

Process design of CO₂ capture from the gas turbine at an oil platform

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Introduction:

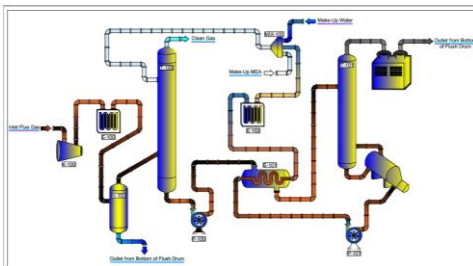
Today, the risk of greenhouse gas pollution is not hidden from anyone and among all carbon dioxide (CO₂) is at the top of list. The climate change and its consequences caused by increasing greenhouses gas specially CO₂ emission from fossil fuels, is not limited to the Norway, it has also become a major concern all over the world. So, by the purpose of reducing and controlling CO₂ emissions, government increased the taxes on CO₂ emission and Norway is one the strictest one. In Norway, it is proven that offshore gas turbines play the most significant role in this disaster. In order to remove the CO₂ emissions, several methods have been proposed, but among all, capturing CO₂ by amine-based absorption column seems to be one of the best alternatives. In this study, to meet Moreld Apply AS needs for one of their projects on an offshore platform in the North Sea in Norway, a simplified standard CO₂ capture process plant has been simulated and designed in Aspen HYSYS. This unit has been missioned to remove the CO₂ content of flue gas with 90 % efficiency from the up-stream. This work covers the CO₂ removal process plant simulation and design, dimensioning, cost estimation, as well as optimization.

Background:

The present project is done as a request of Moreld Apply AS for one of their offshore platform projects in Norway. Due to the demolition of an old Waste Heat Recovery Unit (WHRU) in one of the offshore platforms located in the North Sea, a shortage in the platform's heating medium is forecasted. So then, to compensate for the shortage, a new energy source is demanded for the heating medium. In addition, a CO₂ capture plant is requested to not only reduce the emission (due to the regulations), but also, capturing CO₂ for further investigation.

Problem description and objective:

To meet Moreld Apply AS need, two sequential processes are considered. First process is including the new WHRU unit works in the combined cycle. Due to the limitation in space and also weight (since WHRU is huge in size and weight), two parallel WHRU units are considered. So then, two parallel gas turbines are assigned to serve the two WHRU units. After traversing the whole process, the high temperature exhaust gas will send to the assigned heat exchanger to cool down the gas before sending to the CCUS process in order to prevent damage. Then after, it will send into the CO₂ capture process to remove CO₂.



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