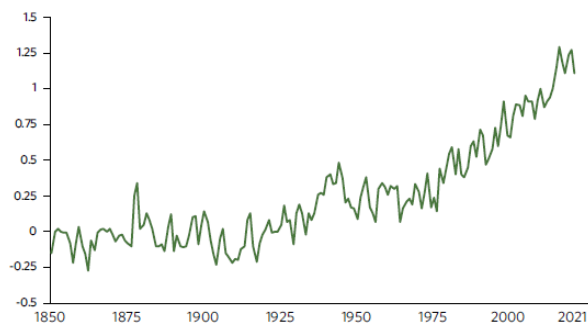


BIRLA INSTITUTE OF TECHNOLOGY & SCIENCE, PILANI CAMPUS
DEPARTMENT OF CHEMICAL ENGINEERING
I Semester – 2022 - 2023
Course Title: Environmental Management Systems (CHE G513)
Mid semester – Closed Book – 30 Marks + Open Book – 30 Marks
Date- 04.11.2022 Time: 11:00 - 12:30 PM

Instructions for Exam :

- 1. Question paper is comprised of two parts – Closed Book and Open Book**
 - 2. Closed book - is comprised of three questions of total 30 Marks and Open Book is comprised of 30 Marks**
 - 3. On returning CB Answer Script – Open book is to be answered in separate Answer Script.**
 - 4. Make necessary assumptions where ever needed.**
- 1. (2+2+2+3+3 = 12 Marks) (Be precise in answering)**
- a. A regulatory approach does not necessarily produce the best environmental results. What is the role played by EMS in this regard ?
 - b. What are the three general options in air emissions abatement ?
 - c. What all organizations collaborate for NAAQS in Indian context ?
 - d. TC 207 formed six subcommittee to review different aspects of EMS in UN Conference on Environment and Development in the year 1992. List down the names of subcommittees with their ISO numbers.
 - e. To develop a list of emission control alternatives, it is important to understand that options are not limited to add-on emission control devices. Any technique that reduces the emissions is a valid consideration. Elaborate the options suggested by BACT standards .
- 2. (2+2+3 = 7 Marks)**
- The Sustainable Development Goals Report 2022 progress towards realizing the 17 Goals and one of the goal is SDG – 13 : Climate Action. – SDG Report
- a) What pre – industrial levels are being discussed as part of the Paris Agreement ?
 - b) Explain the graph for referring the target temperature rise globally as discussed in Climate Action Plan.
 - c) In response, countries are articulating climate action plans to cut emissions and adapt to climate impacts through nationally determined contributions. How do you think Indian Pollution Centers are addressing the challenge of SDG – 13 : Climate Action ?

Global annual mean temperature relative to pre-industrial levels (1850-1900 average), 1850-2021 (degrees Celsius)



Source: The figure is drawn from the the World Meteorological Organization's *State of the Global Climate 2021* report, which combines six international data sets for temperature: HadCRUT.5.0.1.0 (UK Met Office), NOAA GlobalTemp v5 (USA), NASA GISTEMP v4 (USA), Berkeley Earth (USA), ERA5 (ECMWF), JRA-55 (Japan).

3. (3 + 2 + 4+ 2 = 11 Marks)

A multidimensional approach of regulatory, technical, innovative solutions and integrated control strategies have been taken by the government for improving the overall air quality in the country as per the NAAQS .

- a) What are the objectives of the NAMP Program ?
- b) CPCB co-ordinates with various agencies to ensure the uniformity, consistency of air quality data and provides technical and financial support for operating the monitoring stations. Explain the concept of 24 hours sampling and target frequency of monitoring twice a week, 104 days in a year for the purpose of pollutant sampling data analysis ?
- c) Central Pollution Control Board has identified various non- attainment cities all over the country on the basis of national ambient air quality data under NAMP – NAAQS Report. Elaborate specific Action Plans for Industrial Pollution, Vehicular Pollution and Domestic Pollution.

d) Explain the trends of RSPM and SPM Concentration in the city of Faridabad .

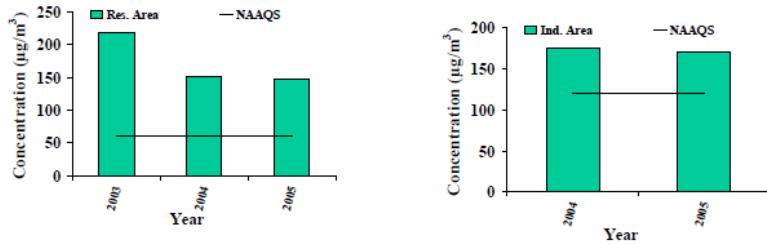


Figure 9.3: Trends in Annual Average Concentration of RSPM in Faridabad.

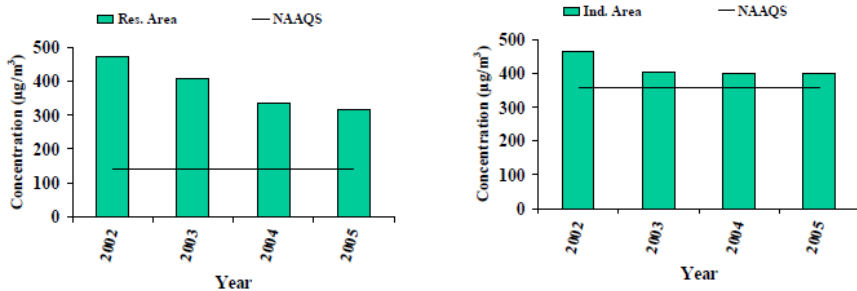


Figure 9.4: Trends in Annual Average Concentration of SPM in Faridabad.

OPEN BOOK

4. The audit objectives were to identify efficiencies that could be implemented to accelerate the MACT standards development process, and to evaluate the Agency's method of determining the MACT floor for emission standards . **[2+3+1 = 6]**
- a) Wherever feasible, USEPA writes the final MACT standard. What is the MACT standard ?
 - b) The 1990 Amendments reflected a different approach for regulating emissions. The technology – based MACT standards include the air abatement technologies. Corroborate the discussion for the MACT that worked well and MACT that had challenges.
 - c) How does the team working on the MACT regulations conclude ?
5. In TMDL study, Sources considered by the states in the development of TMDL include atmospheric mercury deposition, municipal wastewater treatment plants, non-municipal wastewater discharges, and stormwater. The states identified 97.9% of the total mercury load as coming from atmospheric deposition. **[1+2+2+4+2 =11]**
- a) What form of mercury is being considered as pollutant in TMDL based estimation ?
 - b) What concentration is being measured in TMDL study ?
 - c) The concentration is finally estimated in terms of bioaccumulation factor (BAF). How is BAF estimated ?
 - d) Explain the methodology adapted in the TMDL study .
 - e) A letter to EPA was then signed and submitted comprising the entire TMDL study. Who were the signing authorities and under what Act, final letter to EPA was submitted ?
6. As such, a Best Available Technology (BAT) analysis is carried on a case-by-case basis. While industry may not appreciate that the target for BAT is constantly changing, this fact enables the regulatory agencies to push technological advances in emission controls over time. There are several factors to consider when choosing which emission control option is the best available technology (BAT). From an environmental perspective, the best option is the one that minimizes the total emission levels of the pollutant considered. **[3+3+4 = 10]**
- a) What insight is discussed or thought by regulatory agencies to design the BACT standards for various air pollution abatement technologies ?
 - b) Why top down process is used to determine which technology or process is most appropriate for the air pollution abatement technologies ?
 - c) XYZ Company seeks approval for the construction of a tire-fueled cement production facility at a location that is in attainment with the National Ambient Air Quality Standards. The tire-fueled rotary kiln is designed to produce 150 mmBtu/hr, and is intended to operate continuously. Show the BACT analysis for particulate emission control technology for the particular facility ?
7. To spearhead this strategic approach, ISO established a new technical committee, ISO/TC 207 in 1993, Environmental management articulated at the 1992 United Nations Conference on Environment and Development in Rio de Janeiro. Why is the concept of sustainability needs to be connected with engineering principles and engineering design to envisage the SDG goal of 2050 of Net Zero Carbon Emission ? **[3]**