

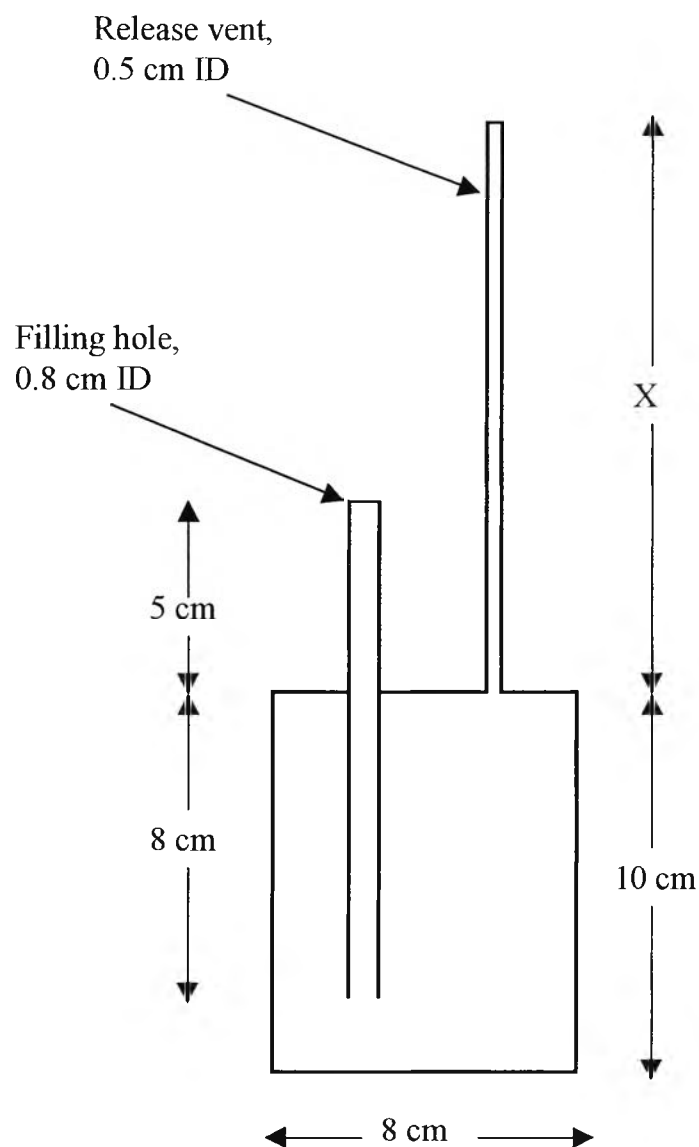
## CHAPTER III EXPERIMENTAL



This experimental study of gasoline emission using a simulated storage tank was performed at four temperatures, three initial gasoline volumes and three release vent heights.

### 3.1 Experimental Setup

Four glass storages were used as storage tanks for gasoline in this study. Each glass storage had  $8\pm 0.5$  cm outside diameter,  $7.5\pm 0.5$  cm inside diameter,  $10\pm 0.5$  cm in height and  $410\pm 15$  ml in volume. The filling tube of the storage had 0.8 cm inside diameter and 13 cm in height, 8 cm of the filling tube was inside the storage and the remaining of 5 cm above the top of the storage. The height of the release vent with 0.5 cm inside diameter was varied from 15, 30 and 45cm. Figure 3.1 shows the configuration of the glass storage tank used in this experiment. A temperature control set, consisting of a water bath and circulator, was used to maintain temperature of the gasoline constant throughout the experiment. The circulator, HAAKE F3-M, was able to control the temperature within  $\pm 0.01^\circ\text{C}$ . To find the weight loss of gasoline, the gasoline-filled storage was weighed with a digital balance, Ohaus TP2KS. The balance had two decimal readability and capacity up to 2,000 g with  $\pm 0.01\text{g}$  accuracy.



**Figure 3.1** Configuration of studied gasoline storage tank used in this experiment

### 3.2 Gasoline Properties

Unleaded gasoline with 95 octane number used in this work was provided by the Petroleum Authority of Thailand (PTT). This gasoline was chosen in this experiment because of its widely used and high evaporation rate. The properties of the gasoline used are shown in Table 3.1.

**Table 3.1** Properties of the gasoline (The Petroleum Authority of Thailand, 1999)

Properties	Limit	Results
API gravity @ 60 °F	-	53.6
Specific gravity @ 60/60 °F	-	0.7645
Octane number, Research method	Min 97.0	97.4
Octane number, Motor method	Min 84.0	-
Lead content, g/l	Max 0.013	0.003
Reid vapor pressure @ 37.8 °C, kPa	Max 62	58.25
Benzene, %vol	Max 3.5	1.6
Aromatic, %vol	Max 50	42.8
Distillation:		
Initial boiling point, °C	-	55.7
10% vol evaporated, °C	max 70	55.7
50% vol evaporated, °C	70-110	102.0
90% vol evaporated, °C	max 170	159.5
End point, °C	max 200	194.7
Recovery, %vol	-	98.0
Residue, %vol	max 2.0	1.0
Color	0.5-1.0	L 1.0

### 3.3 Experimental Procedures

#### 3.3.1 Determination of Temperature Effect

This experiment was carried out to determine the amount of gasoline emitted at different ambient temperature. The gasoline storage with the vent height of 30 cm was used in this experiment. The experiment started with loading liquid gasoline of  $300 \pm 5$  ml into the storage through the filling tube. Then, paraffin film was used to seal the filling hole to ensure that there was no

gasoline leaving through the filling hole. Next, the gasoline-filled storage was weighted by the digital balance. The storage was then placed into the well-circulated water bath with the preset temperature of 25 °C. For every 24 hours, the storage was weighted until 168 hours. The same procedure was repeated for the experiment at 30, 35 and 40°C.

### 3.3.2 Determination of Release Vent Height Effect

This experiment was to determine the effect of release vent height on gasoline emission. The experiment was started with loading liquid gasoline of  $300 \pm 5$  ml into the three storages having three different vent heights of 15, 30 and 45 cm. Paraffin film was used to seal the filling hole. The storage was then placed into the well-circulated water bath with the preset temperature of 30 °C. For every 24 hours, the storage was weighted until 168 hours.

### 3.3.3 Determination of Initial Gasoline Volume Effect

Determination the effect of initial gasoline volume on gasoline emission was also carried out in this experiment. The gasoline storage with the vent height of 30 cm was used in this experiment. The experiment started with loading liquid gasoline with different volumes of 250, 300 and 350 ml. The storage was then placed into the well-circulated water bath with the preset temperature of 40 °C. Again, the same procedure was taken as mentioned before.