3 MATERIALS AND METHODS

3.1 Overview
This section described about the materials and method to be used in order to separate the furfural from PEFB. It is include the raw material processing, catalyst preparation, hydrolysis process and also dehydration process.

3.2 Materials
Palm empty fruit bunch, calcium oxide, water, solid waste catalyst, distilled water, tap water, and sulphuric acid.

Figure 3-1 : Palm Empty Fruit Bunch (PEFB)

Figure 3.1 shows the picture of raw materials taken from the Dominion Square, Lepar Hilir, Pahang. It is under LKPP Negeri Pahang.

Figure 3-2 : LKPP's logo

3.3 Methods
a) Raw Material Preparation
Palm Empty Fruit Bunch (PEFB) is collected at Felda Lepar Hilir. PEFB is sun-dried about 2 days. Then, PEFB is cut into small pieces and are oven-dried at 60 °C for about 2 hours.

![Figure 3-3: PEFB before dried](image1)

![Figure 3-4: PEFB after dried](image2)

Then, the moisture content of the PEFB is calculated by using the equation of:

\[
MC(\%) = \left(\frac{\text{Mass before drying} - \text{Mass after drying}}{\text{Mass before drying}}\right) \times 100
\]  

(1)

After dried, the PEFB is grinded using the grinding machine.

![Figure 3-5: Grinder Machine](image3)
Dried PEFB will be inserted into the grinder machine to produce the small particles of PEFB in order to proceed to the hydrolysis part.

![PEFB after grind](image)

**Figure 3-6 : PEFB after grind**

b) Solid waste catalyst preparation

Egg shells were washed using tap water to remove any unwanted substances. Then, it is rinsed twice with distilled water. The washed egg shell then dried in the oven at 105°C for 24 h. Then, it will calcined in a muffle furnace under static air conditions at 900 °C for 2.5 h after it is reduced to a smaller pieces. Further, it is refluxed in water at 60 °C for 6 h. All the solid particles was filtered and dried in oven at 120 °C overnight. The solid product is dehydrated by calcined at 600 °C for 3 h.

![SWC derived from egg shells](image)

**Figure 3-7 : SWC derived from egg shells**

c) Hydrolysis process