FLOWNEX®
SIMULATION ENVIRONMENT
FOSSIL FUEL POWER

Flownex® SE determines pressure drop [flow] and heat transfer [temperature] for the connected components of a complete system in steady state and transient, e.g. pumps or compressors, pipes, valves, tanks and heat exchangers.

TYPICAL USES:

ANALYSIS

- Simulation.
- Performance assessment.
- Modification assessment.
- Fault root cause assessment.

DESIGN

- System sizing.
- Component sizing.
- Determining operating ranges.
- Flow, temperature, pressure, power consumption, etc.
- Testing of control philosophy.

TRAINING

- System behavior examination
- Performing basic flow and heat transfer calculations.
- Thermohydraulic principles and properties referencing.

BRINGING NUCLEAR QUALITY AND STANDARDS TO SYSTEM SIMULATION

Flownex® is developed in an ISO 9001:2008 quality assurance system and NQA1 supplier approved environment.
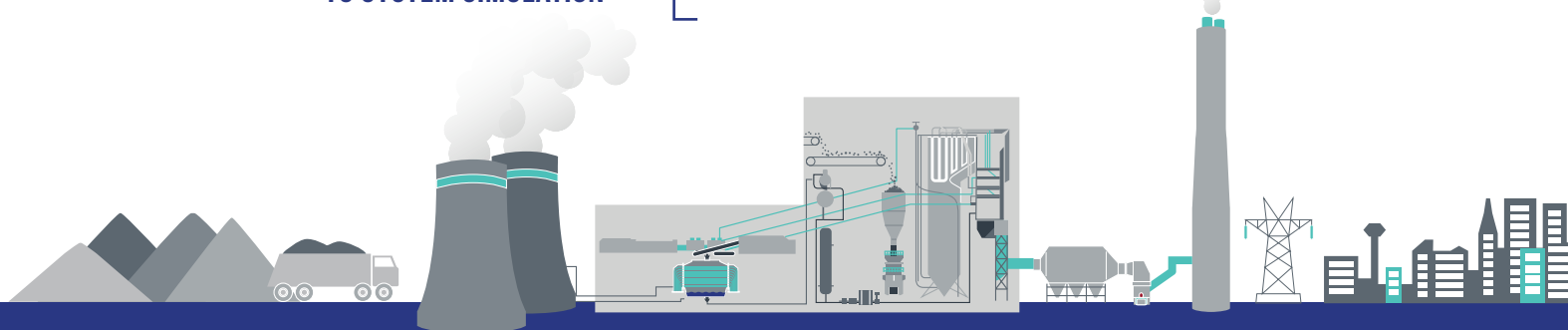
> Engineering productivity for the design and analysis of complex thermofluid systems such as those found in large coal fired power plants is vastly improved by modeling in Flownex®. In addition, the system knowledge and understanding gained by the modeler is invaluable in subsequent activities.

Gary de Klerk, Pr. Eng.
Chief Engineer, Plant engineer
**Turbine Process Group Technology**
ESKOM

FEEDWATER SYSTEMS

- Pipeline, valve and pump sizing.
- Cavitation, flashing and condensing detection.
- Pump performance and NPSH.
- Feedwater heater performance and tube leaks.
- Flash tank behavior.

COOLING WATER CIRCUITS

- Pipeline, valve and pump sizing.
- Water hammer.
- Cooling tower response.
- Heat exchanger sizing.
- Water reticulation flow balancing & energy efficiency.

BOILER STEAM SYSTEMS

- Once-through and reheat boilers.
- Temperature calculation and change rates.
- Boiling stability & boiling regime examination.
- Detection of boiling oscillations (Ledinegg, density wave, pressure drop-type)
- Recirculation rate and steam production.
- Natural circulation boiler.
- Attemperation system.
- Dry out prediction.
- Load changes.

STEAM TURBINE & SUPPORTING SYSTEMS

- Start-up, shutdown and load following operation.
- Turbine trip control.
- Gland steam systems.
- Lubrication systems.
- Generator hydrogen and lubrication systems.
  - Assess cooling system and heat exchanger performance.
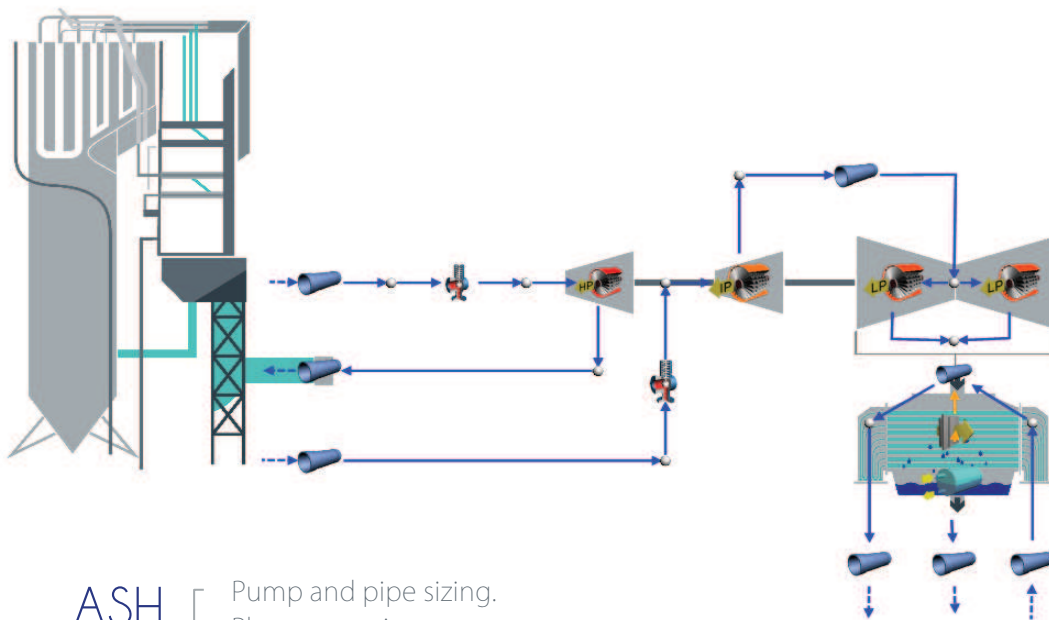
ASH SLURRY

- Pump and pipe sizing.
- Plant expansion.
- Slurry settling and blockage.

NATURAL CIRCULATION BOILER

- Calculation of recirculation rate and steam production.
- Prediction of dry out.

CONDENSERS

- Air leak detection.
- Condenser level following.
- Wet and dry condenser heat exchange.

COMBINED CYCLE PLANT

- High level analysis and design of the complete combined thermodynamic cycle.
- Transient analysis of load change scenarios.

- Cycle effiency analysis under different ambient conditions.
- Root cause analysis for fault finding.
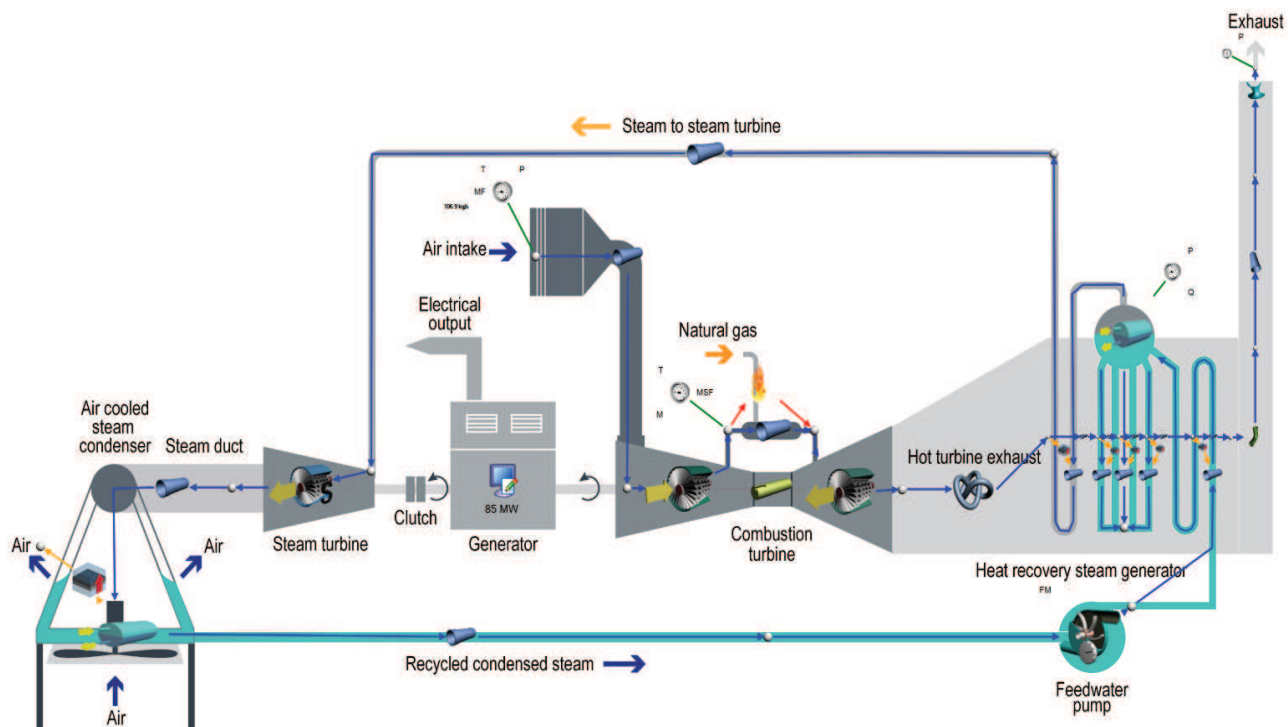
BOILER AUXILIARY SYSTEMS

Start-up fuel oil or gas systems.
- Flow balancing in branching networks.
- Pipe heat loss estimation.
- Pump sizing and viscosity adjustment.
- Control philosophy testing.
- Pump/pipe/injector matching.

Draught group/Flue gas system: Calculation of ID or PA fan capacity margin as function of loss characteristics: Pulverisers, air heater seal leakage, flue gas ducts, precipitators, flow regulator vanes, flue gas desulphurization units (FGD).

SOME FLOWNEX® COMPONENTS FOR POWER GENERATION USE

SOME FLOWNEX® LICENSE HOLDERS:

Eskom
Dominion
EAST KENTUCKY POWER COOPERATIVE
minnesota power
babcock
BiLFINGER

"

Flownex® proved to perform well also for simulations of start-ups (or shutdowns), making it a valuable tool for studying and optimizing such procedures.

Carlo Favalli
Politecnico di Milano
MS Thesis - Eng.

"

HEAT RECOVERY STEAM GENERATOR & BOILER SIMULATIONS

STEADY-STATE DESIGN

- Analysis of natural circulation boiling sections.
- Modeling and design of the heat transfer between the gas and steam side of a heat exchanger.
- Modeling of the complete system, including super-heaters, economizers, evaporators, pumps, turbines, etc.
- Adaptable modeling approach accor-ding to the required level of detail.
- Assists in proper and economical design for the expected operational conditions.

TRANSIENT ANALYSIS

- Determine rates of change in material temperatures.
- Evaluate control philosophy.
- Determine plant power ramp rates.

APPLICATIONS

- Detection of unwanted operating conditions involving:
    - Boiling oscillations.
    - Departure of Nucleate Boiling (DNB).
  - Evaluation of off-design or accident scenarios.
  - Evaluation of temperature gradient during start-up.
  - Evaluation of start-up, shut down and load changes.
  - Flow stability analysis.
  - Flow distribution.
  - Balancing of flow in parallel paths.