1.4Applications of optical fibres in industry and medicine

1.4.1 Optical fibre in communication

The conventional method of communication has more limitation toward signal security and also affected by change in atmospheric factors. To overcome these limitations and factors, te optical fibres are introduced in communication system. In optical fibre communication the protocol consist of transmitter unit and receiving unit in the system.

The transmitter unit

The transmitter unit contains light source, signal to be transmitted, light modulator, amplifiers and coupler. Similarly, the receiver unit consists of couplers, light detectors, amplifiers, filters and output device. The transmitter unit and receiver unit are connected by suitable optical fibre. The layout of optical fibre communication is shown in the fig.4

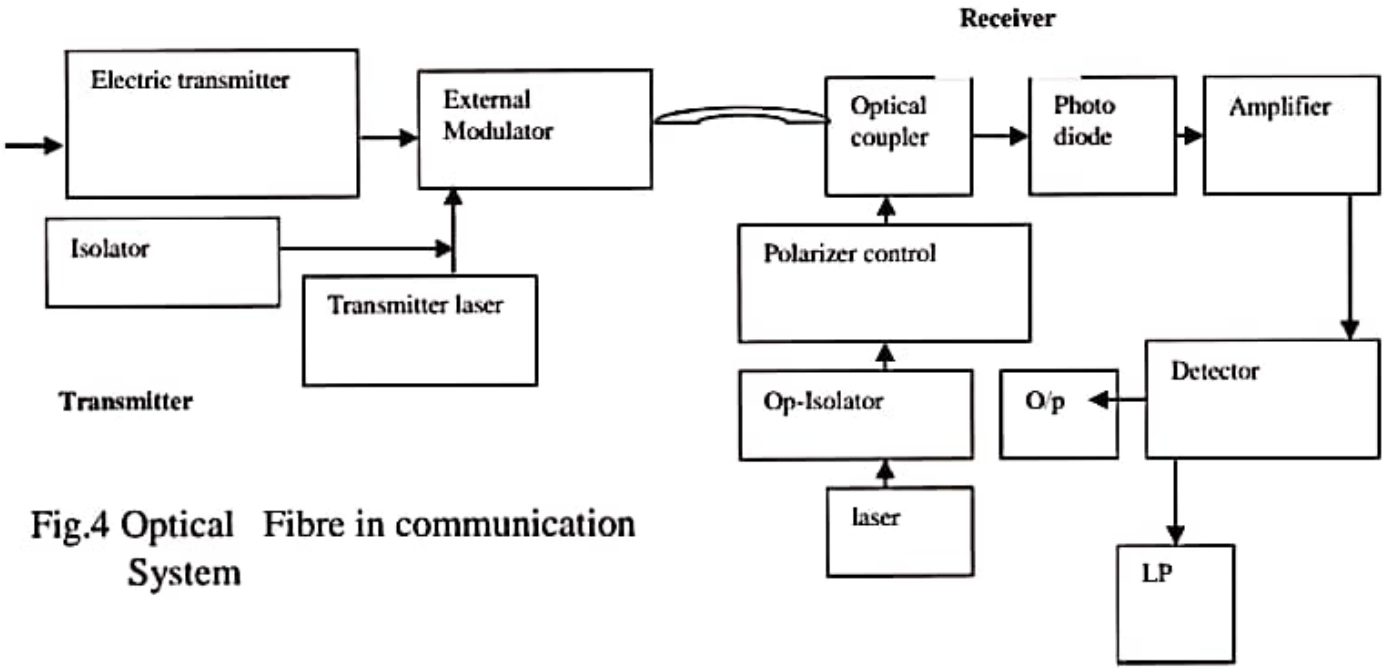

Fig.4 Optical Fibre in communication System

The signal

The signal to be transmitter can be voice, music as audio or movie as video signals. Generally, the signals will be in analog form which can be converted to digital using A/D converters in the transmitter.

The optical communication system (fig) system consist of transmitter unit containing digital source, electrical transmitter, laser as light source, modulator and transmitter channel.

In receiving end, the light detector, amplifier, optical coupler and the de modulator are available.

In transmitter, the digital signal will be converted in to electrical signal, which modulates optical carrier wave through transmitter wave by laser in terms of intensity, frequency or phase.

Modulator

In the modulator the mixing of signal with optical carrier wave takes place. The modulation can be

- Simple ON-OFF keying (OOK)
- Amplitude shift keying (ASK)
- Frequency shift keying (FSK)
- Phase shift keying (PSK)
- Multi level modulation keying (MMK)

The function of the modulator may be electro optic or acoustic optic phenomenon.

Receiver unit

The output of transmitter can be connected to the optical fibre which ends at receiver.

The receiver unit can be two type, they are:

- Homodyne receiver
- Heterodyne receiver

In homodyne receiver, one way communication is encouraged where as the heterodyne receiver encourages to transmit and receive the signal in a single receiver unit. If the transmitted signal alone be received through the receiver whose frequency synchronize with the local laser frequency, it will be homodyne receiver ($f_s = f_l$).

Heterodyne receiver

If the transmitted signal be received through the receiver whose frequency does not synchronize with the local laser frequency, it will be heterodyne receiver ($f_s \neq f_l$). The homodyne and heterodyne receivers are shown in present fig

Transmitter laser

To achieve high bit rate and long range data transmission with low error rate a single mode transmitter laser can be used as in fig.5