



# Ultrasonic Testing

## Part 4

# Ultrasonic Testing

- Sensitivity
- Defect sizing
- Scanning procedures

# Sensitivity

- The ability of an ultrasonic system to find the smallest specified defect at the maximum testing range

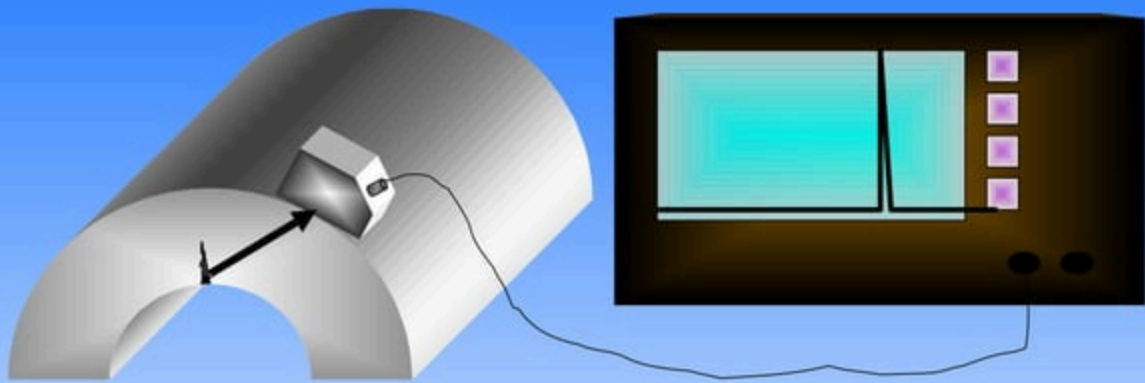
Depends upon

- Probe and flaw detector combination
- Material properties
- Probe frequency
- Signal to noise ratio

# Methods of Setting Sensitivity

- Smallest defect at maximum test range
- Back wall echo
- Disc equivalent
- Grass levels
- Notches
- Side Drilled Holes, DAC Curves

# Artificial / actual defect



Example: The defect echo is set to FSH (Full Screen Height)

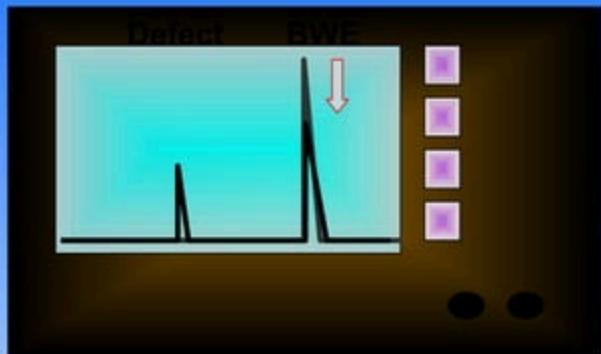
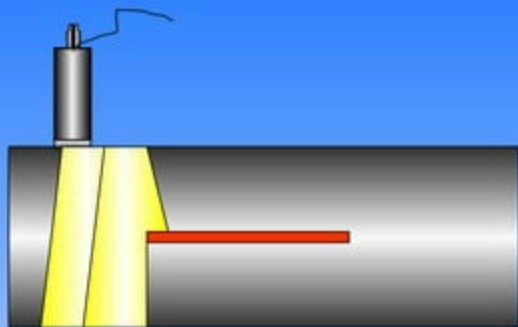
# Sizing Methods

## 6 dB Drop

- For sizing large planar reflectors only
- Signal / echo reduced to half the height
- Example:
  - 100% to 50%
  - 80% to 40%
  - 70% to 35%
  - 20% to 10%

Centre of probe marked representing the edge of defect.

# 6 dB Drop

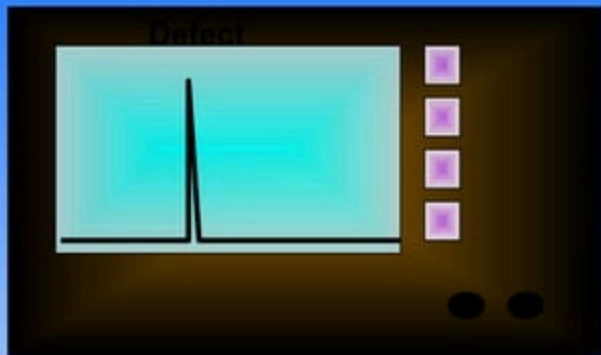
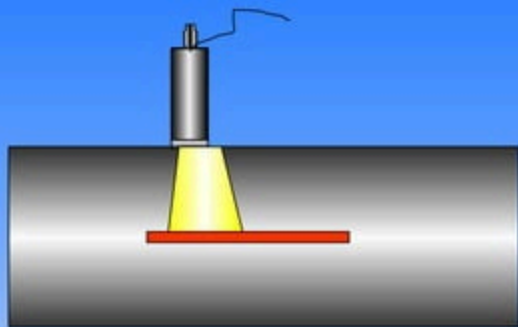


Plan View

The back wall echo reduced as some part of the beam now striking the defect

The echo of the defect has NOT yet maximise as the whole beam Not yet striking the defect

# 6 dB Drop

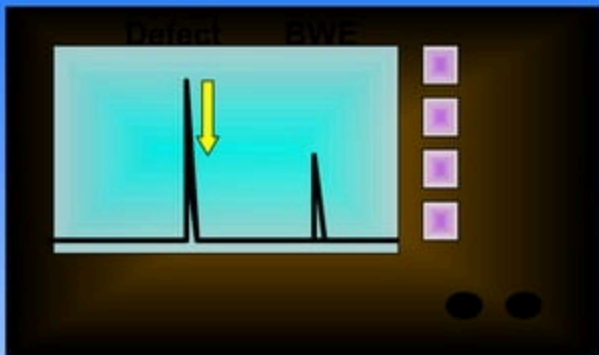
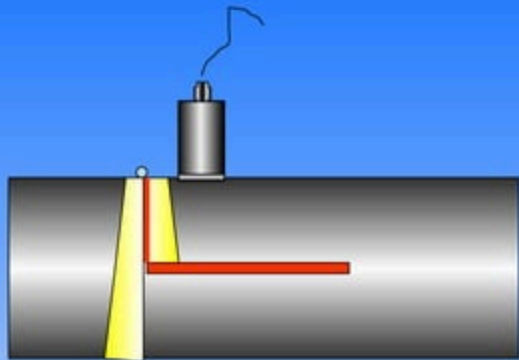


Plan View

**Now the whole beam is on the defect**

**Back wall echo is now may be reduced or disappeared**

# 6 dB Drop



The probe is moved back until the echo is reduced by half of its original height

At this point the probe centre beam is directly on the edge of the defect

The probe is then removed and the centre is marked, and repeat to size the whole defect



Plan View

# Sizing Method

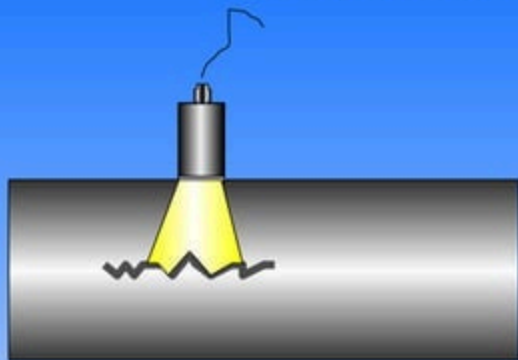
- Maximum Amplitude Technique

For sizing multifaceted defect – eg. crack

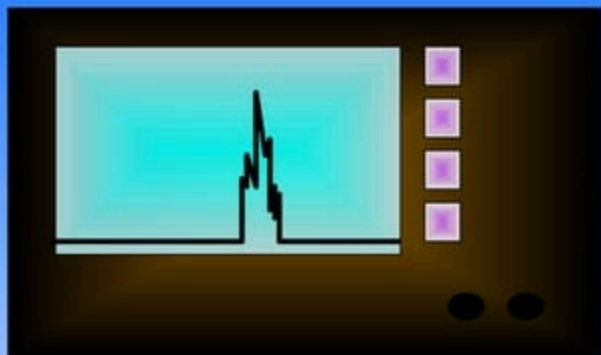
Not very accurate

Small probe movement

# Maximum Amplitude



Multifaceted defect : crack

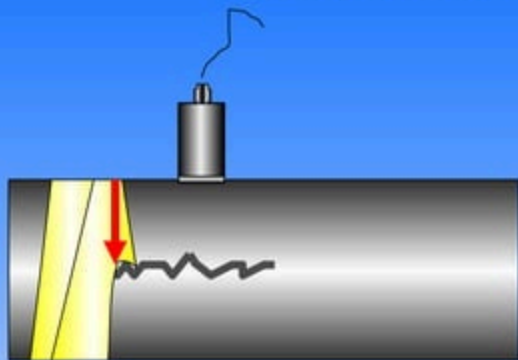


The whole probe beam is on the on the defect

At this point, multipoint of the defect reflect the sound to the probe

The echo (signal) show as a few peaks

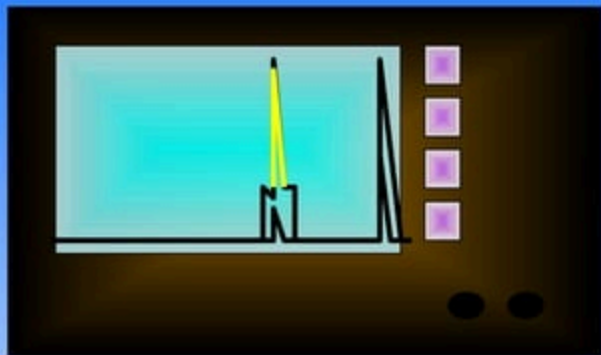
# Maximum Amplitude



Multifaceted defect : crack

The probe is moved out of the defect, the signal disappeared

If the edge of the beam strike the edge of the defect, a very small echo appears



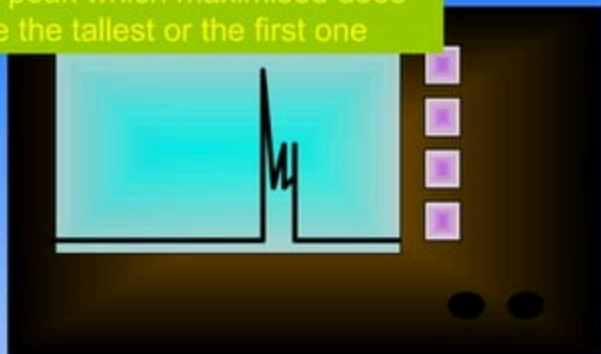
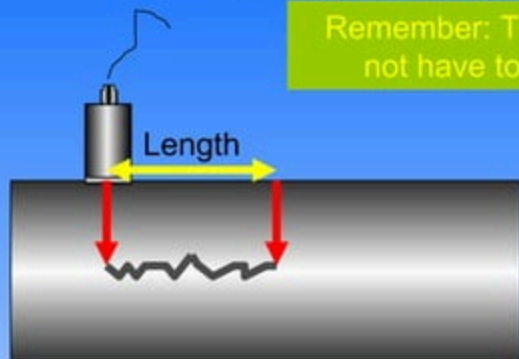
If the probe is moved into the defect, the signals height increase

One of the peak maximised

At this point the MAIN BEAM is directly at the edge of the defect

# Maximum Amplitude

Remember: The peak which maximised does not have to be the tallest or the first one



The probe is to be moved to the other end of the defect

The signals will fluctuate as the beam hits the different faces of the defects

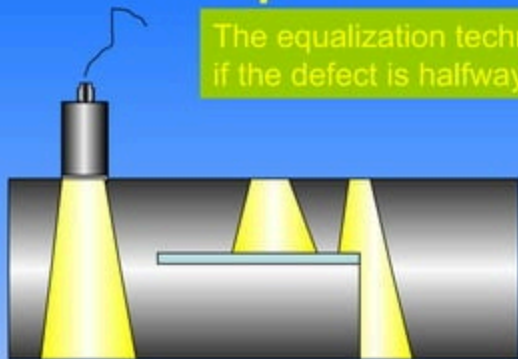
The probe is moved back into the defect and to observe a peak of the signal maximises

Mark the point under the centre of the probe which indicates the edge of the defect

The length of the defect is measured

# Equalization Technique

The equalization technique can ONLY be used if the defect is halfway the thickness



At this point the whole beam is on the back wall

The BWE is at it maximum

At this point the whole beam is on the defect

The Defect echo is at it maximum

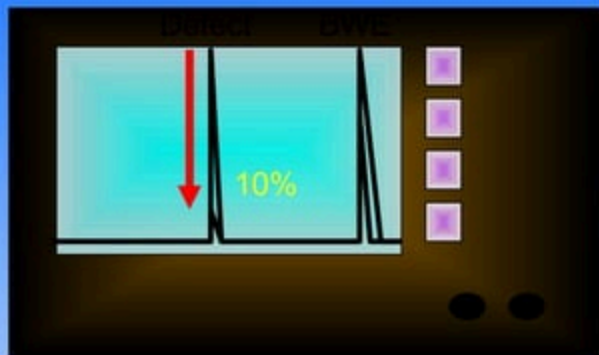
At the edge of the defect, half of the beam is on the defect, and another half is on the back wall

The defect echo is at equal height as the back wall

The point is marked as the edge of defect



## 20 dB Drop



When the main beam is on the defect the defect signal is at it maximum

If the probe is moved and the signal is observed until it is reduced to 10% (20dB Drop), the edge of the beam is on the edge of the defect

Repeat the above at the other side of the defect

Using the pre-constructed Beam profile and a plotting card, the defect maybe sized