

C_5H_{12} formulated 1 kg fuel is combusted with 1,1 air excess ratio. Find the combustion product in terms of kg unit.

$$c = \frac{5 \cdot m_c}{5 \cdot m_c + 12 m_h} = \frac{5 \times 12}{5 \times 12 + 12 \times 1} = 0,833 \quad \left. \begin{array}{l} \text{mass} \\ \text{fractions} \end{array} \right\}$$

$$h = \frac{12 \cdot m_h}{5 m_c + 12 m_h} \quad \text{or} \quad h = 1 - c = 0,167$$

$$O_{min} = \frac{1}{12} c + \frac{1}{4} h + \frac{1}{32} s - \frac{1}{32} o \quad [\text{kmole } O_2 / \text{kg fuel}]$$

$$O_{min} = 0,111 \text{ kmole } O_2 / \text{kg fuel}$$

$$(O_{min} = 32 \times 0,111 = 3,557 \text{ kg } O_2 / \text{kg fuel}) \rightarrow \text{it must be find for calculated "x" terms, x terms can be used in only rich mixtures.}$$

$$L_{min} = \frac{O_{min}}{0,21} = 0,529 \text{ kmole air / kg fuel}$$

$$N_{CO_2} = \frac{1}{12} c = \frac{1}{12} 0,833 = 0,07 \text{ kmole } CO_2 / \text{kg fuel}$$

$$N_{CO} = 0 \rightarrow \text{due to lean mixture}$$

$$N_{H_2O} = \frac{1}{2} h = \frac{1}{2} 0,167 = 0,084 \text{ kmole } H_2O / \text{kg fuel}$$

$$N_{N_2} = 0,79 \cdot \lambda \cdot L_{min} = 0,79 \times 1,1 \times 0,529 = 0,460 \text{ kmole } N_2 / \text{kg fuel}$$

$$M_{CO_2} = N_{CO_2} \cdot m_{CO_2} = 0,07 \times 44 = 3,08 \text{ kg } CO_2 / \text{kg fuel}$$

$$M_{H_2O} = N_{H_2O} \cdot m_{H_2O} = 0,084 \times 18 = 1,512 \text{ kg } H_2O / \text{kg fuel}$$

$$M_{N_2} = N_{N_2} \cdot m_{N_2} = 0,460 \times 28 = 12,88 \text{ kg } N_2 / \text{kg fuel}$$

You can find the solution directly mass unit formulas which given below

$$c = 0,833$$

$$h = 0,167$$

$$O_{mh} = \frac{32}{12}c + \frac{32}{4}h + \frac{32}{32}s - \frac{32}{32}a_1 \text{ (kg } O_2/\text{kg fuel)}$$

$$O_{mh} = \frac{8}{3}c + 8h = 3,557 \text{ kg } O_2/\text{kg fuel}$$

$$L_{miz} = O_{mh}/0,232 = 15,33 \text{ kg-air/kg fuel}$$

$$M_{CO_2} = \frac{11}{3}c = 3,08 \text{ kg } CO_2/\text{kg fuel}$$

$$M_{CO} = 0$$

$$M_{H_2O} = 3h = 1,512 \text{ kg } H_2O/\text{kg fuel}$$

$$M_{N_2} = 0,768 \times 2 \times L_{miz} = 12,9 \text{ kg } N_2/\text{kg fuel}$$