



On March 21, 2010 the Eyjafjalla Volcano in Iceland erupted, and the expanding ash cloud grounded over 3,000 flights in Europe. Then on April 20, a major oil spill began in the Gulf of Mexico. Although the preferred method for dealing with the oil spill is to collect it using skimmers, burning it is also a common option (see above left photo). A major concern in burning this oil is the addition of carbon dioxide to the atmosphere during the combustion process.

Problem 1 – The Gulf Oil Spill is predicted to generate 200,000 gallons of crude oil every day. If 50% of this is ultimately burned-off, how many tons/day of carbon dioxide are generated if the combustion of 1 gallon of oil generates 10 kg of carbon dioxide?

Problem 2 – Scientists have estimated that the Iceland volcano generated 15,000 tons of carbon dioxide per day, and this eruption continued for about 28 days. How many days will the Gulf Oil burn-off have to continue before its carbon dioxide contribution equals that of the total carbon dioxide generated by the Eyjafjalla Volcano?

Problem 3 – It has been estimated that the European aviation industry generates 344,000 tons of carbon dioxide each day. If 60% of this industry was shut down by the ash cloud from the Eyjafjalla Volcano, how many tons of carbon dioxide would have been produced by airline flights during the 5-day shut-down of the industry?

Problem 4 – What can you conclude by comparing your answers to Problem 1, 2 and 3?

Problem 1 – The Gulf Oil Spill is predicted to generate 200,000 gallons of crude oil every day. If 50% of this is ultimately burned-off, how many tons/day of carbon dioxide are generated if the combustion of 1 gallon of oil generates 10 kg of carbon dioxide?

Answer: $200,000 \text{ gallons/day} \times (0.50) \times (10 \text{ kg/ 1 gallon}) = 1,000,000 \text{ kg/day}$ or **1,000 tons/day**

Problem 2 – Scientists have estimated that the Iceland volcano generated 15,000 tons of carbon dioxide per day, and this eruption continued for about 28 days. How many days will the Gulf Oil burn-off have to continue before its carbon dioxide contribution equals that of the total carbon dioxide generated by the Eyjafjalla Volcano?

Answer: The volcano generated $15,000 \text{ tons/day} \times 28 \text{ days} = 420,000 \text{ tons of CO}_2$. The Gulf Oil burn-off generates 1,000 tons/day, so the Gulf Oil burn-off would have to continue for **420 days** before it equaled the emission of the volcano.

Problem 3 – It has been estimated that the European aviation industry generates 344,000 tons of carbon dioxide each day. If 60% of this industry was shut down by the ash cloud from the Eyjafjalla Volcano, how many tons of carbon dioxide would have been produced by airline flights during the 5-day shut-down of the industry?

Answer: $344,000 \text{ tons/day} \times (0.6) \times (5 \text{ days}) = 1 \text{ million tons}$.

Problem 4 – What can you conclude by comparing your answers to Problem 1, 2 and 3?

Answer: The total carbon dioxide generated by the volcano is only 40% of what was generated by the European airline industry during the time it was shut down, and the burn-off of the oil spill will only exceed what the volcano generated if the cleanup continues for over one year, which most experts say is very unlikely. The oil spill cleanup is a small part of the carbon dioxide generated by aviation or by the Icelandic volcano.

Note: Since the crude oil was destined to be burned to generate electricity, and combusted in cars, the fact that the clean-up is producing carbon dioxide is almost beside the point since this very same quantity of carbon dioxide would have been generated anyway once the crude oil is used under more controlled conditions.