Editorial Notes

Modeling and Simulation in Engineering Design and Technology: Improving Project/Product Performance

The use of modeling and simulation (M&S) to increase project or product performance within engineering design and technology is well recognized. The reasons for increasing the use of modeling and simulation applications include the ability to simulate complex real world phenomena into efficient, effective and coherent synthetic environment. Modeling and simulation are employed to gain useful insights about different phenomena under study by creating conceptualizations and considering the implementation constraints in order to develop data and fact as a basis for decision making. Modeling is purposeful abstraction and an idealization of reality, resulting in formal specification of a conceptualization and underlying certain essentials assumptions/constraints while simulation is an execution of a model and resides in the implementation level. For decades, many technologist, scientist and engineers have used models and simulation to create system improvement by analyzing, quantifying, and predicting the performance and design indicators of project/product development.

This season, we are pleased to present ten selected papers dedicated to improve project/product performance particularly by employing the modeling and simulation techniques. This issue is particularly aimed at discussing the role of M&S as a mean to gain better understanding on a phenomenon of a system and how it can be used to improve the object under study in an executable way by providing reliable testing environments and other problem-solving techniques. Furthermore, it is my pleasure to introduce Dr. Suwartha to presenting the editorial note for the special issue of IJTech based on selected papers from the 13th International Conference on Quality in Research (QiR 2013).

The first paper, written by S. Sadighi and R.S. Mohaddecy, presents simulation of an industrial fixed-bed catalytic naphtha reformer for producing high octane gasoline, aromatic feedstock, and hydrogen in the petroleum refining by developing a layered-recurrent artificial neural network (ANN) using the back-propagation method. The collected data from the target plant were divided into past horizontal data (80 data points from the start of run to day 800), and future horizontal data (from day 800 to the end of life cycle). The authors argue that ANN could simulate research octane number (RON), flow rate of produced gasoline, and octane barrel level of past horizontal data with AAD% (average absolute deviation) of 0.238%, 0.813%, and 0.853%, respectively.

The second paper, written by M.I. Alhamid, Nasruddin, Darwin RBS, and A. Lubis, presents characteristics COP cascade refrigeration system using Hydrocarbon refrigerant (propane, ethane and CO_2) at low temperature circuit (LTC). From the result of experimental works, the authors argue that the cooling load, the evaporator inlet and outlet temperature difference will increase, while the pressure difference is almost constant. Furthermore, the characteristics of the pressure and temperature of each component and the COP value at low temperature circuit of load variations using an electric heater at 90 W, 120 W and 150 W result in a COP value of 0.35, 0.48 and 0.60, respectively.

The third paper, written by A.A. Al hattami, J.R. Rathod, E.A. Kadash, H.S. Patel, K.D. Patel, and V.M. Pathak, investigates the physical characteristics of Al/n-CdS thin-film Schottky diode at high temperatures. CdS thin films with thickness of 1000 nm was deposited using CdS in a charged form and characteristic parameters of Schottky junctions formed by a thermal vapor deposition of 500 nm of Al films on pre-coated CdS glass substrates were obtained at the temperature range of 303–393 K. As a result, the authors argue that measurements of the Al/n-CdS Schottky diode cause the zero-bias barrier height increase and the flat band barrier height, ideality factor, and series resistance decrease with increases in temperature.

The fourth paper, written by M.A.A. Abdullah, M. Mamat, M. Awang, E. Kusrini, F.N.A. Mubin, and N.H. Sudin, examines the effect of trihexyltetradecylphosphonium (THTDP) on thermal degradation properties of Low linear density polyethylene/organo-montmorillonite (LLDPE/OMMT) nanocomposites. The obtained OMMT and its nanocomposites were characterized by X-ray diffraction, fourier transform infrared spectroscopy, and elemental and thermogravimetric analyses. The authors argue that the LLDPE/MMT nanocomposites show higher thermal degradation level than that for pure LLDPE based on the barrier action of layered silicates within MMT.

The fifth paper, written by N. Suwartha and C.R. Priadi, examines the characteristics of a recharge pond and evaluates the surface water quality changes using the evaluation method of Runge-Katta Order 4. Laboratory analysis results showed the concentrations of Mn, Fe, BOD and COD were exceeding the water quality standards. The water purification process in the pond was found to be faster in respect of BOD and Mn, Fe, and COD were found to have similar results. The 95% response time of the pond was found to be longer for

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Mn, Fe, and COD (t_{95} = 7.5 d) and the BOD had a faster rate (t_{95} = 6.0 d). The authors argue that Mn concentration in the pond will be doubled (0.45 mg/L) and asymptotically converges on a steady state, while the Fe, BOD, and COD reaches the steady state concentration on the day-17th (224 mg/L).

The next paper, written by G. Gunawan, D. Sutjiningsih, H. Soeryantono and Sulistioweni.W, evaluates the soil erosion for supporting integrated water resources conservation management using Remote Sensing (RS) and Geographic Information System (GIS) framework. The assessment on the average annual rate of potential soil erosion was conducted using Normalized Difference Vegetation Index (NDVI) and Slope. Based on the research findings in Manjunto watershed, the authors argue that the eroded catchment area increased significantly from 3.00 tons to 27.03 ton $ha^{-1}year^{-1}$. The levels of erosion hazard in some soil mapping unit are classified in the very heavy category and should be the first priority in soil and water conservation activities.

The seventh paper, written by M. Krit and A. Rebai, provides a modeling joint effect of corrective maintenance (CM) and preventive maintenance (PM) using stochastic modeling and the parametric estimation of CM-PM efficiencies for industrial systems. The assessment criterion of the maintenance efficiency and the failure intensity has been examined in a bathtub form and it shows that the probability of the maintenance action is preventive rather than corrective. The authors conclude that a method for assessing the efficiency relating to the total process of corrective and preventive maintenances can be used to improve the maintenances policies.

The eighth paper, written by N. Putra, W.N. Septiadi, G. Julian, A. Maulana and R. Irwansyah, discusses on the enhancement of heat transfer performance in Micro Channel Heat Exchanger (MCHE) by reducing the size of the hydraulic diameter and adding fluids that has a better thermal conductivity. The authors argue that the addition of nanoparticle in the base fluid is proven to improve the heat transfer of the MCHE, the 5% Al_2O_3-water and 1% SnO_2-water nanofluids are able to absorb the 9% heat and 12% higher than the base fluid. As a result, the overall transfer coefficient of MCHE when using Al_2O_3-water 5% and SnO_2-water 5% can be increased up to 13% and 14%.

The next paper, written by S.C. Kim and H.M. Jung, examines the use of a lead-free fused radiation shielding fiber (RSF) and evaluates its effectiveness by reducing radiation exposure in a CT scan by means of a multilayer structural coating. Two-way ANOVA was used to analyze the changes in radiation dosage and to examine the correlation based on body parts and thickness of the RSF and a Duncan post hoc test was used to examine the difference depending on each condition. Based on the research findings, the authors argue that this study support the use of the RSF developed in reducing low-dose exposure to secondary X-rays, such as scattered rays. The benefits of using eco-friendly materials (e.g. Ba) for RSF include reducing the weight of the shielding material and assisting in the development of various radiation protections as a way to reduce unnecessary radiation exposure.

The last paper, written by E.A. Setiawan and K. Dewi, examines the use of reflector from stainless steel mirror and aluminum foil to increase the production of electric power. The research examines the effects of flat reflectors on the parameters and I-V characteristic curve of the solar panels. The parameters comprising of solar radiation at solar panel level, solar panel temperature, maximum power output (PMPP), voltage when PMPP is reached (VMPP), current when PMPP is reached (IMPP), short circuit current (ISC), open circuit voltage (VOC), and Fill Factor (FF). Reflector tilt angle were measured at 30, 45, 60, and 75 degrees. The authors argue that the greatest increase in electric power produced by the solar panels is achieved at 75 degrees tilt angle. Aluminum foil reflector and stainless steel mirror can increase the power output of solar panels to around 31.5% and 21.5%, respectively.

I hope that this edition of IJTech conveys some new insights in the way we conduct our research and I am very pleased to announce that, beginning with the first 2010 issue, the IJTech is indexed in various academic journal databases such as SCOPUS, EBSCO, DOAJ and others. This progress is not only a welcome mark of recognition for IJTech but also is important to researchers choosing the best place for publishing their works. Therefore I am pleased to invite you to join us in this venture by sending your work for consideration.

With warmest regards from editorial desk,

Dr. Mohammed Ali Berawi
Editor-in-Chief