

Module 1: Introduction to Combustion

Lecture 5: Scope of Combustion

The Lecture Contains:

 [Scope of Combustion](#)

 [Image Sources](#)

 [Previous](#) [Next](#) 

Module 1: Introduction to Combustion

Lecture 5: Scope of Combustion

Scope of Combustion

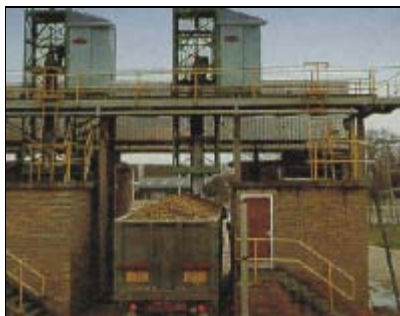
Industrial Process

Thermal energy for process chemical plants, sugar industries, food processing industries are obtained through combustion.

Iron, steel and other metals are produced from raw materials through combustion.

Heat treatment and annealing of metals.

Rotary kilns are used to produce Portlant cement.



Sugar Industry



Food Processing



Process Chemical Plant



Steel Plant

(Figure 5.1)

[◀ Previous](#) [Next ▶](#)

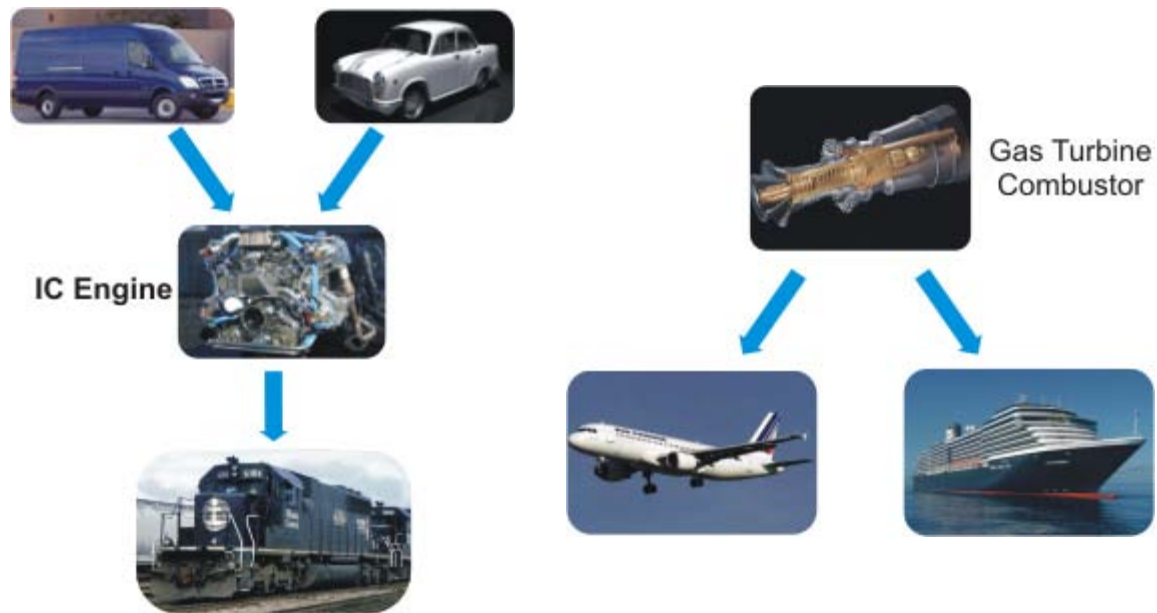
Module 1: Introduction to Combustion

Lecture 5: Scope of Combustion

Transportation

Surface transport vehicles are operated by reciprocating IC Engines

Gas turbine combustors are used widely in air and marine transportation sectors.



(Figure 5.2)

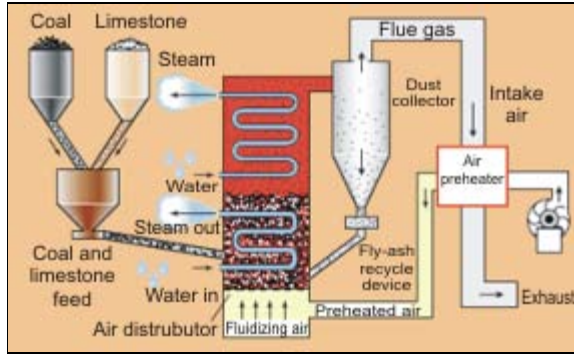
Module 1: Introduction to Combustion

Lecture 5: Scope of Combustion

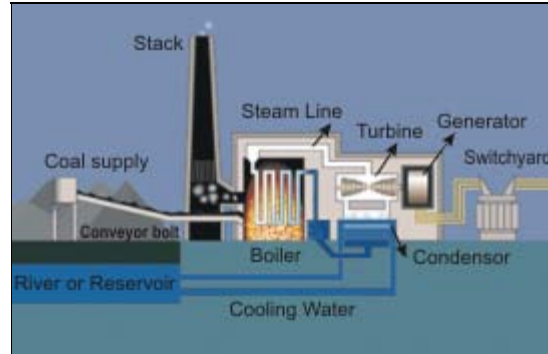
Power
Generation

Most of the thermal power plants are operated by burning coal.

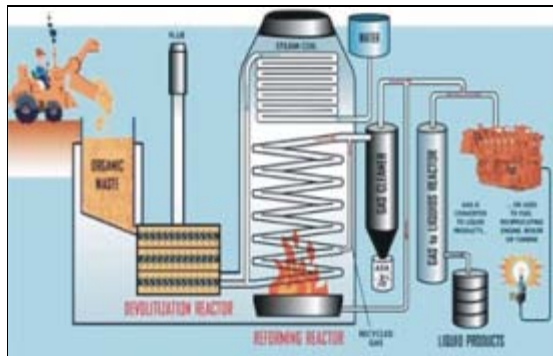
Recently gas turbine power plants are coming up.



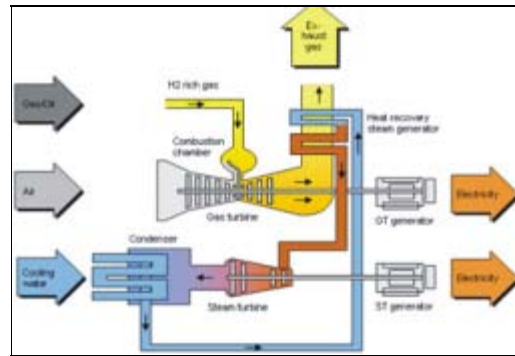
Fluidized Bed Power Plant



Coal Power Plant



Biomass Based Power Plant



Gas Turbine Power Plant

(Figure 5.3)

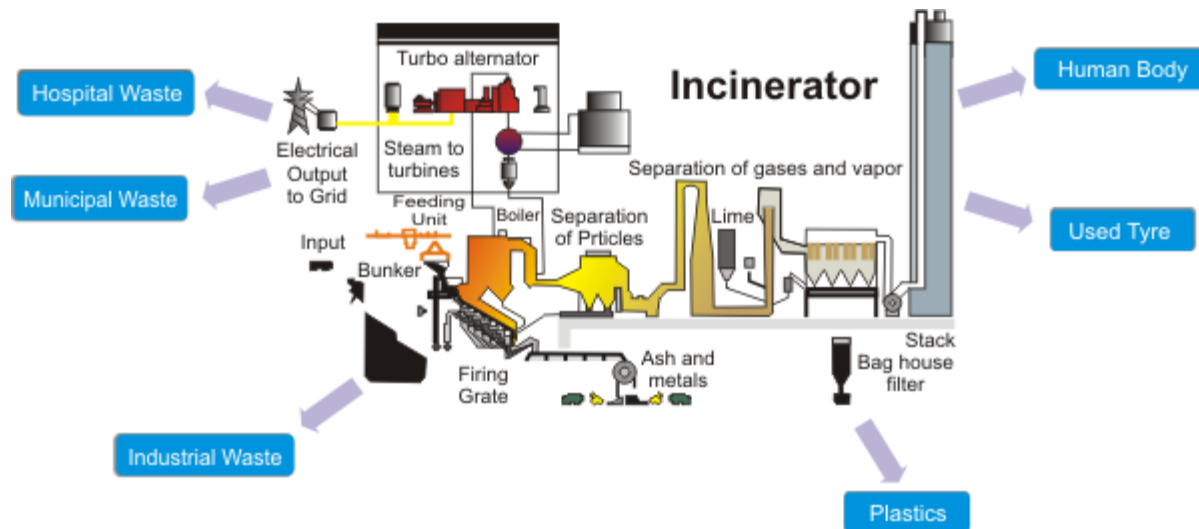
◀ Previous Next ▶

Waste Disposal

Combustion finds application in disposing waste materials.

Incinerators are used to dispose domestic and industrial wastes.

In modern hospitals, incinerators are used to dispose hospital wastes safely.



(Figure 5.4)

Module 1: Introduction to Combustion

Lecture 5: Scope of Combustion

Fire

Sometimes fire causes damage to life and property.

Forest Fire: Damages natural resources and lives.

Structural Fire: Damages property and human lives.

Effective fire breakers should be designed and implemented to avoid fire hazard. By using proper construction materials, Fire hazard can be minimized. Marine life is very much affected by oil spill fire.



(Figure 5.5)

Module 1: Introduction to Combustion

Lecture 5: Scope of Combustion

Environmental pollution

Combustion of any fuel produces certain amount of emissions such as smoke, ash, soot, and other harmful gases.

Major pollution generated in combustion system are CO, CO₂, NO, NO₂, SO₂, ash, etc.

These are due to incomplete combustion and can be minimized by increasing the residence time of fuel-oxidizer mixture in the combustor.

Sources	Particulates	Carbon Monoxide	Unburnt Hydrocarbon	Nitrogen oxides	Sulfur dioxides
Transportation	7	79	60	15	6
Stationary Combustion Systems/Electricity	8	<1	<1	2	69
Industrial Process	23	8	32	13	25
Miscellaneous	62	13	8	70	<1

◀ Previous Next ▶

Module 1: Introduction to Combustion

Lecture 5: Scope of Combustion

Image Sources

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Incinerator :	http://www.winderickx.pl/en/msw_municipal_waste_incinerators.php
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Power Plant :	http://www.teachengineering.org/view_lesson.php?url=http://www.teachengineering.org/collection/cub_lessons/cub_earth/cub_earth_lesson08.xml
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◀ Previous Next ▶

Module 1: Introduction to Combustion

Lecture 5: Scope of Combustion

Image Sources

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◀ Previous Next ▶

Module 1: Introduction to Combustion

Lecture 5: Scope of Combustion

Image Sources

Oil Spill Fire : <http://zeroequalsthree.blogspot.com/2010/09/chaos-oil-spill-chaos.html>

Structural Fire : <http://www.forensicmed.co.uk/pathology/fire-deaths/fire-destruction-of-bodies/>

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Gas Turbine Engine : http://www.ohio.edu/mechanical/thermo/Intro/Chapt.1_6/gasturbine/gas_turbine.html

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Ambassador Car : http://4.bp.blogspot.com/_rMX3SfIKwNc/TEuA4BHyCSI/AAAAAAAAAQk/BO7ZOgEVHtQ/s1600/ambassador

Aeroplane : <http://www.dailymail.co.uk/news/article-564300/Passenger-jet-makes-terrifying-10-000ft-climb-dodge-plane-pilot-showing-child.html>

Ship : <http://www.a1-discount-cruises.com/cruise-ships.htm>

IC Engine : <http://www.birkey.com/technical-illustration/engine-piston-pin-sketch/>

◀ Previous Next ▶