A Review Paper on Telecommunication and Telemetry using OFC

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Abstract— In the contemporary world the modern culture is hugely dependent upon electronics and communication. In the gigabits and above gigabits transmission of data, the fiber optic communication is the perfect choice. This type of communication is used to transmit image, audio, video, telemetry and data over large distances and LAN or computer networks. OFC uses light pulse technology to transmit the information or data over a fiber by changing electrical pulses into light. Some exceptional features of this type of communication are larger bandwidth, longer transmission area, small attenuation, and small size, less weight, secure transmission make this system a major building block or element in any communication infrastructure. Telemetry is a process of automation by which measurements are made and data is collected at remote or at distant points which are inaccessible points transmitted to receiving equipment for monitoring and giving further instructions. Both telemetry and telecommunication work hand in hand by gathering information from inaccessible remote devices and controlling the same devices by sending control actions remotely.

Key words: OFC, Telemetry System, PIPELINE

I. INTRODUCTION

Telecommunication based on Optical Fiber Communication has replaced the conventional copper wire system because it is different from the copper based transmission where the transmission is entirely dependent on electrical signals moving through the cable, this way the fiber optic transmission involves sending of signals that is light wave from one point to the other. A fiber optic communication comprises of transmitter and receiver circuits, a light source and detector circuit containing devices. In this input data is in the form of electrical signals and is given to the transmitting circuit, it changes them into optical signal with the help of a light source. This source is of LED or LASER whose amplitude, frequency and phases must remain stable or it is coherent and free from fluctuation in order to have efficient communication. The light wave is carried to the destination circuitry where the data is converted again to the electrical signal by receiver circuit components. Following are the elements of the system a Light Source, Optical Fiber, Optical Detector.
The basic block diagram is as shown below:

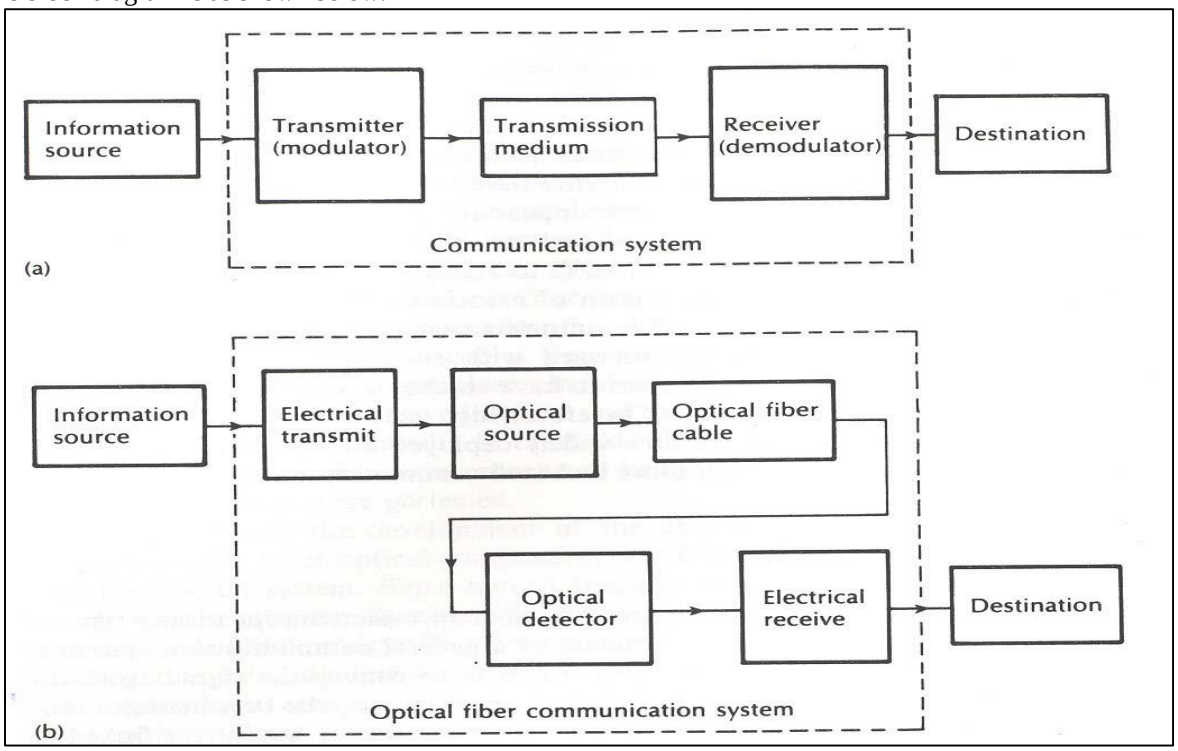

Fig. 1: Optical fiber communication system

II. TELEMETRY IS CRUCIAL FOR WHICH TYPE OF SYSTEMS?

A different type of application consisting of a remote vehicle, tooling package or technical system with a need for sending of control signals and/or collected data. Transmitting electrical signals using coaxial tube copper wires for applications like Boreholes and ROVs has its physical demerits due to large distances, heaviness, size, electronic interference and safety was also an issue. In the 1990's the fiber-optics was gaining attention everywhere across the world and thus it became more commercially available. The ROVs related industries were therefore able to transmit large bandwidth data over elongated distances without having to take tension about electrical intervention and the damage of signals strength over the copper wires. But in regard with the use of OFC in ROVs, operators had to worry about wear and tear of fibers, loss of light waves and learning how to terminate optical fibers. Rising demands of a Technology leads to insistent the limits and the mandate for more and better is always there. Control System, cameras and sensors found on ROVs are always improving over the years, and in many cases have resulted in an increased demand for real time data transfer. The HD digital video is another example where larger data transmission rate is required crucially.

III. BASIC WORKING OF A TELEMETRY SYSTEM

Optical-Fiber or Fiber-Optic Telemetry System's block diagram is as shown below:

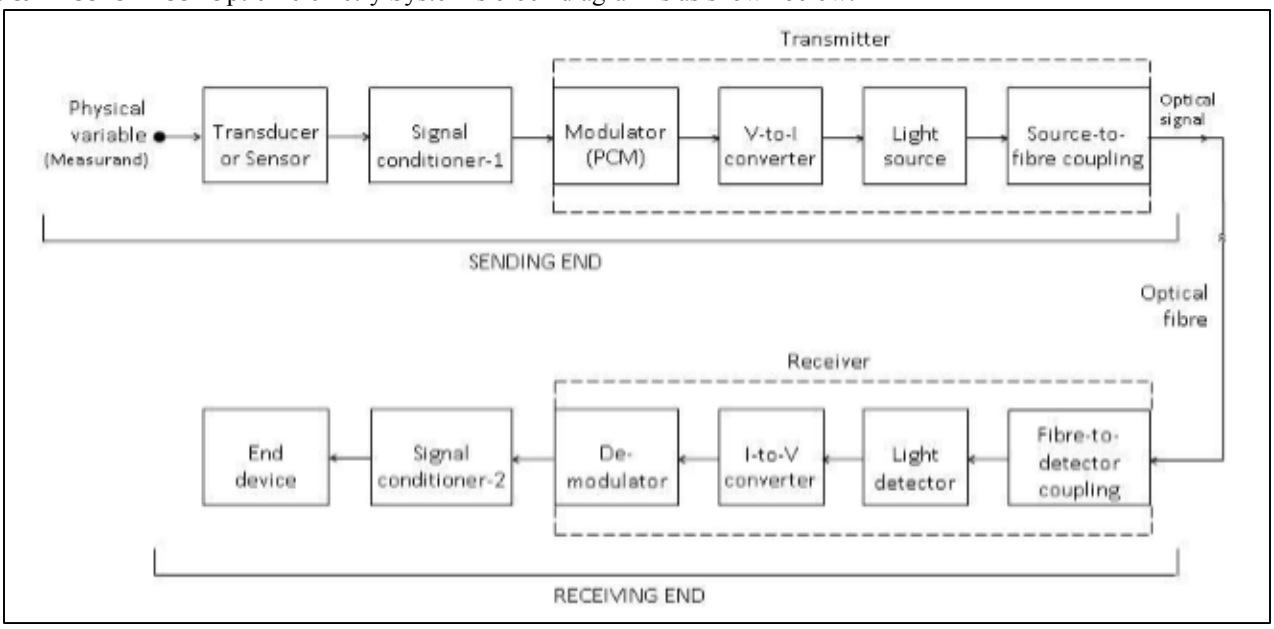

Fig. 2: Block schematic of optical-fibre telemetry system

Block schematic of a fiber optic telemetry system, presented above, shows components of the transmitter and receiver. The system is as explained: (a) the signal of transmission is a narrow infrared optical beam.

1) The medium of transmission works on the principle of TIR and serves as the waveguide for the movement of the optical beam from the transmitting end to the receiving end.
2) The transmitter includes (i) a PCM modulator, which receives a digital value of the measured from signal conditioner-1 and produces voltage pulses in a coded sequence, (ii) a V to I converter, (iii) a light source, mostly laser diode which changes the binary current pulses to binary optical pulses, (iv) light source to optical fiber coupling element.
3) The receiver has components performing reverse work of transmitter. These are:

(i) fiber to light detector coupling unit, (ii) light detector, mostly a PIN diode, (iii) a I to V converter, and (iv) demodulator, carries digital voltage signal to the end device through signal conditioner-2. Sometimes end devices include a D to A converter. Telemetry information is transmitted in an optical fiber communication system in a way that an amplifier pump is given excess power beyond that is necessary to pump the amplifier. The excess power given to the amplifier is not used to pump the amplifier but is rather used for the transmission of the telemetry information. In a specific building block an optical system including a drugged optical fiber amplifier such as, for example and EDFA, is provided with a pump which operates at approx. 1.48 .mm. The amplifier pump is provided with this excess power so as to transmit telemetry related data or control signal. In a specific building block, the telemetry signal can be detected with a low costing photo detector at a preceding station. Also Repeaters are used for strengthening the signal over long distances. The light wave system which is presently being used includes a number of regenerators or repeaters which are located all the way along with the optical fiber from the transmitting end to the receiving end. Each repeater boosts the weak received signal to overcome from transmission losses which are caused after the action of the last repeater. They detect light photo electrically, strengthening the resulting current by electronic means and then use the retimed or the regenerated current to drive a semiconductor laser which further convert the electrical pulses back into an optical signal. The light signal is then given in the optical fiber connecting to the next repeater in the system where the conversion takes place from optical to electrical and back again to optical is repeated continuously. Thus any change in the desired measurements of different parameters are reported at the controlling station in a coded form which is converted into a understandable form and accordingly actions are taken if any changes have to be made by the monitoring station.

IV. EXAMPLE: PIPELINE SETUP

An example of the pipeline setup used for the tests. Within the pipeline, there is a system of tubing and valves which is used to route the fluid to be tested to the appropriate locations to check for leakage.

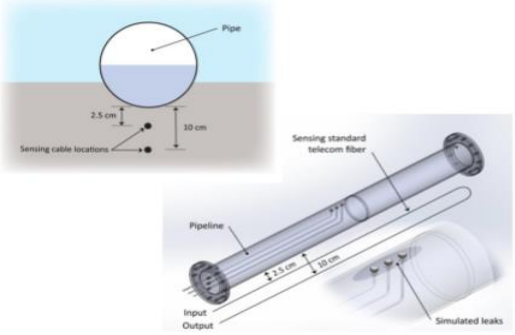

Fig. 3: Example configuration of a pipeline

The tubing penetrated the pipe wall and a 1/7" orifice at the end of the tubing was pierced to simulate a pierce in a pipeline. The discharge of orifice will flush with the exterior diameter of the pipe. Three holes could be opened individually to act out single or multi whole leakages.

V. ADVANTAGES

1) Wider bandwidth: The optical fibre has a very wide frequency range.
2) Minimum transmission loss: The transmission loss of 0.002dB/km.
3) Signal security: The signal to be sent through the fibres does not radiate. Further the signal cannot be recruited from a Fibre easily.
4) Loss : The life of fiber is longer than copper wire
5) Maintenance cost : Handling and installation costs of optical fiber is very nominal
6) EM interference : It is unaffected with electromagnetic interference

VI. DISADVANTAGES

1) Deliberately set for high sensitivity.
2) Consequently telemetry can give false positive alarms: misconception of artifacts as arrhythmia.
3) Telemetry is expensive: 1998 study estimates cost at $683 per patient per day.
4) When and how telemetry should be used has been a matter of debate.

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