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IOT Based RO Water Monitoring System

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ABSTRACT

Reverse osmosis (RO) is proved to be the most reliable, cost effective, and energy efficient in producing fresh water compared to other desalination technologies. It is the fastest-growing desalination technology with a greater number of installations around the world. Availability of fresh water has been the main factor of growth of all civilizations. A key criterion for the RO layout is the specific electricity consumption, which should be as low as possible. That means that the recovery ratio must be kept as high as possible and the accompanying feed water pressure as low as possible, fulfilling the drinking water standards as well as the design guidelines of the manufactures.

Keywords: MSP430, TD1000, Single phase motor, UPVC pipe, Energia software, launch pad with cc3200.

I. INTRODUCTION

Reverse Osmosis (RO) is a process that uses semipermeable spiral wound membranes to separate and remove dissolved solids, organic, pyrogens, submicron colloidal matter, color, nitrate and bacteria from water. Feed water is delivered under pressure through the semi permeable membrane, where water permeates the minute pores of the membrane and is delivered as purified water called permeate water. Impurities in the water are concentrated in the reject stream and flushed to the drain is called reject water. These membranes are semi-permeable and reject the salt ions while letting the water molecules pass. The materials used for RO membranes are made of cellulose acetate, polyamides and other polymers. The membrane consists of hollow-fiber, spiral-wound used for treatment; depend on the feed water composition and the operation parameters of the plant. Reverse Osmosis (RO) is a membrane based process technology used for desalination. Membrane-based seawater desalination and wastewater reuse are widely considered as promising solutions to augment water supply and alleviate water scarcity (S. Lee et al., 2010). The most common membrane processes used are the reverse osmosis (RO) and the electro dialysis (ED) used for brackish water desalination, but only RO competes with distillation processes in seawater desalination (Kalogirou, 2005).

II. METHODS AND MATERIAL

Scope of Reverse Osmosis:

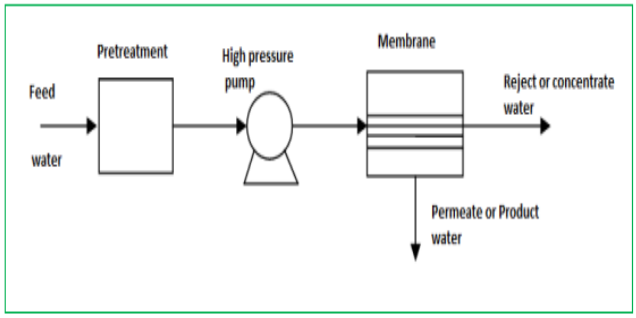
The process has also been applied to treat municipal wastewater. Since conventional municipal treatment processes do not remove dissolved solids, but RO process is used for the removal of dissolved solids. RO is increasingly used as a separation technique in chemical and environmental engineering for the removal of organics and organic pollutants present in wastewater. It is seen from literature review that Reverse Osmosis (RO) processes have been widely used for separation and concentration (recovery) of solutes in many fields. The use of RO in the treatment of various effluents of chemical (Bodalo-Santoyo et al.,2004; BodaloSantoyo et al., 2003), petrochemical, electrochemical, food, paper and tanning industries as well as in the treatment of municipal waste waters have been reported in the literature and were studied by many researcher (Schutte et al., 2003). Removal of organic contaminants by RO processes was first demonstrated by Chian et al. (1975). The presence of individual contaminants can cause problems, hence the removal of individual contaminants by RO has been studied by very few researchers (Murthy et al., 1999; Moresi et al., 2002; Arsuaga et al., 2006). Murthy and Choudhari (2008) studied the paper on “Treatment of Distillery Spent Wash where UF and RO membranes used for purification of the wastewater by removing the colour and the contaminants. A number of

studies(Kimura et al.,2003; Bellona et al., 2004; Xu et al.,2005) have been reported on the application of RO for the removal of Organics such as endocrine disrupting chemicals, plastic additives, pesticides, pharmaceutically active compounds (PhaC's), benzene and toluene. Cellulose acetate and polyamide membrane has good salt rejection for inorganic salts like NaCl, Na2SO4 - . However, for organics, the rejection is reported to be lower and varies widely in the range of 0.3-0.96 (Pozderivic et al., 2006; Senthilmurugan and Gupta, (2006). RO process removes fluoride proportionately, if TDS is at tolerable level and fluoride content is high then one can use special alum-resin filter, works under gravitational force. (Krishnan S. et al., 2005).

Reverse Osmosis Process Description:

The RO process is simple in design consisting of feed, permeate and reject stream. For feed water it is necessary to provide pretreatment in order to remove inorganic solids and suspended solid and using high pressure pump given feed through semi permeable membrane. Depending upon the permeate where it is used necessary post treatment is given. A schematic diagram of the RO process is shown figure 1.

A schematic diagram of the RO process is shown figure 1. Figure1. Schematic Diagram of the RO Process



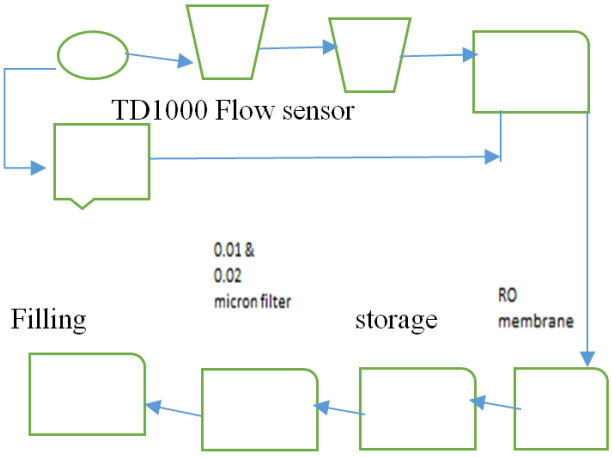
Reverse Osmosis Requisites:

An RO desalination plant essentially consists of four major systems: (a) Pretreatment system, (b) High pressure pumps, (c) Membrane systems, and (d) Post-treatment. Pre-treatment system is provided to remove all suspended solids so that salt precipitation or microbial growth does not occur on the membranes. Pre-treatment may involve conventional methods like a chemical feed followed by coagulation/ flocculation/sedimentation, and sand filtration or membrane processes i.e micro filtration (MF) and ultra-filtration (UF). High-pressure pumps supply the pressure needed to enable the water to pass through the membrane and have the salt rejected. The pressure ranges from 17 to 27 bar for brackish water, and from 52 to 69 bar for seawater.

The water flow sensor consists of a plastic valve body, a water rotor and a hall-effect sensor. When the water flows through the rotor, rotor rolls and the speed of it changes with a different rate of flow. The hall-effect sensor outputs the corresponding pulse signal.

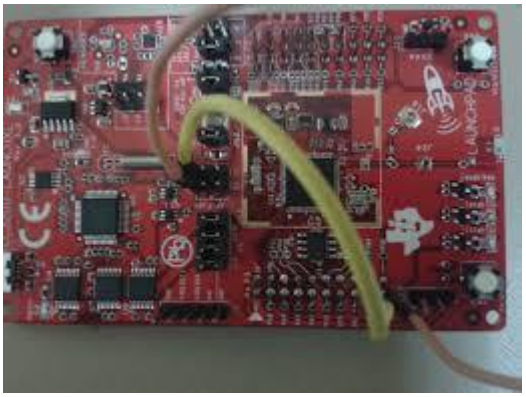
III. RESULTS AND DISCUSSION

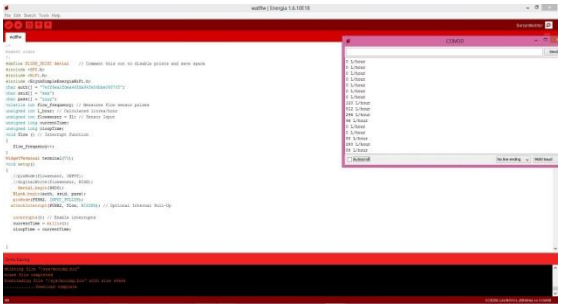
Reclamation of wastewater and sensing the water flow



- From the above block diagram, initially the raw water is stored in the tank.
- The next process is carried out for 20mins by adding germicide to the raw water.
- The water from the germicide process is step in to the sand filter method where the sand, bubbles are arranged in the tank.
- We know that sand is the best purifier of water
- Carbon filter is used to remove the smell from the water and charcoal make it odour less.

- The water is then passed to the 5micron filter with high pressure by using motor.
- The RO membrane has 0.0001nano fibers; it removes fine dust particles when the hard water is passed into the RO membrane with high force.
- Then the soft water is stored in the tank and it is ready to use.





IV.FUTURE SCOPE

RO provides a cost-effective solution that has the potential to improve the lives of people drinking water with high levels of contaminants. Overall, the membrane field has advanced immensely. Being economical, environmentally friendly, versatile, and easy to use, membranes are a leading choice for water purification applications and should continue to be for many years to come. This type of device will be used in the petrochemical industry, with very different membranes, for dehydrogenation processes or the partial oxidation of methane. Such applications could be much more important, but the development of suitable membranes poses a number of very challenging technical problems.

In SWRO (Sea water Reverse osmosis) unit, the operating conditions and performance of the HFF SWRO unit which received the NF product as feed. The SWRO unit consists of two vessel units, which are connected in series. During the test period, the operating pressure was maintained at 60 Kg/cm2 and the temperature ranged from 23 to 34 o C. The average permeates recovery of the first and second vessels were around 30 and 21 percent respectively and the overall recovery of the integrated SWRO system was about 45%. Chemical analysis revealed that the majority of the hardness ions and other dissolved salts were concentrated in the brine reject. The study revealed that an increase of top Brine Temperature from 1000 C to 130 o C produces 48% increase in water production. (Hamed, 2005).

V. CONCLUSION

The project carried out by us made an impressing task in the field of water purification method. This project has also reduced the cost involved in the concern. Project has been designed to perform the entire requirement task which has also been provided.

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