

**DESIGN OF SEMI-CONTINUOUS  
FIXED DOME BIOGAS PLANT  
FOR  
NATURAL RUBBER EFFLUENT TREATMENT**

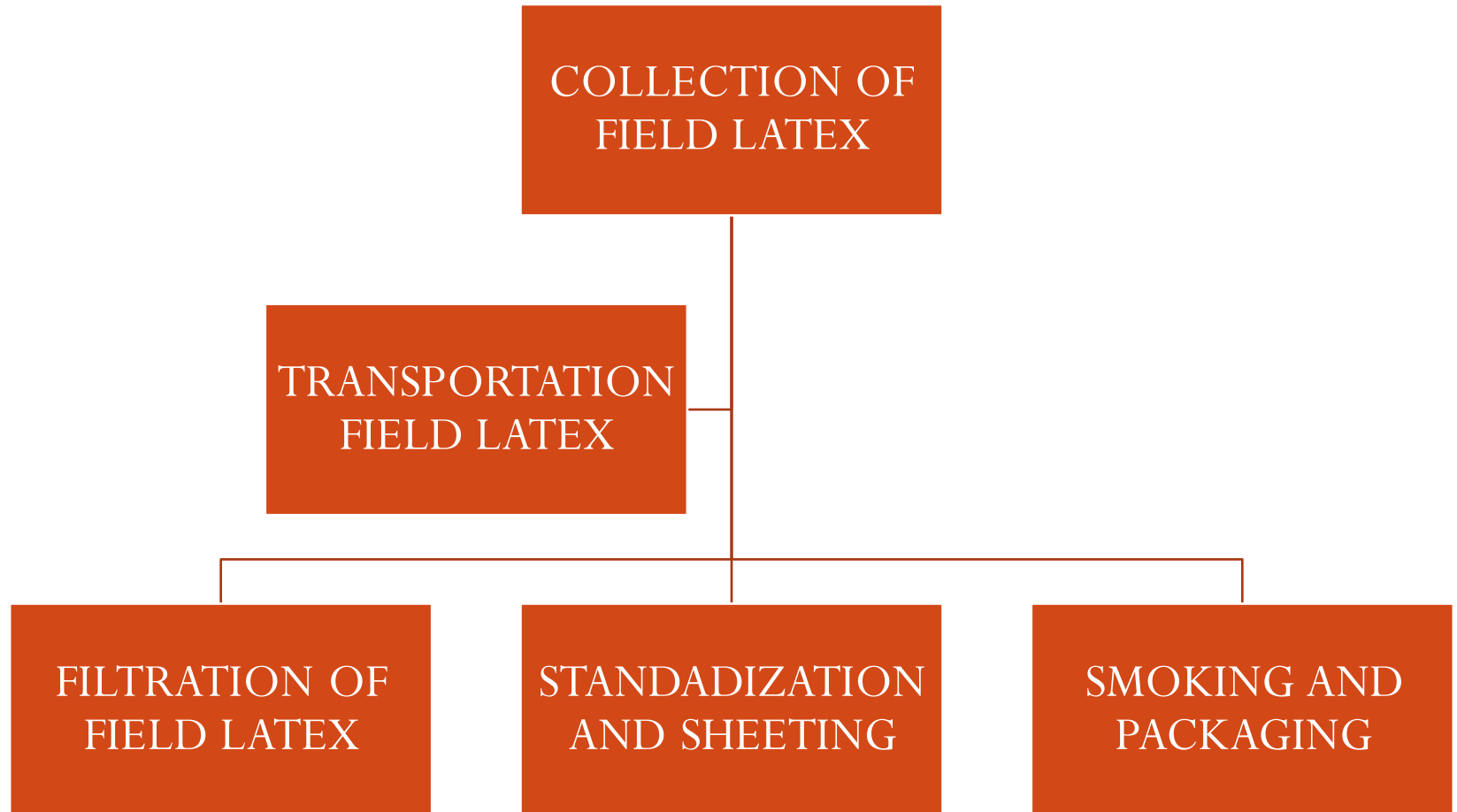
By

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# OVERVIEW OF RSS PRODUCTION PROCESS



# WHY RSS EFFLUENT?

LOW pH  
VALUE

PREVENT  
AMMONIA  
INHIBITION

LOW  
AMMONICAL  
NITROGEN

# BIOGAS PLANTS

```
graph TD; A[BIOGAS PLANTS] --> B[BATCH TYPE]; A --> C[SEMI CONTINUOUS FLOW TYPE]; A --> D[CONTINUOUS FLOW TYPE]; C --> C1[FLOATING DOME]; C --> C2[FIXED DOME]; D --> D1[PLUG FLOW]; D --> D2[FLOATING FLOW];
```

The diagram is a hierarchical flowchart. At the top is a large orange rectangle labeled 'BIOGAS PLANTS'. A downward-pointing arrow leads to a second orange rectangle labeled 'BATCH TYPE'. From the bottom of the 'BIOGAS PLANTS' box, two arrows branch out to the left and right, leading to 'SEMI CONTINUOUS FLOW TYPE' and 'CONTINUOUS FLOW TYPE' respectively. From 'SEMI CONTINUOUS FLOW TYPE', two arrows branch out to the right, labeled 'FLOATING DOME' and 'FIXED DOME'. From 'CONTINUOUS FLOW TYPE', two arrows branch out to the right, labeled 'PLUG FLOW' and 'FLOATING FLOW'. All boxes and arrows are orange with white text.

BATCH TYPE

SEMI CONTINUOUS  
FLOW TYPE

FLOATING DOME

FIXED DOME

CONTINUOUS  
FLOW TYPE

PLUG FLOW

FLOATING FLOW

# COMPONENTS OF THE SCFD MODEL

TANKS

```
graph TD; A[TANKS] --- B[COLLECTION/COAGULATION]; A --- C[FILTRATION TANK]; A --- D[MIXING TANK]
```

COLLECTION/  
COAGULATION

FILTRATION  
TANK

MIXING TANK

# THE BIOREACTOR

THE DIGESTER

COMPOST  
PIT

REACTING  
CHAMBER

GAS DOME

GAS HOLDER AND INLET PIPE

# COMPOST PIT

- ACCOMODATES RSS EFFLUENT AND THE STARTER
- OCCUPY 3/4 VOLUME OF THE DIGESTER
- FOUNDATION – 15 CM THICK AND REINFORCED WITH 1/4" ROD

# REACTING CHAMBER

SHAPE - CYLINDRICAL

CAST WITH CONCRETES 15 CM  
THICKNESS

REINFORCED WITH  $\frac{1}{2}$ " ROD

ANAEROBIC DIGESTION TAKES  
PLACE



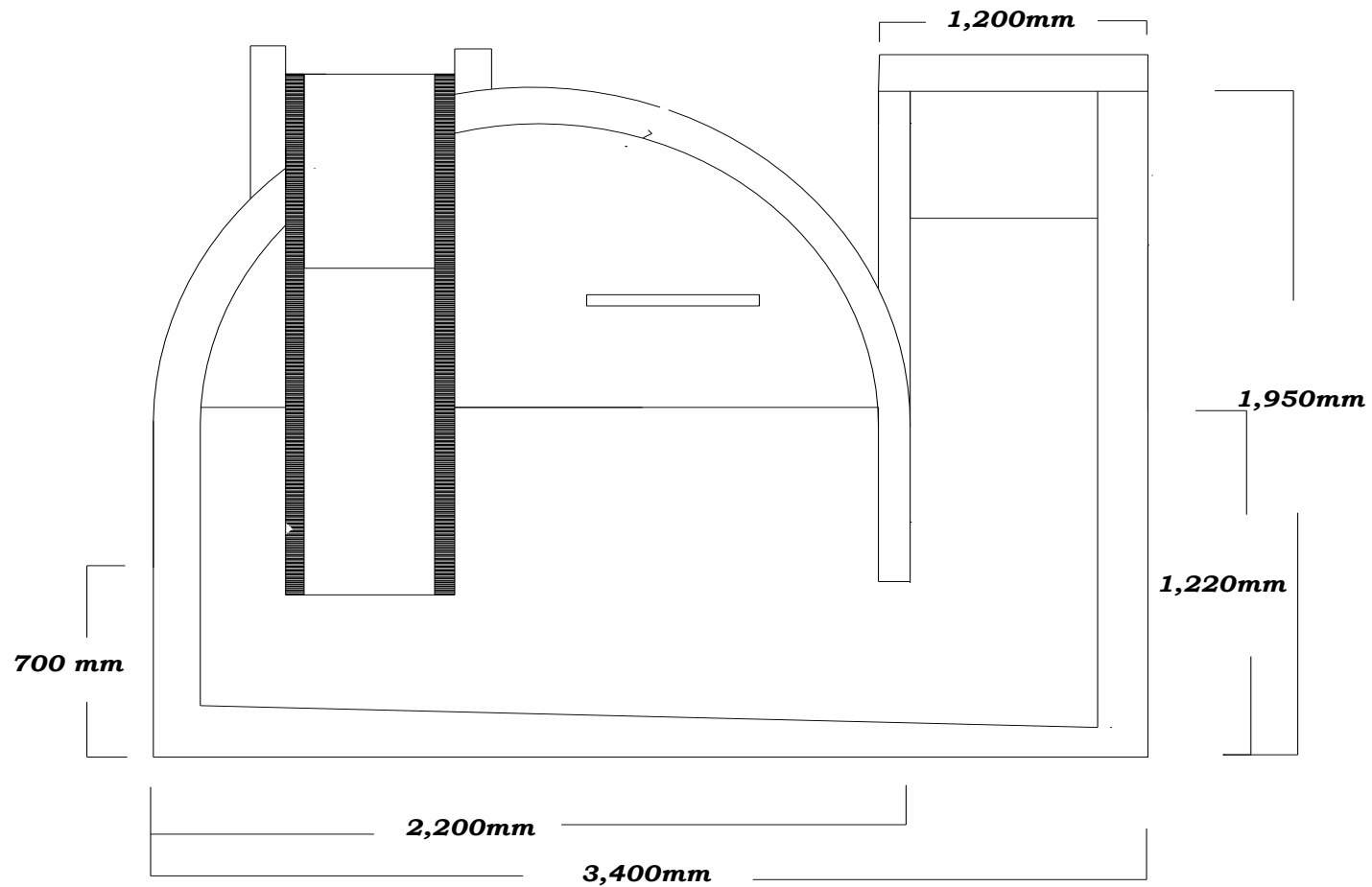
# GAS DOME

- GAS DOME TO DIGESTER RATIO – 1:1 TO 1:3 DEPENDS ON RETENTION TIME

- CONSTRUCTED USING CASTING TECHNIQUE REINFORCED WITH ¼" ROD

- CEMENT:SAND:GRAVEL = 1:3:3

# WORKING DIAGRAM



# GAS DRYER/CLEANER

Methane  
(CH<sub>4</sub>)



CO<sub>2</sub>,  
H<sub>2</sub>S,  
H<sub>2</sub>O<sub>(g)</sub>



Biogas

# Effects of $\text{CO}_2$ , $\text{H}_2\text{S}$ , $\text{H}_2\text{O}_{(g)}$

$\text{H}_2\text{S}$  will form sulfur dioxide ( $\text{SO}_2$ ) and sulfuric acid ( $\text{H}_2\text{SO}_4$ ) during combustion which results in a very aggressive corrosion.

The corrosion will literally reduce the downstream equipment's lifetime by years

Combustion of un-cleaned biogas will result in acid rain from emissions of sulfur dioxide ( $\text{SO}_2$ ).

Reduce the Heating Value

# Methods of Cleaning Biogas

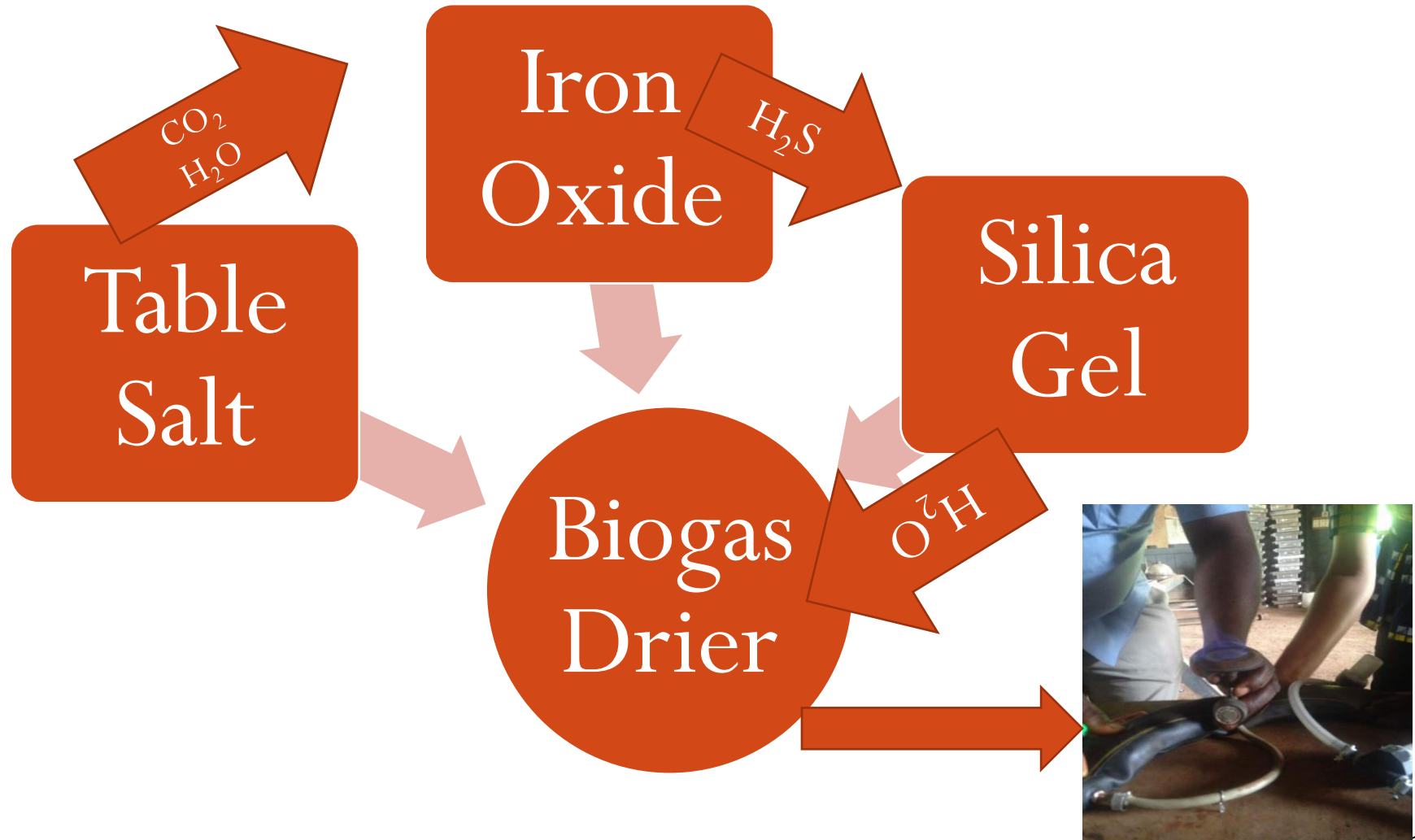


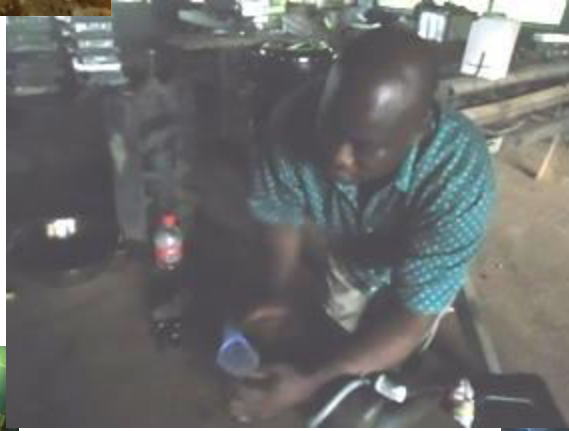
Water Swollen  
Reverse Osmosis  
Membrane

Biotrickling Filters

Biological  
Scrubbers

# Materials and Method





# the Research is Still Ongoing



The Research  
is Still Ongoing

**Thanks to all the technical staff of  
Fabrication Unit, RRIN, Benin City.**



# ACKNOWLEDGEMENT



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graph TD; A[ACKNOWLEDGEMENT] --> B[RRIN EXECUTIVE DIRECTOR  
DR. A.I. AIGBODION]; B --> C[HEAD, PRODUCTION DEPARTMENT  
DR. T.U. EZEKAHDE]; C --> D[HEAD, RSS PRODUCTION UNIT  
DR. I.O. BAKARE];
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THANKS

FOR

LISTENING