Equipment III
Furnaces

✓ Course Objectives

1. Describe the purpose and function of a fuel-fired furnace.

2. Identify the components of a fuel-fired furnace.

3. Describe common applications for fuel-fired furnaces in chemical processing.

4. Describe the types of furnaces by category including classification by draft, fuel, geometry, heat transfer, and application.

5. Identify typical operating parameters associated with controlling a furnace.

6. Describe common performance issues related to furnaces and their causes and indicators.

Abc Key Terms (Define the following)

burner management system (BMS) - _____

_____

damper - _____

_____

flame impingement - _____

_____

flue - _____

_____

High Heating Value (HHV) - _____

_____

Low Heating Value (LHV) - _____

_____

pilot - _____

_____

refractory - _____

_____

📐✏️ Principles

Furnace Classifications

Draft	Fuel	Geometry	Heat Transfer	Application
natural	gas	cabin	indirect	heater *provides indirect heat to process fluids*
forced	oil	box	direct	
induced	solid	cylinder		reactor *charge fluids react inside the furnace*
balanced				
				incinerator/kiln *waste solids or fluids are burned for disposal*

✏️ Questions

1. What percent of air is oxygen?
    a. _____ %Volume   b. _____ %Mass

2. Label the parts of this gas fuel burner.

Combustion Air ➤   ◀ Combustion Air
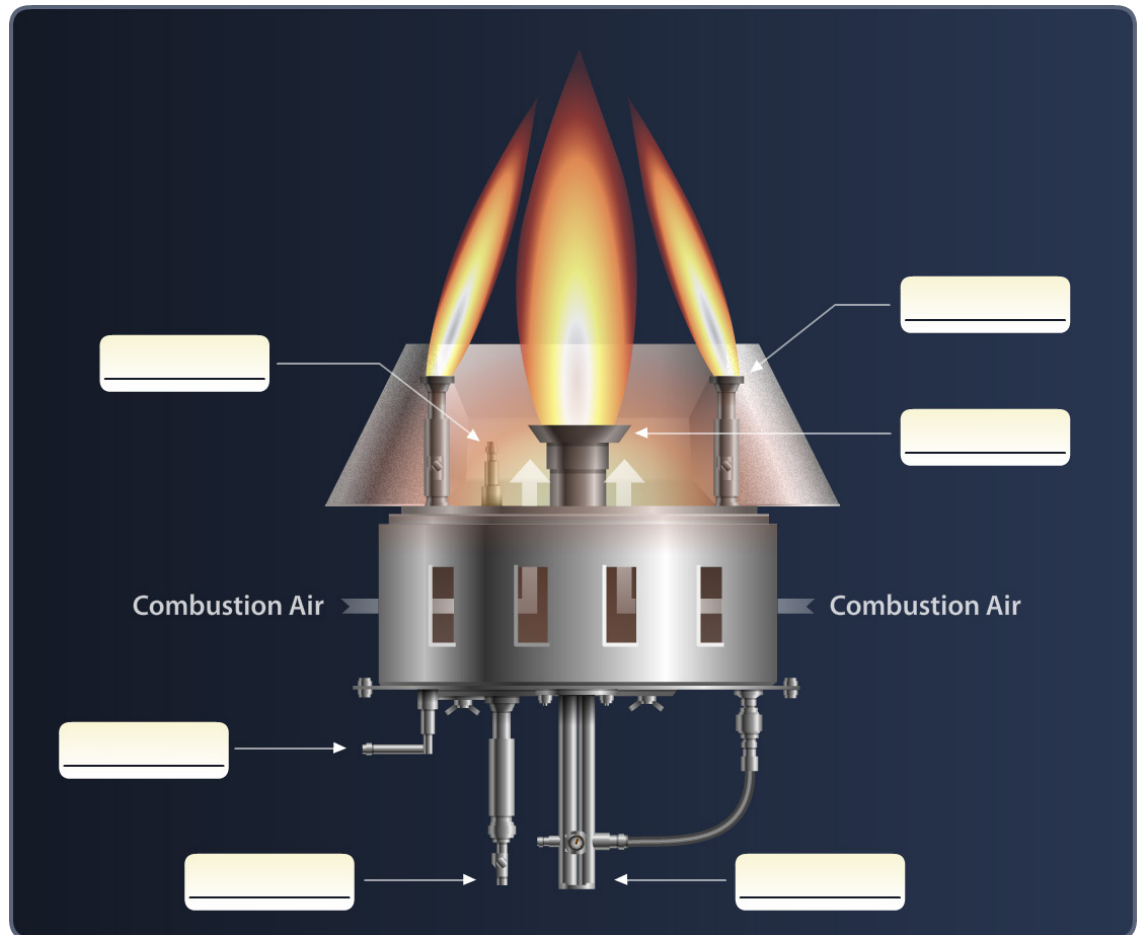
3. Describe the functions of a burner management system.

    _____
    _____
    _____

4. A furnace draft configuration in which a fan is located before the inlet and pushes air through the furnace is called a(n) _____ furnace.

5. List three types of solid fuel burners.
    1) _____
    2) _____
    3) _____

6. Describe tube arrangements in a cylindrical furnace.

   _____
   _____
   _____

7. What is the difference between direct and indirect heat transfer?

   _____
   _____
   _____

8. What is the purpose of flue gas recuperation?

   _____
   _____
   _____

9. List equipment used to control flue gas emissions.

   _____
   _____
   _____
   _____

10. What is the disadvantage of too much combustion air?

   _____
   _____
   _____

11. What is the disadvantage of too little combustion air?

   _____
   _____
   _____

12. What is the purpose of purging during the startup of a furnace?

   _____
   _____
   _____

13. List four conditions that can affect the efficiency of a furnace.
   1) _____
   2) _____
   3) _____
   4) _____