Liquid Effluent Radiation Monitoring System

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Abstract— Liquid Effluent Radiation Monitor (LERM) is used for measuring the volumetric radioactivity of sea water. Radiation is the unwanted electromagnetic waves or signals which are coming out from nuclear power plant, cosmic rays and terrestrial medium. Effluent is an outflowing of water or gas from natural body of water, or from manmade structure. Effluent is defined by the United States environmental protection agency as "Waste water treated or untreated that flows out of a treatment plant, sewer or industrial outfall. Generally refers wastes discharge into surface water. " Radiation is all around us. Radiation is measured in the unit of Sievert voltage (sv). It is in our environment and has been since the Earth was formed. As a result, life has evolved in the presence of significant levels of ionizing radiation. It comes from outer space (cosmic), the ground (terrestrial) and even from within our own bodies. It is in the air we breathe, the food we eat, the water we drink and the materials used to build our homes.Future applications of the Nuclear Materials Identification System will require detectors that are significantly larger than those previously used. Typical NMIS measurements have utilized fast plastic scintillator detectors on the order of 6x6 inches square and liquid scintillators on the order of 6 inches in diameter. Health outcomes would vary depending on how healthy the person is before the exposure and the medical care they receive. If the exposure affects only parts of the body, such as the hands, effects will likely be more localized, such as skin burns.

Key words: Liquid Effluent Radiation Monitor, Scintilator detector, Microcontroller, Photomultiplier, Display unit, Power supply, HV generator, Voltage divider

I. INTRODUCTION

The radiation monitoring systems shall be permanently installed and fitted with centralized remote displays and alarms in the control room. To supplement the permanently installed measuring systems, the nuclear power plant shall be provided with portable or locally installed measuring instruments. Radiation exposure arising from the operation of a nuclear power plant shall be kept as low as reasonably achievable. A nuclear power plant and its operation shall also be designed so that the limits presented in this decision are not exceeded. The existing system has several disadvantages like solar energy and wind energy that are being in the system as an energy source can supply the load only for a particular period of time. A major drawback of the existing system is the charging of energy from the solar and wind is not always available.

The main objective of this project is to provide an radiation monitoring system for remote locations such as research areas and industrial waste water. Our system build on a modular concept and consists of standardize detector assemblies, processing and display unit and computer based system management station. This modular concept provide the operator with a high performance installation requiring minimal maintenance and up keep. After some incident happened, scientist looking forward to implement a system which are used to detect the radiations. And one of the systems which are used to detect and gives information about the level of radiation in the liquid is liquid Effluent Radiation Machine.

The block diagram consists of mainly two units i.e. Data Processing Unit and Detector Unit. Here we are using standardised plastic scintillator detector to detect the radiation coming out from the source. It detect the radiation in the form of voltage which is called as threshold limit voltage. Photomultiplier which is in the form of glass tube are used to absorb radiated energy. These radiated energy is in the form of light. Voltage divider is used to divide the voltage level and select wanted signals.

Here we used a DC-DC convertor with modern technology with 1.5 Amp. Output current it provides higher isolation than other conventional regulator up to 1.6 kv (1600v).The microcontroller used in it is PIC24HJ64GP506.it is operated on 40 MHz frequency with relatively low power consumption as it operated on 3.3v.The PIC 24 microcontroller provide both serial communication i.e.RS485 and RS232 with respect to the directional control. Alpha numeric display is used to show the readings of radiation over remote control area of radiation. The test result confirms the efficient operation of the prototype by detecting low and high radiation level in the waste water or sea water. The proposed system is designed to meet occupational health and safety standard with respect to liquid effluent radiation monitoring system in residential and commercial premises.

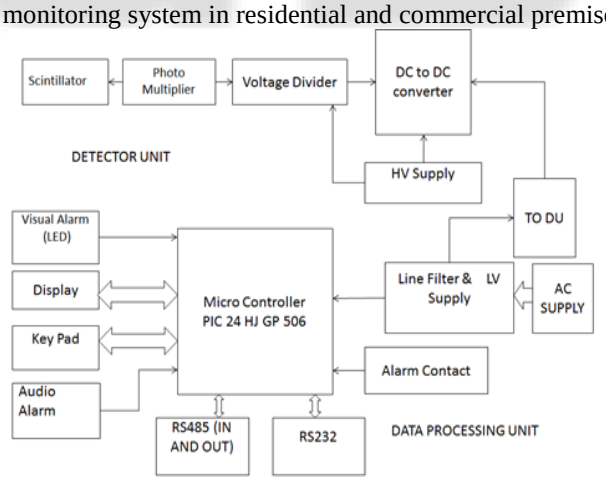

Fig. 1: Block Diagram of Liquid Effluent Radiation Monitor

II. RESULT AND CONCLUSION

According to survey 50%of people die within 30 days after receiving 5sv to 10 sv (Sievert voltage) of radiation. Because radiation affect different people in different ways it is not possible to say that the dose is going to be fatal or normal. So it is necessary to detect the radiation level of the environment. The test result confirms the efficient operation of the prototype by detecting low and high radiation level in the

waste water or sea water by using liquid effluent radiation monitoring system.

The proposed system is designed to meet occupational health and safety standard with respect to liquid effluent radiation monitoring system in residential and commercial premises.

III. FUTURE SCOPE

As LERM operated with wired transmission system, in this system we can use new technologies for wireless communication with control room for high speed communication. The future of the radiation application treatment of liquid effluent has been well established in the European countries. For environmental purpose depend on technical development this will reduce the operation cost and make the radiation technology very competitive for environmental application.

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