AAVARTAN'19

VIGYAAN PROBLEM STATEMENTS

(Department of Chemical Engineering)

1. Modification of Design of an Evaporator

Abstract: An evaporator is a device used in a process to turn the liquid form of a chemical substance such as water into gaseous form or vapor. The liquid is evaporated or vaporized into gaseous form of a targeted substance in that process.

The evaporator while evaporating might encounter problems related to corrosion, scale formation, fouling and frost and they create major problems in evaporator, due to which the efficiency lags. Design a model of Evaporator used now a days that would improve their performance.

2. Wastewater Treatment by Electrolysis

Abstract: The disposal of industrial waste water generally proves to be a complex treatment when various organic and inorganic products are present. Such effluent stream due to its high in TDS content is not biodegradable and cannot be treated using conventional aerobic or anaerobic treatment processes.

The waste water so formed is very difficult to be treated by chemical methods and can be treated by using electrolytic method. Prepare a suitable method that is used to treat waste water by electrolytic method.

3. Cooling Tower Problems - Corrosion, Scale Formation and Algae

Abstract: The cooling tower is a rejection device that rejects waste heat to the atmosphere through the cooling of water stream to a lower temperature. Cooling tower may either use the evaporation of water to remove process heat and cool the working fluid to wet bulb air temperature.

The cooling tower while cooling might encounter problems related to corrosion, scale formation and algae and they create major problems in cooling tower, due to which the efficiency lags and heat transfer also gets affected. Make a model of cooling tower used now days and also suggest new methods or developments needed to be done to counter these problems

4. Process Modification of Hazardous Waste

Abstract: Hazardous waste is the waste which is having the potential to harm the human health as well as environment by physical and chemical characteristics. It is in solid, semi solid or pasty form .There are many environmental effects on its disposal. This waste instead of being disposed can be used in other ways so that it can be useful in generating energy. Develop some techniques that would use hazardous waste for useful processes.

5. CO_2 Sequestration (Carbon Absorption and Storage)

Abstract: The goal of carbon sequestration is to capture CO_2 that would otherwise accumulate in atmosphere and put it in safe and permanent underground storage before they contribute to climate change. Most proposed methods would capture CO_2 from concentrated sources like power plants. The Carbon dioxide accounting for global warming is in this way reduced. Develop a model regarding CO_2 sequestration and also develop artificial ways used for CO_2 sequestration.

6. Reducing Chemical Oxygen Demand

Abstract: The COD is the indicative measure of amount of oxygen that can be consumed by reactions in a measured solution. It is one of the major problems that are responsible for water pollution. It is due to addition of chemicals into water by industries. It can be prevented by various processes. Suggest some ideas for prevention or even purification of water so that there will be reduction in COD.

7. Biodegradable Plastic

'Biodegradable' plastic lead people to believe that it will just naturally decay over time, the same way as a banana would. Unfortunately, this is not the case. For this type of plastic to biodegrade it requires high temperatures and sunlight. Biodegradable plastic is designed to decay at temperatures above 50°C, which means it is not going to biodegrade if it is just disposed. In fact, it's not going to biodegrade anywhere other than in specialized facilities.

Another issue is the fact that the process requires sunlight to work properly. Biodegradable plastics are not buoyant, meaning the plastic will sink in the ocean and not be exposed to sunlight. It also means they won't decay when buried in a landfill. Innovative ideas are required to make a 100% biodegradable plastic which can degrade in ambient conditions.

8. Heat Exchanger

There are a wide range of heat exchanger problems which may cause poor performance, or in some cases cause the exchanger to stop working all together. The most common heat exchanger problems can be a lot harder to resolve, leading to ever increasing operating costs and high capital costs to implement a suitable solution. Some of the most common heat exchanger problems for many process plants include Exchanger leakage Such as Pass Partition bypassing (thermal leakage) and Fouling. Design a heat exchanger which can resolve these problems.

9. Problems in the Distillation Column

Problems in the column relate to loss of capacity or efficiency. The maximum hydraulic capacity of a column is the highest throughput at which it will operate without flooding. At the flood point liquid accumulates on trays or in packing because of excessive vapour flow, i.e. pressure drop, or maybe mechanical restriction. Flooding usually continues until the operator takes action. Design a distillation column which can prevent this.

10. Problems outside the Distillation Column

There are many ways in which problems outside the column can affect column performance. The control systems employed can cause, or contribute to operational problems in distillation columns. A few typical examples are given below:

(a) A temperature sensor for composition control should be situated at a point in the column that will provide sensitivity to composition changes failure to do so can lead to sluggish control and products being off specification for unacceptable periods of time.

(b) The wrong setting of a temperature sensor/control can lead to the situation where a required tops or bottoms composition cannot be achieved.

Design a distillation column to eradicate this problem.