Foaming prediction in the post-combustion CO2 capture plants (amine-based) by utilizing machine learning techniques

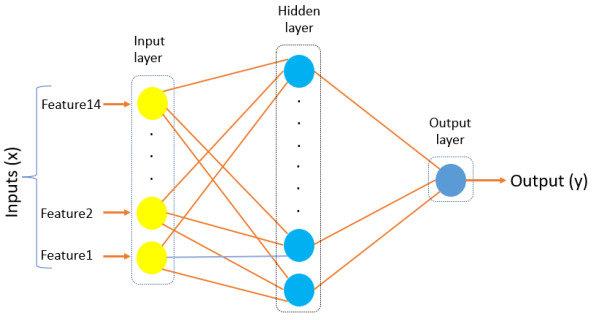
Master's thesis number: MT-68-22

Introduction and background:

Human activities have increased the emitted greenhouse gases into the atmosphere. Among greenhouse gases, the excess of CO2 in the atmosphere has caused severe environmental issues such as global warming and ozone depletion. To reduce emitted CO2, there have been substantial efforts to develop new methods and technologies applied to the exhaust gas from industrial activities to reduce the concentration of greenhouse gases (in a way that is not harmful for human and environment) prior to release them into atmosphere. Post-combustion flue gases contain significant amount of CO2. One common method for capturing CO2 released from post-combustion flue gases is to use an amine-based (i.e., solvent) CO2 capture plant.

Problem description and objective:

Post-combustion CO2 capture plants (amine-based) face some challenges such as foaming that occurs within the plant's columns (absorber and stripper) and results in a decreased CO2 capturing efficiency. Methods such as adding anti-foam to the columns can mitigate the effect of foaming. However, the main challenge is the foaming prediction before its occurrence. Despite its importance, there has been no model that can simulate the foaming occurrence based on the physics or thermodynamics of the process. Therefore, this report focused on the developing, for the first time, a data-driven model that can simulate and predict the undesirable foaming occurrence.



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