ZDMP Blog

Applying Industry 4.0 component inspection in Electronic Automotive production

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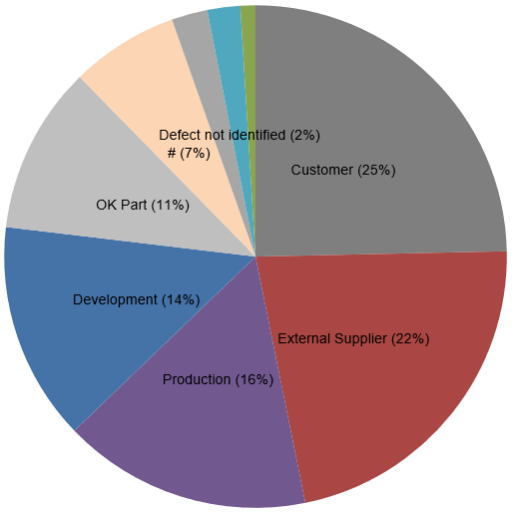
Some questions for you

- What are the main defect categories in electronic automotive production?
- What new processes and methods could be used to assure electronic products without defects?
- Could the Computer Tomography technologies, utilised in medicine for diagnostics, be used for automotive production quality checks?
- Could the XRAY/CT laboratory inspection be suitable for large volume electronic product manufacturing?
- Could the Industry 4.0 technologies be used for assuring zero defect product?

Introduction

Electronic automotive products usually contain one or more PCB (Printed Circuit Boards)'s and other mechanical components (housing, screws, connectors, covers). Due to processes and technological limits, hard specifications for automotive products, and strong price pressure, components provided by suppliers do not always comply with specifications. Moreover, safety is critical for the automotive products, as the environment and working conditions are difficult. Therefore, the quality of the components and materials are crucial, as they impact the quality of the final product.

The zero defects production process presumes quick identification of the source of the defect to avoid larger consequences. Further measures include systematic work to solve the issues and implementation of methods to proceed proactively rather than reactively.



Based on analysis of the product failures in electronic components production, the following defect categories were identified:

- Customer-caused defects, usually due to improper assembly or product usage (25%)
- Components or materials that are defective or not compliant with specification that were not identified during the assembly or production process (22%)
- Production defects, not identified during the assembly process
- Defects due to design issues

Checking the mechanical and electrical components' quality during the production, especially for complex products, becomes:

- A complex technical challenge, often requiring sophisticated equipment.
- Inefficient, often the testing time is too high for the full quality test and does not allow the possibility to test all involved components or perform all needed tests.
- Too expensive for big volume production.
- Inflexible, requiring significant development and operating costs.

In this regard, there is the strong need for new process development to assure the quality of the components based on supplier quality processes and fast feedback loops for quality correction.

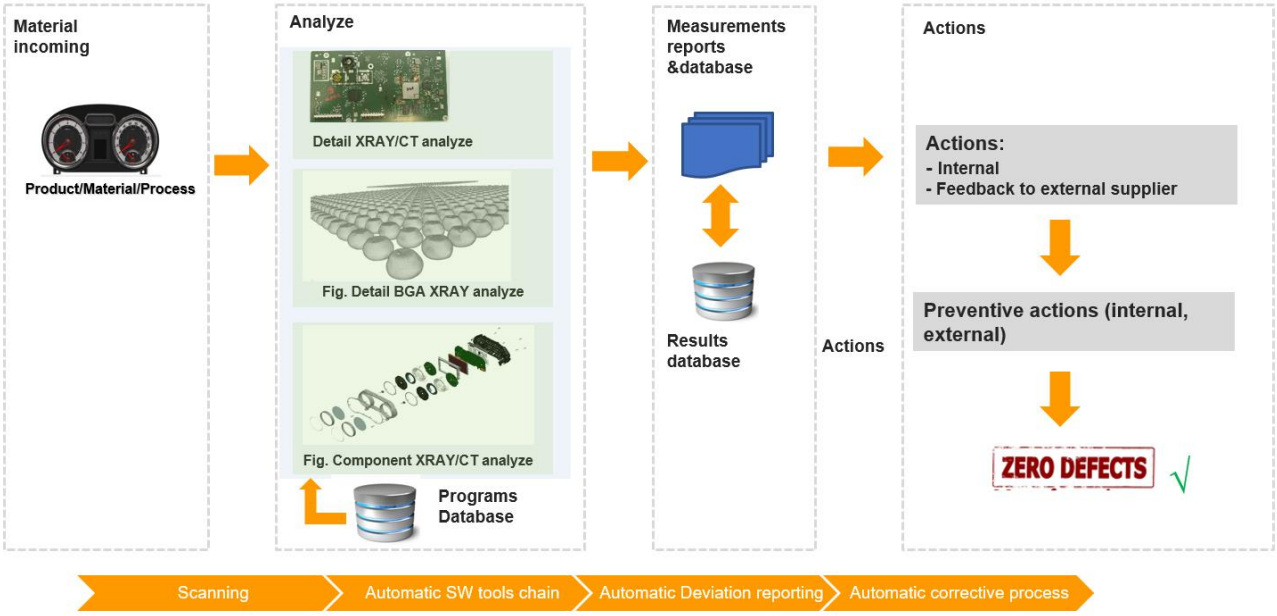
The Electronics usecase of ZDMP proposes component testing using X-Ray and automatic feedback processes to suppliers for component quality improvement.

What ZDMP will achieve

The classical identification of material and component defects (supplier quality check) is typically a time and resource consuming process with limited quality results.

The proposed ZDMP development uses the new XRAY/CT technology that is, up to now, mainly applied to laboratory experiments and medical investigations.

The results are a flexible environment that allows automatic check of suppliers' materials and components using XRAY/CT. Moreover, additional features, such as 3D dimensional measurements, and comparison based on specification and automatic escalation of the management process.



One example is presented below. The product connector is scanned by XRAY/CT, the software Tools generate the 3D model of the analysed part and compare it with the specifications. The proposed method allows a detailed dimensional analysis, an easy visualisation of the deviations from normality, and automatic storage of the results in the data base and trends analysis.

The proposed method could be used for a wide area of materials (metallic, plastic, complex 3D cavities) and only needs the intervention from the operator to load and unload the XRAY/CT machine.

The measurement results are available in a cloud storage accessible through the WEB application. Moreover, the system sends the measurement report to the responsible people and performs the management escalation steps and information flow if needed.

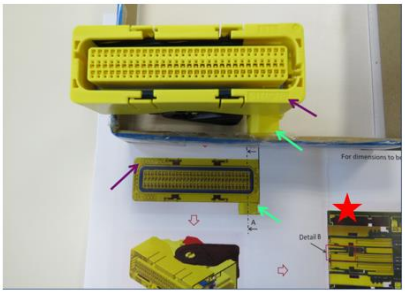


Fig. Incoming material check

Expected:

1. Use XRAY&3D with methodology capability for mechanical component check.
2. Easy operations from the user, automatic measure and compare of the specific parameters.

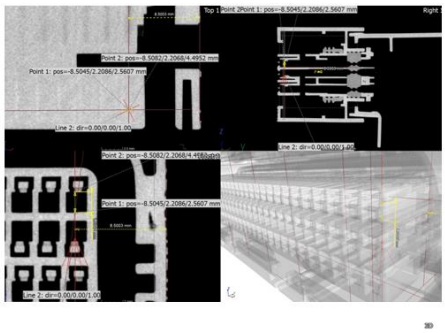
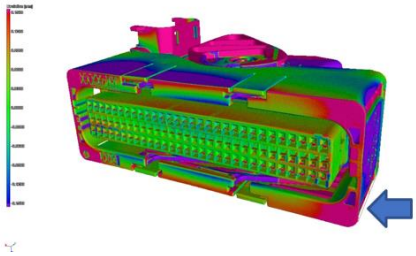


Fig. Detailed measurement



Out of tolerance

Fig. 3D image with the results of the CAD-file and volume comparison

ZDMP Links

• Architecture Component(s)	N/A
• Work Package	WP9 – ZDMP Traditional Sector Cases: Electronics
• Tasks	All

References

None