# Journal of Scientific & Industrial Research

**VOLUME 74** **NUMBER 8** **AUGUST 2015**

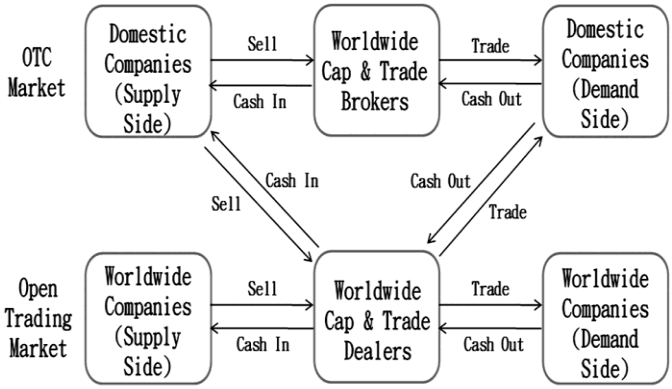
## CONTENTS

### Management & Information Technology

**433** **Platform-Integrated Cap and Trade with Renewable Energy Technologies**

**Grace T R Lin, J S Wang & P H Hsieh**

Taiwan is an island country that is technological-innovation-oriented but has scant natural resources. Taiwan addressed the emerging policy and strategic issues in renewable energy development and carbon reduction. Those themes regarding how to enhance green competitiveness for enterprises were also emphasized in particular. In this study, we looked at the related concerns at a country level. The Delphi method was applied to select the renewable energy that meets the requirements of the environmental, economic, and energy policy goals of Taiwan. Conversely, a cooperation platform was designed to integrate the mechanism of C&T and suggested renewable energy technologies. Besides, a SWOT analysis was used to elaborate on and verify the empirically functioning aspects of the platform design.




### S & T and Industrial Research

**438** **Strengthening Smith Predictor Robustness via Azadi Controller (Positive Feedback)**

**S Azadi**

A Smith Predictor Controller is one the best nominates for the plants with large time delays. The controller theoretically performs perfect for suppressing the plant vibrations with strong consequences. However, when the plant model have some uncertainties from the nominate values, the robustness of controller which is based on the plant model violates, and converse results attains. Many researchers have challenged to overcome these uncertainties on the plant models either by fine computing the plant models, or by introducing some other compensators to the Smith predictors. However, when the uncertainties on the plant dynamics overstates, Smith Predictor cannot achieves its main function. In this research work, I applied Azadi controller to the Smith Predictor, and testify the system for very large variations on the plant dynamic. Azadi Controller actually is an adaptive controller with just one simple variable gain.

**444** **Improved Robustness and Finite Time Convergence for a Multivariable Process using Integral Terminal Sliding Mode Controller via Multilevel Switching**

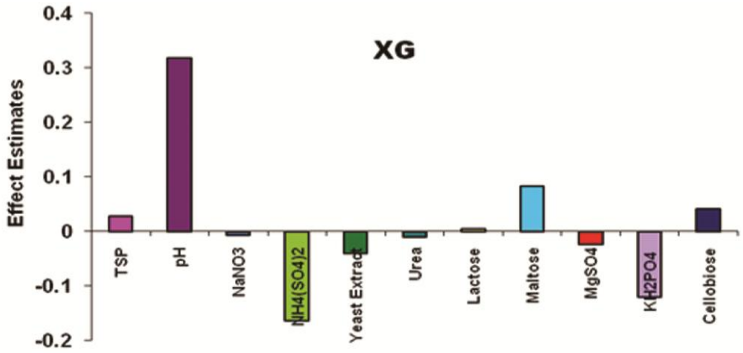
**S Sutha, P Lakshmi, S Sankaranarayanan & H A Shabeer**

This paper discusses the control of non-linear multivariable process named as Completely Modified Quadruple Tank Process (CMQTP) operating in Minimum Phase (MP). Initially PI (Proportional Integral) controller is designed to control the level of bottom two tanks. Then Sliding Mode Controller (SMC) strategy is designed with relative degree two. In order to reduce the control input effort, Back stepping Sliding Mode Controller (BSMC) is introduced. For a finite settling time and robust performance, Terminal Sliding Mode Controller (TSMC) is used. To improve the controller performance, integrality property is added to TSMC which leads to Integral Terminal Sliding Mode Controller (ITSMC). The undesirable chattering effect is reduced by introducing a novel Multi level switching algorithm.

**450** **Co-optimization of xyloglucanase and β-glucosidase using response surface methodology**

**R Rashmi & K R Siddalingamurthy**

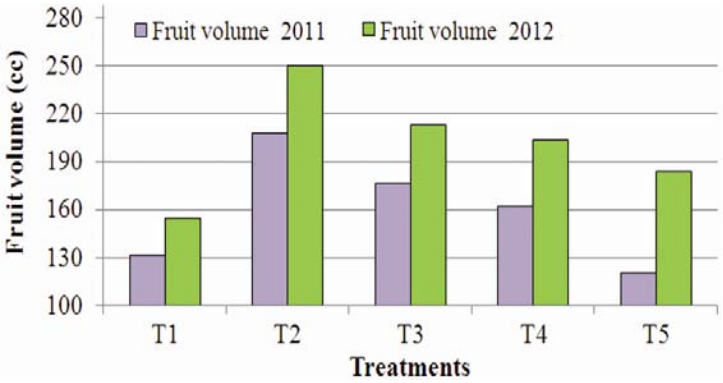
Xyloglucanase and β-glucosidase are important accessory enzymes required for hydrolysis of lignocellulosic biomass. In an effort to reduce the cost of production, tamarind kernel polysaccharide was used as the substrate for production of both enzymes. Further, enhancement of enzymes' production was carried out using Plackett-Burman design and a relatively new methodology, viz. ridge analysis. The results indicate that the tamarind kernel polysaccharide supported production of both enzymes significantly. By statistical analysis, significant media components were identified and optimized.



**457 Effect of fertigation on yield and economics of tissue culture pomegranate (*Punica granatum* L.) cv. Mridula.**

**T Shanmugasundaram & G Balakrishnamurthy**

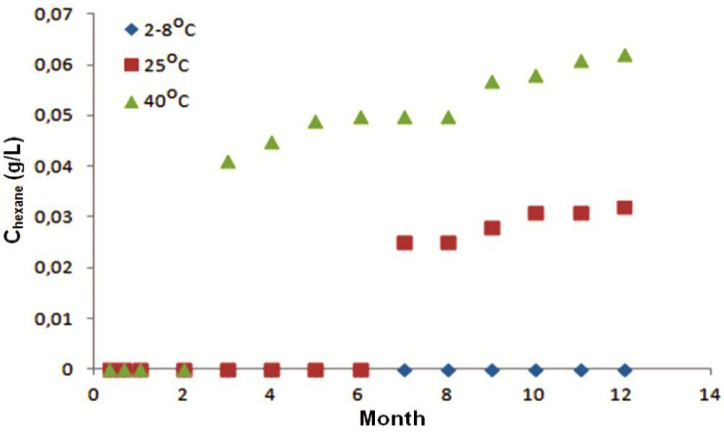
The study was conducted during 2011 to 2013 to find out the effect of fertigation on yield and economics of tissue culture (TC) pomegranate (*Punica granatum* L.) cv. Mridula grown under ultra high density planting (UHDP).The experiments was laid out in randomized block design with five treatment of fertigation levels *viz*., 50, 75, 100 and 125 % recommended dose of water soluble fertilizers (applied twice in a week) including soil application (control) and replicated four times and to test various yield attributes of 2-3 years old TC pomegranate (*Punica granatum* L.) cv. Mridula grown under UHDP. The investigation indicated 50 % recommended dose of fertilizers through fertigation ($T_2$) resulted in maximum number of fruits per plant (52.38), average fruit weight (211.43 g), fruit volume (228.75 cc), fruit yield / plant (11.1 kg), yield per hectare (18.5 tonnes), total cost of cultivation (2,93,600 Rs $ha^{-1}$), net return (11,88,401 Rs $ha^{-1}$) and benefit cost ratio (4.05) as compared with soil application of recommended doses of NPK and higher doses of NPK applied through fertigation.




**461 Determination of hexane impurities in eye drops solutions utilizing HS-GC/FID**

**C Pistos, S Karampela, I Vardakou, I Papoutsis, C Spiliopoulou & S Athanaselis**

The potential deleterious effects of extractables/leachables in pharmaceutical products led the USP, EP and JP to require extractable and toxicity testing of container/closure systems. To that, a HS-GC/FID method was developed and validated for the determination of hexane as potential extractable residue from pharmaceutical container closure system into eye drops solutions. A migration study was further applied in eight eye drops formulations currently marketed products after short and long term exposure of these products at various temperatures. This method allows the establishment of hexane safety qualification thresholds to monitor eye drops solutions products for this residue.

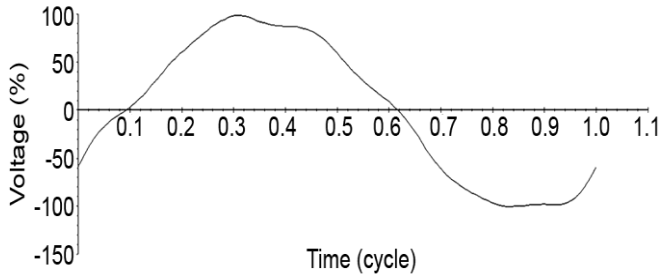


## Energy and Environment

**466 Power Quality Enhancement by Using SVC in Real Time Power System**

**S Sujatha & R Anita**

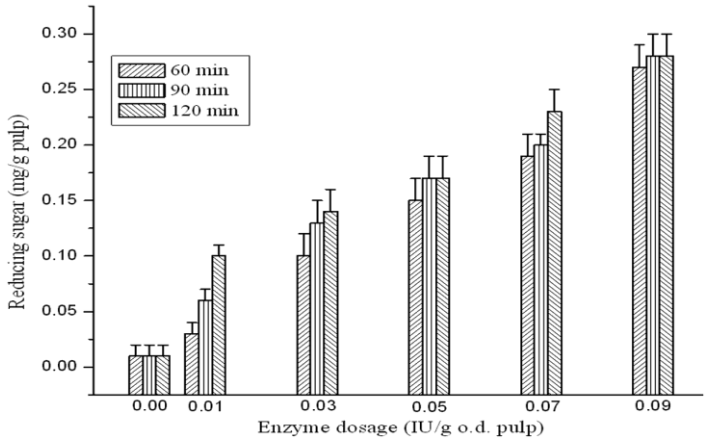
Electrical power distribution system is facing various problems such as unbalanced loading, reactive power burden, harmonic distortion and voltage regulation. The appropriate choice for such problem is the Static Var Compensators (SVCs) due to its low cost and simple control strategy. This paper proposes to minimize the harmonics injected into the power distribution systems by the operation of SVC used in coordination with fast changing loads. The main objective of this paper is to mitigate the harmonics in real time industrial power system and compare the results with IEEE std 519-1992. Industry encounters many non-linear loads like arc furnace, VFD which injects the harmonics. In order to reduce the harmonics and its impacts in this paper introduced the FACTS device such as SVC which effectively reduces the harmonics presents in the supply and there by enhances the power quality.




**471 Cellulase-assisted refining optimization for saving electrical energy demand and pulp quality evaluation**

**R Singh, N K Bhardwaj & B Choudhury**

Papermaking process necessitates fibers to be refined mechanically to develop greater bonding potential. This is achieved in refining step, which requires a huge energy demand. In the present paper, efficiency of biocatalysis was investigated for saving energy by taking different enzyme dosages, reaction times and conditions that were compatible for papermaking process. Bleached mixed hardwood pulp was taken as raw material along with cellulase as biocatalyst to get good quality paper as product. After the enzymatic pre-treatment, pulp was refined in PFI mill. Parameters were compared in terms of number of PFI revolutions required to achieve fixed level of Canadian standard freeness (CSF), 300 ml without affecting the physical strength properties of paper.



## Waste Utlilization

**476** **Extraction of resin from cashew nut sludge an Agro-industrial wastes**

**S Sivamani & P G Priya**

In this work, the extraction of resin from the cashew nut sludge (agro-Industrial waste) was done using three different solvents namely methanol, propanol and diethyl ether. Among the three solvents propanol shows the better results for extraction of resin and it was further confirmed with FTIR, TGA-DTA and DSC. The FT-IR (Fourier Transform Infra Red Spectroscopic analysis was used to explore the structural changes of the extracted resin using propanol. The maximum peak obtained using propanol as a solvent for the extraction of resin was 14-16 min intensity. All the experimental study throughout the present study indicated that the obtained resin has wide application on waste water treatment. In future, it can be used as a cheap substitute instead of commercial resin for a better environment.

## Author-Reader Platform

**479** **Instructions to contributors**