Microphone Characteristics

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- The quality of a microphone is determined by the following characteristics:
- Sensitivity
- Signal--to-noise ratio
- Frequency response
- Distortion
- Directivity
- Output impedance .

Sensitivity:

- It is defined as output in millivolts (or in dB below 1 volt) for the sound pressure of 1 Pa (or ID microbars at 1000 Hz.

- As the norm al level of speech provides a sound pressure of l microbar (or 0.1 Pa), the sensitivity based on this criteria for 1 microbar pressure (or 0.1 Pa) level would be onetenth the value for 1 Pa pressure. (Some Manufacturers quote the sensitivity in terms of dBm, i.e., power output in dB below 1 milliwatt.)

Signal-to-noise Ratio:

- Some noise (called self-noise or thermal noise) is generated inside the microphone due to resistance of the circuit, built-in transformer, etc.
- It is represented in terms of the sound pressure level (SPL.) that would give the same output as the noise output.
- The output is measured by passing it through a weighting filter which accounts for the reduced sensitivity of the ear at high and low audio frequencies. The acoustically weighted output is represented i
- Distortion Besides frequency distortion (uneven frequency response) described above, there are two types of distortions in microphones, namely, non-linear distortion, and phase distortion.

Non-linear Distortion:

- This disorts the amplitude of the audio signal, which retilts iii production of such harmonics in the output that are not present in the input sound.
- For quality microphones. such distortion should be less the 5%. For high-fidelity sound systems, distortion should not be more than 1%.

Phase Distortion:

- This may cause change of phase relationship between different components of a complex sound wave.
- Phase distortion occurs when multiple microphones are used causing relative path difference from the source of sound.

Directivity:

- The directivity of a microphone is defined with the help of a polar diagram.
- The angle for half-power points in a polar diagram represents directivity of a microphone.
- Maximum power is in the axial direction of the microphone t wards source of sound. When the microphone's axis deflects away from the source of sound, power output is reduced be heard same by listeners in all parts of the room.

CRYSTAL MICROPHONE

- Certain crystals such as rochelle salt and quartz possess the property of generating small emf when subject to stress or strain.
- This effect is utilised in what is known as the crystal microphone.
- A thin finger shaped slice of crystal is secured at one end by means of a compliant clamp, and the apex of a cone is made to bear against the other.Sound pressure waves causes the cone to alternately, press against and bend the crystal slice and release it.
- Thus the corresponding voltages are generated across the slice. A pair of contacts is fixed to opposite surfaces to take off the signal.
- An improvement is obtained if the single slice of crystal is replaced by two slices cemented together.
- Then, when the pressure is exerted, one slice is compressed and other is strecthed

- Thus equal and opposite voltages are produced which, being in series like the cells of a car battery, give double the output.
- Any nonlinearity which may arise due to different mechanical strains between pressure and release is also thereby compensated. The double crystal unit is termed as bimorph.
- With some of the better microphones the cone does not actuate the crystal directly but through cantilever.
- Another type of construction is the sound cell where several crystal elements are sealed together, this also termed as multimorph.
- The crystal microphone is the type most widely used in lower cost installations.
- The crystal microphone is normally non-directional although a pressure-gradient crystal microphone which gives unidirectional response pattern is also being marketed.

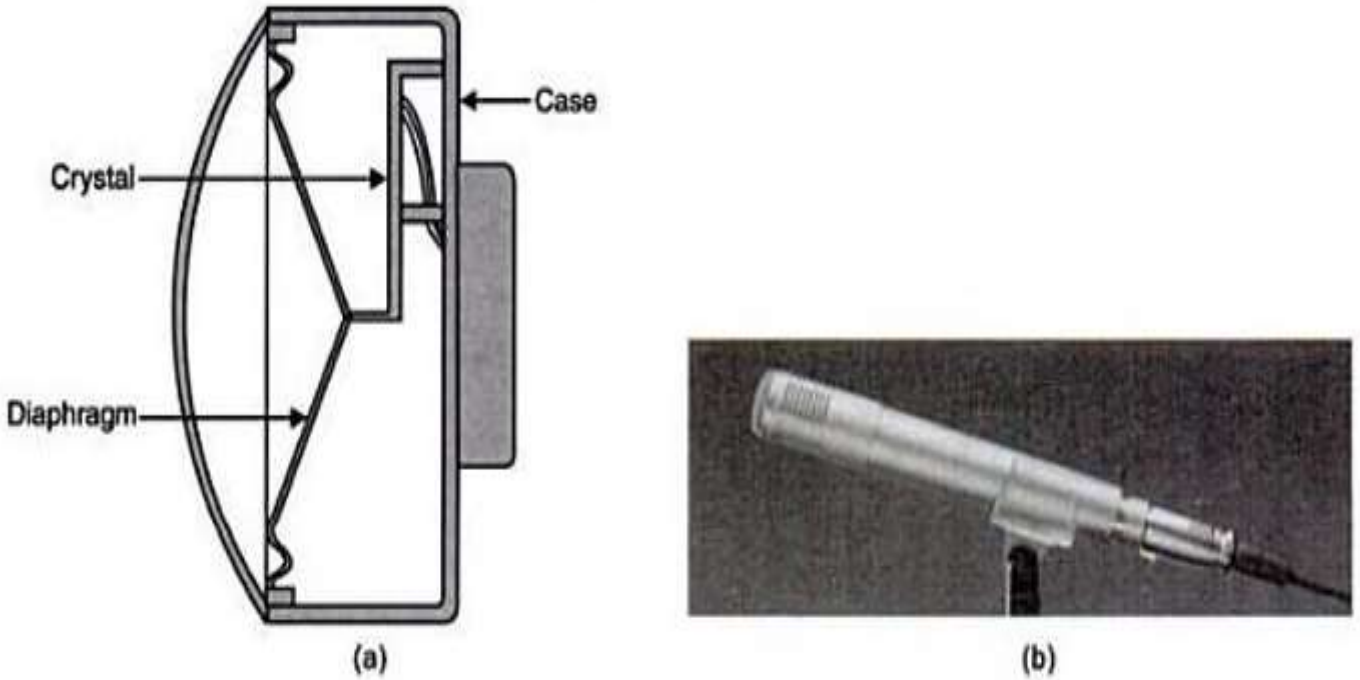

Fig 1.16 Crystal Microphone