TASK - 05

Batch - 04

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**Issues of E-Waste caused due to IC products:  
1. At Fabrication Stage:**

* Various chemical and gases waste such as SF6, NF3 and PFCs generated the fab stage. These substances are used etching, deposition, cleaning and other process. These substances are hazardous to the environment pollution if not handled and disposed properly.
* The production of ICs involves cutting and shaping silicon wafers to form individual chips. Defects in wafers during manufacturing, such as contamination or physical defects, can result in entire wafers being scrapped. This generates waste and increases production costs.
* Silicon wafers used for IC fabrication must be free of defects to ensure proper functioning of the integrated circuits. Defects can arise from impurities in the silicon material, contamination during handling, or errors in manufacturing processes.
* Variations in process parameters during photolithography, deposition, etching, and other stages can lead to defects such as incomplete pattern transfer, incorrect layer thickness, or improper alignment.
* Masks used in photolithography are crucial for defining patterns on silicon wafers. Any defects or errors in the masks can result in defective ICs during fabrication.

**E-Waste Management system Values chain**

**Collection and Sorting:**

E-Waste containing IC products is collected through recycling programs, manufacturer take-back initiatives, and electronic waste drop-off points.

Sorting separates ICs and other electronic components based on material type and potential for reuse or recycling.

**Dismantling and Recycling:**

ICs and electronic components undergo dismantling to recover valuable materials such as metals (gold, silver, copper) and plastics.

Recycling processes involve mechanical shredding, separation using magnets and eddy currents, and chemical processes to extract and purify materials.

**Environmental and Health Protection:**

Proper disposal of hazardous materials like lead and mercury ensures compliance with environmental regulations (e.g., Restriction of Hazardous Substances in Electrical and Electronic Equipment directives).

Health and safety measures protect workers from exposure to toxins during dismantling and recycling activities.

**End Product Recovery:**

Recovered materials are processed into raw materials for manufacturing new electronic products or other industries, closing the loop on resource recovery.

**Success factors of E-Waste Management system Values chain**

* Strong environmental regulations and Extended Producer Responsibility (EPR) programs enforce responsible management of E-Waste, incentivizing manufacturers to design for recyclability.
* Advances in recycling technologies, such as robotic dismantling systems and chemical recovery processes, improve efficiency and reduce environmental impact.
* Educating consumers and businesses about the importance of E-Waste recycling promotes participation in recycling programs and reduces improper disposal.
* International cooperation among governments, manufacturers, recyclers, and NGOs is crucial for harmonizing standards, sharing best practices, and preventing the export of hazardous E-Waste to developing countries.

**Our inference:**

A comprehensive strategy is needed for managing e-waste effectively along the whole value chain, from design and manufacturing to end-of-life recycling. The IC industry can lessen the negative effects of E-Waste on the environment and human health while advancing sustainable resource management. This can be achieved by incorporating environmental considerations into IC design, encouraging technological innovation in recycling, increasing public awareness, and fostering worldwide collaboration. Sufficient efforts in legislation, innovation, and education are necessary to properly tackle the multifaceted issues linked to E-Waste related to ICs.

**Reference:**

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