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The Difficulties In Recycling Inhalers

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The different types of inhalers



Metered Dose inhalers – MDIs

- Mixture of materials
- Different physical states
- Possible emissions
- Large environmental benefits



Dry Powder Inhalers – DPIs

- Multiple polymers
- Separation is difficult
- Higher probability of exposure to the pharmaceutical product
- Minimal environmental benefits

The Dream vs Reality

Large batches of inhalers



We saw tablets, cosmetics, batteries and nasal sprays all mixed in with the inhalers

The Generative AI Era

Robots are great!

- Canister cannot be damaged in the process
- Fugitive emissions
- Expensive set up
- Health and safety
- Not all inhalers look the same
- Contamination on the inhaler
- Personalisation of an inhaler
- Different propellant



Ultimately people are more versatile and can react to the many variables

MDI

Complex design and materials

Solids

- Different plastic polymers
 - Actuator and dust cap
 - Canister stem
 - Metering valve/seals
- Aluminium canister
- Pharmaceutical product

Liquid

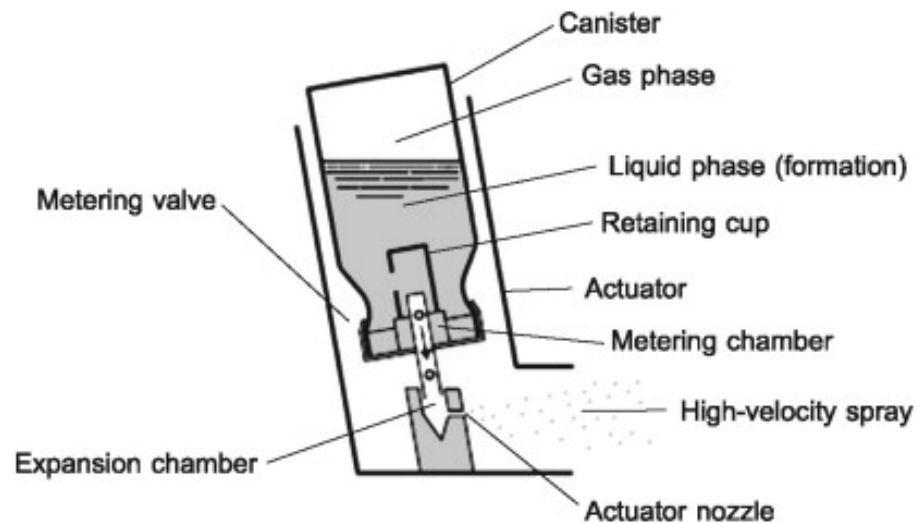
- Pressurised propellant

Gas

- Propellant

Can include

- Cardboard box
- Paper instructions
- packaging



Canister Components

- Controlled environment to prevent fugitive emissions
- Purity of the propellant
- Filter out the product
- Separation
 - solids
 - liquids
 - gases
- Chemical properties to make efficiencies



Outputs from an MDI



- Plastic GWP saving
 - 0.01 kg of CO₂ per inhaler
- Metal GWP saving
 - 0.1 kg of CO₂ per inhaler
- Gas GWP saving
 - Possible 25.74 kg of CO₂ per inhaler
- Average discarded inhaler to be **4.04 kg of CO₂**

Factors

Our goal is to maximise the benefit from the carbon savings

- Transport – limit carbon footprint
- Comply with legislation
- Storage of hazardous waste
- Permitted facility to process
- Getting a large enough batch



What's next



Changes within the pharmaceutical industry is a long process

The focus is on:

- Convenience to the user
- Additional technology
- Different propellants

Recycling needs to be considered within the design process

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