

Biochar production unit is installed at ICAR, NEH, Umiam under NICRA

A continuous biochar production unit has been installed in the Institute to produce biochar from different agricultural and forest waste biomass. The unit is capable of converting up to 300 kg/hr of woody biomass into biochar. Shredded biomass is introduced to the partial-oxidation reactor, a controlled aerobic (O_2 limited) environment that contains some limited atmospheric air, where it is carbonized at 300-550 °C for between 2-30 minutes. Feedstock introduction rate and residence time in the reactor are process-dependant and can vary widely depending on operating conditions. Air and gases are motivated by a suction blower, which controls the rates of production. Temperatures are controlled by managing the ratio of available air to biomass and ensuring that it is well below the complete combustion ratio. This management of air to biomass allows for the preservation of solid carbon through the process and drives off nitrogen, oxygen, hydrogen, and other biomass constituent components.

Carbonized material and pyrolysis gases are moved into the secondary reactor, or drop box. In the secondary reactor, coarse particles of carbonized material are separated from the gas stream and continue to be heated at 250-550°C for 2-10 minutes. The pyrolysis gas produced during the first stage is used as sweep gas for the second stage, and is primarily composed of N_2 , H_2 , CO, CH_4 , and other higher VOCs and trace gases. No oxygen should be available in this stage of the process. Incorrect running procedures can introduce oxygen, which can be very dangerous (i.e. unintentional combustion of process gases; explosion). The coarse char particles that are removed from the gas stream by a baffle, into the secondary reactor, are augered out of the secondary reactor into a clean 55-gal steel drum. Materials must remain in the steel drum or other fire proof container until cooled. Cooling will take a minimum of 2 days if cooling agents such as water are not used.

Pyrolysis gases are burned in a flare at a temperature between 500-1500°C. This flare can be lit with a “weed burner” torch once wood gas is produced in reaction. Wood gas will be a yellow color once it can light, this can take 15-35 minutes after starting the process.



Continuous biochar production unit

The biochar production unit will be used to produce biochars from different biomass sources. The produced biochar will be characterized for their elemental compositions and physical properties. Experiments will be under taken in future to find the effect of biochar application on soil and different crop growth.