

TOPIC 2

WASTEWATER



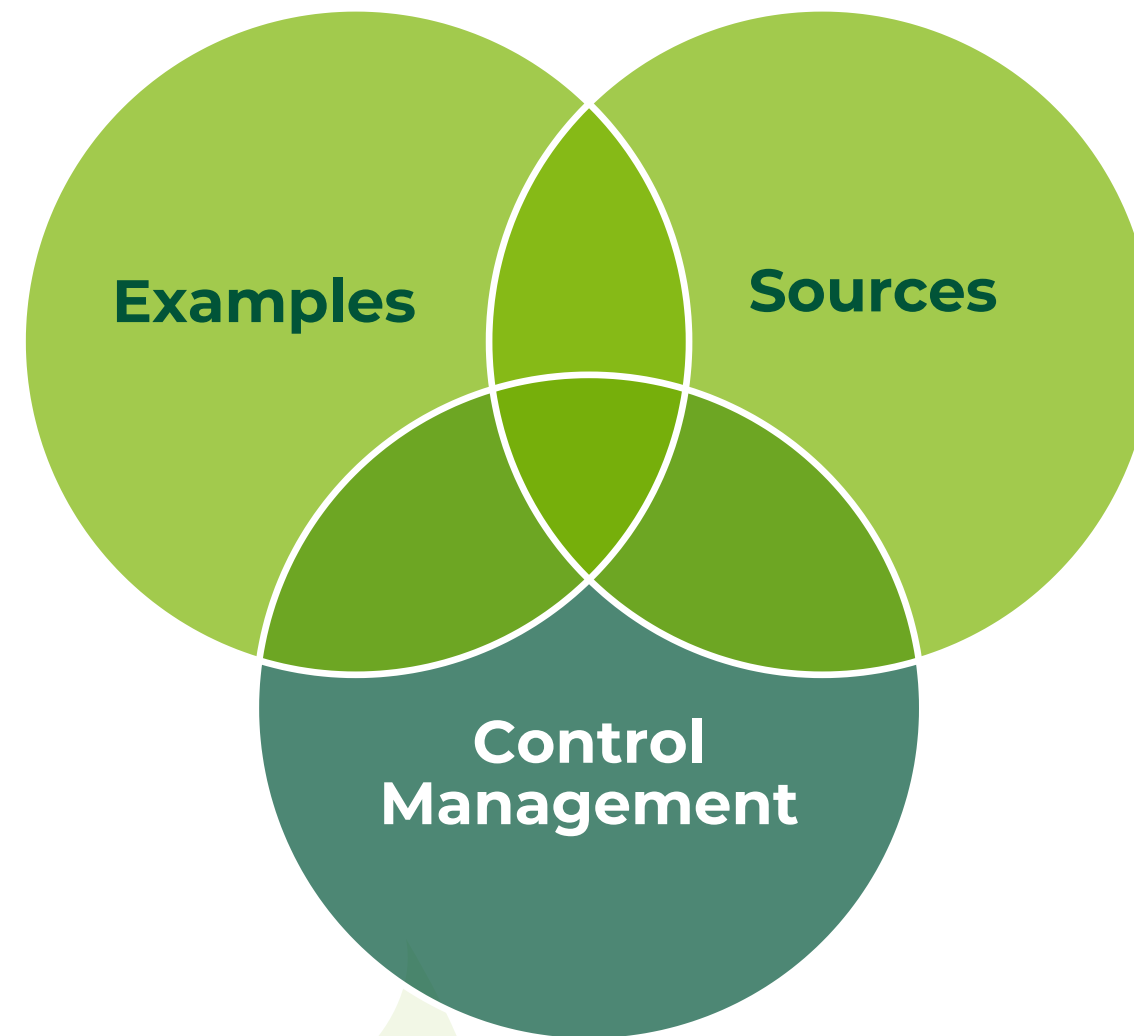
Lesson Learning Outcomes:

In the end of lesson, you will learn:

- State examples of wastewater from industry.

- Describe the sources of wastewater (Refer video).

- Explain control measures to manage each type of waste (Refer video).



INTRODUCTION

Wastewater is a byproduct of domestic, industrial, commercial or agricultural activities. It is defined as used water from any combination of domestic, industrial, commercial or agricultural activities, surface runoff or stormwater, and any sewer inflow or sewer infiltration. The amount of wastewater generated, and its characteristic hugely affected by the type of process occur. In oil and fat industry, almost all processes involved produce wastewater.



NO.	PROCESS	AVERAGE WASTE LOAD FLOW (m ³ /day)
1.	Milling and extraction	95
2.	Caustic refining	42
3.	Deodorization	19
4.	Acidulation	72
5.	Further processing	19
6.	Margarine production	265
7.	Salad dressing/mayonnaise	189
TOTAL		701

Average wastewater flow from different oil seed processing stage (Boyer, 2005).

Main contributors to wastewater:

Oilseed Plantation

Oilseed Extraction

Crude Oil Refining

Refined Oil
Modification

Increased demand of edible oil throughout the world has resulted in establishment of many edible oil industries leading to generation of huge amount of wastewater. Wastewater is generated mostly during the processing operations and washing of equipments. This wastewater has high nutrient content, biological oxygen demand (BOD), chemical oxygen demand (COD), lipids (fats, oil and grease) and organic and inorganic contents, so if disposed untreated it can result in soil, water and air pollution.



Oilseed Plantation

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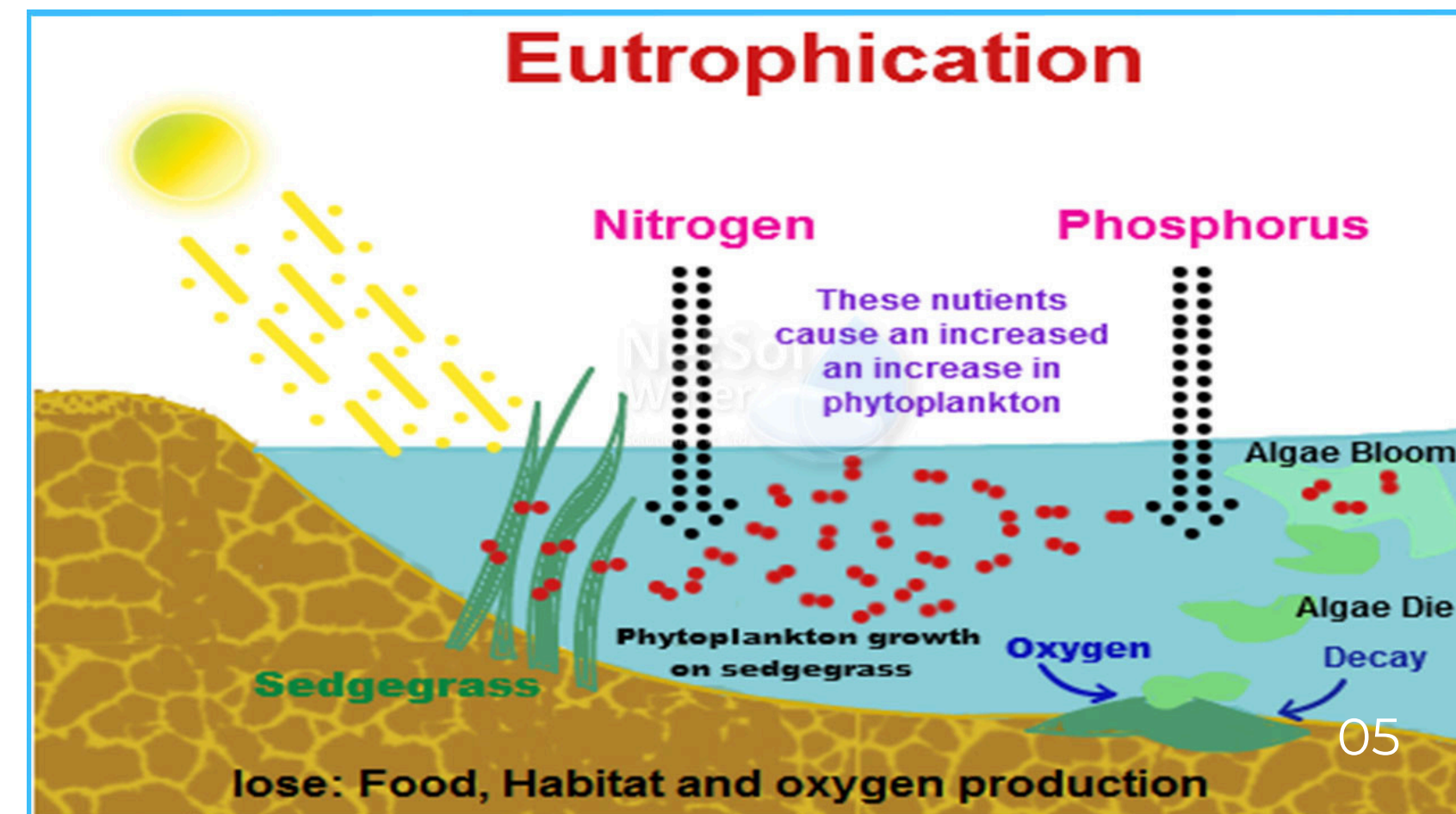
Oilseed plantation is a large-scale estate meant for farming that specializes in feedstock crops for oil and fat industry.

Oilseed plantation especially palm oil has always been linked to the environment because it is a land intensive stage in the whole oil and fat industry.



Impact of oilseed plantation:

Excessive fertilization and their application to cropland cause nutrient (mainly nitrogen and phosphorus) runoff and leaching from agricultural land which contributes to eutrophication of aquatic ecosystems and pollution of groundwater, with harmful effects on human populations



Oilseed Extraction

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Once harvested, oilseed will be transported to mill for extraction process. Upon arriving to the extraction facilities/mills, they will undergo preparation prior to the extraction process. Oilseed will be cleaned or washed if necessary. The oilseed will then be sterilized in pressurized vessel. The process is crucial to the final oil quality as well as the strippability of fruits.



Impact of oilseed extraction:

- Wash water from cleaning process usually contain coarse biomasss, particulates that can manifest in water runoff which increase the solid content in wastewater.
- Wastewater generated during sterilization process mainly consist of mixture of oil from the extraction process and distillate.
- Crude oils, contain significant quantities of organic phosphorus in the form of phosphatides.

Oilseed Refining

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Crude oil refining process is the main contributor of wastewater in oil and fat industry. Variations in refining process methods will greatly impact wastewater characteristics. It is crucial to understand each process so that best control measures could be proposed for each particular wastewater generated.

Impact of oilseed refining:

- Degumming process removes phospholipids, gum and other sticky materials by adding phosphoric acid which result in wastewater contains phosphorus.
- Acidulation of the oil using sulphuric acid causes wastewater contains sulfate might increase dissolved solids in water stream and form odor-causing compounds under anaerobic conditions.
- Wastewater generated during sterilization process mainly consist of mixture of oil from the extraction process and distillate.
- Crude oils, contain significant quantities of organic phosphorus in the form of phosphatides.



Refined Oil Modification

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Oil modification process refers to the further process to convert refined oil into other products. Palm oil modification process such as in the production of margarine and mayonnaise also contributes in wastewater generation from oil and fat industry.

Impact of refined oil modification:

- Production of margarine involve chemical process known as hydrogenation. In this process, nickel is used as catalyst to facilitate the conversion process. Nickel may enter the wastewater stream from cleanup and minor losses in the hydrogenation process areas caused by nickel catalysts.





Thank You

