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# Use of Biomass Waste in the Construction Industry

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# USE OF BIOMASS WASTE IN THE CONSTRUCTION INDUSTRY

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## Objectives

- To reduce the emissions of Carbon dioxide from cement manufacturing industries which contribute to 8% (40,000 million tons of $CO_2$) of the total emissions every year.
- Show proof-in principle that incorporation of biomass ash as a cement replacement material will produce High strength & more Durable concrete.

**Methods used:**

X-ray Diffraction, Thermo-gravimetric analysis, Strength activity index, Calorimetric analysis, Consistency, Setting time, Compressive strength, Flow, Shrinkage test, Alkali-Silica reaction, Sulfate attack, Water absorption and sorptivity.

**For this research, we used Rice Husk (RHA) as one of the biomass wastes and tested for its reaction with cement.**

**Motive:** About 1100 million tons of Biomass waste is being produced every year in the USA alone that ends up being dumped as landfills. So, why not use a waste material, that can very well enhance the properties of a concrete mixture thereby helping in the reduction of waste as well.

## Rice Husk Ash production

Figure 1: RHA production

## Principles

Burn the Rice Husk to a certain temperature → Ground to various particle sizes → Test the samples for its characteristics → Use the best sample for further testing

## Results

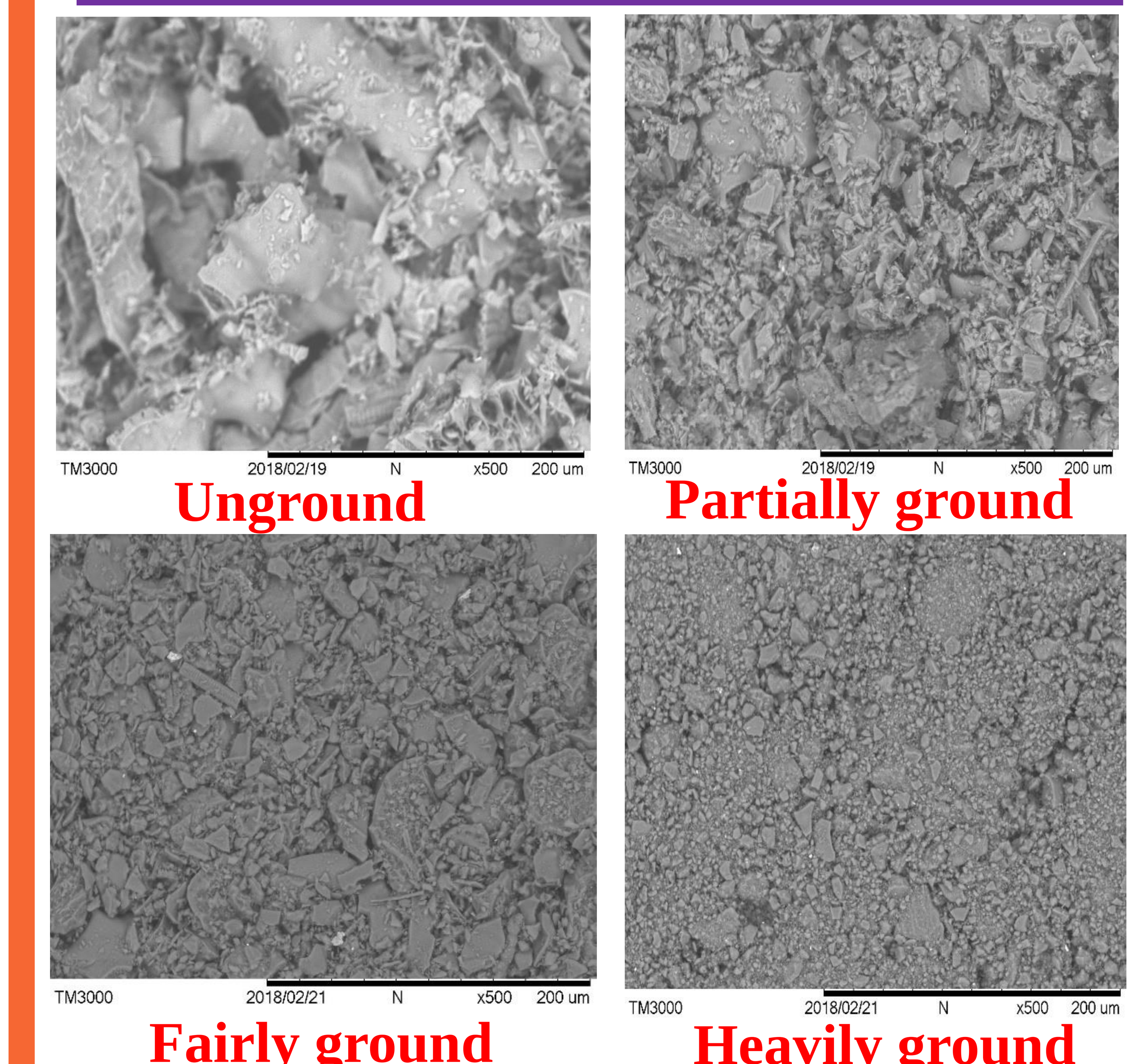


Figure 2: Fineness of RHA

Table 1: Strength Activity Test

| STRENGTH TEST - Designation | Avg. Compressive strength (psi) | % strength |
|---|---|---|
| Cement samples | 5079 | 100% |
| Cement + Partially ground Biomass waste) samples | 5425 | 106.8% |
| Cement + Fairly ground Biomass waste) samples | 5876 | 115.6% |
| (Cement + Heavily ground Biomass waste) samples | 6541 | 128.8% |

Table 2: Thermo-Gravimetric Analysis (TGA)

| TGA TEST - Designation | $Ca(OH)_2$% 28 days | $Ca(OH)_2$% 56 days |
|---|---|---|
| Cement samples | 13.69 | 15.60 |
| Cement + Partially ground Biomass waste) samples | 11.23 | 13.56 |
| Cement + Fairly ground Biomass waste) samples | 9.54 | 11.41 |
| (Cement + Heavily ground Biomass waste) samples | 5.97 | 5.33 |

## Outcomes

- The strength of the mixture (biomass + cement) was 130% of its control (cement alone)
- The mixture with biomass was so durable and exceeded the performance with that of a mixture with only cement.

**Future studies:** Use of biowaste for Ultra High Strength concrete structures.

**Proposed collaborations:**
With agriculture department to work on other bio-wastes and save planet earth by reducing the emissions of harmful gases from the cement manufacturing industries.

**Cement production:**

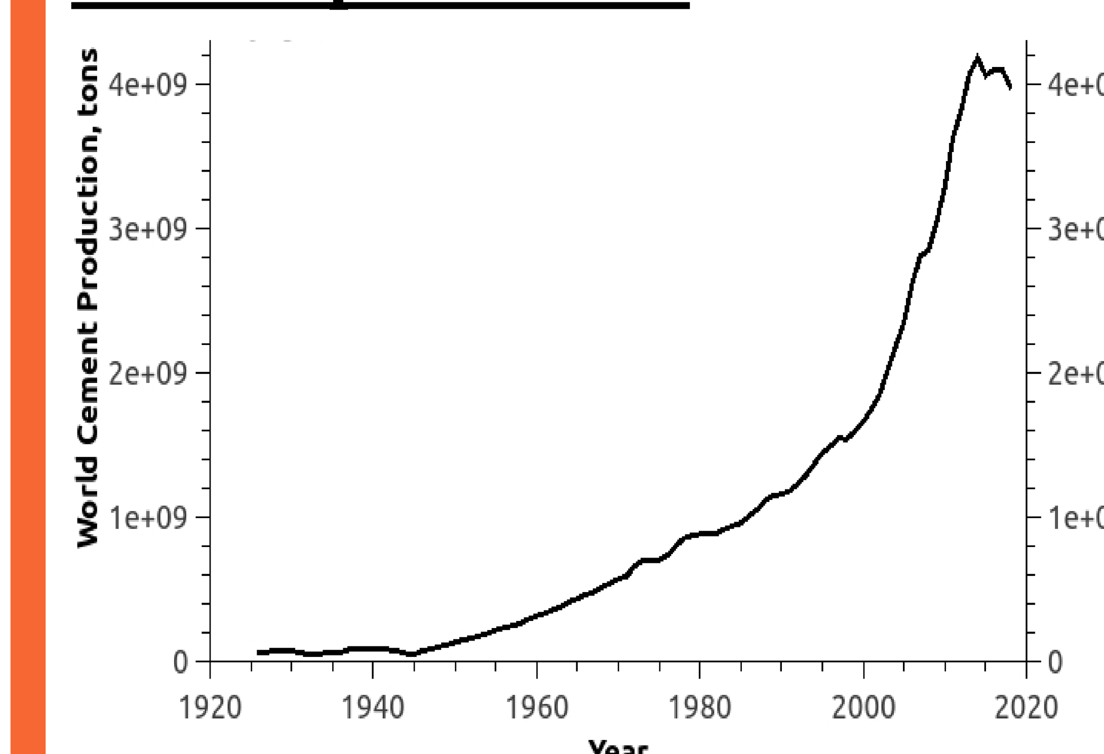


Figure 3: World cement production
Source: USGS, Ugo bardi -2019

## Conclusions

**DON'T LANDFILL YOUR BIOMASS WASTE, PRODUCE CEMENT WITH IT !!**

**References:**

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