



Semiconductor Chips Shortage in Vehicle Manufacturing

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Why in News

Recently, an unusual **shortage of inputs, especially semiconductor chips**, has made **India-based vehicle manufactures** (car manufactures and premium bikes) curtail production across categories.

Key Points

- **Semiconductor Chips:**

- Semiconductors are **materials which have a conductivity between conductors** (generally metals) **and nonconductors or insulators** (such as most ceramics). Semiconductors can be pure elements, such as **silicon or germanium**, or compounds such as **gallium arsenide or cadmium selenide**.

Conductivity is the measure of the ease at which an electric charge or heat can pass through a material.

S.No	Conductors	Semiconductors	Insulators
1	Easily conducts the electrical current.	Conducts the electric current less than conductor and greater than insulator.	Does not conduct any current.
2	Has only one valence electron in its outermost orbit.	Has four valence electron in its outermost orbit.	Has eight valence electron in its outermost orbit.
3	Conductor formed using metallic bonding.	Semiconductors are formed due to covalent bonding.	Insulators are formed due to ionic bonding.
4	Valence and conduction bands are overlapped.	Valence and conduction bands are separated by forbidden energy gap of 1.1eV.	Valence and conduction bands are separated by forbidden energy gap of 6 to 10eV.
5	Resistance is very small	Resistance is high	Resistance is very high
6	It has positive temperature coefficient	It has negative temperature coefficient	It has negative temperature coefficient
7	Ex: copper,aluminium,etc	Ex: silicon, germanium, etc	Ex: Mica, Paper, etc

- A **semiconductor chip is an electric circuit** with many components such as transistors and wiring formed on a semiconductor wafer. An electronic device comprising numerous of these components is called **Integrated Circuit (IC)**, and can be found in electronic devices such as computers, smartphones, appliances, gaming hardware and medical equipment.
 - These devices find **widespread use in almost all industries, especially in the automobile industry**.
- Electronic parts and components today account for **40% of the cost of a new internal combustion engine car**, up from less than 20% two decades ago.
 - Semiconductor Chips account for a bulk of this increase.**

- **Reason for Shortage:**
 - **Covid and Lockdowns:**
 - The **Covid-19 pandemic** and the subsequent **lockdowns** across the world that forced shut crucial chip-making facilities in countries including Japan, South Korea, China and the US.
 - Its shortage causes **cascading effects**, given that the first one creates pent-up demand that becomes the cause for the follow-up famine.
 - **Increased Consumption:**

The number of transistors mounted in IC chips has doubled every two years. Notably, the **increase in chip consumption over the last decade is also partly attributable** to the rising contribution of electronic components in a car's bill of materials.
- **Impact:**
 - **Reduced Supply:**

Consumers of semiconductor chips, which are mainly **car manufacturers and consumer electronics manufactures**, have not been receiving enough of this crucial input to continue production.

Chip shortage is measured in chip lead time, which is the **gap between when a chip is ordered and when it is delivered**.
 - **Reduced Production of Automobiles:**

With just-in-time deliveries, carmakers typically kept low inventory holdings and **relied on an electronics industry supply chain** to feed production lines as per demand.
 - **Delayed Supply and Reduced Features:**

It has caused **delaying vehicle deliveries**, some companies have reportedly started **discarding features and high-end electronic capabilities** on a temporary basis to deal with the chip shortage.

Way Forward

- The **present slump in the automobile industry seems to be a temporary** phase. **Vaccination** drive and economic recovery will provide a much needed trigger.
- However, at least for some time, there is a **need to reduce Goods and Services Tax (GST)** on entry level cars and that on the two wheelers. **The state governments also need to reduce the road tax.**

Source: IE