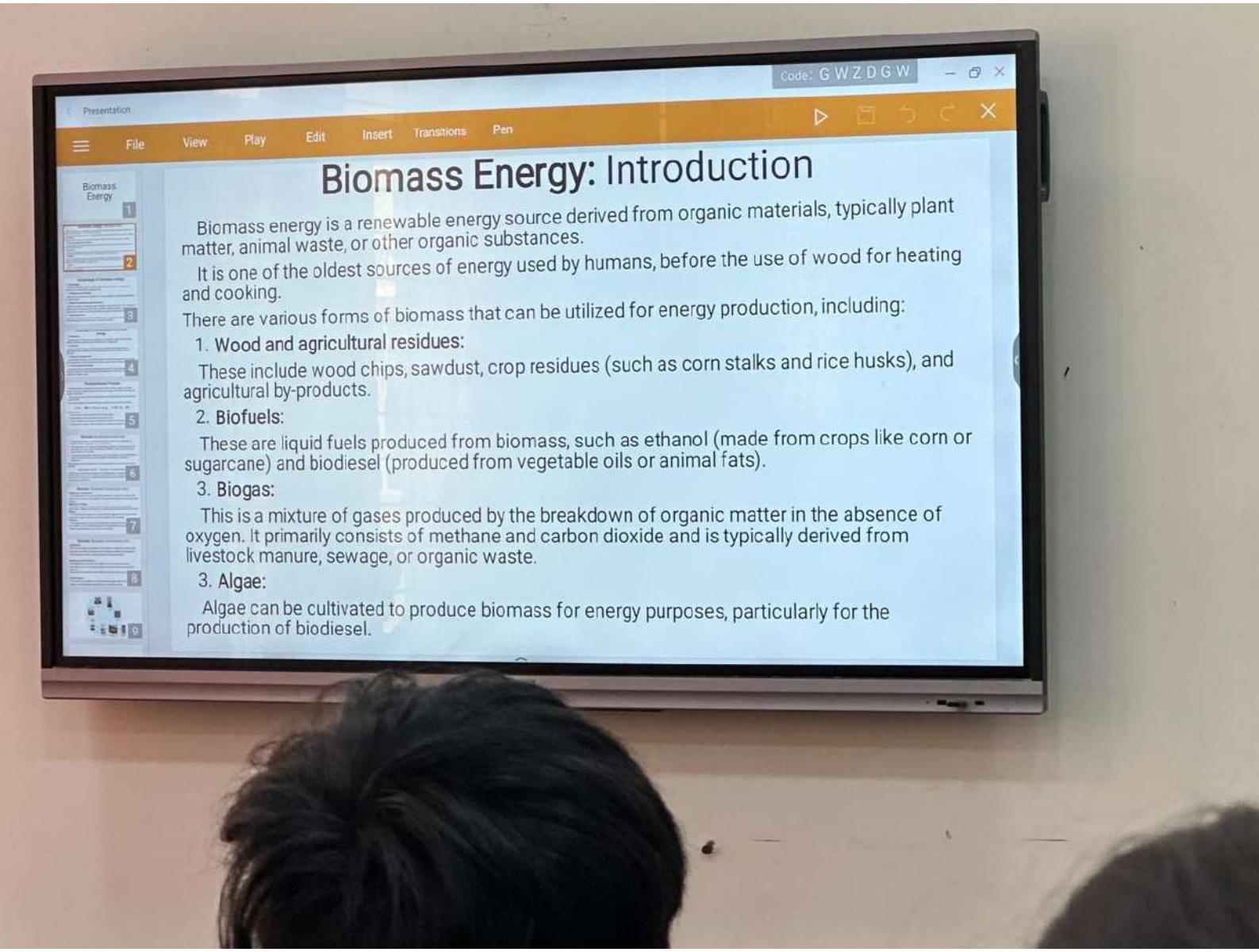

Code: G W Z D G W
Presentation
File
View
Play
Edit
Insert
Transitions
Pen
Biomass Energy
Biomass Energy: Introduction
Biomass energy is a renewable energy source derived from organic materials, typically plant matter, animal waste, or other organic substances.
It is one of the oldest sources of energy used by humans, before the use of wood for heating and cooking.
There are various forms of biomass that can be utilized for energy production, including:
1. Wood and agricultural residues:
These include wood chips, sawdust, crop residues (such as corn stalks and rice husks), and agricultural by-products.
2. Biofuels:
These are liquid fuels produced from biomass, such as ethanol (made from crops like corn or sugarcane) and biodiesel (produced from vegetable oils or animal fats).
3. Biogas:
This is a mixture of gases produced by the breakdown of organic matter in the absence of oxygen. It primarily consists of methane and carbon dioxide and is typically derived from livestock manure, sewage, or organic waste.
3. Algae:
Algae can be cultivated to produce biomass for energy purposes, particularly for the production of biodiesel.

Advantages of biomass energy

1. **Renewable:**

   Biomass is derived from organic materials that can be replenished, making it a sustainable energy source.

2. **Widespread availability:**

   Biomass resources are abundant in many regions, reducing dependency on fossil fuels.

3. **Reduced greenhouse gas emissions:**

   While biomass combustion does release carbon dioxide, it is considered carbon-neutral because the carbon dioxide emitted during combustion is offset by the carbon dioxide absorbed by plants during growth.

4. **Waste reduction:**

   Biomass energy can utilize organic waste materials, providing an environmentally friendly means of waste disposal.

Presentation

Code: G W Z D G W

File View Play Edit Insert Transitions Pen

Biomass Energy

Challenges & considerations of biomass energy

1. **Emissions:**

Combustion of biomass can produce air pollutants such as particulate matter, nitrogen oxides, and volatile organic compounds.

2. **Land use:**

Large-scale biomass production may compete with food crops for agricultural land, leading to concerns about land use change and food security.

3. **Resource management:**

Sustainable biomass production requires careful management to prevent soil degradation, deforestation, and other environmental impacts.

4. **Technological limitations:**

Some biomass conversion technologies are still in the development stage and may require further research and investment to become commercially viable on a large scale.

Code: G W Z D G W

ew Play Edit Insert Transitions Pen

Photosynthesis Process

Photosynthesis is the process by which green plants, algae, and some bacteria convert light energy into chemical energy in the form of glucose (a sugar molecule).

This process takes place in chloroplasts, the specialized organelles found in plant cells.

The overall equation for photosynthesis can be summarized as follows:

$$6CO_2 + 6H_2O + \text{light energy} \rightarrow C_6H_{12}O_6 + 6O_2$$

In this equation:

1. CO_2 represents carbon dioxide from the atmosphere.
2. H_2O represents water absorbed by the plant's roots.
3. $C_6H_{12}O_6$ represents glucose, the carbohydrate produced during photosynthesis.
4. O_2 represents oxygen, which is released as a byproduct into the atmosphere.

Code: G W Z D G W

Presentation

File View Play Edit Insert Transitions Pen

Biomass Energy 1

Biofuels: Biodiesel conversion

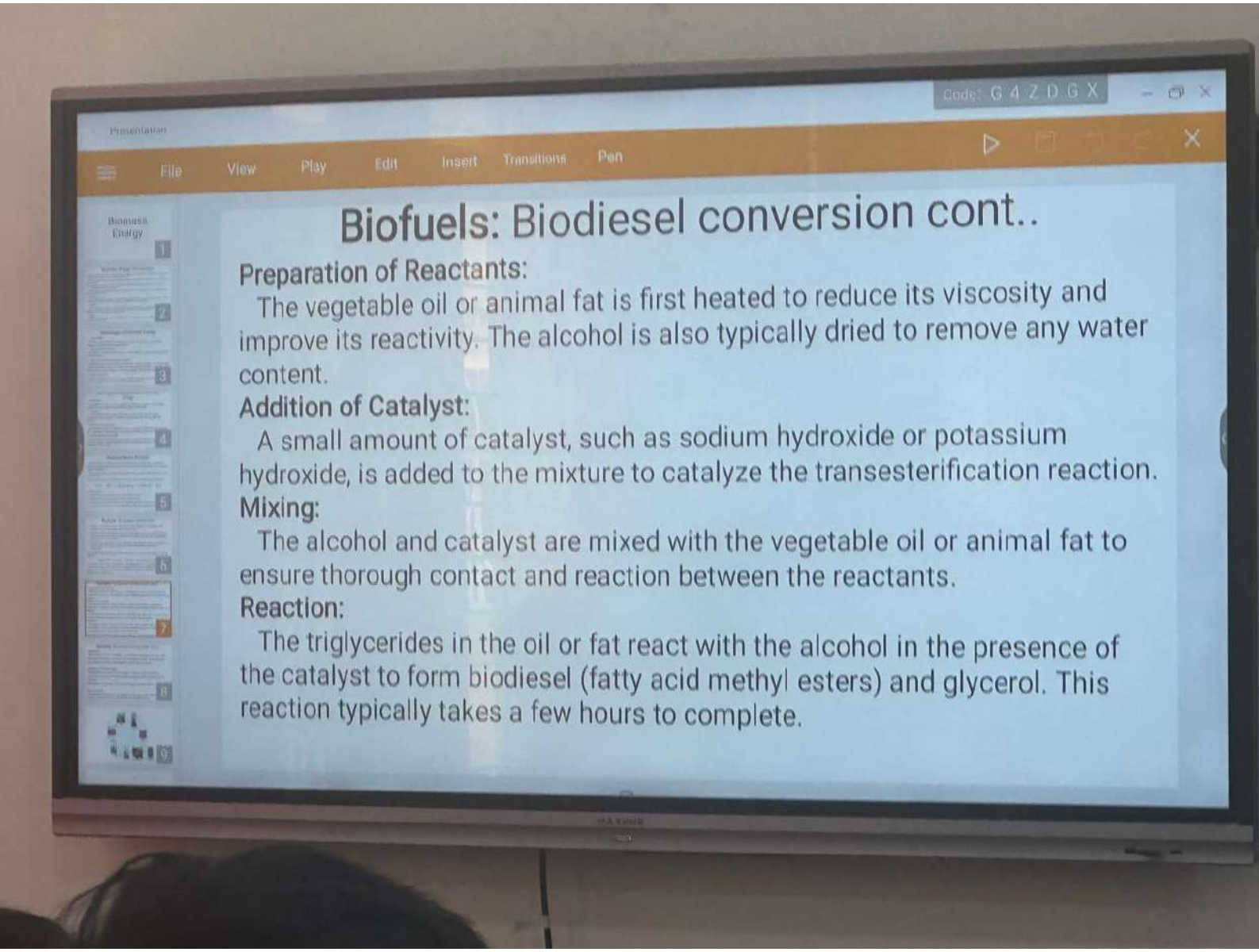
1. Transesterification is a chemical reaction used in the production of biodiesel from vegetable oils or animal fats.
2. It involves the conversion of triglycerides (the main components of oils and fats) into fatty acid methyl esters (FAMEs), which are the primary constituents of biodiesel.
3. The reaction typically involves the use of an alcohol, such as methanol or ethanol, and a catalyst, such as sodium hydroxide or potassium hydroxide.

The general reaction equation for transesterification can be represented as follows:

Triglyceride + Alcohol → Glycerol + Fatty Acid Alkyl Ester

In the case of biodiesel production, the triglycerides in vegetable oils or animal fats react with an alcohol (usually methanol or ethanol) in the presence of a catalyst to produce biodiesel (fatty acid methyl esters) and glycerol as a byproduct.

MAXHUB

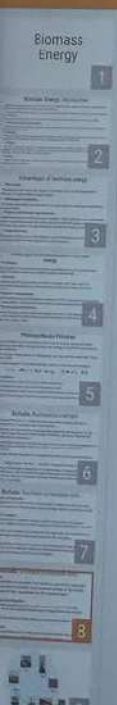

Code: G 4 Z D G X
Presentation
File View Play Edit Insert Transitions Pen
Biomass Energy
Biofuels: Biodiesel conversion cont..
Preparation of Reactants:
The vegetable oil or animal fat is first heated to reduce its viscosity and improve its reactivity. The alcohol is also typically dried to remove any water content.
Addition of Catalyst:
A small amount of catalyst, such as sodium hydroxide or potassium hydroxide, is added to the mixture to catalyze the transesterification reaction.
Mixing:
The alcohol and catalyst are mixed with the vegetable oil or animal fat to ensure thorough contact and reaction between the reactants.
Reaction:
The triglycerides in the oil or fat react with the alcohol in the presence of the catalyst to form biodiesel (fatty acid methyl esters) and glycerol. This reaction typically takes a few hours to complete.

Presentation

Code: G 4 Z D G X

File View Play Edit Insert Transitions Pen

Biomass Energy



Biofuels: Biodiesel conversion cont..

Separation:

After the reaction is complete, the mixture is allowed to settle, and the glycerol, which is heavier than biodiesel, settles at the bottom. The biodiesel is then separated from the glycerol layer.

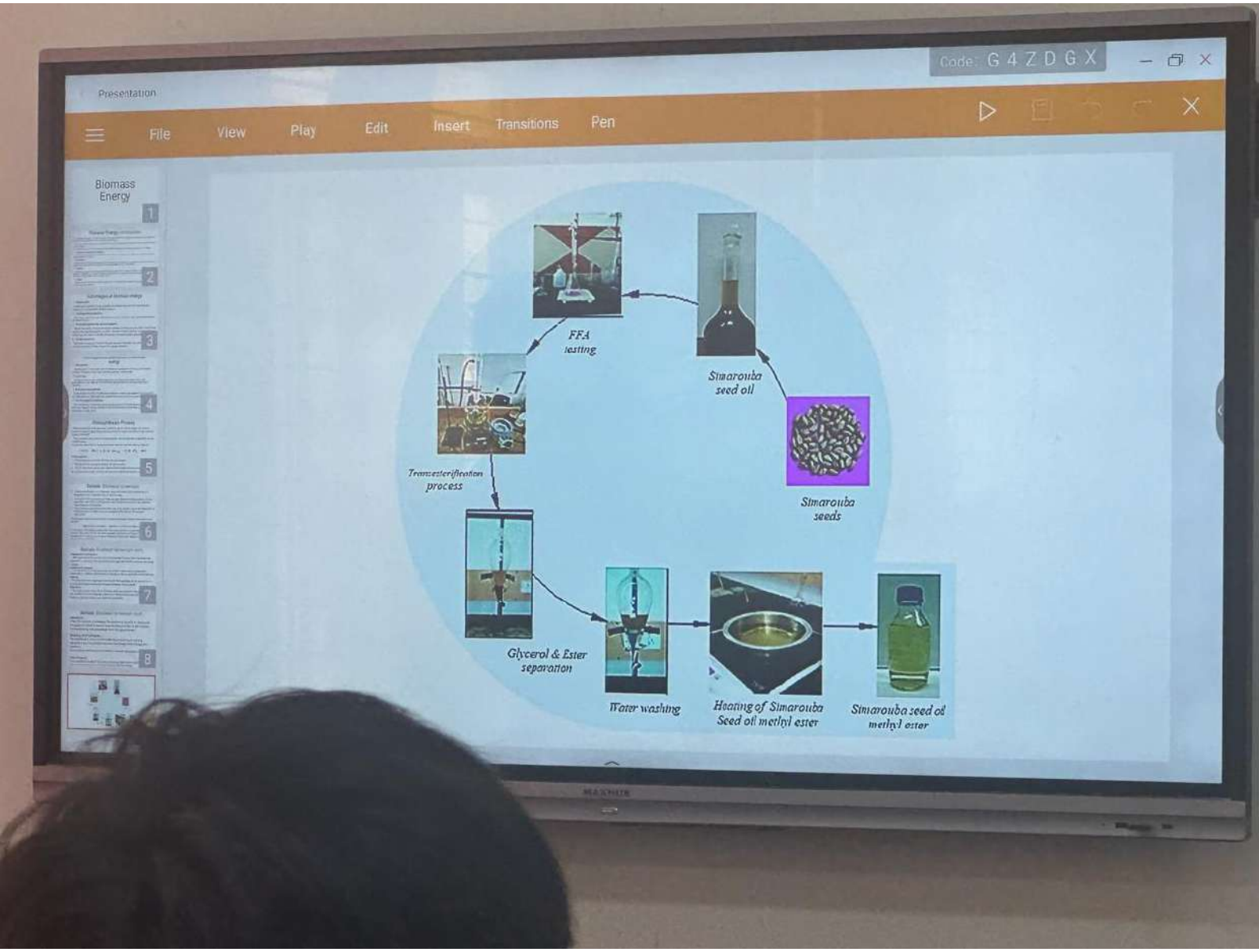
Washing and Purification:

The biodiesel is washed with water to remove any remaining impurities, such as catalyst residues and soap formed during the reaction.

The purified biodiesel is then dried to remove any water content.

Final Product:

The resulting biodiesel is a clean-burning alternative fuel that can be used in diesel engines with little to no modifications.


Code: G 4 Z D G X
Presentation
File
View
Play
Edit
Insert
Transitions
Pen
Biomass Energy
FFA testing
Simarouba seed oil
Simarouba seeds
Transesterification process
Glycerol & Ester separation
Water washing
Heating of Simarouba Seed oil methyl ester
Simarouba seed oil methyl ester