide range of key products in automotive manufacturing processes and will ensure the optimization of industrial production processes, environmental sustainability and energy impact.



ZDMP Links

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| • Architecture Component(s) | N/A |
| • Work Package | WP9 – ZDMP Traditional Sector Cases: Automotive & Machine Tools |
| • Tasks | All |

References

None