



CIVA
N·D·E | 11

Simulation Software for Non-Destructive Testing

Application Example N°1



Inspection before launching manufacturing

Background

Many components and types of equipment are subject to **inspection requirements**, during both manufacturing and in service. For example, in-process inspection of components in aerospace, and in-service monitoring of equipment in nuclear facilities. The inspection challenge increases for:

1. Components and equipment with complex geometries.
2. Parts composed of new materials.
3. Parts with limited accessibility.

It is therefore essential to inspect parts **at the earliest possible stage** of the manufacturing process. Doing so minimizes the cost and waste associated with down time and value added to defective parts.

Benefits

The newest developments in CIVA make it possible to **anticipate** inspection conditions during the mechanical design stage that may impact **manufacturing and operational** feasibility, as well as the ability to meet regulatory requirements.

More specifically, CIVA can now handle **complex geometries**, as well as **the latest developments** in probes, inspection strategies and data-analysis techniques.

Being able to accurately simulate your inspection during the design process allows you to **identify and account for critical inspection issues**. This greatly **reduces** unforeseen problems and thus **additional costs** during operations.

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Inspection before launching manufacturing

Case study

Accounting for complex materials and geometries

THE PROBLEM

The geometric complexity of a part must be analyzed as far upstream in the design process as possible to **allow specification of appropriate NDT methods**.

For those parts with a **complex profile**, such as welded specimens, the access to the inspection zone can be difficult if not impossible.

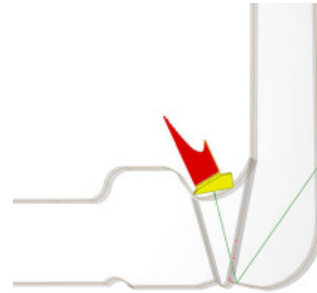
Because the probe does not match the surface and there can be a **loss of coupling**, defect detection can be compromised.

Knowing potential inspection issues at the component design stage may allow **changes in geometry that lessen the inspection challenge**. For example, changing the surface profile to better match the probe greatly improves the inspection results.

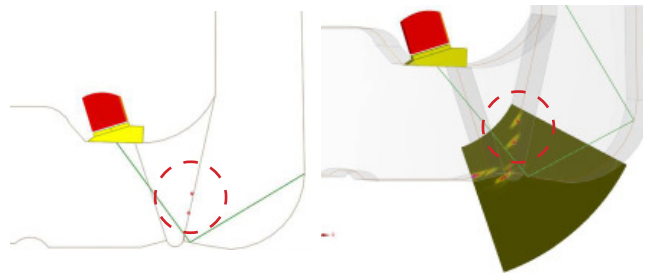
CIVA'S CONTRIBUTION

The CIVA simulation tool allows you to **evaluate and validate your inspection methods early on** in the design process.

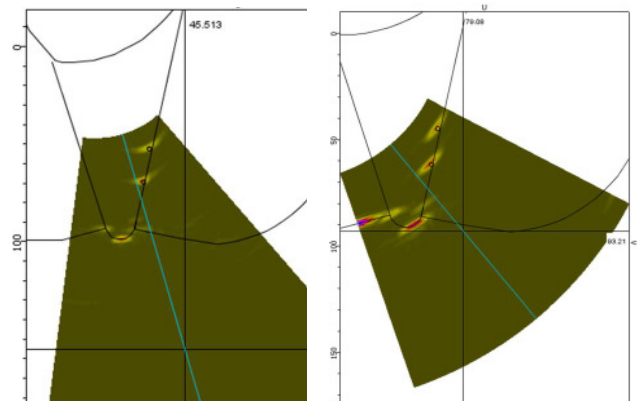
For example, CIVA allows you to check the inspectability of parts up front, so that possible design changes can be considered. Performing these studies at the design stage can avoid significant additional costs later by preventing problems during manufacturing and in service. These costs can be particularly high for major projects with complex parts.



Component with side-drilled holes and a planar crack intersecting the root of the weld. The match between the probe and specimen is imperfect because of the complex surface profile.



The same component with a slight modification of the surface geometry to better accommodate the ultrasonic probe.



There is a drop of 10 dB in **signal amplitude** for the case of restricted versus satisfactory access.

These cases illustrate the benefits that can be realized when inspection methods are evaluated before launching manufacturing. The required analyses can be performed with CIVA.

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