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Review of doctoral Thesis

Dissertation Title: Integrated Approach of Intelligent Asset Maintenance and Resource Conservation for Circular Economy

Author: MEng. Hon Huin Chin

Doctoral dissertation by MEng.Hon Huin Chin brings the extended analysis of the Pinch-based methods in conserving the material resources for an industrial site. The topic is very important in the actual great consumption in the contemporary global industrialization in contrast to the natural material resources consumption. Thus, the ideas and results on the design and formulation of the theoretical mathematical models for the process control of the mass resources consumption as well as waste discharges reduction in frame of process integration well corresponds to the actual circular economy needs.

The presented four developed models are based both on the idea of a Pinch Analysis and the so-called Onion Model based also on the Circular Integration concept. The cases studies confirm the possible applications of this approach. Contemporary, water pollution is a very serious problem, its scarcity and resorting to clean fresh water. This very important task which needs a theoretical support from the science and research sector.

First of all, it is possible to stress the following main contributions of the author dissertation to The developing advanced approaches for resources conservation and asset maintenance.

Next is necessary to mention the methodology the Process integration based on the combination of the Pinch Analysis and the multi-level fresh resources extension to the total Site Mass Integration on the higher level of process design and its industrial production in worth products with a good practical application production on the market in frame e.g. Eco-Industrial Park and Industrial Symbiosis. The developed methodology is also useful to Fault Diagnosis of process units.

The topics of the thesis also extends the knowledge to the incorporation of different types of resources, and water integration, into the resource conservation network. Such problems are

currently of a considerable importance, both in terms of circular waste treatment as secondary raw materials for the synthesis of valuable products, and also because of the environmental aspects as a waste material regeneration. This is a important way for the technology and the economical objective optimization of variant to the new technological processes being developed.

The concept map to a model the multi-resource integration, tracing the processing of the 3way trade-off paths of the transformation of the secondary raw materials to products and servise in an import triangle structure, forming a system of circularity were described as well.

Later on, the results of MEng.Hon Huin Chin,presented in his dissertation extended set of his publications which were published in 5 articles 3th times he was the first author, in the impacted the high prestige journals (Q1 andQ2); (Impact Factors3.0 - 11.5 and Cite Score 14.7-1.1), next 5 publications with Cite Score 4th times he was the first author and finely 9 International conferences presentation 8th times he was the first author (China, Grecee, Bosnia+ Herzegnovina, Czech, Russia, Croatia impacted, the high prestige journals (Q1 andQ2); (Impact Factors3.0 - 11.5 and Cite Score 14.7-1.1),

Next 5 publications with Cite Score and finely8th times he was the first author 9. International conferences presentations (China, Grecee, Bosnia+Herzegnovina, Czech, Russia, Croatia, 8th times he was the first author of the works It is therefore clear that MEng.Hon Huin Chin´s achievements have been successfully assessed by the scientific community of the field at international level.

The author of thesis formulated his dissertation as a very erudited engineer with a wide overview of professional literature and knowledge in the fields of chemical technology, chemical reaction engineering, industrial economy, physical chemistry, as evidenced by the individual chapters of the text of his dissertation: The formulation of complex mathematical models for describing transport phenomena. Theoretical experience of Meng.Hon Huin Chin is very evident from his dissertation theses, which can be demonstrated in the application of various numerical methods for the description of the real technology process. It is very valuable on the dissertation that Meng.Hon Huin Chin managed to verification of the certain process control parameters in testing of the proposed mathematical modeling.

In summary, the doctoral Thesis - dissertation dealt with an important topic, which is undoubtedly proposals for procedures for the design and control processing and rational use of mass transfer process integration, wastes utilization in frame of the circular economy, and economy profits. The proposed complex process models allow the future simulation of process to analyze the influence of control parameters on the contents of product components at each stage. Undoubtedly, the author's efforts to test the possibility of intensifying the processing of wastes, are undoubtedly also beneficial.

Graphical editing of text is at a high level and the description of the process simulations performed is detailed and can thus be useful in the further continuation of research in the given field.

Finally, I would like conclude that the submitted dissertation by MEng.Hon Huin Chin it meets all the conditions laid down in the doctoral dissertation and therefore I strongly recommend his thesis to be accepted for the defence.

14th October,2021, Prof. Ing. Jiří Hanika, DrSc., Dr. h. c.