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CREATING SUSTAINABLE DESIGN AND TECHNOLOGY DEVELOPMENT: A CALL FOR INNOVATION

Mohammed Ali Berawi*

Department of Civil Engineering, Faculty of Engineering, Universitas Indonesia, Kampus UI Depok,16424, Indonesia

Technology innovation plays a critical role in expediting transition to a sustainable mode of development and it becomes an important instrument to increase the flow of new ideas and next-generation products. Central to innovation management is the ability to produce worthy ideas for improvement. Creating and accessing idea generation in industrial innovation settings contribute to an essential step towards design and technology development. The acceleration of design and technology development is a key effort to gain product or project competitiveness advantages: producing improved products that draw on the latest technologies and service models. Designs and technologies evolve through different phases and need different approaches to speed them along – from creating ideas, producing new prototypes to product commercialization.

Creating alternatives: Moving Forward

The development and exploitation of alternative ways in producing valuable design and technology are required to satisfy the growing needs of complex goods and services. The source of 'new' ideas can result in two ways, firstly, a search for additional functions that differentiates products and services, and secondly, an improvement in the processes currently used to perform the desired function. The value of a process can be measured in terms of how well it performs essential functions and achieves the desired purpose.

Responding to this issue, we are pleased to present ten selected papers dedicated to the acceleration of sustainable design and technology development. With this theme, the issue discusses technology innovation and ways to find creative alternatives to produce an effective solution for design and technology improvement. The following papers focus on process and technology improvements towards designing better system under study.

The first paper, written by H.B. Aditiya, K.P. Sing, M. Hanif, and T.M.I. Mahlia, examines the effect of acid pre-treatment on enzymatic hydrolysis in bioethanol production from rice straw. The rice straw was first processed with mechanical treatment, followed by acid pre-treatment using 2.0 M sulphuric acid (H_2SO_4) at 90^{o}C for 60 minutes. The glucose yield was found to be 9.71 g/L. Then, the rice straw pre-treated with the acid was hydrolyzed using 24 mg of cellulase from Tichoderma Ressei ATCC 26921 over a 72-hour period, which yielded a total glucose of 11.466 g/L. The research showed that combination of enzymatic hydrolysis and acid pre-treatment yielded higher ethanol content after fermentation compared to acidic pre-treatment alone.

The second paper, written by E. Kusrini, N.S. Shiong, Y. Harahap, Y. Yulizar, Dianursanti, R. Arbianti, and A.R. Pudjiastuti, investigates the effects of monocarboxylic acids (formic acid, lactic acid, and acetic acid) and potassium persulfate on the morphology, structure, and particle size distribution of chitosan nanoparticles. The nanochitosan prepared in the different acids had similar structures based on the FTIR spectra. The lowest concentration of potassium persulfate capable of producing chitosan nanoparticles was about 1.2 mmol; the yields of nanoparticles increased with increased concentrations of potassium persulfate.

Afterward, the third paper, written by D. Tristantini, D. Supramono, and R.K. Suwignjo, examines the catalytic effect of K_2CO_3 in steam gasification of lignite char on mole ratio of H_2/CO in syngas**.** In the gasification process, char with a surface area of 172.5 m^2/g was used along with catalyst, K_2CO_3, in a fixed bed reactor with variations in the steam/char mass ratio (2.0, 3.0, and 4.0) in gasification temperature of 675^{o}C, 750^{o}C, and 825^{o}C, respectively. The results showed that steam gasification using char resulting from controlled pyrolysis achieved the highest mole ratio of H_2/CO both with and without catalysis at gasification temperature of 675°C and steam/char mass ratio of 2.0.

The next paper, written by F. Behzad, H. Bahmanyar, H. Molavi, and S. Manafi, highlights the effects of mother drop diameter, liquid static hold-up, number of stages and rotating speed on mean drop diameter in a Rotating Sieved Disc Contactor (RSDC) for Water-Toluene system. Correlation analyses for mean drop diameter

* Corresponding author's email: maberawi@eng.ui.ac.id, Tel. +62-21-7270029, Fax. +62-21-7270028
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in a RSDC consider the drops break up and drop coalescence with static hold-up. The authors argue that static hold-up and mother drop diameter moderate the effects of the breakage phenomena.

The fifth paper, written by F. Yusivar, H.S. Haslim, Y. Farabi, and K. Nuryadi, proposes an improved scheme for combined regenerative and mechanical brakes in Electric vehicle. A simulation was conducted to validate the effectiveness of the proposed braking control scheme. The simulation was run under SIMULINK in MATLAB with C language programming which was integrated in MATLAB S-function, known as C-Mex S-function. The speed acceleration was limited to 1.2 m/s^2 and the deceleration waslimited to -0.6 m/s^2. The result showed that the proposed method of the combination of regenerative and mechanical braking could be used to compensate the insufficient braking torque because of the voltage limiter.

The sixth paper, written by N. Adriansyah, M. Asvial, and B. Budiarjo, presents an approximation for a Spatial Time Division Multiple Access (STDMA) link-scheduling algorithm based on geometrical node exploitation to improve spatial reuse performance. The geometrical location of nodes was exploited in order to reduce computational complexity and to achieve higher accuracy in Signal to Interference and Noise Ratio (SINR) requirement. The research shows that geometrical parameters, such as the sum of a link's degree and distance, derived through interference and scheduling weight parameters, can be exploited to improve the spatial reuse in a SINR-based STDMA wireless mesh network.

The next paper, written by M.A. Nassar, H.M. Awad, M. El-Sakhawy, and Y.R. Hassan, examines the optimum mixture of virgin rice straw pulp and recycled old newsprint pulp (ONP) on their antimicrobial activities. The ONP pulp was blended with rice straw pulp at 4 intervals ranging from 0 to 100% and it was observed that the blending of ONP with rice straw pulp enhanced the strength of the virgin fiber. The improvement of rice straw pulp was visually evaluated by Scanning Electron Microscopy (SEM) on handmade paperboard sheets. The results showed that most samples have moderate antimicrobial activity against most of the pathogenic microorganisms used, such as *Bacillus subtilis*, *Escherichia coli*, *Candida albicans* and *Asperagillus niger*.

The eighth paper, written by A.E. Husin, M.A. Berawi, S. Dikun, T. Ilyas, and A.R.B. Berawi, presents a forecasting demand on mega infrastructure project to increase financial feasibility of the project. The research approach involves forecasting demand with a System Dynamics simulation model that could provide a reliable estimate and generate scenarios to compare the financial feasibility of the project before and after the process involving innovation of project functions. Analysis involving demand forecasting with the System Dynamics Approach has confirmed that the mega infrastructure project development with additional functions would increase the revenues of the overall project.

The next paper, written by I. Surjandari, A. Rachman, Purdianta, and A. Dhini, proposes a batch scheduling model for dynamic multi-item multi-level assembly in job shop with parallel machines.The models were developed for due date fulfillment and due date assignment in static and dynamic conditions, with the objective to minimize total actual flow time while considering the defect rate at each stage of the process. Insertion technique was used in the scheduling process and performed in batch operations at all available positions on all machines. Furthermore, the computational experiment results verified the validity of the models and the proposed algorithm.

The last paper, written by P. Atmodiwirjo, and K.D. Paramita, addresses the challenges in developing design ideas that can promote creativity in primary school children's learning environment. The findings of the study illustrate how boxes, as simple three-dimensional objects, can be constructed into a system that offers various possibilities for enhancing learning activities. The possibilities offered by the arrangement of boxes and their surfaces indicate the importance of understanding the presence of objects in space not as independent entities but as a part of the whole spatial system. As a result, the author suggests that the learning environment needs to be designed as an integrated system of learning spaces and objects that together can promote creative learning.

I hope that this special edition of IJTech conveys some new insights in the way we conduct our research. I am pleased to accept and respond to any comment and enquiry you may have on the direction and content of IJTech and I invite you to join us in this venture by sending your work for consideration.

With warmest regards from editorial desk,

Dr. Mohammed Ali Berawi
Editorial in Chief