



SNS COLLEGE OF TECHNOLOGY

AN AUTONOMOUS INSTITUTION



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DEPARTMENT OF AGRICULTURE ENGINEERING

COURSE CODE & NAME: 16AGT301 & HEAT POWER ENGINEERING

III YEAR / V SEMESTER

UNIT : 1 FUELS AND COMBUSTION

TOPIC 7 : Flue Gas Analysis



FLUE GAS ANALYSIS (ORSAT'S METHOD)



- The mixture of gases such as CO_2 , O_2 , CO , etc., coming out from the combustion chamber is called flue gases. The analysis of a flue gas would give idea about the complete or incomplete combustion process. If the flue gases contain considerable amount of CO , it indicates that incomplete combustion and it contain a considerable amount of oxygen indicates, complete combustion. The analysis of flue gas is carried out by using Orsat's apparatus.
- **Description of Orsat's Apparatus**
- It consists of a horizontal tube, having 3 way stopcock. At one end of this tube, U-tube containing fused CaCl_2 is connected. The other end of this tube is connected with a graduated burette. The burette is surrounded by a water-jacket to keep the temperature of gas constant. The lower end of the burette is connected to a water reservoir by means of a rubber tube.
- The level of water in the burette can be raised or lowered by raising or lowering the reservoir. The horizontal tube is also connected with three different absorption bulbs I, II and III for absorbing CO_2 , O_2 , CO .



FLUE GAS ANALYSIS (ORSAT'S METHOD)



- **Bulb- I** : It contains 'potassium hydroxide' solution, and it absorbs only CO₂
 - **Bulb - II**: It contains 'alkaline pyrogallol' solution, and it absorbs only CO₂ and O₂
 - **Bulb.:III** : It contains 'ammoniacal cuprous chloride' solution, and it absorbs only CO₂, O₂ and CO.
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- **Working**
 - The 3-way stopcock is opened to the atmosphere and the reservoir is raised, till the burette is completely filled with water and air is excluded from the burette. The 3-way stopcock is now connected to the flue gas supply, the flue gas is sucked into the burette, and the volume of flue gas is adjusted to 100 cc by raising and lowering the reservoir. Then the 3-way stop cock is closed.



FLUE GAS ANALYSIS (ORSAT'S METHOD)



- **a) Absorption of CO₂ .**

- The stopper of the bulb-1 containing KOH solution is opened and all the gas is passed into the bulb-1 by raising the level of water in the burette. The gas enters into the bulb-I, where CO₂ present in the flue gas is absorbed by KOH. The gas is again sent to the burette. This process is repeated several times to ensure complete absorption of CO₂. The decrease in volume of the flue gas in the burette indicates the volume of CO₂ in 100 cc of the flue gas.

- **b) Absorption of O₂**

- Stopcock of bulb-I is closed and stopcock of bulb-II is opened. The gas is again sent into the absorption bulb-II, where O₂ present in the flue gas is absorbed by alkaline pyrogallol (925 g of pyrogallol + 200g of KOH in 500 ml distilled water). The decrease in volume of the flue gas in the burette indicates the volume of O₂.



FLUE GAS ANALYSIS (ORSAT'S METHOD)

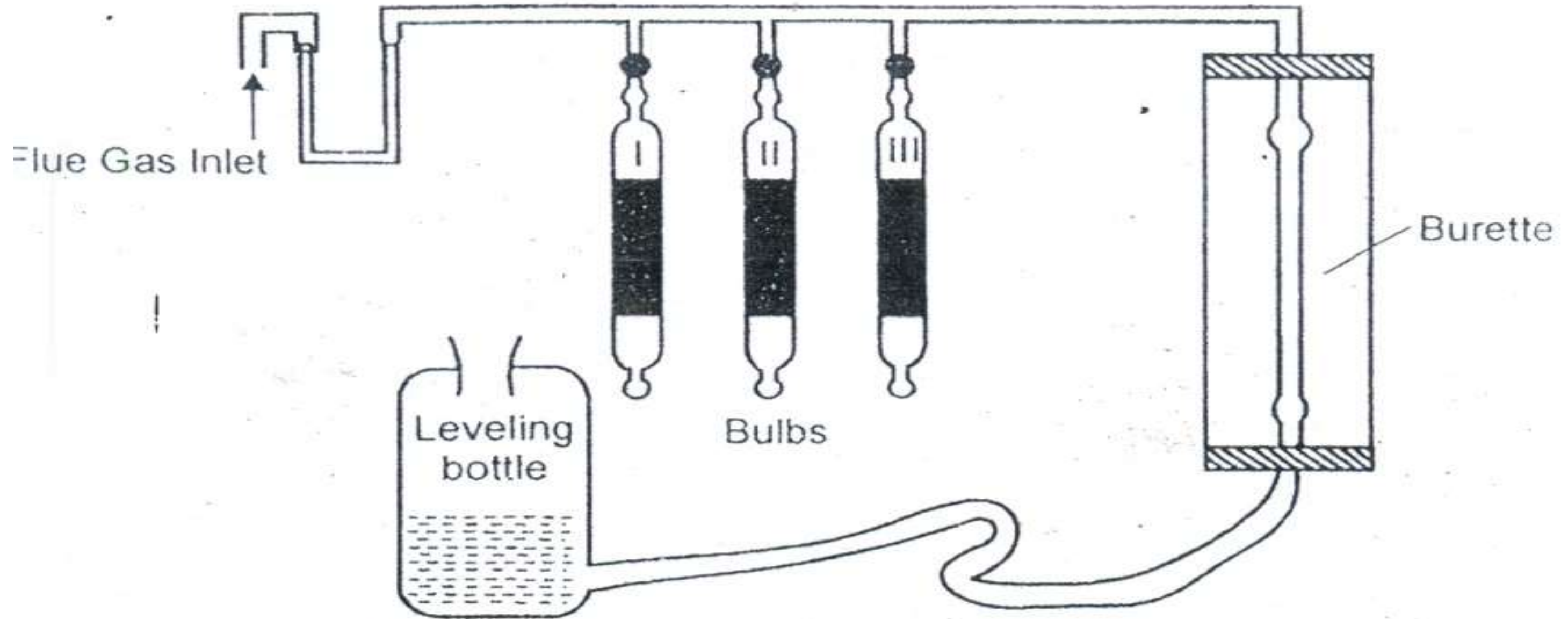


c) Absorption of CO

- Now stopcock of bulb-II is closed and stopcock of bulb-III is opened. The remaining gas is sent into the absorption bulb-III, where CO present in the flue gas is absorbed by ammoniacal cuprous chloride (100 g CuCl_2 + 125 mL liquor ammonia + 375 mL distilled water).
- The decrease in volume of the flue gas in the burette indicates the volume of CO. The remaining gas in the burette after the absorption of CO_2 , O_2 and CO is taken as nitrogen



ORSAT'S APPARATUS





THANK YOU..!!