THE STRATEGIC APPROACH TO DATA MONITORING & ACQUISITION USING EMBEDDED SYSTEM FOR EFFLUENT TREATMENT PLANT (ETP)

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ABSTRACT

In Textile industries wastewater, otherwise known as effluent, as a bi-product of their production. The effluent contains several pollutants, which can be removed with the help of an effluent treatment plant (ETP). he demand of water requirements for basic needsincreases with increase in population and industrialization. The biggest consumers of water are textile, tannery, pulp and paper and electroplating industries and perhaps these are the most serious polluters of environment. These industries generate equally large volumes of coloured waste water, in which colour is contributed by colloidal or suspended material.With the advent of industrialization and urbanization, purity of water is of main concern. The "clean" water can then be safely discharged into the environment. Obtaining an indication of current state-of-art in full-scale wastewater treatment plants internationally with regard to the used types and numbers of sensors and to which extent these sensors are used for process control purposes. Effluent from textile dyeing industries must meet the national effluent discharge quality standards set by the Government of India ,including the "Quality Standards for Classified Industries "In this project Ph value, temperature, flow and conductivity of waste water is monitored & controlled by using different sensors/controller and it is implemented by the microcontroller based system. Testing and documenting the effect of different types of sensors for Ph value, temperature, flow and TDS of water in a comparative study at a full-scale wastewater treatment plant. A sensor inventory was given in the distributed questionnaire and the plants were asked to identify the variables continuously measured and monitored. Altogether different wastewater characteristics are measured on-line at the ETPs considered. The number of ETPs at which sensors and on-line analyzers are used and the number at which those are used for control are presented. DO (Dissolve oxygen),Suspended solids(SS), temperature, pH and level sensors are established technology at ETPs; the operators consider them to function well apart from the above sensors.

* Flow and level * pH, conductivity and turbidity

* Pressure and temperature * water analysis parameters (DO, P, NH4, NO3 etc.)

Keywords-Design, Build, Integration, Automation, Control System, Redundant, Visual Basics, Monitoring, Communication, Microcontroller, Alarming, Control Logic, Plant Metrics, Budget

I INTRODUCTION

Heavy metals are non-biodegradable and tend to accumulate in living organisms causing diseases and disorders. Arsenic, Cadmium, Chromium, Copper, Lead, Mercury, Zinc are chief examples of Heavy metals having potential health effects on long term exposure like skin damage, kidney damage, allergic dermatitis, Wilson's Disease, high blood pressure, delayed physical and mental development and even cancer. Heavy metals are common in industrial applications such as in the manufacture of pesticides, batteries, alloys, electroplated metal parts, textile dyes, steel etc With the advent of industrialization and urbanization, the increasing concentration of heavy metals in environment is of chief concern. Conventional methods for removal of heavy metals pose specific shortcomings. Amongst the various technologies, adsorption process is feasible for convenience, easy operation and simplicity of design. Biosorption using low cost bio materials as adsorbents is technically workable and economically viable sustainable and green technology for removal of heavy metals especially in dilute waste waters.

Different types of science background, from engineering to chemistry, can make a significant contribution in elucidating the biosorption phenomenon to develop understanding that could reliably serve as a base for a successful technological enterprise.

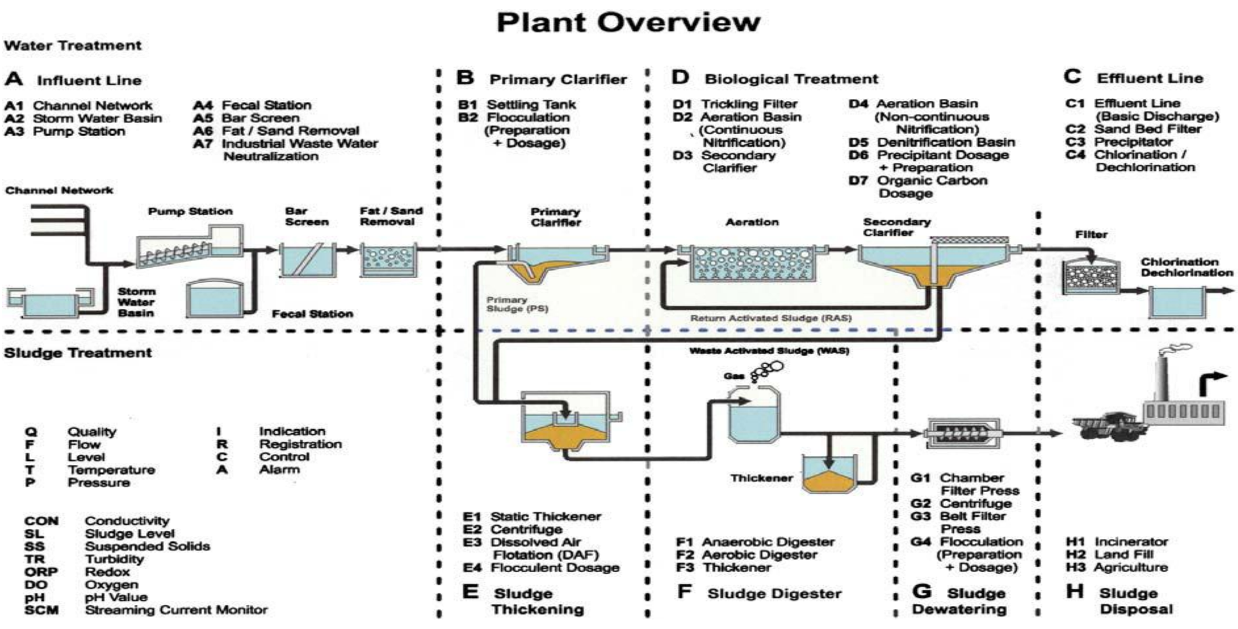


Fig 1: Plant Overview

In the upper half of the process diagram (figure 1), the first stage consists of the influent lines, pump station and plant intake (section A), where coarse screens remove large objects. Sometimes smaller screens (1-2cm) are used to remove floating fat, paper and smaller items such as fruit, rind or waste food lumps. The liquid then passes into the primary clarifiers (Section B) where suspended solids and floating substances are removed. The raw liquid passes to the biological treatment tanks (section D) and the primary sludge goes to the thickener (section E) for blending.

In the aeration tanks, bacteria feed on the organic matter and nitrify harmful ammonia. Artificial oxygenation promotes this process so the bacteria multiply and accelerate the water cleaning process. The partly-cleaned liquor is fed to the secondary clarifier where further separation occurs. The activated sludge in the bottom of the secondary tanks is passed to the thickening tank (section E) for blending with the sludge from the primary clarifiers. The relatively clean liquid from the top of the secondary clarifier is then chlorinated and de-chlorinated prior to discharge (section C). In some more advanced plants, a chemical cleaning process is added to the biological process. These may use precipitants such as ferric chloride or aluminum sulphate to remove organic carbon, phosphorus and some of the nitrogen based compounds. This may occur in either the primary or secondary clarifiers or in the aeration tank.

The lower half of figure 1 shows solids handling and disposal. Sludge from the primary and secondary clarifiers is mixed. The thickened sludge passes to the digester (section E) where further biological process generates methane gas, which is often used as an energy source. The digested sludge from the base of the digester then passes to the dewatering stage, (section G) where a variety of techniques are used to remove most of the water and produce an energy-rich ersidue This residue is pumped to the disposal area (section H) to be used for incineration, for fertilizer production or for landfill, depending on the chemical composition of the treated residue.

II. LITERATURE SURVEY


Fig 2: Monitoring & controlling parameters of ETP.

A total of about 130 ETPs have come up in the country either established or in the process of establishment to cater the needs group of industries. Of which about 91 ETPs are in operation. Treatment of waste water from industries is mandatory since the available resources of drinkable water is about to extinct.

A lot more research is going on nationally and internationally Automation of Effluent treatment Plant. By measuring the different parameters like pH value, temperature, flow, and TDS we can judge the water purification standard.

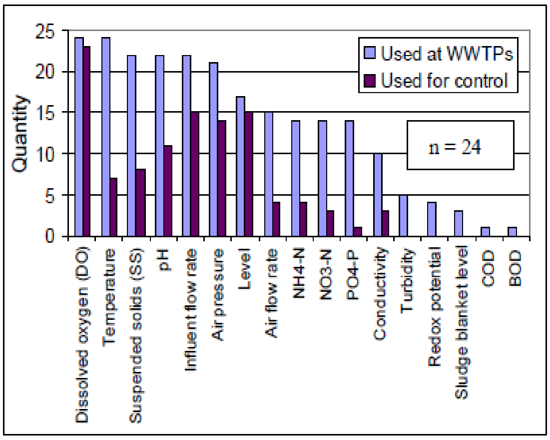


Fig3:

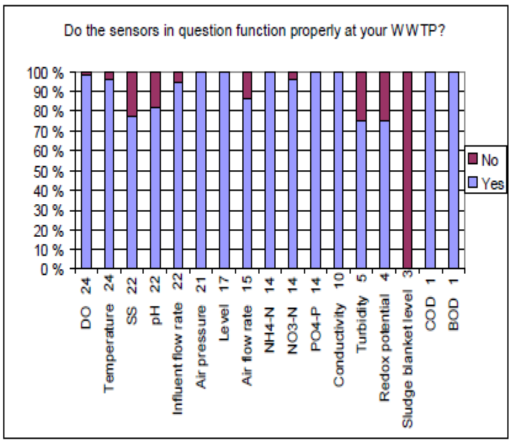
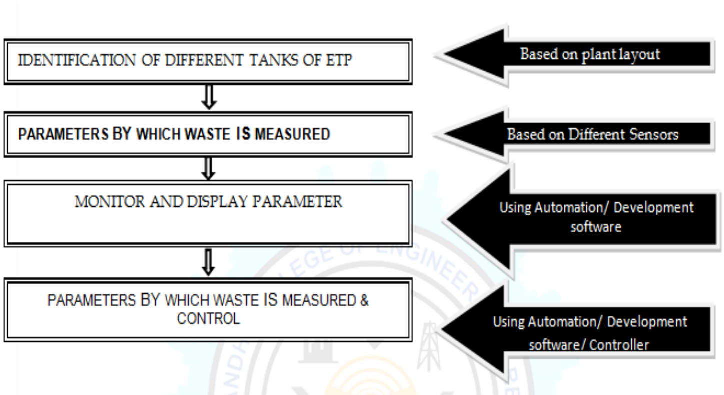


Fig 4:

Fig3: Number of WWTPs (ETPs) using sensors and on-line analyzers and their use for control

Fig 4: Functionality, number and type of sensors and on-line analyzers

III. OVERVIEW OF METHODS USED FOR ACCESS CONTROL SYSTEM



Our objective is to develop the efficient data acquisition system which is used to overcome the conventional method. Monitoring & controlling parameters of ETP.

- To design power supply for purpose of operation of different Tanks of ETP for the measurement of various parameters like pH value, flow of liquid, level etc.
- Based on plant layout and different sensors aquise the parameter using controlling board by interfacing controlling board with different sensors.
- Control unit
- I/O board & DC to Dc controller: These device type are design for interfacing sensors with input output board for converting analog information to digital.
- Development software: Data which aquise by sensors with I/O board is interlink with software using VB.net. It consist whole plant layout, design of different tank with real time system.

- Indication board: This board monitors and display parameter of ETP plant using hardware and software.
- Signal simulator: Calibration of different parameter.
- Sensors like Temperature, level, flow, pH & TDS sensors
- Controller: like Temperature, level, flow, pH & TDS sensors
- Control Valve: controlling flow of different liquids.

IV. PROPOSED WORK

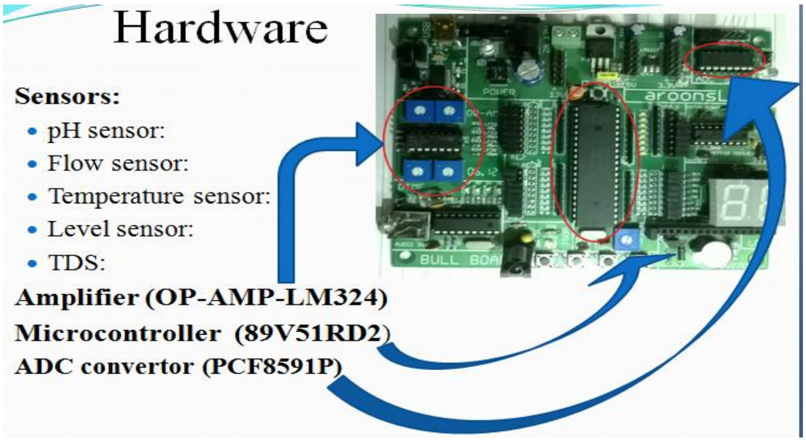


Fig 5: Hardware

Software Visual Basic 6.0

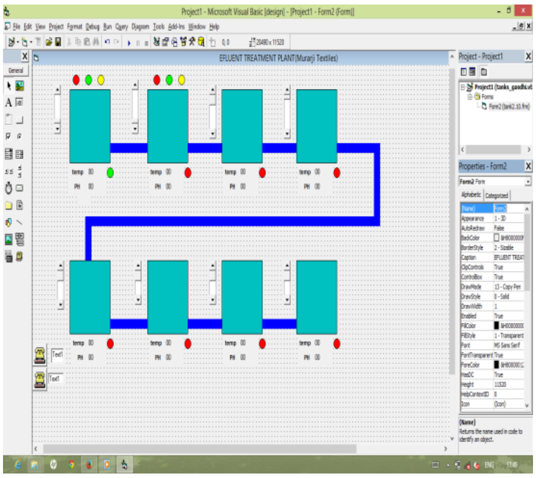
Visual Basic is a tool that allows you to develop Windows (Graphic User Interface - GUI) applications. The applications have a familiar appearance to the user.

- Some Features of Visual Basic
- Full set of objects - you 'draw' the application
- Lots of icons and pictures for your use
- Response to mouse and keyboard actions
- Clipboard and printer access
- Full array of mathematical, string handling, and graphics functions
- Can handle fixed and dynamic variable and control arrays
- Sequential and random access file support
- Useful debugger and error-handling facilities
- Powerful database access tools
- Package & Deployment Wizard makes distributing your applications simple

V. RESULT

- All sensors should be interfaced with microcontroller and GUI software successfully.
- The graphics in the VB 6.0 should vary with the varying output of the sensors.
- The data from the sensors should be displayed accurately on the operator's computer screen.

- Caution alarms should ring up as soon as any output of the sensor crosses the danger mark.



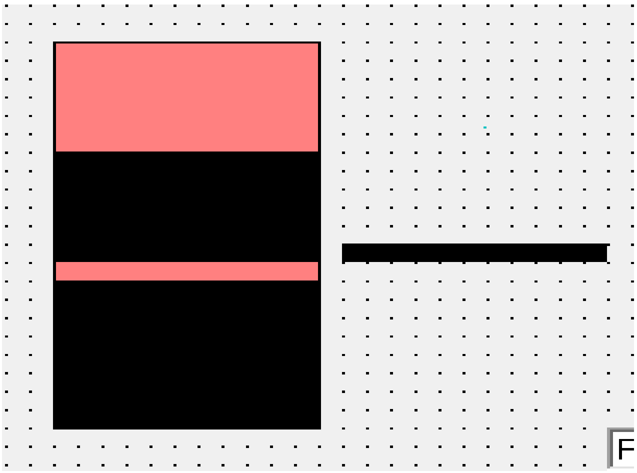


Fig:6 Graphical representation of ETP in Visual Basic **Figure A: Construction Of Tank**

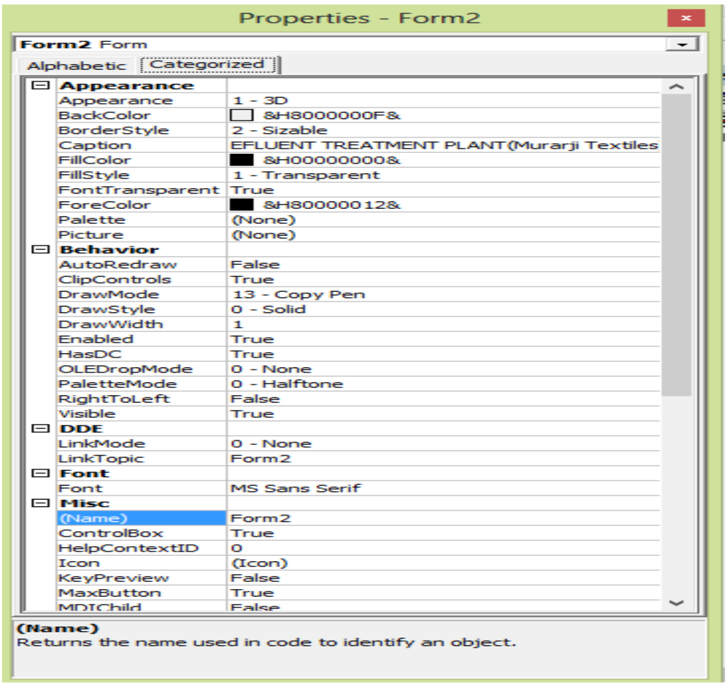


Figure B : The Dialog Box Of The Properties Assigned To The Tank.

VI. CONCLUSION AND FUTURE WORK

Prediction of wastewater flow rate and load in real-time, utilization of automatic on-line analysers in control, Better aeration control, more reliable on-line measurements. Infiltration into the sewage network, heavy rainfalls and snowmelts are named as the most important bottlenecks for improving the operation of the plant in four of the answers. Additionally, the maintenance of automation equipment and reliability of measurements are mentioned often.

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