

Techniques to Achieve Sustainable Development Goals (SDGs) in the Pharmaceutical Industry

The pharmaceutical industry can align with **SDGs** by adopting innovative and sustainable practices across manufacturing, supply chains, and research. Here are techniques aligned with key SDGs:

1. Green Chemistry and Sustainable Manufacturing (SDG 12: Responsible Consumption and Production)



- **Use Eco-friendly Solvents:** Replace hazardous chemicals with biodegradable, non-toxic alternatives.
- **Process Optimization:** Implement continuous manufacturing to reduce energy consumption and waste.

- **Green Catalysis:** Use biocatalysts (enzymes) instead of heavy-metal catalysts to reduce chemical waste.
- **Energy Efficiency:** Use renewable energy (solar, wind) in production facilities to lower the carbon footprint.

Example: GlaxoSmithKline applies green chemistry principles to minimize harmful by-products during drug manufacturing.

2. Digital Transformation and Smart Technologies (SDG 9: Industry, Innovation, and Infrastructure)

- **IoT and AI Monitoring:** Use **Internet of Things (IoT)** sensors for real-time monitoring to optimize resource use.
- **Blockchain for Supply Chains:** Ensure traceability and reduce waste by securely tracking products across the supply chain.

Example: Roche uses AI to optimize manufacturing efficiency and reduce waste.

3. Natural Product-Based Drug Discovery (SDG 15: Life on Land)

- **Bioprospecting:** Explore natural sources (plants, algae, bacteria) for sustainable drug production.
- **Green Extraction Methods:** Use solvents like **natural deep eutectic solvents (NADES)** to extract compounds sustainably.

Example: Companies like Pfizer are investing in natural drug discovery to replace synthetic pharmaceuticals.

4. Drug Repurposing and Shelved Drug Utilization (SDG 3: Good Health and Well-being)

- **Drug Repurposing:** Identify new uses for existing drugs to reduce development time and costs.
- **Shelved Drug Reactivation:** License and redevelop previously discontinued drugs to meet current health challenges.

Example: Drug repurposing during the COVID-19 pandemic led to faster treatment availability.

5. Circular Economy Practices (SDG 12: Responsible Consumption and Production)



- **Pharmaceutical Take-Back Programs:** Encourage consumers to return unused medicines for proper disposal.
- **Material Recovery:** Recycle and reuse packaging materials and active pharmaceutical ingredients (APIs).
- **Eco-Packaging:** Use biodegradable or recyclable materials for drug packaging.

Example: Novartis runs a drug take-back program to reduce pharmaceutical waste and prevent environmental contamination.

6. Water Conservation and Wastewater Management (SDG 6: Clean Water and Sanitation)

- **Zero Liquid Discharge (ZLD):** Implement systems to treat and recycle all wastewater.
- **Advanced Filtration:** Use membrane bioreactors (MBRs) to remove pharmaceutical residues from wastewater.

Example: AstraZeneca has adopted ZLD technology to manage pharmaceutical wastewater.

7. Partnerships and Policy Collaboration (SDG 17: Partnerships for the Goals)

- **Public-Private Partnerships (PPP):** Collaborate with governments and NGOs for sustainable healthcare initiatives.
- **Policy Advocacy:** Support regulations that promote environmental responsibility and fair access to medicine.

Example: The Access to Medicine Foundation works with pharmaceutical companies to improve medicine availability globally.