

INTERNSHIP PROPOSAL

JUNE 2015 – Contact: monika.topel@energy.kth.se

OBJECTIVE

Analyse the operating conditions of steam turbines in Concentrating Solar Power Plants.

BACKGROUND

The dynamic thermal modelling of steam turbines is crucial for the better understanding of their behaviour during transient operation. Studying such behaviour is especially relevant for those steam turbines operating in concentrating solar power (CSP) plants. Due to the fluctuating nature of the solar supply, the number of start-up cycles endured by solar steam turbines is greater than those in base load plants, with multiple starts possible during a 24h period. In order to accomplish faster start up speeds while still ensuring safe operation of the turbine it is important to first understand the operating conditions that these machines are subjected to during their operation in CSP plants.

Accurate prediction models for the dynamic operation of CSP plants are thus necessary to be able to understand the operating conditions of the steam turbine. In the KTH-CSP group, this modelling is performed using an in-house tool called DYESOPT. Using this tool, published studies and models have been carried out on state-of-the-art tower based CSP plants like Gemasolar and Ivanpah. These studies, however, have not been focused on steam turbine operation. Therefore, this internship project will focus in quantifying these turbine aspects in CSP plants.



Aerial picture of the Ivanpah DSG Solar Power Facility in California

SPECIFIC TASKS

- T1 Get familiarized with the DYESOPT modelling tool**
 - Understand the current modelling structure used in the KTH-CSP group. Especially those previously developed models for Ivanpah and Gemasolar.
- T2 Gather information on power plant operating parameters**
 - Perform a literature search about the nominal rated conditions of Gemasolar and Ivanpah in order to then tune the current models to the reality of these plants.
- T3 Evaluate/Compare steam turbine operating conditions in Gemasolar and Ivanpah.**

Run the annual performance analysis of both power plants and quantify the operating conditions of their steam turbines (number of starts, equivalent operating hours, start-up costs). Then compare and contrast these conditions in a written report.

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STUDENT REQUIREMENTS

- Strong theoretical background in thermodynamics and power cycles.
- Knowledge in programming with Matlab.

EXPECTED DELIVERABLES

- Available DYESOPT models tuned to Ivanpah and Gemasolar operating conditions .
- Report on Steam Turbine Operating Conditions in Tower-based CSP plants.

LOCATION AND TIMEFRAME OF THE PROJECT

The project is to be performed at the Department of Energy Technology at KTH Stockholm Campus. The duration of the internship is expected to be **2.5 months**. Below is a proposed timeframe:

Week#	1	2	3	4	5	6	7	8	9	10	11	12
T1	■	■	■	■								
T2				■	■	■	■					
T3							■	■	■	■	■	
Report												■

SUPERVISION AND CONTACT

Main Supervisors

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