

CORPORATE OFFICE

Delhi Office

706 Ground Floor Dr. Mukherjee
Nagar Near Batra Cinema Delhi -
110009

Noida Office

Basement C-32 Noida Sector-2
Uttar Pradesh 201301

CURRENT AFFAIRS

Date: 9 September 2023

FLEX-FUEL TECHNOLOGY

This article covers "Daily Current Affairs" and the topic details "Flex-fuel Technology". The topic "Flex-fuel Technology" has relevance in the "Science and Technology" section of the UPSC CSE exam.

For Prelims:

What is Flex-fuel Technology? Its benefits?

For Mains:

GS2: Science and Technology

Why in the news?

Toyota recently introduced a prototype of the Innova Hycross featuring a hybrid powertrain that can operate on flex-fuel.

FLEX-FUEL TECHNOLOGY

- **Flex-fuel technology enables a vehicle to utilise multiple fuel types or even fuel mixtures**, distinguishing it from conventional gasoline-powered cars.
- Flexible fuel vehicles (FFVs) have an internal combustion engine and can operate on gasoline and any blend of gasoline and ethanol up to 83%.
- The current configuration involves a combination of gasoline and either ethanol or methanol.
- This capability is achieved by installing a fuel mixture sensor and utilising specialised engine control module (ECM) programming.
- These components detect and seamlessly adapt to varying ratios of specified fuels, ensuring the vehicle's adaptability to different fuel sources.

HISTORICAL DEVELOPMENT AND PREVALENCE

- The concept of flex-fuel technology originated in the early 1990s when the automotive industry sought innovative solutions for fuel diversification.
- Its initial application can be traced back to the 1994 Ford Taurus, which marked a significant milestone in adopting this technology.
- As of 2017, the adoption of flex-fuel technology had expanded significantly, with approximately 21 million flex-fuel vehicles in operation worldwide.

CHANGES IN CONVENTIONAL GASOLINE-POWERED CARS

- Flex-fuel vehicles share many components with traditional petrol-powered cars.
- Special ethanol-compatible components are essential to adapt to ethanol or methanol's unique chemical properties and energy content.

- **Fuel pump and fuel injection system:** Modifications to components like the fuel pump and fuel injection system are necessary for ethanol compatibility.
- **The engine control module (ECM)** undergoes calibration to accommodate the higher oxygen content of ethanol.
- **Exhaust systems** are equipped with modified catalysts to reduce hydrocarbon emissions.
- **Fuel filter and lines:** Adjustments are made to the vehicle's fuel filter and pipes to ensure optimal performance with flexible fuel options.

PROS OF FLEX-FUEL TECHNOLOGY

- **Environmental Benefits:** Ethanol blending in flex-fuel vehicles significantly reduces harmful pollutants, including carbon monoxide, sulphur, carbon, and nitrogen oxides.
- **Decreased Dependency on Imports:** Blending ethanol helps decrease the dependency on oil imports for fueling vehicles, enhancing energy security and reducing foreign oil dependence.
- **Improved Acceleration:** Many flex-fuel cars exhibit improved acceleration performance when operating on higher ethanol blends, enhancing driving dynamics.

CONS OF FLEX-FUEL TECHNOLOGY

- **Reduced Fuel Efficiency:** Flex-fuel vehicles typically experience a 4-8% reduction in fuel efficiency when using ethanol as a primary fuel source, as their engines are optimised for petrol.
- **Water-Intensive Crop Production:** Ethanol blending relies on source crops such as sugarcane, which are known to be water-intensive, potentially posing environmental and sustainability challenges.
- **Dependency on Specific Crops:** A significant portion of ethanol production, over 90% in India as of 2019-20, is derived from crops like sugarcane, which can have political implications due to their importance in certain states.

BENEFITS OF ETHANOL BLENDING IN INDIA

The National Biofuel Policy 2018 in India aims for a 2025 target of 20% blending of ethanol in petrol.

- **Reduction in Oil Imports**
 - Ethanol blending in India has significantly reduced the oil import bill, saving billions of rupees and enhancing energy security.
 - In 2020-21, ethanol blending reduced 26 million barrels of petrol and saved Rs 10,000 crore.
- **Future Savings**
 - The expected implementation of E20 by April 2025 in India is estimated to result in annual savings of Rs 35,000 crore in oil import costs.
- **Electrified Flex-Fuel Vehicles**
 - Electrified flex-fuel vehicles are being introduced to address fuel efficiency challenges, combining the benefits of a flex-fuel engine with an electric powertrain.

Sources:

[Toyota's flex-fuel prototype: How it will work, what advantages it offers | Explained News – The Indian Express](#)

Q1. With reference Flex Fuel Technology, consider the following statements:

1. Flex-fuel vehicles (FFVs) have an internal combustion engine and can operate on gasoline and any blend of gasoline and ethanol up to 83%.
2. Flex-fuel technology was developed recently when the automotive industry sought new ways to diversify fuel sources.
3. Modifications to components like the fuel pump and fuel injection system are unnecessary for ethanol compatibility in flex-fuel vehicles.

Which of the statements given above is/are NOT correct?

- (a) 1 and 2 only
- (b) 2 and 3 only
- (c) 3 only
- (d) None

Answer: (b)

Q2. Consider the following :

1. Ethanol blending in India aims for a 2025 target of 20% blending of ethanol in petrol.
2. Ethanol blending in India has significantly reduced the oil import bill, resulting in billions of rupees in savings and enhanced energy security.
3. Reduced Fuel Efficiency and reduced acceleration are some of the drawbacks of Flex-Fuel Technology.

How many of the abovementioned statements are correct?

- (a) Only one
- (b) Only two
- (c) All three
- (d) None

Answer: (b)

Q3. Discuss the significance of flex-fuel technology and ethanol blending in India's automotive sector and energy policy.

Gaurav Nikumbh

ERG CHECH 002

This article covers "Daily Current Affairs" and the Topic details "Erg Chech 002". The Topic "Erg Chech 002" has relevance in the Science and Technology section of the UPSC CSE exam.

For Prelims:

About Erg Chech 002?

For Mains:

GS 2: Science and Technology

Why in the news:

In May 2020, researchers came across distinctive rocks in the Sahara Desert containing distinct greenish crystals. These rocks were identified as remnants from the early Solar System.

These particular rock fragments are part of the Erg Chech 002 meteorite, representing the oldest volcanic rock ever found, with an estimated age dating back approximately 4.56556 billion years.

ABOUT ERG CHECH 002

- Erg Chech 002 is categorized as an “ungrouped achondrite,” and its origin is from melted planetesimals, with the specific parent body unknown.
- Analysis of Erg Chech 002 revealed a high concentration of lead-206 and lead-207, as well as the presence of undecayed uranium-238 and uranium-235.
- Comparisons with other achondrites, particularly volcanic angrites, showed that aluminum-26 dispersion in the early Solar System was irregular.

KEY FINDINGS:

- Aluminum-26 has a relatively short half-life of approximately 717,000 years, making it challenging to directly detect in significant quantities within a 4.6-million-year-old space rock like Erg Chech 002.
- However, when Aluminum-26 undergoes decay, it transforms into Magnesium-26, a stable and non-radioactive isotope of Magnesium.
- This conversion process from Aluminum-26 to Magnesium-26 can be employed as a dating method, serving as a clock for space rocks like Erg Chech 002. It helps determine the initial amount of Aluminum-26 in these rocks.
- To effectively use the Aluminum-26-Magnesium-26 decay system as a dating tool, it's crucial to understand whether Aluminum-26 was uniformly distributed throughout the solar nebula responsible for the formation of the solar system's planets, asteroids, and comets.
- The researchers studied Erg Chech 002, an achondrite rock formed from melted planetesimals. They combined their findings with data on angrite meteorites, a rare subset of achondrites. Achondrites are meteorites that exhibit signs of having undergone melting and share similarities with volcanic rocks found on Earth.
- Detailed examination of rocks containing distinctive greenish crystals has confirmed their extraterrestrial origin, signifying their connection to the early Solar System.
- These rocks are fragments of the Erg Chech 002 meteorite, which is the oldest volcanic rock ever identified.
- Chondrites represent the most common class of meteorites, accounting for more than 85% of all meteorite falls.

SOURCE:

<https://www.space.com/meteorite-4-billion-years-early-solar-system>

Q.1 Recently seen in the news, “Erg Chech 002” is :

- (a) A space mission of ESA.
- (b) A new Russian ICBM
- (c) A meteorite
- (d) USAs new station in Arctic

ANSWER: C

Q.2 With reference to Erg Chech 002, consider the following statements:

1. It represents the oldest volcanic rock ever identified.
2. Its age was identified by using the Aluminum-26-Magnesium-26 decay system as a dating tool.

Which of the statements given above is/are correct?

- (a) 1 only
- (b) 2 only
- (c) Both 1 and 2
- (d) Neither 1 nor 2

ANSWER: C

Q.3 Discuss the significance of the Erg Chech 002 meteorite in planetary science, focusing on its role in dating early Solar System events. How does its discovery contribute to our knowledge of celestial body formation and the challenges in studying such ancient space rocks?

Rishabh

