

Book reviews

Benchmarking In The Process Industries

Munir Ahmed and Roger Benson, Institution of Chemical Engineers, Warwickshire, UK, 1999, 155 pp, £45, hardback, ISBN 0-85295-411-5

Benchmarking is a process of learning from a comparison. It is a method of getting external inputs to effect improvements. However, the term 'Benchmarking' has many connotations. Those in 'hard' disciplines like engineering, traditional business management, etc., look at the term benchmarking mostly from a measurement and comparison perspective. Those dealing with 'soft' subjects like architecture, marketing, social science, etc. highlight learning and improvement aspects. However, recent experience both in the East and the West has shown that both these perspectives need to be married. Benchmarking could, therefore, be interpreted as a method of measuring, learning, and adaptation. Following the above paradigm, this book has looked at Benchmarking as a process of measuring and comparing performances with the best in the world, with the intention of learning and hence continuously improving. It has, therefore, rightly emphasised the process of comparison, not only in terms of hard performance measures, but also in terms of qualitative measurements of underlying practices and related people aspects. In terms of typology of benchmarking, the book has taken a more holistic meaning of benchmarking, covering both performance and process benchmarking. The overall paradigm on benchmarking as used by the authors deserves a special appreciation from all.

The book essentially deals with the process manufacturing sector, covering a large number of industries such as chemicals, pharmaceuticals, food, steel and similar others. The core process in such manufacturing industries makes use of the well-developed disciplines of chemical technology and chemical engineering. It is very surprising that there has been a considerable expenditure of effort on measurement and on the optimisation of technical efficiency of such core processes, but there has been a very little work on the measurement and improvement of a process manufacturing unit as a whole, covering all the related technical and administrative operations. The authors of this book have rightly selected the total manufacturing process as a focus for benchmarking. This has made the book a highly useful one to both academics and practitioners. The authors have very clearly highlighted the emerging vision of

such a manufacturing unit while dealing with the subject of benchmarking. The vision reads as, "A world-class process manufacturing plant delivers outstanding safety, health and environmental performance, exceeds customer requirements from very reliable assets, exhibits operational excellence and is operated by highly motivated people". The above mentioned vision has been shown very clearly as a driver for setting up an appropriate performance measurement system.

There are two terms 'world-class' and 'excellence' that have been often used to speak about those units which are said to have achieved a distinction of being good performers over a period of time. The authors of this book have, therefore, attempted several performance indicators that reflect good performance of a process plant. Some of the indicators include OTIF (On Time In Full Delivery), OEE (Overall Equipment Effectiveness), SHE related indicators, etc. More than that, the authors have done a great job by providing Benchmark Values for a world-class unit in respect of each of the above mentioned indicators. These Benchmarks could be used by practitioners without much difficulty. Here lies the utility of the book to practitioners. The reviewer has not seen many books or monographs, which provide such Benchmark Values.

The authors have very rightly emphasised that sustained good performance can only be achieved if a plant follows technical and managerial practices of a higher order. They have, therefore, attempted to provide some guidelines for assessing practices and human resource related attributes. However, these guidelines are rather sketchy. The utility of this book could have been enhanced had the authors, even briefly, discussed the fundamental principles of measurement for assessment of such 'soft' aspects. We would be highly delighted if the authors were to attempt to write another book focusing on such measurement aspects. They mention various frameworks to identify processes and practices. However, it is very surprising to note the absence of the process classification system which has been developed by the International Benchmarking Clearinghouse, run by the American Productivity and Quality Centre, Houston, USA.

Finally, may I express my great appreciation again to the authors for the lucid presentation of plant level performance indicators and Benchmark Values against each one of them. This book is of great value to practical managers working in process industries. It has also attempted to predict the

impact of the emerging developments in process engineering technology on World-class Benchmarks. The book may be of interest to process technologists and is definitely worth reading by all who are interested in Benchmarking in the Process Industries.

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Principles Of Physical Chemistry: Understanding Molecules, Molecular Assemblies, Supramolecular Machines

Hans Kuhn and Horst-Dieter Försterling, John Wiley & Sons, Ltd, 1999, 970 pp, £27.50, paperback, ISBN 0-471-96541-3, paperback, ISBN 0-471-95902-2, hardback

This book reflects a significant effort to present most of the topics traditionally covered in Physical Chemistry textbooks as well as fast developing subjects (biophysics, supramolecular machines) in a novel and unconventional manner. Thus, the book constitutes an alternative approach to Physical Chemistry not only with respect to its content but, more importantly, with respect to the method of presentation and structure of its material.

The traditional sequence of introductory courses in Physical Chemistry, which involves the coverage of classical thermodynamics first, followed by that of classical and quantum mechanical statistical thermodynamics, is now reversed and the postulates of quantum mechanics are introduced right from the beginning (noticeably, the very first chapter of the book is devoted to wave-particle duality). The authors choose to treat Physical Chemistry subjects with emphasis on the microscopic origin of the macroscopic properties of the matter. Modelling the behaviour of atoms and molecules as well as their interactions by means of quantum and classical mechanics leads to the prediction/interpretation of the macroscopic behaviour of systems of increasing complexity. The principles of Physical Chemistry thus derived are checked and applied to experimental facts throughout the text.

The first third of the book (Chapters 1–10) is, in my opinion, the best part of it and deals with quantum mechanics basics, atomic properties, the chemical bond and intermolecular forces. It introduces all basic types of spectroscopy in connection with predictions of atomic and molecular behaviour. The underlying mathematics is rigorous but excellently presented, in a clear and step-by-step manner (this is a general feature of the mathematical content of the entire book). The chapters on atomic and molecular orbitals are very comprehensive and contain sufficient drawings, while emphasis is given in π -electron systems and the application

of the Hückel molecular orbital method to a number of systems. Also, the chapter on light absorption and emission is full of useful examples.

The second part of the book (Chapters 11–21) deals with the more traditional aspects of Physical Chemistry such as equilibrium thermodynamics, chemical and phase equilibrium and chemical kinetics. Again, emphasis is put on the microscopic models describing the macroscopic properties of matter, with the help of quantum and classical statistical thermodynamics. Although the presentation of the principles (especially in the case of the laws of thermodynamics) is skilfully done based on a number of typical examples, some secondary but standard subjects (for example activity coefficients, azeotropes, electrochemical kinetics, etc.) are either only briefly discussed or not presented at all. Obviously, this was due to space limitations since the book contains extensive material on quantum mechanics and new areas of interest (see final chapters), but I still feel that the material omitted is required for undergraduate level studies.

The final part of the book (Chapters 22–24) covers, in a very concise way, organised assemblies (films, liquid crystals and polymers) with particular emphasis on their applications and discusses two brand new topics in Physical Chemistry, namely that of supramolecular assemblies and the correlation of supramolecular engineering with the origin of life. Many fascinating examples of supramolecular machines (that is of systems of co-operating molecules) such as sensors, transducers, processing devices, memories and energy converters are described. The principles of tailoring the behaviour of matter by using the lock-and-key technique and programmed environmental change (supramolecular engineering) are extended to the rationalisation of the origin of life, the living form of matter. This last chapter, although profound and thought provoking is rather too advanced and demanding to be included in an undergraduate textbook.

This work contains a number of numerical problems and their solutions, aiming at the application of the presented principles to characteristic cases. Other useful insets include 'Boxes' containing the discussion of specific topics that are not covered in the main text body, and 'Foundations' which contain detailed proofs of relationships and in depth analysis of important points. Finally, an extensive list of up-to-date further readings is given for each chapter.

Summarising, 'Principles of Physical Chemistry' by Kuhn and Försterling is a very interesting and truly novel approach to the subject which could be used as an auxiliary textbook for undergraduate science students (chemists, physicists, biologists) and should also be useful to teachers who want to get familiar with a modern look into Physical Chemistry.

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