



## **Industrial Steam Systems** **Virtual INPLT Training & Assessment**

Session 3 (Miscellaneous Losses)

Friday – October 28, 2022

10 am – 12:30 pm ET

# Unburned Fuel Loss

- Fuels containing ash commonly present an energy loss in the form of unburned fuel in the ash
  - The unburned fuel component is typically carbon
    - The other fuel components are generally more reactive than carbon
      - Also carbon is usually the dominant fuel component

# Loss On Ignition (LOI) Analysis

1. Measure the mass of the raw collected sample (ash and carbon) -  $m_{\text{fullsample}}$
2. Expose the collected sample to a combustion source for an extended period to ensure all combustible material has reacted
3. Measure the mass of the remaining sample, which is ash alone -  $m_a$

$$LOI = \frac{m_{\text{Carbon}}}{m_{\text{Carbon}} + m_{\text{Ash alone}}} = \frac{m_C}{m_C + m_A} = \frac{m_C}{m_{\text{Full Sample}}}$$

$$m_C = m_{\text{full sample}} - m_a$$

# Loss On Ignition (LOI) Analysis

$$m_C = \frac{LOI (m_A)}{(1 - LOI)}$$

$$\frac{m_C}{m_{Fuel}} = \varphi_{uf}$$

$$\lambda_{misc} = \frac{HHV_C}{HHV_{Fuel}} \varphi_{uf}$$

$$\lambda_{misc} = \frac{14,108 \frac{Btu}{lb}}{HHV_{Fuel}} \varphi_{uf}$$