Steam Turbine Series Part 3: Creating Steam Turbine Models in THERMOFLEX – using fundamental building blocks

ST Series - Summary

- <u>Part 1</u> – Creating ST models the quick-and-easy way.
  - Aimed at developer (upfront study) tasks
  - ST Assembly Wizard
  - Full automation used to build and compute ST
- <u>Part 2</u> – Manipulating ST model to match desired (OEM-provided) performance
  - Aimed at advanced developers/engineering companies
  - Knobs to adjust to dial-in performance
- <u>Part 3</u> – ST models built using fundamental building blocks
  - Aimed at OEMs & engineers possessing detailed steam turbine heat balance data, and wanting to exercise full control over all modeling details

EASE-OF-USE

FLEXIBILITY

Thermoflow

ST Modeling with Fundamental Blocks (the 5 W's)

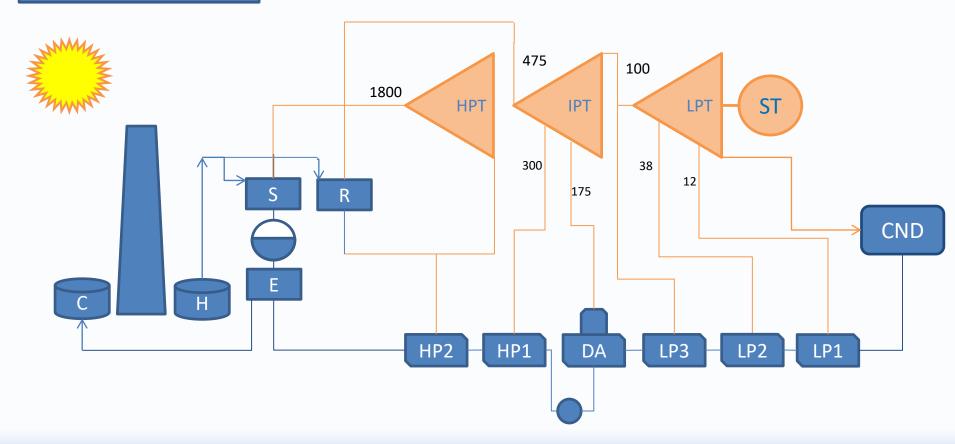- **Who:** All THERMOFLEX users (targets OEMs and those with unusual configurations, or desire to control every detail)

- **What:** Fully-flexible method to model steam turbines in detail where virtually every aspect of the model is on the flowsheet

- **Where:** THERMOFLEX– fully flexible modeling environment with > 220 standard built-in components handling 7 fluid types

- **When:** THERMOFLEX 1995, ST Assembly 2003

- **Why:** Employ the (THERMO)FLEXibility inherent in THERMOFLEX to build comprehensive, fully detailed model including user-defined methods to define calculation to match in-house codes

Our Old Example – Solar Rankine Cycle

New Piece

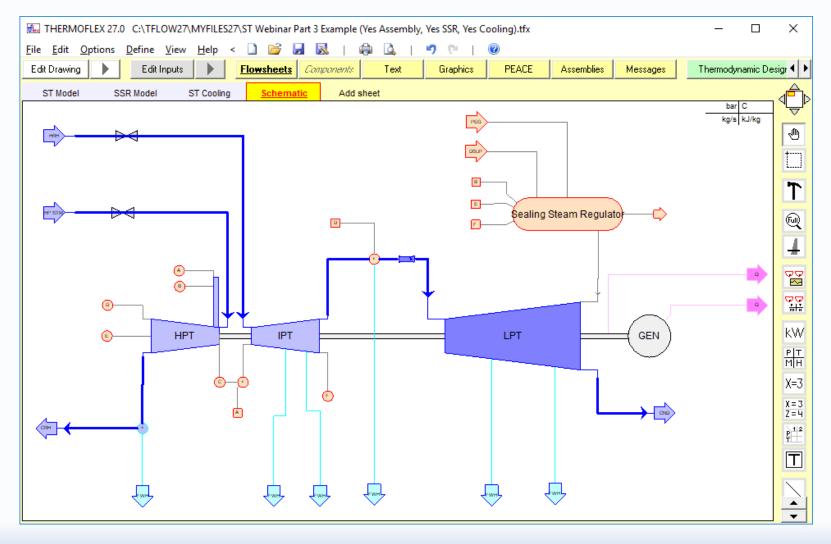Already-built Pieces

Example – Solar Rankine Cycle

- "Build" today's model by walking through waypoints in the build progression:
    1. Schematic overview
    2. Building blocks
    3. Layout turbine groups
    4. Connect primary steam path through turbine
    5. Layout & connect leak streams
    6. Define FWH extractions
    7. Add Sealing Steam Regulator (SSR)
- "Building" complete
    1. Add assembly (remove stop valves & leaks)
    2. ST & Gen Cooling loads
    3. User-defined OD efficiency variation
- Throughout process take note of tradeoff:
    – Flexibility in this approach vs. Ease-of-Use demoed in Parts 1 & 2.

Example – Solar Rankine Cycle