

Editorial Notes

Experimental in Engineering Design and Technology: Improving Research Outcomes

It is widely acknowledged that the use of experimental works have been applied in various research fields, engineering design, and technology in order to increase product performance and quality. For decades, many researches, scientists, and engineers, have used experimental design (e.g. modelling and simulation) to explain some kind of causation, to provide answers to research questions, to control variance (differences), and to reduce design costs. Speeding up the design process, reducing design changes, product material and labor complexity, and achieving manufacturing cost savings are argued as the result of the experimental design. In sum, experimental can be used as a vehicle for knowledge production in research through design, and it helps us to improve our everyday lives.

This season, we are delighted to present the special edition of International Journal of Technology (IJTech) dedicated to improve research outcomes in engineering design and technology particularly through experimental research. This special edition presents twelve selected papers from the 13th International Conference on Quality in Research (QiR 2013) in Yogyakarta, Indonesia. This special issue discusses on the experimental works and simulation of integrated design in urban eco-technology that providing information, evaluation, and empirical solution as well as the contributions to the existing and future development of humanity.

The first paper, written by R. Hendroko, A. Wahyudi, S.K. Wahono, G.A. Praptiningsih, Salafudin, Salundik, and T. Liwang, proposes the utilization of the sludge Crude Jatropha Oil (S-CJO) waste for bio-refinery and improvement productivity of biogas made from dried capsule husk (DH-JcL). By mixing DH-JcL of JatroMas cultivars in the toxic category with the sludge S-CJO as a co-substrate about 10% water at a ratio of 1:8, the authors conclude that S-CJO is appropriate as co-substrate for DH-JcL, and can increase the biogas productivity with feed in less than 10% of S-CJO allocation per day.

The second paper, written by E.F. Karamah, and I. Sunarko, presents a disinfection process of bacteria *Escherichia coli* using a hydrodynamic cavitation method. The disinfection process was conducted in two different contactors; orifice plate and venturi injector, with variations concentration 10^6 CFU/mL, 10^5 CFU/mL, and 10^4 CFU/mL. The result shows that orifice plate gave a better, more effective, and 10 minutes faster disinfection than the venture injector.

The third paper, written by S. Muryanto, A.P. Bayuseno, Sutrisno, W. Sediono, and W. Mangestiyono, examines the effects of flow rates and Cu^{2+} on the kinetics of gypsum ($\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$) scale formation in a piping system. The experiment was carried out using a rig built in-house, and the scaling was monitored by measuring the decrease in Ca^{2+} concentrations of the scaling solution. The authors found that crystallization of gypsum which led to scaling was preceded by induction times (26 to 42 min). Depending on flow rates and impurities concentration of Cu^{2+} , the gypsum scale mass generated can be reduced up to 61%.

Furthermore, Y. Muharam, and H. Septian presents a simulation of gas leakage in a rectangular kitchen room of $3\text{m} \times 2\text{m} \times 3\text{m}$ to obtain the information on fire prevention. Two models were considered; a system without exhaust fan and with an exhaust fan. The result of first model suggests that when the room is in flammability limit of methane, within 38117 seconds the room should be free from the fire triggers. The authors argue that second model demonstrates the increase in the exhaust velocity does not decrease linearly the gas concentration, therefore, if a gas leakage occurs then the gas flow must immediately be stopped and the door must be opened.

The fifth paper, written by Harinaldi, C. Deberland, and D. Rhakasywi, investigated the effect of shape of the orifice of an impinging synthetic jet assembly on the apparatus cooling of a heated surface. The prototype of the synthetic jet actuator coupled with two piezoelectric membranes were used in the heat transfer experiments and CFD simulation by using two orifice shapes; square and circular. Based on the simulation result the authors conclude that the square orifice has a larger covered area than circular orifice, resulting in larger entrainment rate that leads to an increase of convective heat transfer performance.

The sixth paper, written by P.S. Komala, Y. Dewilda, and Z. Wulandari, examines the use of mono culture bacteria using tempe industrial waste water as co-substrate for biodegradating azo dye Remazol Black 5. Sixteen species of pure microorganisms were isolated from anoxic, contact, stabilization and membrane reactors. The tempe waste water was varied in concentration between 10% and 50% v/v. The azo dye

biodegradation in anaerobic condition was best shown by the Isolate A1A, *Exiguobacterium* sp. A2, and *Bacillus* sp. A4 with removal efficiency of 43.82%, 29.94%, and 35.91%, respectively.

The seventh paper, written by S.S. Moersidik, Z.R. Pratiwi, and Zulkifliani, examines the effect of dispersant utilization (solvent-based and water-based) related its performance efficiency in the presence of *Pseudomonas aeruginosa*. The experiment was used varying Dispersant-Oil Ratio (DOR) into 3 levels (1:8, 1:20, and 1:25), and carbon source adaptation into 3 levels (0%, 1%, and 2%). The authors found that effectiveness of both dispersant is similar, around 33% and biodegradation by *Pseudomonas aeruginosa* achieved 25% in 72 hours.

The next paper, written by M.I.M. Thiyahuddin, D. Thambiratnam, Y.T. Gu, and R. Gover, explores the use of composite material (MDPE, steel, water) to enhance the crashworthiness of portable water-filled barriers. A common type of road safety barrier of 2000mm×900mm×600mm was used in experimental impact test with extensive numerical simulations. Their findings show that impact of a road barrier which is 80% filled is a good estimation. The authors conclude that addition of a composite structure greatly reduces the probability of tearing, so that allows the water to remain longer in the barrier to absorb energy.

The ninth paper, written by D.V. Wildsmith, and P. Smith, presents broader images of sustainable green cities as a challenge to the transformation of Jakarta into an eco-architectural hub that balances social, economic, and environmental issues. In comparing the virtual reality of green cities with the actual realities of civic space, traffic congestion, and climate change, the Hotel Indonesia Roundabout and plans for the MRT are analyzed. A visionary design allows for the addition of green parks above the city and underground commercial and transport facilities below the city as one alternative.

The tenth paper, written by M.A. Hadiyat, and R.D. Wahyudi, presents a simulation study to find factor level combination that yield optimum response by adopting the procedures of Response Surface Methodology (RSM) and integrating the Steepest Ascent (SA) method in the Taguchi experiment. A bivariate normal distribution with some additional error terms was generated to represent the surface form of response for two factors; “high” and “low” level values. The authors argue that the proposed SA calculation in the Taguchi experiment is unable to reach the best optimum response, however it still gives a better approach in shifting the factor levels to the closer point for the optimization effort.

The next paper, written by P. Leviakangas, introduces a holistic view Intelligent Transport System (ITS) and the technologies to improve transport system performance in numerous ways. Illustration of the economics aspect of ITS; risks and benefits, ITS and infrastructure investment, estimated impacts of ITS, and the potency of ITS as an industry and market especially in Finland are discussed evidently. As the conclusion is that a solid and tangible base (i.e. companies that deliver hardware, equipment and systems) are the essential factors to build a successful new ITS industry.

The last paper, written by S. Anjani, R. Hidayati, Y.A. Adlan, A. Suzianti, and R.T.V. Hapsari, propose an ergonomically friendly design for a batik stool to reduce musculoskeletal disorders (MSD). The design is tested with the Jack Task Analysis Toolkit in a virtual environment using JackTM 6.1 software. Based on simulation result the authors recommended stool design of 36 cm high, 37.5 cm long, 38 cm wide, a 5° angle from the horizontal surface, with additional backrest height of 46.7 cm, a tilt angle of 100°, and armrest height of 18.4 cm is considered to be more ergonomically friendly for batik crafters according to the decline in Posture Evaluation Index (PEI) scores.

We hope that this special edition of IJTech brings some new insights in the way we conduct our near future research. We are welcoming any comment and enquiry you may have on the direction and content of IJTech and we invite you to distribute this esteemed journal to your colleagues.

With kind regards from editorial desk,



Dr. Nyoman Suwartha
Managing Editor