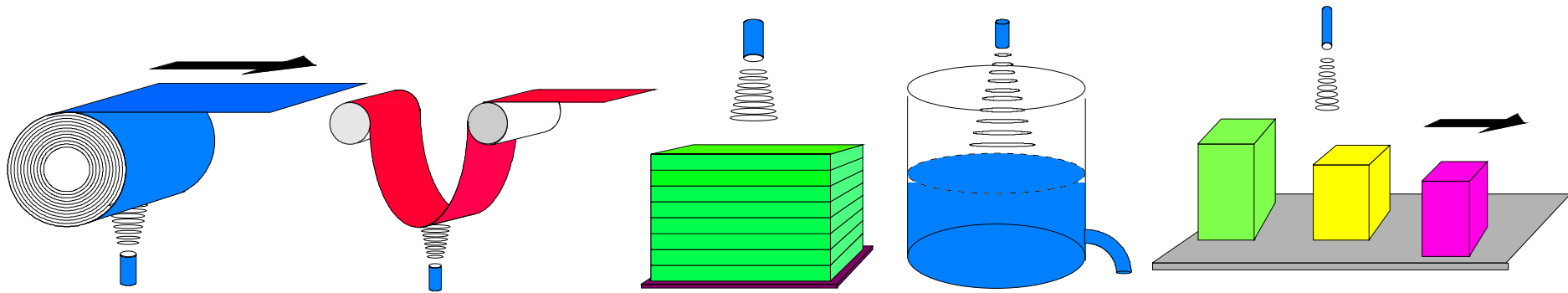


## Ultrasonic Sensors - Applications

- Distance Measurement
- Detection of moving parts
- Presence Check
- Counting of parts
- Level Measurement
- Slope Control
- Position Control

## Ultrasonic Sensors - Applications



Diameter  
Measurement

Slope Control

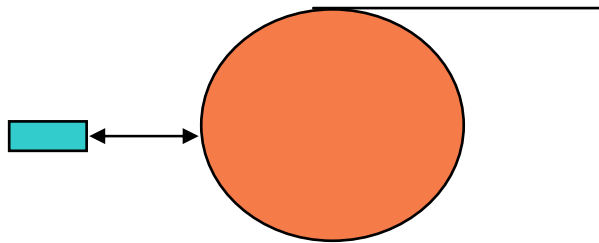
Height  
Measurement

Level Detection

Parts Counting

## Ultrasonic Application

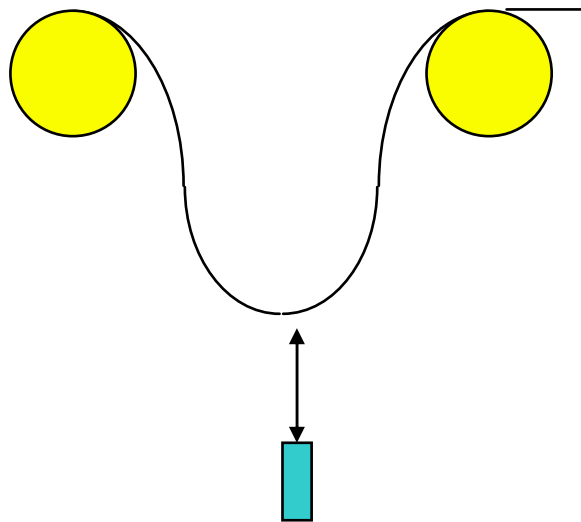
### Winding and Unwinding



Paper  
Metal Working  
Aluminium  
Textile  
Plastic  
Packaging Machines

## Ultrasonic Application

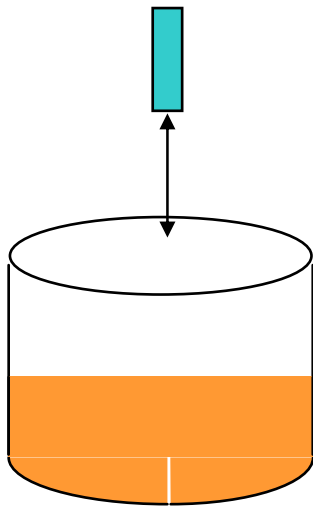
### Slope Control



Paper  
Metal Working  
Aluminium  
Textile  
Plastics  
Packaging Machines  
Chemical Industry

## Ultrasonic Application

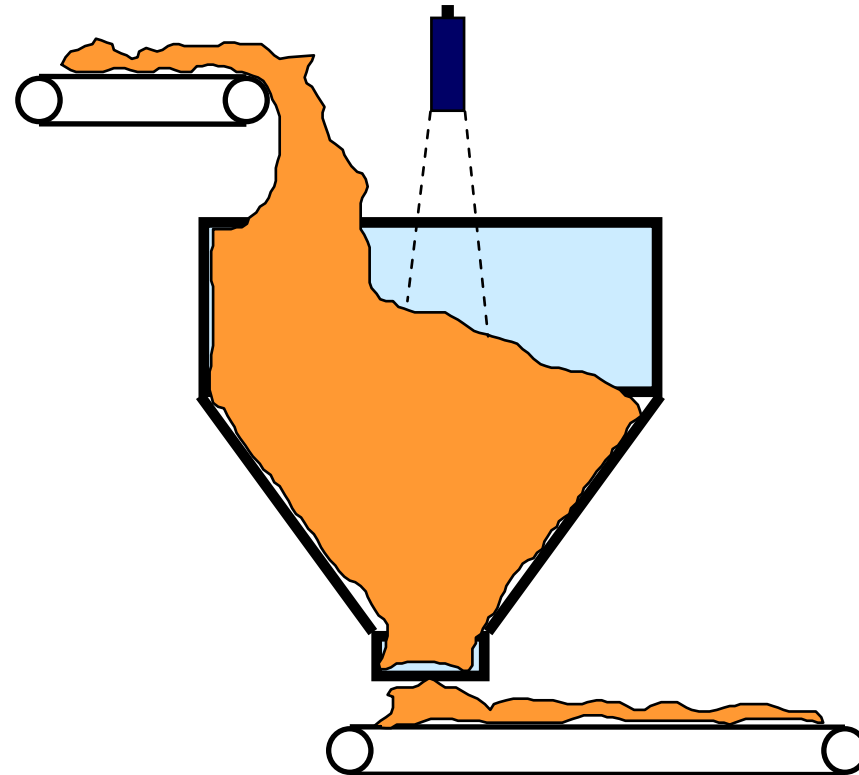
### Level Measurement



Paper  
Food & Beverage  
Water Treatment  
Chemical Industry  
Plastic Industry

## Ultrasonic Application

Detection of hard  
and liquid materials

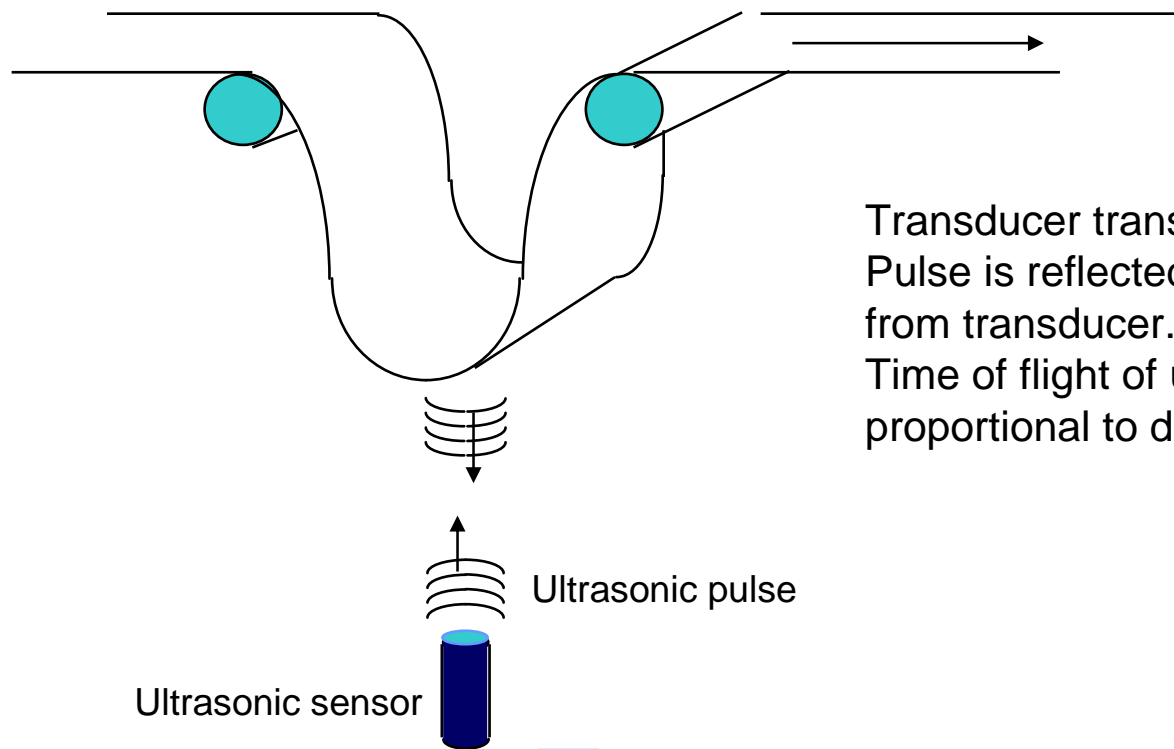


## Ultrasonic - Advantages

Independent of

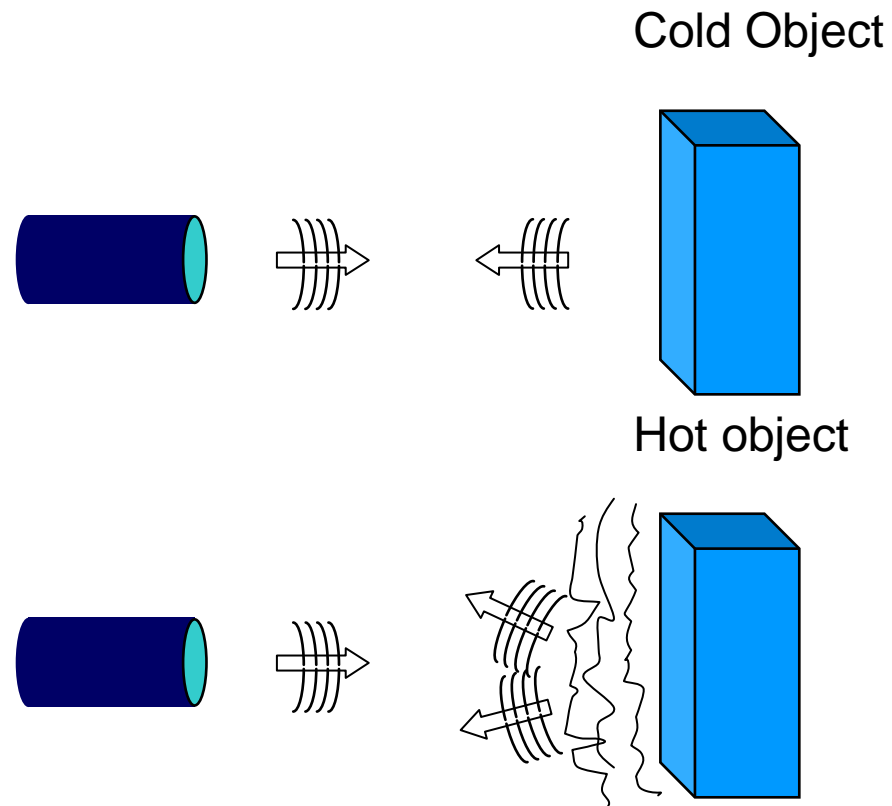
- MATERIAL
- COLOUR
- LIGHT
- DUST
- MIST

## Ultrasonic - Measuring principle



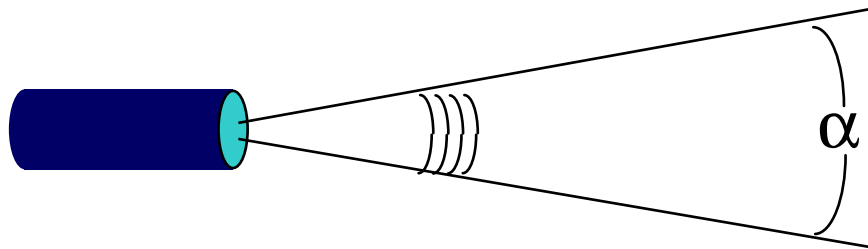
Transducer transmits an ultrasonic pulse.  
Pulse is reflected from slope and received  
from transducer.  
Time of flight of ultrasonic pulse  
proportional to distance sensor - slope

## Ultrasonic - Influence of hot air

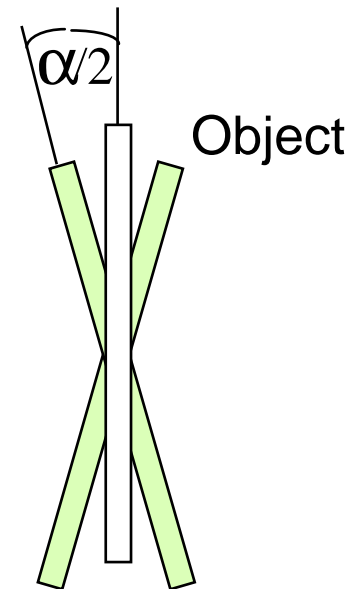


## Ultrasonic - Beam angle

Beam angle  $\alpha$

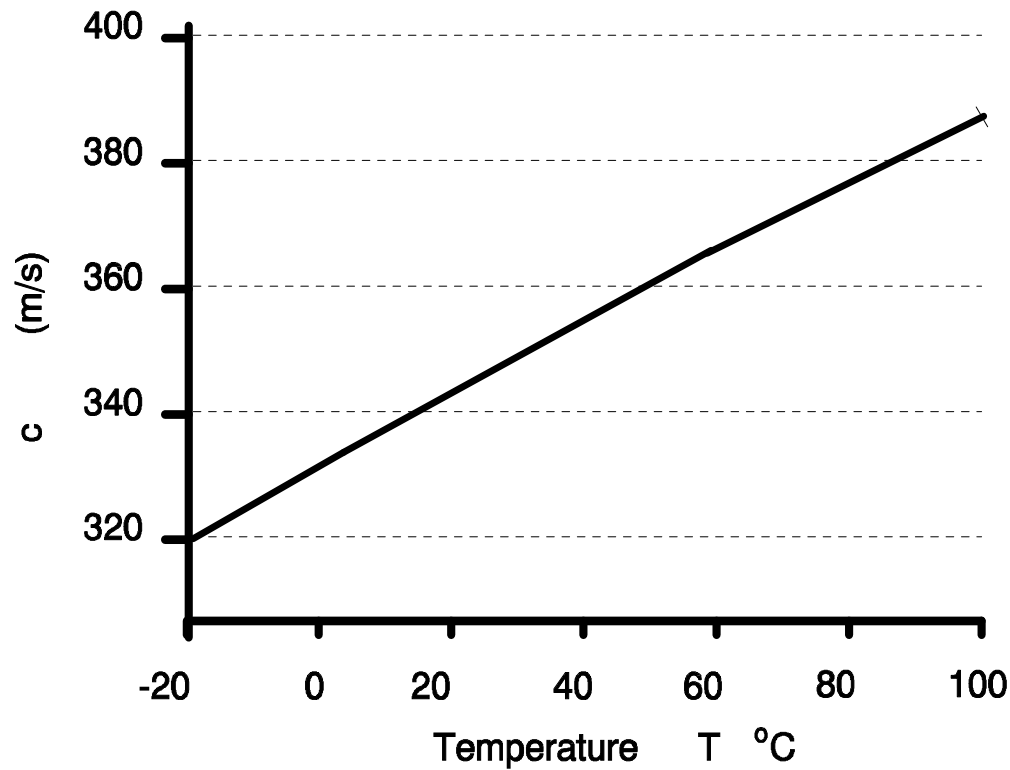


Object may have tilted max.  
around the half opening angle.



## Ultrasonic Measurement

### Sound Velocity in Air



Temperature influence

Exact Measurements  
have to be temperature  
compensated

## Ultrasonic Measurement

### Relative Humidity Influence

