AIR-COOLED CONDENSER USERS GROUP, LONDON

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Wind Mitigation Solution – User Experience

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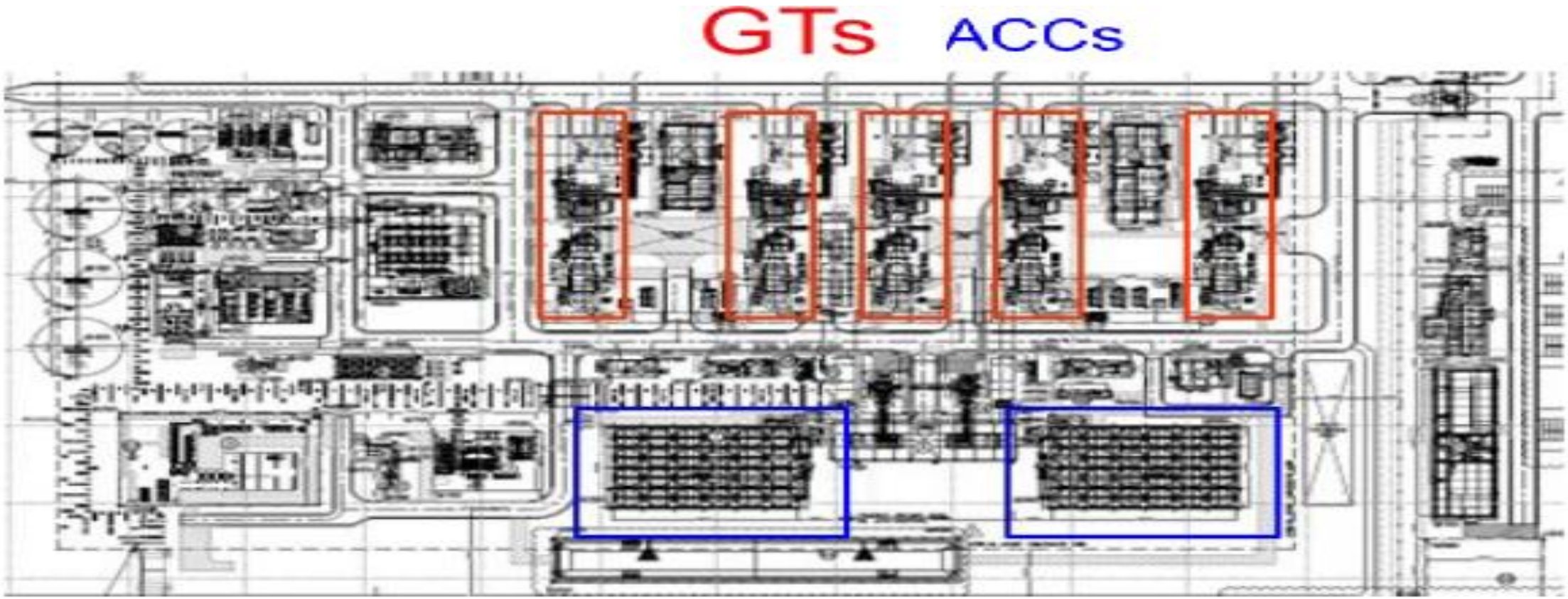
Site Location

ENGIE
Fadhili O&M Company

Plant Configuration



24 Module / Cell ACC - Each

High Vacuum Issue

Project was facing high vacuum issue since beginning of the project

- Lower Extraction Steam flow to Process
- High Wind Speed
- High Ambient Temp during Summer
- Heavy Dust / Sandstorms during Summer

As high vacuum could trigger cascading trip events within plant and in adjacent process facility, we took following major steps to manage process. Load reduction was the key to manage poor vacuum issue.

- Generated and implemented a detailed operator instructions so appropriate actions could be taken (at different high vacuum setpoints).
- If Operator fails to manage situation, control logics were built for emergency load shedding to reduce steam flow to ACC.

Plant De-loading Impact

Due to this mentioned plant load reduction,

1. **Revenue Loss:** With load reduction during summer peak time - where load demand is also at peak with maximum penalty factor in Liquidated Damages.
2. **Environmental Impact - Gas Flaring:** With sudden load reduction (specially with High Wind), rejected fuel gas had to be flared until gas supply reduced from source. This flaring of pure gas was not only huge revenue loss but causing environmental pollution as well impacting organizational KPI's.

ACC Performance Optimisation Options

We explored different available solutions and found two options for increasing the ACC performance;

1. **Wind Mitigation System:** Installing different layout wind screens to reduce the Wind impact as in our case this was one of the major contributor due to Hot Air Recirculation (HAR) and Air Inlet Disturbance (AID).

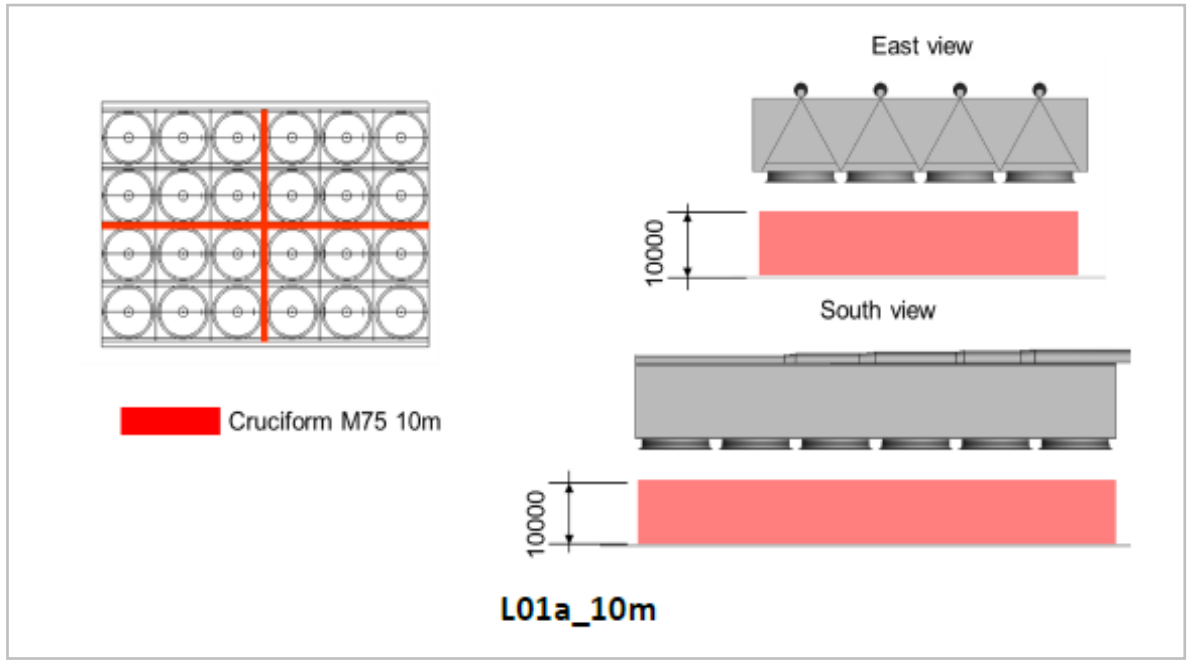
2. **Adiabatic Cooling System:** Installing pump(s) along with showering mechanism and reduce the dry bulb temperature of the air flow before reaching the finned heat exchanger surface by using Adiabatic cooling principal. This solution required huge water for evaporation purposes, estimated water consumption was around 130 m^3/h.

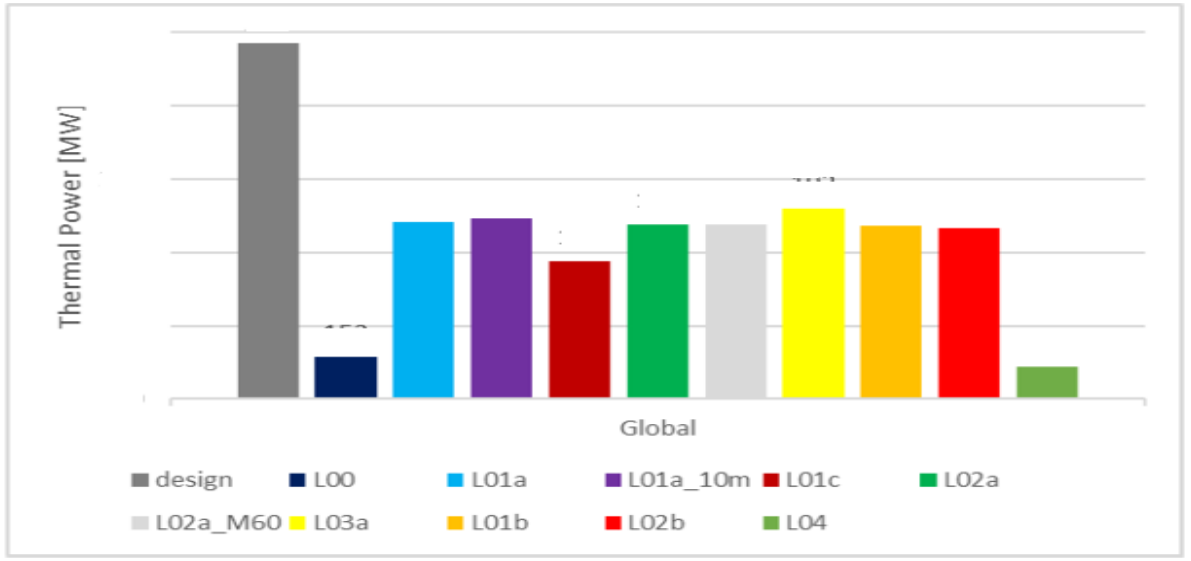
Based upon above optimization options, Wind Mitigation projected was selected to move forward due to the water availability concerns which was the key for 2nd option.

CFD Analysis

"**ERGON research srl**" conducted CFD analysis based upon the site actual past data, and concluded:

1. The ACCs were suffering significant derating in thermal power at higher wind speed with wind blowing from the North direction. The windscreens were able to substantially mitigate such losses. The windscreen effectiveness increases with the windspeed.
2. The most performing layout was found L03a. L01a_10m was chosen as cost-effective optimum layout.





Project Execution

For the selected layout from CFD study, **“Galebreaker”** services were utilized for the material fabrication, delivery and site installation support. Project implementation was completed successfully before start of summer windy weather conditions, as per project target date.

Performance Comparison Before vs After

After completion of ACC wind mitigation project, we didn't eliminate the vacuum issue completely, but during windy days, it improved vacuum greater than 60-70mbara (variable with wind speed), it is worth to mention that we passed one summer with complete ROI (Return of Investment) with the following.

1. Load reduction events reduced drastically.
2. By avoiding sudden load reduction events, Fuel gas Flaring events reduced (environmental regulation compliance).
3. Plant Availability & Reliability improved significantly with better ACC vacuum having safe operational margins.

What's Next: With implemented solution during windy days, vacuum improvement is extremely noticeable, increases further with higher wind as higher winds make the wind screens more effective. We are exploring the other possible solutions or best practices, with which we can improve performance further in harsh weather conditions which includes higher ambient temperatures as well.

Thank You

for your Attention

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