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The microphone represents a critical link between

SOUND & LIGHTING

THE MICROPHONE - PART II (Dynamic and Condenser)

the acoustic sound and the electronic equipment which follows. It is extremely important that the right microphone is chosen to match the frequency range, dynamic range and tonal characteristics of an instrument or voice. The mic must be positioned effectively; it must be dependable and hopefully affordable.

There are two basic systems of operation in performance microphones that are used almost exclusively, dynamic and condenser.

A dynamic microphone generates an electrical signal when sound waves cause a conductor to vibrate within a magnetic field.

There are two kinds of dynamic microphones: moving coil and ribbon.

In a moving coil microphone a coil of wire is attached to a diaphragm and suspended in a magnetic field. The diaphragm vibrates when sound waves hit it; the corresponding motion of the coil within the magnetic field induces an electrical signal.

A ribbon microphone has a metal strip suspended between two permanent magnets. Sound pressure vibrates the ribbon which in turn produces an output voltage.

The single ribbon element provides a short conductor length as compared with a coil of wire and it is suspended over a wide magnetic gap providing very low magnetic field strength as compared to the close magnetic gap that the moving coil is suspended in. For these reasons a ribbon mic has a very low output and requires a step-up transformer to bring its signal output up to reasonable operating levels.

The net result is that a ribbon microphone with its small and light strip reacts very quickly to variations in sound pressure, providing accurate sound reproduction, extended frequency response and excellent transient response. The resulting sound is clear with a crisp high-end and a warm natural low-end which can greatly enhance a voice or soften the edge of brass instruments.

On the negative side, the ribbon element can be very fragile and can overload with high sound pressure levels. Ribbon microphones tend to be bulky because they require a larger magnetic structure and a step up transformer to get a reasonable output level and a large pop filter section to protect the ribbon element.

Dynamic moving coil microphones are renowned for their ruggedness and reliability. When properly designed, they are capable of handling extremely

high sound pressure levels without distorting. They can have good frequency response which can easily be tailored for specific purposes by building resonant cavities around the diaphragm or alternately affecting its motion with acoustic dampening materials.

The second system of operation is the condenser microphone.

In the condenser system there are two charged plates. One (the back plate) is stationary, the other plate is a thin, taut metallized plastic diaphragm suspended over the back plate. Sound waves vibrate the diaphragm which varies the spacing between the two elements. The resulting differences in voltage produces an electrical signal.

Condenser microphones have an internal pre-amplifier and impedance matching circuit powered by a battery or an external power source (phantom power).

Because the diaphragm can be extremely lightweight, condensers have extended and smooth frequency response, they react quickly to transients and provide very accurate reproduction of high frequencies.

However, condensers can be overloaded, particularly in the pre-amplifier stage. They are quite fragile, and are susceptible to problems caused by humidity or extremely high temperatures.

Condenser mics are particularly suited to instruments with a lot of transients, harmonics and high frequency content such as percussion, cymbals and stringed instruments.

The dynamic moving coil mic is really the workhorse of sound reinforcement. Stick it in front of anything and it will do a good job. For specific applications ribbon microphones can give a beautiful sound but they are not common in live situations since they are usually somewhat bulky and fragile. There are only a few ribbon mics made which are suited to live stage work.

Condenser microphones are also somewhat fragile although there are a number of extremely rugged ones now available. Most sound men will have at least a few available for critical applications.

In all cases treat your mics carefully and with respect. They are as important to a sound engineer as an instrument is to a musician.

We'll look at some specific miking considerations and applications next issue.

As vice-president of Westbury Sound and president of Select Concert Products Inc., Don Barber has been studying sound systems since 1973. He also studies theatre at Queen's University.