SPEQ LLC

COMPUTED TOMOGRAPHY APPLICATIONS

Description

Computed Tomography (CT) is a significant refinement of Digital Radiography (DR) technology. DR develops an overlapped image of the internals of an object, very similar to that of a standard radiograph. CT acquires a 2-dimensional slice through an object at selected locations. The detail at each slice is not shadowed by the material above or below. Slices can be examined individually or be combined to develop a computerized 3-dimensional model of the item. Both dimensional and material properties information can be determined from the scans.

Practical Applications

Early applications of industrial CT were for defect detection and were performed by the aerospace industry. Later both the aerospace industry and automobile manufacturers started using CT for reverse engineering (developing CAD drawings from CT scans of an object). The oil industry also has been using CT to scan core borings. As the experience base has increased over the last 30 years and new needs have been identified, industrial CT equipment and technique have been constantly improved.

History

CAT scanning (medical CT) began in the 1970's. The CT used in industrial applications was developed in the early 1990's from the CAT scanners used by the medical profession. Industrial CT uses higher energy sources than medical scanners which permits it to penetrate high density material and still determine internal detail.

Additional CT Capabilities

- Comparative Computed Tomography (CCT Pat. Pend.): Commercial grade versions of parts or components can be scanned and compared to the record baseline file of acceptable qualified items.
- Material Receipt Inspection & Record: Sampling of incoming items can be scanned and compared against recorded scans to equate dimensions and materials.
- Internal Inspection as Preventative Maintenance (PM) Alternative: Items that would normally be disassembled for PM can be scanned to determine wear, alignment, and condition of internals. Unnecessary invasive action that could result in damage of item can be avoided.
- Reverse Engineering: CAD drawings can be developed from a CT scan for an item lacking original drawings or missing specific dimensional information.
- Manufacture Quality Control: A sampling of critical parts can be CT scanned to ensure product quality.
- Post-Failure Examination: The failure mechanism internal to a failed component can be evaluated before disassembly, without destroying evidence of why the failure occurred.
- Finite Element Analysis (FEA) of Flawed Item: A model containing an actual material defect can be developed from a CT scan and analyzed for acceptability.

SPEQ CT Projects

Starting in the 1990s, SPEQ LLC (SPEQ) staff, through previous employers, began investigating technologies that could be useful for examining the internals of sealed power plant spare parts non-destructively. Digital radiography provided a viable option for accomplishing this objective on simple components but was less effective for more complex items.

Example Tasks:

- Digital Radiograph and CT Slices of MOV Motor
  - ✓ Checked for generic condition of degraded rotor bars of in-tact MOV motor.
- CT Slices Through Motor Bearing
  - ✓ Checked bearing condition of in-tact MOV motor.
- CT Evaluation of Sealed Pilot Valve
  - ✓ Examined sealed valve to look for internal non-metallics which may have degraded.
  - ✓ Avoided destructive exam of limited quantity inventory item that was no longer made.
- CT Evaluation of Agastat Time Delay Relays
  - ✓ Looking for potential causes of unreliable operation that may be lost on disassembly.
  - ✓ Found mis-positioned diaphragm & many casting voids that could impact operation.
  - ✓ Confirmed identical configuration of Commercial Grade & Safety Related relays.

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Contact: Jon Frenn
jonfrenn@speqllc.com
847-757-1606

Office Phone: 847-566-5059
872 S Milwaukee Ave Suite 104
Libertyville, IL 60048
www.speqllc.com