PHOENICS Case Study: HVAC - Heat Dispersion from Load Banks
By Shakil Ahmed, CHAM, October 2019 / PH - 2019

Load banks are units that can carry a high electrical load and, as a consequence, vent heat into the environment. They are often installed outside of an industrial facility and connected permanently to a power source or, on occasion, portable versions can be used for the purposes of testing these power sources and assessing local energy demand.

Example of a Load Bank

In view of the potential for high-temperature gases being released from load bank vents, it becomes necessary to assess their impact upon their immediate environment to ensure that there are no consequential adverse effects upon nearby structures, ventilation intakes and personnel.

CHAM was asked to assess the impact of two stacked, high-capacity load banks situated in alternative locations adjacent to a waterside industrial facility. The load banks were modelled as outlets emitting 2MW of heat each, with a balanced air intake and exhaust of 1440m^3/minute.

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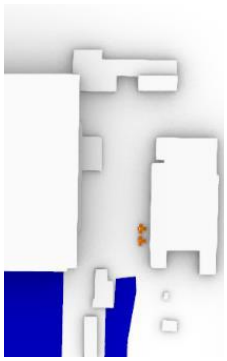
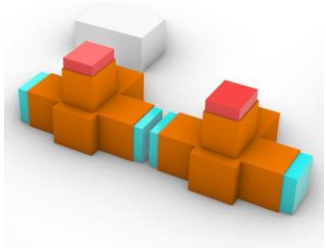
The intakes are linked to the exhaust such that in the event of hot air becoming recirculated into the intakes, the re-circulated air itself becomes re-heated. At the load banks' exhaust vents 2MW of heat is added to the air drawn in by the intakes.



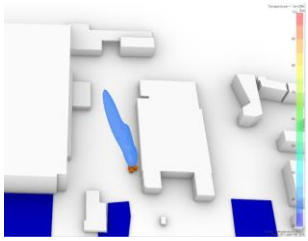
Orange – load banks location (one of two locations investigated) Blue – water channels

The prevailing south-westerly wind conditions were taken from wind atlas data, with a typical air temperature of 20^{o}C.



Orange – outline geometry of load banks
Red – exhaust vents
Blue – air intakes

The CFD simulations took into consideration several conditions permitting the investigation of typical and expected worst-case environmental situations.



Temperature iso-surface at 25^{o}C

The results showed that, for the scenario considered, the hot air exhausted from the load banks has little effect on their immediate surroundings, being diluted rapidly by the on-shore wind and rising rapidly above head height due to buoyancy. Similar iso-surfaces of the hot air, plotted at the more-critical temperature of 50^{o}C, indicate even smaller impact.

The study referenced above was undertaken by CHAM within three days of instruction, showing that CFD simulations permit informed assessments to be made on a speedy and cost-effective basis.