Modern Generator Designs / Robotic Core Stacking
David Charlton
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Charlotte Products & Services

Steam turbine manufacturing
- Machining, assembly & balance
- Full replacement elements

Turbine & valve service
- Rotor, stator complex weld repair
- Nuclear / fossil valves & actuators
- Rebuilds & replacements

Generator manufacturing
- 150 MVA - 1200 MVA units
- Machining, winding, assembly & balance

Generator and exciter service
- Rewinds, partial repairs, modernizations

Gas turbine manufacturing
- Machining, fabrication, assembly and balance

Gas turbine service
- Rotor repair, stator repairs, replacement, LTE
Stator Core Design

- Supports the stator windings
- Magnetic path for rotor flux
- Two types of stator core stacking techniques
  - Individually stacked laminations
  - Stator core donuts
Stator Core Design

Stator Core Cooling

- Radially cooled
  - Conventional air
  - Hydrogen
- Axially cooled
  - Conventional air
  - Hydrogen

Axially Cooled Core

Radially Cooled Core
Stator Core Manufacture

- Individually stacked stator laminations
  - New cores robotically stacked
  - Replacement cores – hand stacked
- Vertically stacked in factory or field
  - Requires rotating frame
Robotic Stator Core Stacking

- Programmable robots used for stacking
- Laminations stacked in segments, then inspected for Critical to Quality attributes
- Approximately 150,000 laminations per generator core
Stator Core Robot Stacking Video
Lamination Lifting & Core Stacking Process

- The segment of iron is moved to the core stacking station
- Tooling (pins & drifts) for correct positioning and core shape
Stages of Core Stacking

Stacking ➔

Pressure for core consolidation ➔

Fully stacked, ready for turn down ➔
Measurements of Core Stack
(Bonded Core Packs “Donuts” and Dry Stack Core)

- Inspection & measurement of core stack
  - Visual inspections
  - Critical to Quality measurements
Moving a Stacked Core to Winding
Wound Core Assembly
Global Vacuum Pressure Impregnation Chamber
Modern Stator Core Mounting

- Stator core is spring mounted on the bedplate by steel spring assemblies to:
  - Isolate double frequency core vibration
  - Limit torque build up during power system faults

Spring bar is welded to individual spring brackets that are connected to stator key bars.

Spring suspension mounting along the generator.
Stator Core: Turbine Deck Restack Options
Bonded Core Pack “Donut” Design

- Donut Core (i.e., bonded core packs)
  - Pre-manufactured core sections
  - Allows horizontal core stacking in the field
  - Electrically tested prior to shipment
  - Highly consolidated core
  - OEM & OOEM core replacements
Donut Installation Trolley
Air-Cooled Generator – Final Assembly
H2-Cooled Generator – Final Assembly
Thank you!