Boiler Flow Distribution - Steinmüller

Industry application: Power Generation

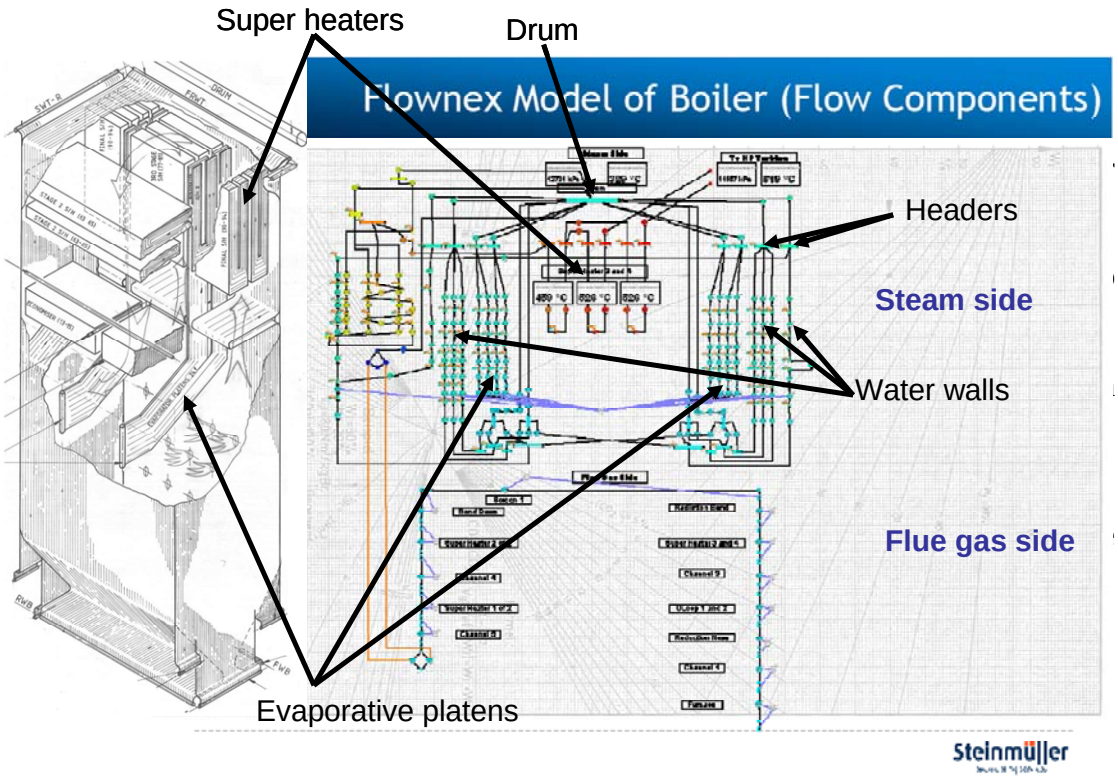
Introduction

Steinmüller is an innovative engineering services provider operating in Southern Africa for over 45 years. With the global backing of the Bilfinger-Berger Group they excel at developing, implementing, optimising and maintaining industrial plants using state-of-the-art technologies.

In the quest to repower retired power stations, Steinmüller used Flownex to successfully solve, simulate & predict the implications of repowering a boiler plant. Using Flownex the engineering team was able to do what-if studies and to make decisions such as whether to remove the evaporative platens to optimize the plant in terms of reliability, plant availability and overall plant efficiency. Flownex proved valuable in the investigation by providing the new flow distribution in the water walls and super heaters based on design changes and also the steam condition that is provided to the turbines.

Challenges

The evaporative platens gave many operational issues including header cracking causing unnecessary and costly down time due to maintenance. Simulations were required to predict the effects of removing the platens within the boilers. The simulation had to point out the new steam flow distribution based on the design changes and also any new possible hot spots on the tubes due to poor flow through the remaining water walls and super heater tubes.



The steam conditions available to the turbines also had to be considered.

Solution

With the aid of Flownex Steinmüller was able to simulate various scenarios the boiler plant would experience, proving to be a valuable tool in “what-if” studies.

With the ability to implement momentum conservation Flownex allowed Steinmüller to solve, simulate & predict:

- Flow distribution in water walls and Superheater tubes based on geometry, elevation and heat radiation and convection from the boiler flame.
- Dynamic pressure and level in the drum.
- The steam conditions and steam quality available to the turbines.
- Simulate both the flue gas and steam networks in the same solution linked with:
    - radiation and convection heat transfer from the flame and flue gas to the tube walls,
    - conduction through the tube walls and
    - the convection on the inside of the tubes to the steam side.

Results

By simulating the complete flow distribution model of a de-mothballed boiler plant in Flownex, Steinmüller was able to make the correct design decisions with regard to the Evaporator platens and the effect of their possible removal in terms of flow distribution, possible hot spots and steam quality to the turbines. This proved the wide range of application of Flownex and that it is extremely valuable to engineers to do “what if” studies.

Quotes

Steinmüller

“Equation Elements (user coded components and behavior) empower the user with the ability to create his/her own flow components and incorporate complex phenomena”
Philip Oosthuizen, ***Senior Process Engineer, Steinmuller Engineering Services***

“The combination of skilled engineers and access to the latest global technology from the BBPS Group, and advanced tools and equipment means that Steinmüller Engineering Services is able to provide clients in the power generation industry with an extensive range of services”