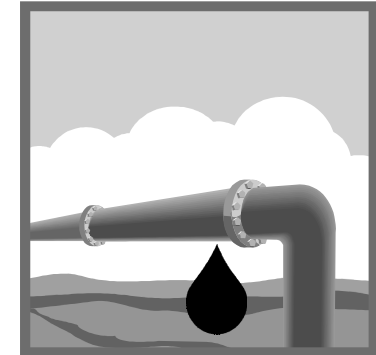
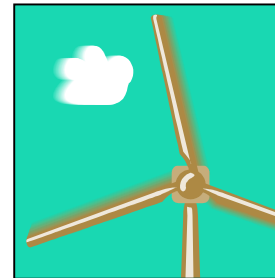




# INTRODUCTION

# What do we measure ?

- 4 Types of Measurements
  - LEAK
    - Solution
    - BT-1000
    - MDT
  - FLOW
    - Solution
    - MDT
  - BURST
    - BT-1000
  - CREEP
    - BT-1000



## Why do we measure ?

- Protection of the product
  - Leak Testing
  - Example : Food industry
- Avoid contamination
  - Burst Testing
  - Leak Testing
  - Example Package medical devices
- Checking the product
  - Flow
  - Leak
  - Example cooling systems



## AUTOMOTIVE

### COMPONENTS

*Engine Sub-Assemblies  
Cylinder Blocks  
Cooling Systems  
Fuel Systems  
Brakes  
Transmissions  
Emission Controls  
Power Steering*

### MEDICAL DEVICES

*Catheters  
Intravenous Infusion Sets  
Blood Devices  
Filters  
Blood and Drainage Bags  
Bottles  
Implantable Devices  
Package Integrity Testing  
Solution Vials*

## What ?

*Heating and  
Air Conditioning Coils  
Heat Exchangers  
Home Appliances  
Film Canisters/Pouches  
Spray Nozzles  
Faucets, Valves and Couplings  
Refrigerator Assemblies  
Pumps  
Food and Beverage Containers  
Toner Cartridges  
Tubing and Hoses  
Water Filters*

## APPLIANCE

### INDUSTRIAL AND

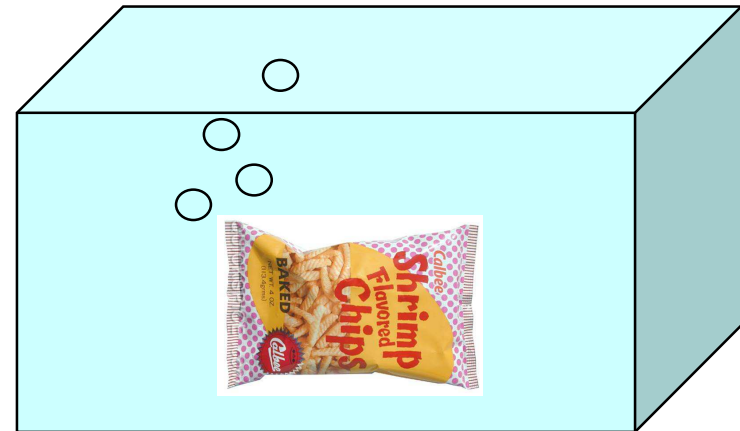
# Leak Testing

- Different methods
  - Bubble ("Dunk")
  - Pressure decay
  - Gas sensing
  - Mass flow sensing
  - Mass spectrometry
  - .....



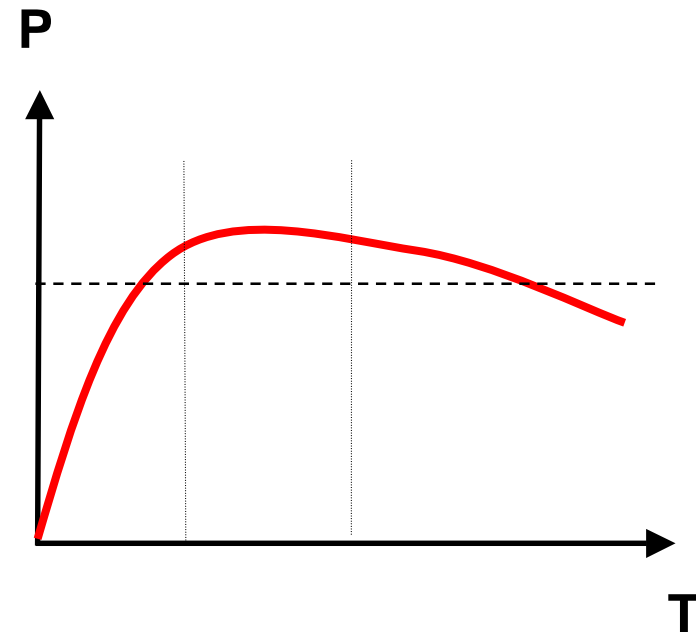
## Bubble method

- Principle
  - Immersion
  - Looking at bubbles
- Advantages
  - Inexpensive as simple
- Disadvantages
  - Long testing time (30 s)
  - Only big leaks (1-2 mm)
  - Operator depending



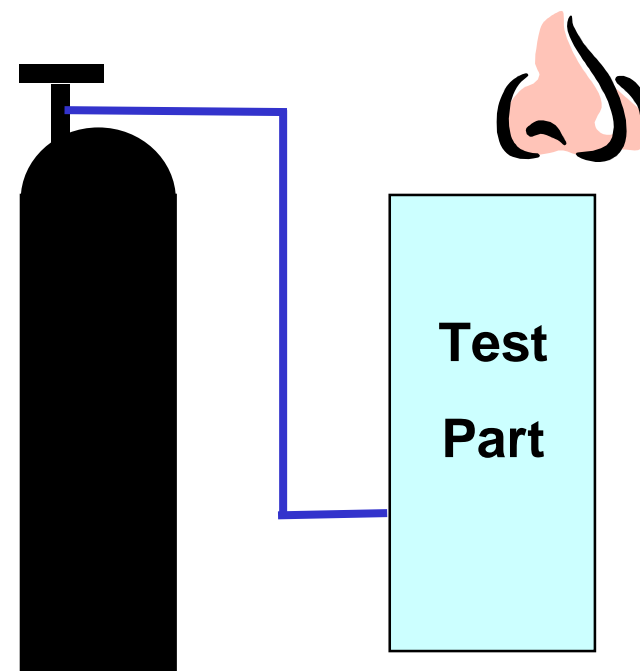
## Pressure decay

- Principle
  - Measure change on pressure between atm. and sample
  - Quantifies pressure drop
- Advantages
  - Undepending on operator
  - Fast
- Disadvantages
  - As sensitive as available measuring time



## Trace Gas Sensing

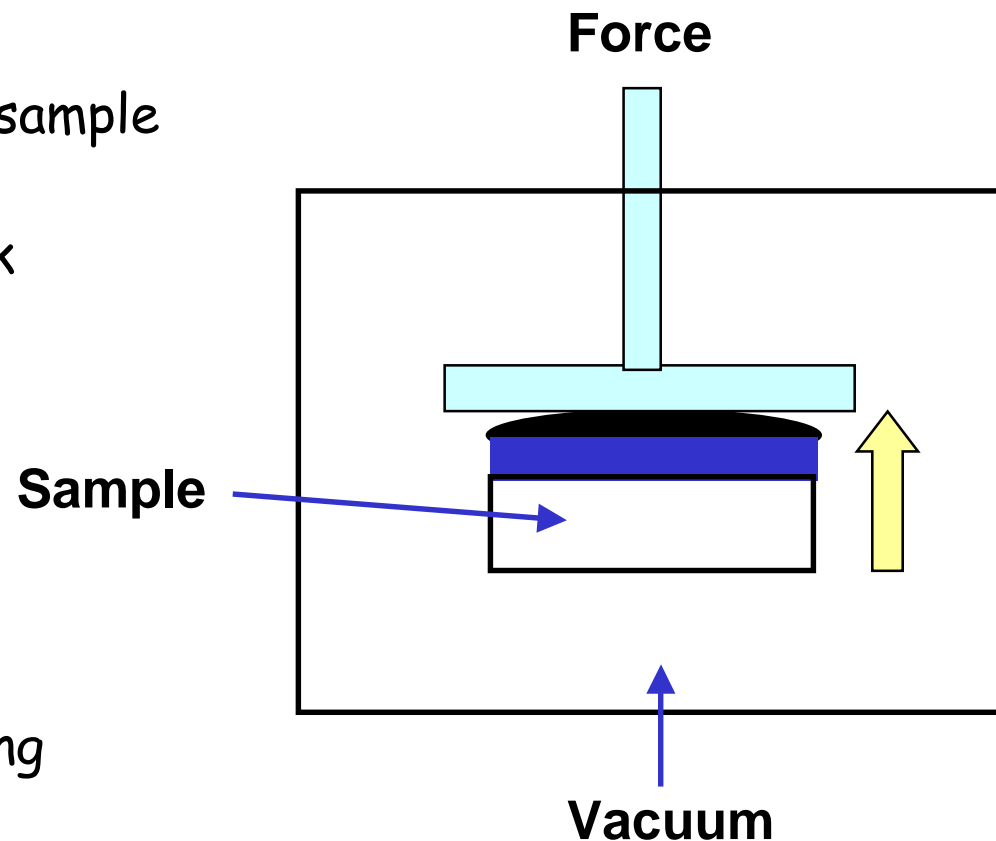
- Principle
  - Pressurize sample with gas
  - Sense gas
- Advantages
  - Easy and low cost
  - Fast
- Disadvantages
  - Gas hazard
  - Quantify hole is difficult
  - Not for sealed packages





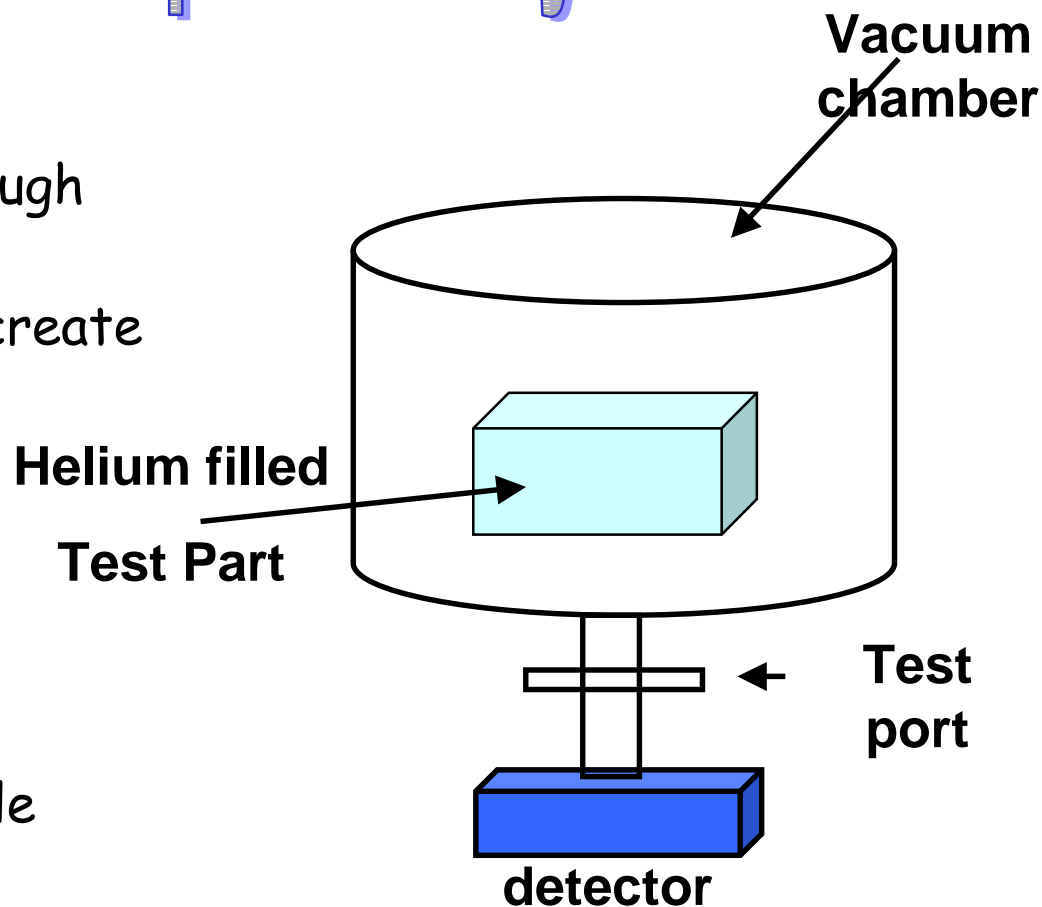
# Force Decay testing

- **Principle**
  - Measure Force from sample in Facuum
  - Change in force = leak
- **Advantages**
  - Simple
  - Fast
  - Non destructive
- **Disadvantages**
  - Only flexible packaging



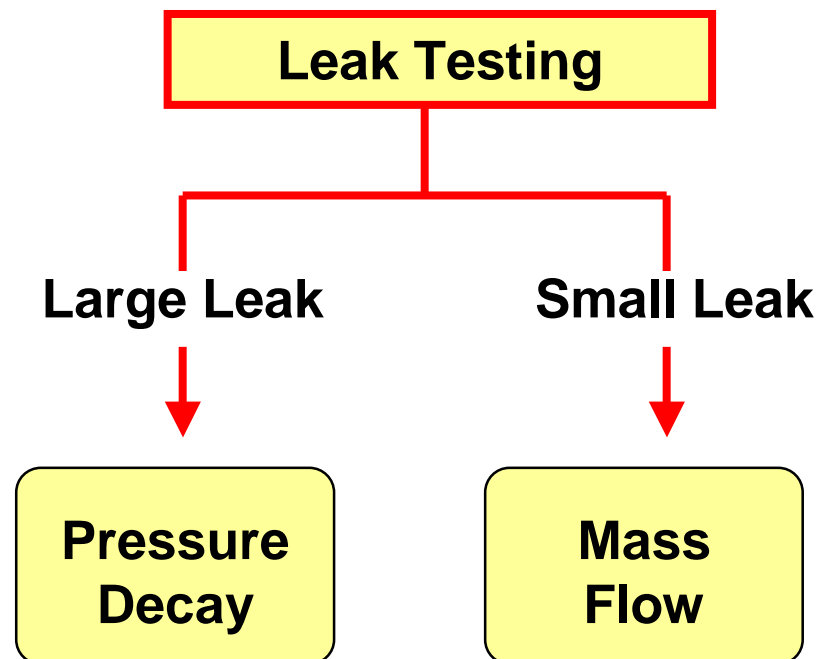
# Mass Spectrometry

- **Principle**
  - Measure gass through spectrometry
  - Prat in vacuum to create gass flow
- **Advantages**
  - Very Precise
- **Disadvantages**
  - Slow
  - Helium filled sample
  - Expensive

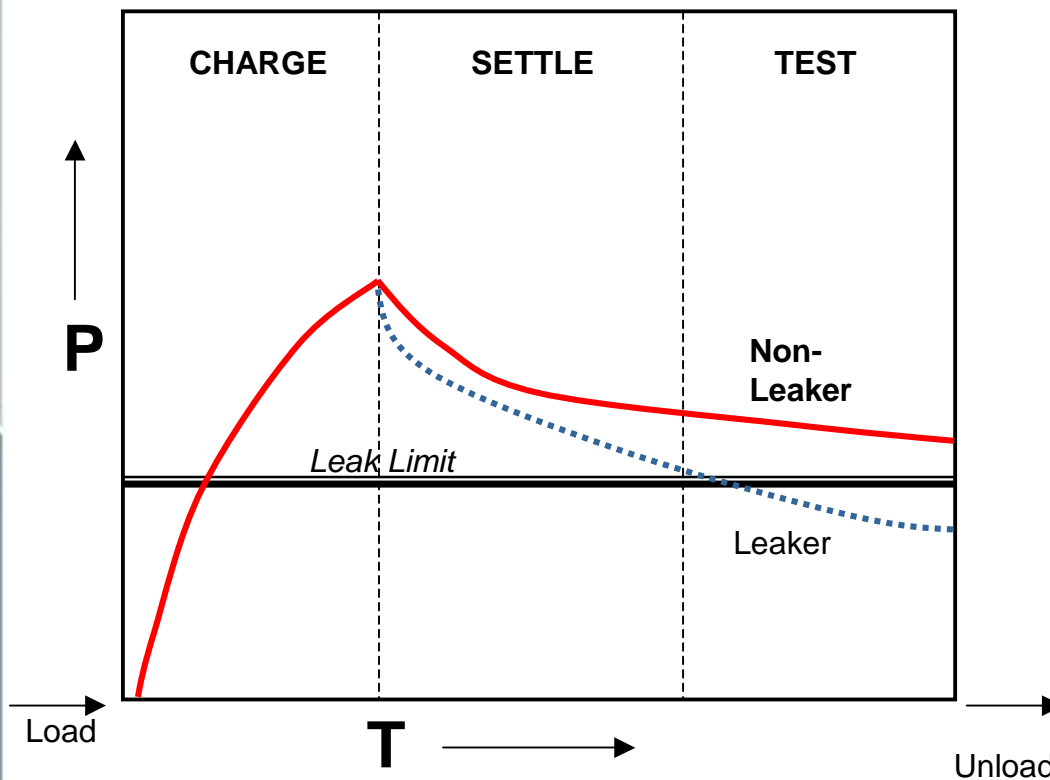


## How do we measure ?

- Hole
  - Contamination
  - Product loss
- Size
  - Acceptance depends on
    - Material
    - Application
- Measure
  - Flow
  - Pressure decay



# Pressure decay



## - Charge

- Air in package
- Length depending on package

## - Settle

- Package expansion
- Adiabatic cooling

## - Test

- Pressure decay over time
- PASS/FAIL

## Flow ?

- *Flow measurement for leak*

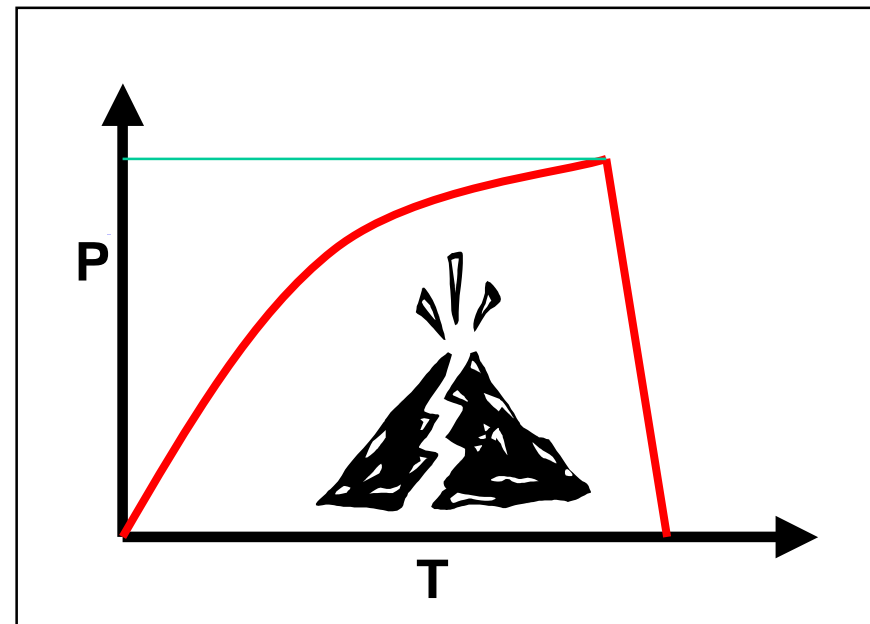
- Air in sample @ certain pressure
- Measure air flow with flowmeter
  - Hole size depends on air flow value
- Example
  - Air conditioning systems

- *Flow measurement for obstructions*

- Air in sample @ constant flow
- Measure flow in sample
- Compare value with target
- Example
  - Blockage in catheter

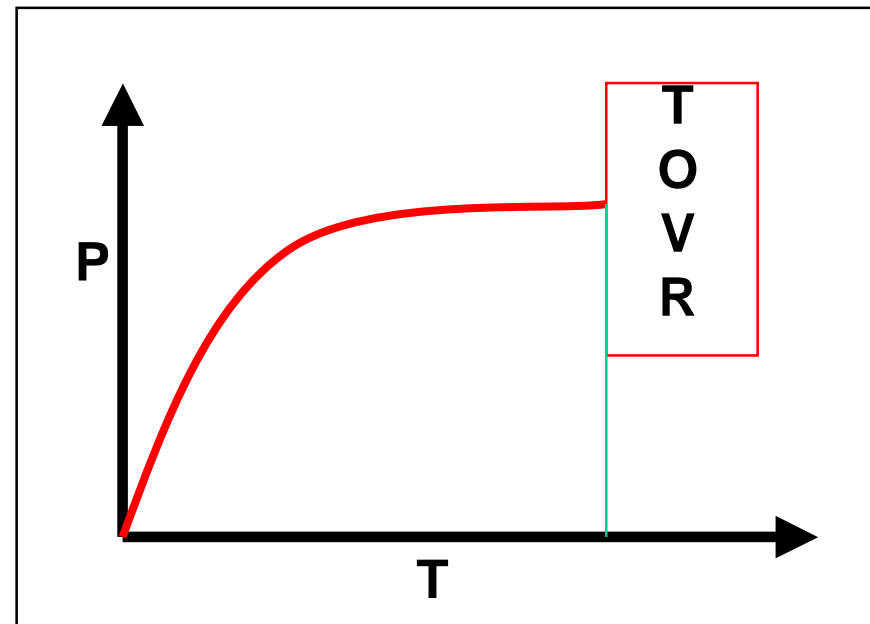
## Burst ?

- Add Air into package
  - Controlled speed
  - Continue at constant speed
- Record max pressure
- **Unit**
  - Only pressure transducer
  - No Flow measurement



## Creep

- Add Air into package
  - Controlled speed
  - Keep pressure constant @ certain level
  - Record time @ failure
- **Alternative QC method**
  - Test during fixed time @ constant pressure.
  - PASS/FAIL result



## Unit selection

