APPTRONICS review

Volume 1, Issue 4, 2008 November 30

From the HoD's desk

Energy Crisis

Dear Reader,

Today the world is in crisis, not just from one source but from many. We already hear a lot about the financial crisis, and how it is affecting the job and future of several thousands of people in banking and IT sectors. Now it is also important to focus our attention on energy crisis. The energy crisis that is creeping up on us, which was left unattended, can escalate to a global crisis.

The growing disregard for the environment has not been without consequences. We are experiencing the effects of global warming and changing weather patterns all around the world .

Kerala, in spite of its poor state of industrialisation, is also reeling under energy crisis. This year alone, lack of enough rainfall has resulted in drying up of our dams and great reduction in energy production. Of late, the government has forced 'power-cuts/load shedding' as a form of crisis management to deal with the situation. But the problem must be dealt with at the grass root level. We must begin by educating ourselves about the problem. This could be achieved to a great extent by spreading awareness through schools and colleges. I hope our Apptronics bulletin takes up leadership and initiative to spread this message among all.

Contents

Introducing science journals

NASA Tech Briefs

- Published by National Aeronautics and Space Administration of the United States
- Monthly publication
- First issue as a single sheet report published in 1960
- Converted to a magazine in 1970
- Joint venture of NASA and TechBriefs media Group
- Contains technical discoveries made by NASA
- Spans a wide array of fields, including electronics, physical sciences, materials, computer software, mechanics, machinery/automation, manufacturing/ fabrication, mathematics/information sciences, and life sciences.
- Regular columns describe new patents, industry products, software, and literature.

Sreejith Ravi receiving gold medal from minister G. Sudhakaran for winning first rank in B. Tech from CUSAT.

Published by HOD, AEI, Rajagiri School of Engineering and Technology, Kochi- 682039.

Observations/Comments

[A column by PRM]

Why do most of us hesitate to read good books related to our fields of activities? Why are we satisfied with the level of knowledge acquired, on S&T topics, in the good old days through our regular class room studies? Why aren't we bothered about updating it?

Answer to all such questions could be rather simple: There is no demand.

Industries and research institutions engaged in advanced S&T areas do provide the staff with such demands, in fact, challenging demands.

There too, of course, the case is not so for the entire staff; at least 20 to 30 per cent of the staff are posed with challenges sufficient enough to make them search for good books/ articles, and read.

But what about us, the teaching community? Our environment is totally different. We are in general governed by Newton's law of inertia, and Fermat's principle of least action. Neither the curriculum nor the syllabus poses the teachers with the requirement of serious reading.

And consequences??

Good old, but dirty, pages of information get transferred to those destined to sit in our classes! Those poor students never get challenged.

The teachers keep damaging their thinking faculty. They do not find enthusiasm to prepare and teach. They get satisfied with supplying copies of the irrelevant stuff they have in their old note books or their torn out text books to the poor guys who happily sit in front of them without being worried about what they really learn! [Of course, it does not harm the formal university examination results; in fact it provides a short cut. And, what else do you need?]

Students do not get guided to acquire the process of analytical thinking, the process of learning.

Teachers get a lot of spare time to improve personal relations!

The country does not get professionals through the process of education, it simply gets degree holders!

The country keeps getting more and more passive observers, if not ??, to incidents as that happened in Mumbai.

The future depends on what we do in the present

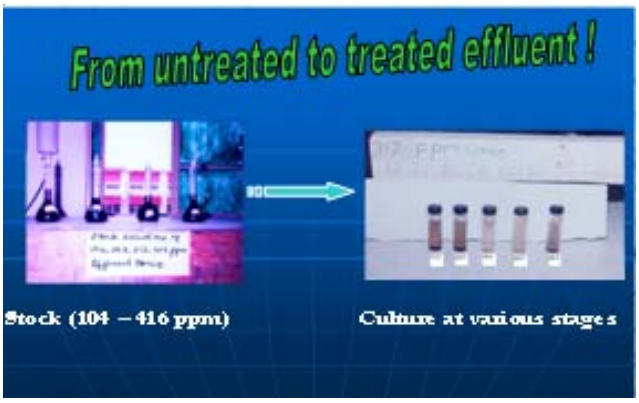
-Mahatma Gandhi

Microbial De-colourization of Azo Dye Effluents

[Sushma R Nair]

Presented at the IIIrd International Congress on Bioprocesses in Food Industries, Nov 6 – 8, 2008, Osmania University, Hyderabad.

Discharge of effluent from the dye industry into local water bodies poses environmental concerns as it increases the chemical oxygen demand of the receiving waters and also adversely affects aquatic flora and fauna. It is known that micro-organisms degrade many such dyes into simpler, colourless substances. Microbial processes are preferred over chemical treatment since resins used are costly and the regeneration of absorbing resin is energy intensive.



The microbial process carried out by us involved culturing the bacteria *Cellulomonas biazoata* in a suitable medium into which effluent dye was mixed in order to be treated. The dye used here was of the azo-type, containing the –N=N- bond which gives the compound its colour.

The biotechnological technique was carefully monitored for chemical and physical parameters and samples were withdrawn for analysis at regular intervals. The bioprocess involved microbial action at the site of the –N=N- bond. This breakage led to removal of colour, along with the generation of amines from the complex azo-compound.

Results of our studies, showed that 85 %-90% colour got removed by the end of the process. The cause of colour removal could be breakage of -N=N- bond, adsorption of dye on cells, or consumption of dye by the organism.

Colour removal was confirmed to be largely due to break-up of azo bonds as a result of the acidic environment created by metabolic activity. Experiments indicated negligible consumption of dye by the microorganism. A significant observation was that biodegradation, rather than chemical modification of dye, took place. This was experimentally determined. Some adsorption of dye on cells was also observed, which was confirmed through experiment.

Safety Instrumented Systems (SIS)

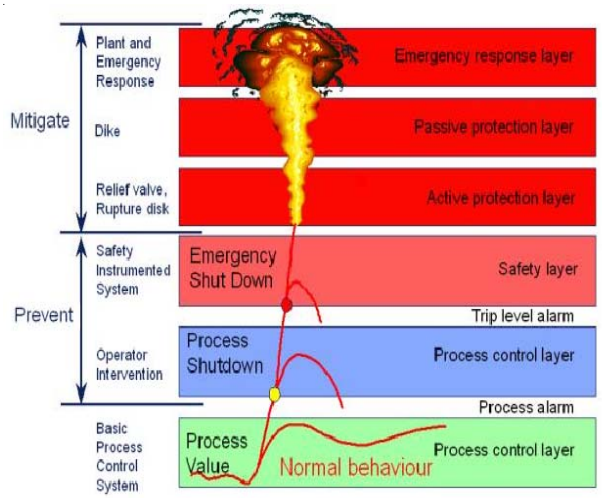
The operation of many industrial processes involves inherent risks due to the presence of dangerous materials like gases. SIS are specifically designed to protect personnel, equipment and the environment by reducing the likelihood (frequency) or the impact severity of an identified emergency event.

Explosions and fires account for millions of dollars of loss in the chemical, and oil and gas industries each year. Since a great chance for loss exists, it is common to employ Safety instrumented systems (SIS) to provide safe isolation of flammable or potentially toxic materials in the event of a fire or accidental release of fluids. Safety levels can be arranged as layers described below.

The first layer is the Basic process control system (BPCS). The control system itself provides significant safety through proper design of process control. The next layer of protection is also provided by the control system and the system operators. Automated shutdown sequences in the process control system combined with operator intervention to shut down the process form the next layer of safety. The third layer is SIS. It is a safety system independent of the process control system. It has separate sensors, valves and logic systems. No process control is performed in this system; its only role is safety. The fourth layer is an active protection layer. This layer has valves or rupture disks designed to provide a relief point that prevents a rupture, large spill or other uncontrolled release that can cause an explosion or fire. The fifth layer is a passive protection layer. It consists of a dike or passive barrier that serves to contain a fire or channel the energy of an explosion in a direction that minimizes the spread of damage.The final layer is plant and emergency response. If a large safety event occurs, this layer responds in a way that minimizes ongoing damage, injury or loss of life. It may include evacuation plans, fire fighting, etc. Overall safety is determined by how these layers work together.

The elements involved in safety instrumented system are: a sensor, a logic solver and a final control element. The purpose of sensors is to help measurement of process parameters (e.g. temperature, pressure, flow, etc.) used to determine if the equipment or process is in a safe state. Sensor types range from simple pneumatic or electrical switches to smart transmitters with on-board diagnostics. These sensors are dedicated to the SIS. Logic solver determines what action is to be taken based on the information gathered. Highly reliable logic solvers are used which provide both fail-safe and fault-tolerant operations. It is typically a controller that reads signals from the sensors and executes pre-programmed actions to prevent a hazard by providing output to final control elements.

Final Control Element implements the action decided by the logic system. This final control element is typically a pneumatically actuated on-off system configured using solenoid valves. It is essential that all three elements of the SIS system function as designed in order to safely isolate the process plant in the event of an emergency.



Probability of Failure upon Demand (PFD)

There are two ways by which SIS could fail. 1) Commonly called a spurious trip which usually results in an unplanned but safe process shutdown. While there is no danger associated with this type of failure, the operational costs can be very high. 2) Here failure does not cause a process shutdown or trip, it remains undetected, and permits continued process operation in an unsafe or dangerous manner. If an emergency demand occurred, the SIS would be unable to respond properly. These failures are known as covert or hidden failures. By understanding how components of SIS can fail, it is possible to calculate a probability of failure on demand (PFD). In order to determine the PFD of each element, the analyst needs documented historic failure rate data for each element. This failure rate is used in conjunction with the test interval (TI) term to calculate the PFD. It is the TI that accounts for the length of time before a hidden fault is discovered through testing. Increase in TI directly helps to improve chance of identification of potential failures.

-Sheeba V

Everyone thinks of changing the world, but no one thinks of changing himself

-Leo Tolstoy

Solar Energy
-A promising solution to energy crisis

Want a solution for energy crisis? The best way is to go for available renewable energy.

"Mithradham" renewable energy centre in India has been set up as a model for promoting renewable energy with a goal to propagate about renewable energies in India and elsewhere for nurturing our environment for the future. It is an educational institution which functions fully with renewable energy. This centre is powered by a 5.1kW solar power station and is the first eco friendly demonstration, education and training institution in India. Here, all system are installed by the German solar company Würth Solar, which is a pioneer in the latest CIS (CuInSe2) solar technology.

The solar power station comprises of solar modules/panels, charge regulator, battery and inverter. **Solar modules** make use of different types of materials like mono crystalline silicon, polycrystalline silicon, amorphous silicon and CIS (**c**opper **i**ndium **s**elenide), with efficiency of 16-22%, 14-18%, 5-8% and 10-14% respectively. **Charge regulator** is used as a safety measure for the battery. Charge regulation allows charging from solar panel when battery voltage goes below a threshold and opens the charging path when battery is charged fully. **Solar battery** is also called accumulator, since lead acid battery is mostly used for it. Photovoltaic (PV) cell uses C100 battery (C=capacity of battery). Battery is used to store the extracted solar energy. **Inverter** converts DC to AC supply.

The basic design inputs to be taken for the installation of a photovoltaic (PV) system are listed below.

1) How much energy in Wh is required?
2) Battery size
3) Size of module or panel

At Rajagiri, we already have solar powered street lights (12V DC, 75W peak, CFL 11W, Battery 75Ah), domestic lights (74W), Lantern, colour TV (75W), box type solar cooker, solar radio and Scheffler cooker. AEI department is on its way to develop home lighting system especially for economically backward families without connection to the public electricity supply network.

Many countries like Germany and UAE have installed PV system on a large scale. It is high time for India too to think about PV system in order to save future generations.

-Anuj Abraham

Students' Page ✓ 500

Biometrics and face recognition technology

Imagine yourself going to a retail store to buy the things that you need, and finally just show your face in front of a camera to pay your bill. Does that sound interesting? This fantasy is made possible by face recognition techniques in biometric identification systems.

A retail store (for example, a grocery store) may have cash registers equipped with cameras; the cameras would be focused at the faces of customers, so pictures of customers could be obtained. The camera would be the primary means of identifying the customer, and if visual identification failed, the customer could complete the purchase by using a PIN (personal identification number). After the cash register had calculated the total sale, the face recognition system would verify the identity of the customer and the total amount of the sale would be deducted from the customer's bank account. Wide-reaching applications of face-based retailing are possible, including retail stores, restaurants, movie theaters, car rental companies, hotels, etc.

If you wish to learn about the latest achievements as well as currently unsolved issues of face recognition, read W. Zhao, R. Chellappa, A. Rosenfeld, P.J. Phillips, Face Recognition: A Literature Survey, ACM Computing Surveys, 2003, pp. 399-458.This paper provides critical survey of still- and video-based face recognition research. This survey paper provides a review of the existing literature, and offers some insights into the studies of machine recognition of faces.

-Arathy Iyer (S7 AEI)

Curiosity corner

Googolplex

What is googolplex?
First correct answer will win a small prize

Answer to the question in the previous issue

Tyre pressure monitoring system.

The sensing device is located in the tyre. This remote sensing module is comprised of a pressure sensor, a signal processor, and an RF transmitter. The system compensates for pressure variation due to temperature. Hence a temperature sensor is also required. The power supply is provided by a long life battery that the embedded intelligence helps to manage as effectively as possible.