

Problem:

A utility boiler was experiencing regular opacity spiking during start-up, along with burner trips and instability. Recent operation as a peaking unit with a high frequency of starts and stops, the utility needed to improve the opacity and reliability during light-off and warm-up.

Unit Description: Heavy oil fired, 125 MW CE tilting tangentially-fired boiler. Unit is equipped with 8 burners (two per corner) with both warm-up and main oil atomizers/oil guns.

Solution:

STEP performed an onsite evaluation and was able to determine that the burner trips, instability, and opacity was a result of burner pressure fluctuations during light-off. STEP proposed a transient hydraulic analysis of the burner light-off sequence (for the first three burners placed into service) including: supply piping, return piping, steam purge, atomizing steam, and fuel oil supply characteristics. A computer model of the system was created and is illustrated in Figure 1.

Through transient analysis (with specially developed correlations for atomizer performance), STEP was able to match observed field conditions. Once the validated model was obtained, STEP modeled changes to the sequences such as fuel pressure "kickers", adjusted timing, and more, as well as hardware changes. Numerical analyses were both quick and efficient without the expense and other problems (opacity, manpower, etc) associated with field trials.

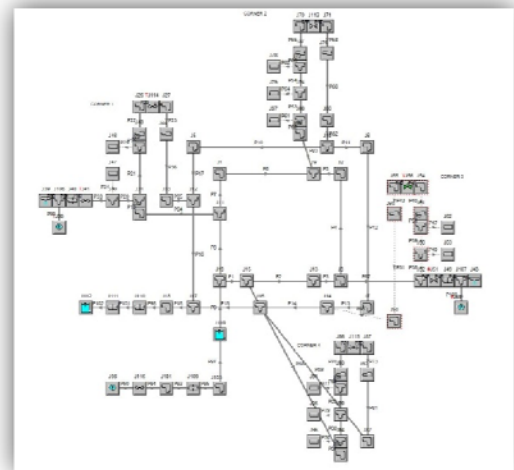


Figure 1 - Transient Model Schematic

Results:

STEP recommended changes to the piping system, which:

- Eliminated burner trips
- Eliminated opacity associated with burner start-ups
- Eliminated opacity associated with burner shut-down and purging

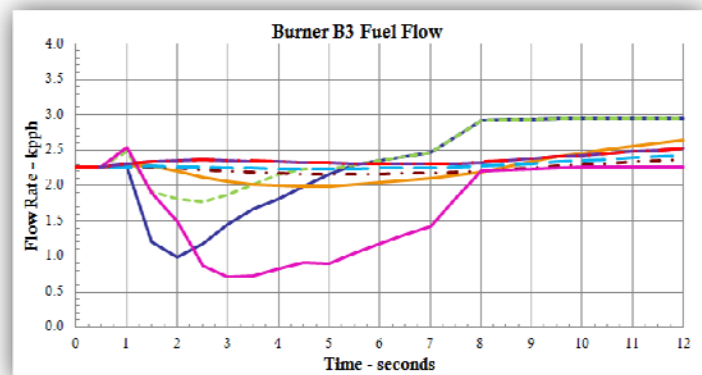


Figure 2 - Sample Transient Burner Flow Rate Analysis