

SEISMIC INSTRUMENTATION

1. Seismograph

- 24 – 120 channels or more
- Digital
- Screen control



2. Geophones (Seismometers):

A geophone is used to transform seismic energy into electrical voltage.

Geophones

- Cylindrical coil suspended in a magnetic field
- The inertia of the coil causes motion relative to the magnet generating a electrical signal
- Geophones are sensitive to velocity

Instrument response

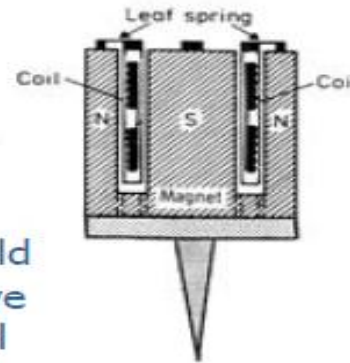
- The relation between the input ground motion and the output electrical signal

Natural frequency

- The frequency which produces the maximum amplitude output

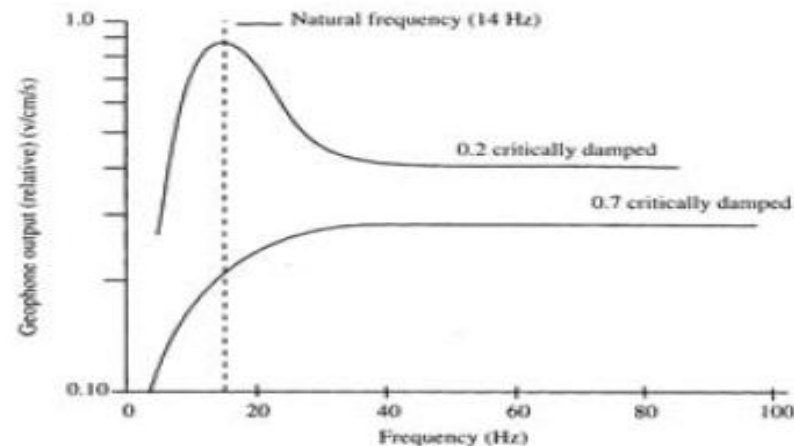
Damping

- Reduces the amplitude of the natural frequency response and prevents infinite oscillations
- Want a **flat response**



Hydrophones

- Used at sea
- Use piezoelectric minerals to sense pressure variations

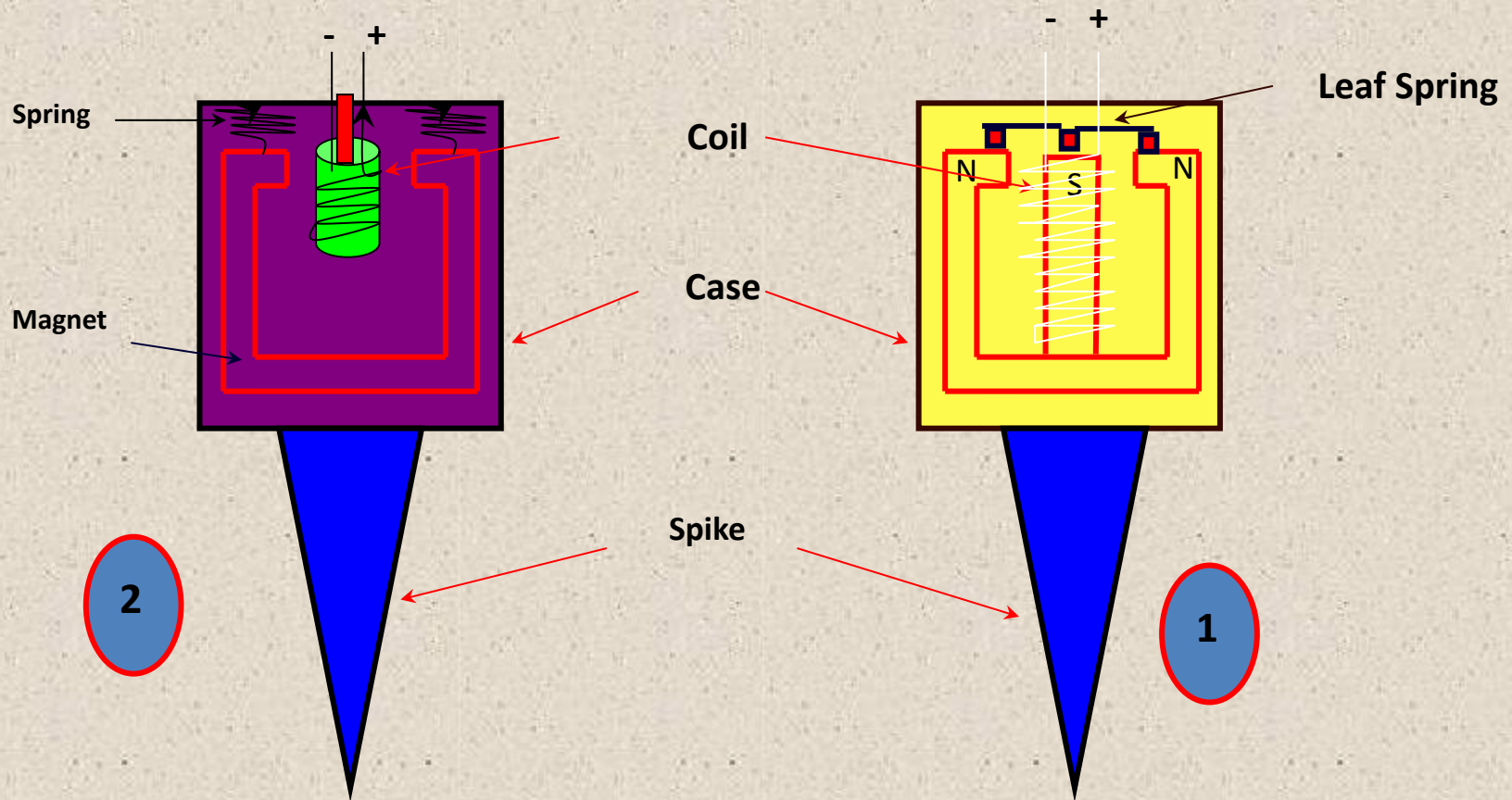


Type of Geophones:

A- Land survey:

Two types of geophones are used:

- Moving coil geophone (1).
- Moving magnet geophone (2).



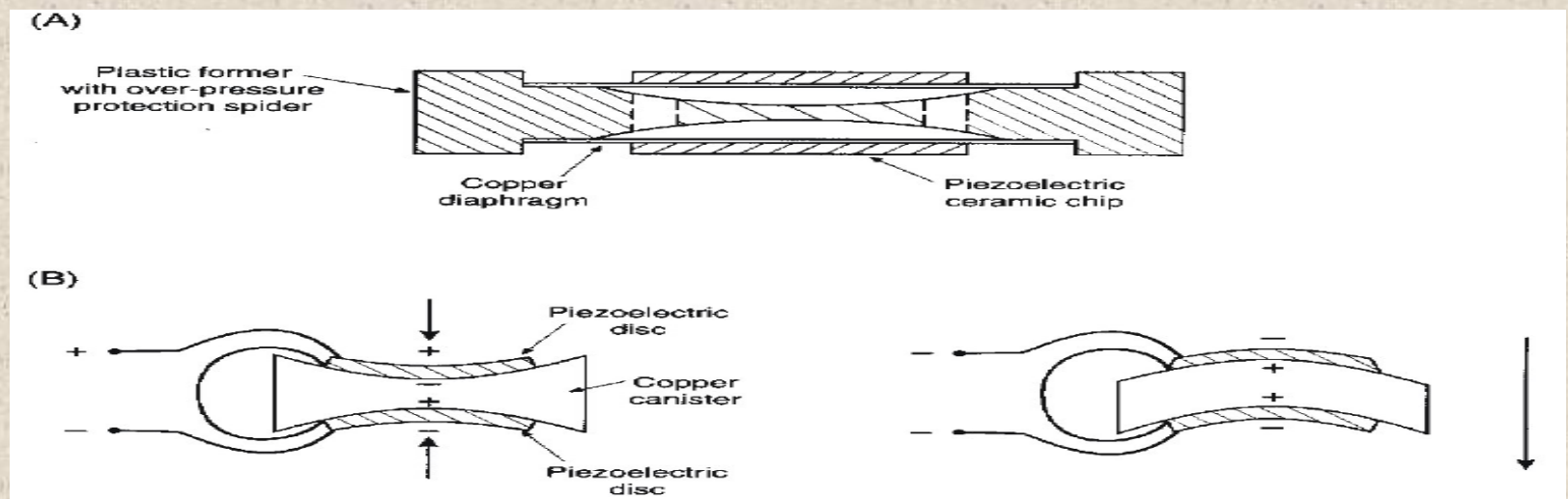
B- Sea survey:

Hydrophone :

Hydrophones used to detect the pressure variations in water due to a passing seismic wave.

A hydrophone comprises two piezoelectric ceramic discs cemented to a sealed hollow canister.

- ❖ A pressure wave squeezes the canister, bending the ceramic and generating a voltage.
- ❖ The two discs are connected in series so that the output generated by acceleration of the hydrophone cancels
- ❖ Pressure will squeeze ceramics and so produce output.



SEISMIC SOURCES

1. Explosives:

- %60 of seismic works use dynamite. It is a mixture of Nitroglycerin + Gelatin + Binding material
- The explosive sources that were placed in the shot holes are similar to those used for blasting during road construction.

Advantages

- has sharp peak
- Decrease surface noise
- has wide range of frequency



Disadvantages

- requires drill hole
- dangerous
- 3- Stack of charge

2- Weight drops:

- composed of a rectangular steel plate, 2 to 3 tons usually, and dropped 3 to 4 times at height of 3 m
- used in desert areas.

Advantage

- Not dangerous
- Easily used , cheap
- Not distort the surface



Disadvantage

- Record is weak, so dropped 3-4
- Low frequency
- Not used in mountainous area

3- Vibroseis:

- It is used to generate seismic wave in the form of a wave train of control energy.
- Always 4 vibrators are used

Advantage

- controlled frequency is
- The energy is controlled
- Not distort the surface



Disadvantage

- Not suitable when soil is too thick
- Expensive
- Not used in mountainous area

4- Sledge Hammer:

- used to generate seismic wave of small energy,
- used for shallow depths of investigation

Advantage

- very cheap
- easily used
- Not distort the surface



Disadvantage

- Give small energy
- used only for shallow depths
- Low frequency