

**Li Sun\***, Robin Smith, Performance Modelling of New and Existing Steam Turbines, **Industrial & Engineering Chemistry Research**, 2015, 54 :1905-1915

This work investigates the effect of structural parameters (turbine size and type) and operating parameters (inlet steam temperature and pressure, steam flowrate, single or multi-stage exhaust rate and pressures) on turbine performance for power generation. The paper extends the steam turbine performance model based on the Willans' line. The model achieves high accuracy for a wide range of steam turbines at full-load and part-load operation, which has been verified against data for commercial turbines and from the open literature. The correlation of turbine efficiencies provides realistic insights from the model. The model can be applied in utility system design, operational optimization, and system retrofit with complex multi-stage turbines. For existing turbines, adjustment of operating conditions and steam header conditions can be explored. This overcomes problems from previous correlations, which did not account for changes in steam mains pressures. Regression of coefficients from existing turbine operating data can be used to give better performance prediction for existing turbines, allowing more effective system optimization.

High lights:

- A new model to estimate a new or existing steam turbine performance
- Effect of structural parameters and operating parameters on power estimation
- Model high accuracy for a wide range of steam turbines at full-load and part-load operation
- Applied in design, operational optimization, and system retrofit
- Interaction with model coefficients and turbine efficiencies