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Canada

Well to Pump:

SUPERNOVA
DALHOUSIE UNIVERSITY | HALIFAX, NOVA SCOTIA

Name: _____
Date: _____

Estimated Completion Time: ~15 minutes

Introduction

Workshop Reminder:
In the Green Aviation workshop, we explored sustainable aviation fuel and how it helps reduce greenhouse gas emissions. Today, we will use our knowledge and experience from the workshop to discuss the emissions that are produced during the entire lifespan of a specific fuel. Understanding how the emissions and the amount that are produced from the entire lifespan of fuel will help us understand the impact that sustainable aviation fuel has and other renewable fuels.

Lesson Information:
During the entire lifespan of fuels or renewable fuels there will be some emissions created. This can simply be from the transportation of the fuels by trucks or boats before the fuel has even been used in a vehicle. Sustainable aviation fuels (SAF) is an interesting fuel type though. While we still burn the fuel to produce power for a plane, it will still be net zero. This is because the crops that were used to produce the SAF absorbs the same amount of greenhouse gases that were emitted when the SAF was burned.

Activity

Scenario:
Imagine you are a chemical engineer and were tasked to determine the amount of carbon emissions from fuels including emissions from transporting the fuel. Your goal is to calculate the amount of emissions from each fuel type. To succeed, you need to use the concepts we've just introduced.

Fuel Type	Well-to-Tank	Tank-to-Pump	Vehicle Emissions
Electric (Grams of CO_2 per kWh)	449.5	226.83	0

Gasoline (Grams of CO2 per L)	**523.3**	**370.60**	**765.38**
Jet Fuel (Grams of CO2 per L)	**517.8**	**403.45**	**916.22**
SAF (Grams of CO2 per L)	**230.41**	**151.2**	**780.41**

Example Calculations for Electric:

$$449.5\ g\ CO2/kWh\ +\ 226.83\ g\ CO2/kWh\ +\ 0\ g\ CO2/kWh\ =\ 676.33\ g\ CO2/kWh$$

$$100\ kWh\ \times\ 676.33\ g\ CO2/kWh\ =\ 67633\ grams\ of\ CO2\ produced$$

67633 grams of CO2 was produced from the well to the vehicle for electric vehicles

1. **Question 1:**

   Calculate the amount of CO2 that is produced from each fuel type from well to vehicle for 100 litres of fuel. Use the table of values on the previous page.
   Answer:

   Gasoline:

   Jet Fuel:

   SAF:

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2. **Question 2:**
   What fuel generated the most CO2? Why do you think this is the case?
   Answer:

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3. **Question 3:**
   What fuel type produced the lowest amount of carbon emissions? Why do you think so?
   Answer:

Worksheet Debrief

Summary:
In this worksheet, we've explored the emissions that are produced during the entire lifespan of a specific fuel through calculating the amount of CO2 produced from well to vehicle emissions, while recognizing its relation to Green Aviation workshop. By calculating the amount of emissions produced, you have demonstrated how emissions that are produced during the entire lifespan of a specific fuel can be utilised to compare to other fuel types to select a more sustainable and eco friendly choice. Remember, understanding and exploring these concepts not only enhances your scientific knowledge, but also prepares you for [Mention any further applications or things happening in the world].

Answer Key (if applicable):

1. **Question 1:** Gasoline = 165928 grams of CO2, Jet Fuel = 183747 grams of CO2, SAF = 116202 grams of CO2
2. **Question 2:** Jet fuel
3. **Question 3:** SAF
