

# FACTORY PHYSICS

*Third Edition*

Wallace J. Hopp  
Mark L. Spearman



# Factory Physics Third Edition

**Fumihiko Kimura**



### **Factory Physics Third Edition:**

**Factory Physics** Wallace J. Hopp, Mark L. Spearman, 2011-08-31 Our economy and future way of life depend on how well American manufacturing managers adapt to the dynamic globally competitive landscape and evolve their firms to keep pace. A major challenge is how to structure the firm's environment so that it attains the speed and low cost of high volume flow lines while retaining the flexibility and customization potential of a low volume job shop. The book's three parts are organized according to three categories of skills required by managers and engineers: basics, intuition, and synthesis. Part I reviews traditional operations management techniques and identifies the necessary components of the science of manufacturing. Part II presents the core concepts of the book, beginning with the structure of the science of manufacturing and a discussion of the systems approach to problem solving. Other topics include behavioral tendencies of manufacturing plants, push and pull production systems, the human element in operations management, and the relationship between quality and operations. Chapter conclusions include main points and observations framed as manufacturing laws. In Part III, the lessons of Part I and the laws of Part II are applied to address specific manufacturing management issues in detail. The authors compare and contrast common problems, including shop floor control, long range aggregate planning, workforce planning, and capacity management. A main focus in Part III is to help readers visualize how general concepts in Part II can be applied to specific problems. Written for both engineering and management students, the authors demonstrate the effectiveness of a rule-based and data-driven approach to operations planning and control. They advance an organized framework from which to evaluate management practices and develop useful intuition about manufacturing systems.

**Factory Physics** Wallace J. Hopp, Mark L. Spearman, 2001 Publisher Description *Factory Physics* Wallace Hopp, 2007 After a brief introductory chapter, *Factory Physics 3e* is divided into three parts: I The Lessons of History, II *Factory Physics*, and III Principles in Practice. The scientific approach to manufacturing and supply chain management developed in Part II is unique to this text. No other text or professional book provides a rigorous, principles-based foundation for manufacturing management. The Third Edition offers tighter connections between Lean Manufacturing, MRP, ERP, Six Sigma, Supply Chain Management, and *Factory Physics*. In addition to enhancing the historical overview of how the *Factory Physics* framework evolved, Wallace Hopp, 2000-04 *Factory Physics* Wallace Hopp, Mark Spearman, 2007-10-24 After a brief introductory chapter, *Factory Physics 3e* is divided into three parts: I The Lessons of History, II *Factory Physics*, and III Principles in Practice. The scientific approach to manufacturing and supply chain management developed in Part II is unique to this text. No other text or professional book provides a rigorous, principles-based foundation for manufacturing management. The Third Edition offers tighter connections between Lean Manufacturing, MRP, ERP, Six Sigma, Supply Chain Management, and *Factory Physics*. In addition to enhancing the historical overview of how these systems evolved, the authors show explicitly how users can achieve Lean Manufacturing objectives: faster response, less inventory, using the integration aspects of MRP, ERP, SCM systems along with the variance analysis methods of Six Sigma.

Factory Physics provides the overarching framework that coordinates all of these initiatives into a single focused strategy

*Factory Physics* Wallace Hopp, 1995-09 After a brief introductory chapter *Factory Physics* 3e is divided into three parts I The Lessons of History II *Factory Physics* and III Principles in Practice The scientific approach to manufacturing and supply chain management developed in Part II is unique to this text No other text or professional book provides a rigorous principles based foundation for manufacturing management The Third Edition offers tighter connections between Lean Manufacturing MRP ERP Six Sigma Supply Chain Management and *Factory Physics* In addition to enhancing the historical overview of how these systems evolved the authors show explicitly how users can achieve Lean Manufacturing objectives faster response less inventory using the integration aspects of MRP ERP SCM systems along with the variance analysis methods of Six Sigma *Factory Physics* provides the overarching framework that coordinates all of these initiatives into a single focused strategy

**Manufacturing Systems and Technologies for the New Frontier** Fumihiko Kimura, 2008-05-19 Collected here are 112 papers concerned with new directions in manufacturing systems given at the 41st CIRP Conference on Manufacturing Systems The high quality material includes reports of work from both scientific and engineering standpoints *ebook: Managing Operations Across the Supply Chain* Swink, 2016-09-16 *ebook Managing Operations Across the Supply Chain*

*Project Management: The Managerial Process* 6e Erik Larson, Clifford Gray, 2014-07-16 *Project Management The Managerial Process* 6e *Lean Math: Figuring to Improve* Mark R. Hamel, Michael O'Connor, 2017-01-25 Lean transformations are decidedly more challenging when the math is inconsistent with lean principles misapplied or just plain wrong Math should never get in the way of a lean transformation but instead should facilitate it Lean Math is the indispensable reference for this very purpose A single comprehensive source the book presents standard and specialized approaches to tackling the math required of lean and six sigma practitioners across all industries seasoned and newly minted practitioners alike Lean Math features more than 160 thoughtfully organized entries Ten chapters cover system oriented math time the ilities availability repeatability stability etc work inventory performance metrics basic math and hypothesis testing measurement experimentation and more Two appendices cover standard work for analyzing data and understanding and dealing with variation Practitioners will quickly locate the precise entry ies that is relevant to the problem or continuous improvement opportunity at hand Each entry not only provides background on the related lean principles formulas examples figures and tables but also tips cautions cross references to other associated entries and the occasional Gemba Tale that shares real world experiences The book consistently encourages the practitioner to engage in math assisted plan do check act PDCA cycles employing approaches that include simulation and trystorming Lean Math truly transcends the numbers by reinforcing and refreshing lean thinking for the very purpose of Figuring to Improve REVIEWER COMMENTS Hamel and O Connor provide both the novice and experienced lean practitioner a comprehensive common sense reference for lean math For example I know that our Lean Support Office team would have gladly used dozens of Lean Math entries during a recent

lean management system pilot The concepts context and examples would have certainly helped our execution and provided greater clarity during our training activities Lean Math is a must have book for Lean Support Office people Dave Pienta Director Lean Support Office Moog Inc Aircraft Group A practical math book may sound like an oxymoron but Lean Math is both pragmatic and accessible Hamel and O Connor do an excellent job keeping the math as simple as possible while bringing lean principles to the forefront of the discussion The use of insurance and healthcare industry examples especially helps simplify the translation for lean practitioners in non manufacturing industries Readers will be able to use the numerous tables and figures to clearly illustrate and teach lean concepts to others Lean Math is a reference book that every lean practitioner or Black Belt should have in their library Peter Barnett MBB Liberty Management System Architect Liberty Mutual Insurance Lean Math is a comprehensive reference book within which the lean practitioner can quickly find straightforward examples illustrating how to perform almost any lean calculation Equally useful it imparts the importance of the relevant lean principles While coaching some recent transformation efforts I put Lean Math to the test by asking several novice practitioners to reference it during their work They were promptly rewarded with deeper insight and effectiveness a reflection of this book's utility and value to the lean practitioner Greg Lane international lean transformation coach speaker and author of three books including Made to Order Lean Excelling in a High Mix Low Volume Environment While the technical social and management sciences behind lean must be learned by doing their conceptual bases are absolutely validated by the math This validation is particularly crucial to overcoming common blind spots ingrained by traditional practice Hamel and O Connor's text is a comprehensive and readable resource for lean implementers at all levels who are seeking a deeper understanding of lean tools and systems Clear diagrams and real world examples create a bridge for readers between theory and practice theory proven by practice If math is the language of science then Lean Math is indeed the language of lean science Bruce Hamilton President Greater Boston Manufacturing Partnership Director Emeritus for the Shingo Institute Mark and Michael have done a tremendous service for the lean community by tackling this daunting subject There are so many ways to quantify value display improvement and define complex problems that choosing the right methods and measures becomes an obstacle to progress Lean Math helps remove that obstacle Almost daily operations leaders in every industry need the practical math and lean guidance in these pages Now finally we have it in one place Thank you Zane Ferry Executive Director National Operations QMS Continuous Improvement Quest Diagnostics Too many lean books dwell on principles but offer little to address critical how to questions such as How do I use these concepts to solve my specific problem With plain English explanations simple illustrations and examples across industries Lean Math bridges a long standing gap Hamel and O Connor's Lean Math is sure to become a must have reference for every lean practitioner working to improve performance in any modern workplace Jeff Fuchs Executive Director Maryland World Class Consortia Past Chairman Lean Certification Oversight Committee Lean Math fills a huge gap in the continuous improvement library helping

practitioners to translate data activities and ideas into meaningful information for effective experimentation and intelligent decisions This reference comes at a critical time for the healthcare industry as we struggle to improve quality while controlling costs Though we don't make widgets our people processes and patients will benefit from the tools provided in this reference The numerous examples as well as the Gemba Tales scattered throughout the book bring life to the principles and formulas Lean Math is impressive in both scope and presentation of content Tim Pettry Senior Process Improvement Specialist Cleveland Clinic Lean Math is a great book for those times when only the correct answer will do The math along with the Gemba Tales are helpful for those in the midst of the technical aspects of a transformation as well as those of us who once knew much of this but haven't used it in a while Beau Keyte organization transformation and performance improvement coach author of two Shingo Award winning books The Complete Lean Enterprise and Perfecting Patient Journeys Math and numbers aren't exclusively the domain of six sigma Toyota leaders describe lean as an organizational culture a managerial approach and a philosophy They also maintain that the last piece of lean is technical methods which includes the math we need for properly sizing inventory levels validating hypotheses gauging improvement and more Lean Math is a useful book that compiles important mathematical and quantitative methods that complement the people side of lean Hamel and O Connor are extremely qualified to deftly explain these methods Lest you think it's a dry math text there are Gemba Tales and examples from multiple industries including healthcare which illustrate these approaches in very relatable ways Mark Graban Shingo Award winning author speaker consultant and blogger When you begin a lean journey it's like starting an exercise regimen the most important thing is to start But as you mature and as you achieve higher levels of excellence rigor becomes increasingly important Lean Math provides easy elegant access to the necessary rigor required for effective measurement and analysis and does so in practical terms with excellent examples Misael Cabrera PE Director Arizona Department Environmental Quality *Hospital Operations* Wallace J. Hopp, William S. Lovejoy, 2013 In Hospital Operations two leading Operations Management experts and five practicing clinicians demonstrate how to apply new OM advances and metrics to substantially improve any hospital's performance Replete with examples Hospital Operations shows how to generate principles driven breakthrough ideas to systematically improve emergency departments operating rooms nursing units and diagnostic units Back cover *Machine Learning-based Prediction of Missing Parts for Assembly* Fabian Steinberg, 2024-06-18 Manufacturing companies face challenges in managing increasing process complexity while meeting demands for on time delivery particularly evident during critical processes like assembly The early identification of potential missing parts at the beginning assembly emerges as a crucial strategy to uphold delivery commitments This book embarks on developing machine learning based prediction models to tackle this challenge Through a systemic literature review deficiencies in current predictive methodologies are highlighted notably the underutilization of material data and a late prediction capability within the procurement process Through case studies within the machine industry a significant

influence of material data on the quality of models predicting missing parts from in house production was verified Further a model for predicting delivery delays in the purchasing process was implemented which makes it possible to predict potential missing parts from suppliers at the time of ordering These advancements serve as indispensable tools for production planners and procurement professionals empowering them to proactively address material availability challenges for assembly operations

**Manufacturing Mastery** Rebecca Morgan,2021-08-31 While there are those who say manufacturing is dying it is not and will not Without a universal vow of poverty growing economies will only increase demand Manufacturing in the 21st century is not a question of if Rather it is a function of why what who where and how The nature and pace of change in those factors are overwhelming many Fear futile resistance and uncertainty are common While manufacturing will not die individual manufacturing companies will if they do not learn to thrive in this new world This book is a dynamic guide for manufacturing leaders who want to reduce the ambiguity and overwhelming changes and develop a realistic progressive and responsive thinking process that enables success It provides a business operating system framework that is the foundation for connecting the many pieces of a manufacturing business into an effective profitable operation The author walks through the elements relationships capabilities and mutability 21st century manufacturing requires Executives of manufacturing companies will be better able to think about and execute viable strategies leveraging the changing economy Essentially manufacturing is becoming increasingly complex as are business and socioeconomic and political realities Rapidly evolving technology adds to the confusing environment that precludes more of the same better faster and cheaper as a workable business strategy The tsunami of information hitting owners and leaders is overwhelming many and it is easy to become frozen in place Economic growth and improving standards of living require that all of this change be broken into bite size understandable pieces that thaw the minds of executives allowing them to assess what is best right now and move forward This book does not overwhelm with details and models rather it provides thinking and examples in small chunks that enable manufacturers to develop and master skills for high level strategic leadership in ambiguity

**Air Transport and Operations** R. Curran,2012 This book presents the proceedings of the joint conference held in Delft the Netherlands in June 2012 incorporating the 3rd International Air Transport Operations Symposium ATOS the 3rd Association of Scientific Development in Air Traffic Management in Europe ASDASeminar the 6th International Meeting for Aviation Products Support Processes IMAPP and the 2012Complex World Seminar The book includes the majority of academic papers presented at the conference and provides a wide overview of the issues currently of importance in the world of air transport pIOS Press is an international science technical and medical publisher

**Making Apparel Manufacturing Lean** Anand K. Deshpande,2021-06-23 I have been a Lean Management Consultant for the past decade and have been asked interesting questions by my prospects clients I d have to say the most made statement has been Lean only works in the Automotive Industry and is not applicable to our industry This misconception is what triggered me to write a book on Lean

for the various industries that I consult in i e one book for every industry This book on the application of LEAN in Apparel Manufacturing is my first foray into authoring a book This book is an attempt to educate its readers on how to implement the practical aspects of LEAN on the shopfloor It begins with the dissemination of the interrelated elements of the Toyota Production System the objective of TPS and its importance in Production Management The concepts of LEAN and waste elimination are then explained with an overview of the Seven Types of Manufacturing Wastes Value Stream Mapping a frequently used tool to map the waste has been elaborated in four chapters These chapters explain concepts like Product Family Matrix KPI definitions guiding principles to design a Lean process and the construction of the AS IS and the TO BE Value Stream Maps Individual chapters are devoted to the elements of TPS like 5S Visual Management Skill Management Process Standardization and Single Minute Exchange of Dies These chapters explain the concepts and their application in detail equipping you with the required tools and techniques The chapter on Balanced Score Card and Hoshin Kanri explains the mechanism of aligning the vision of the factory to the individual objectives The chapters on A3 Problem Solving and Quality Management initiate the readers to a scientific methodology of problem solving We follow up with chapters on Kanban Systems and WIP Management in order to get a sense of Pull systems The chapter on Total Productive Maintenance lays emphasis on measurement of OEE% and the problem solving cascade We end this book with chapters on Shopfloor Control sustaining a Lean culture and providing a Lean Implementation Model for Apparel Manufacturing I would like to extend my gratitude to Deepak Mohindra Chairman Apparel Resources for his continued support and guidance My wife Manali my daughters Aishwarya Arya and my mother Padma have also been my constant motivators I would also like to thank my past and current clients for implementing my advice This book would be incomplete without mentioning Ashish Grover who was a great support during preliminary Lean pilots on the garmenting shopfloor This book is my tribute to him I hope that this book creates more value for you and your organization Wish you all the best in your LEAN journey

**Production/operations Management** William J. Stevenson,1999 The material in this book is intended as an introduction to the field of production and operations management It is suitable for both undergraduate and graduate students

**Complete Business Statistics** Amir D. Aczel,1999 An undergraduate textbook for majors in business

**Engineering Your Future** Stuart G. Walesh,2012-03-06 Round out your technical engineering abilities with the business know how you need to succeed Technical competency the hard side of engineering and other technical professions is necessary but not sufficient for success in business Young engineers must also develop nontechnical or soft side competencies like communication marketing ethics business accounting and law and management in order to fully realize their potential in the workplace This updated edition of Engineering Your Future is the go to resource on the nontechnical aspects of professional practice for engineering students and young technical professionals alike The content is explicitly linked to current efforts in the reform of engineering education including ABET s Engineering Criteria 2000 ASCE s Body of



Knowledge and those being undertaken by AAEE AIChE and ASME The book treats essential nontechnical topics you ll encounter in your career like self management interpersonal relationships teamwork project and total quality management design construction manufacturing engineering economics organizational structures business accounting and much more Features new to this revised edition include A stronger emphasis on management and leadership A focus on personal growth and developing relationships Expanded treatment of project management Coverage of how to develop a quality culture and ways to encourage creative and innovative thinking A discussion of how the results of design the root of engineering come to fruition in constructing and manufacturing the fruit of engineering New information on accounting principles that can be used in your career long financial planning An in depth treatment of how engineering students and young practitioners can and should anticipate participate in and ultimately effect change If you re a student or young practitioner starting your engineering career Engineering Your Future is essential reading

*Manufacturing Systems Modeling and Analysis* Guy L. Curry, Richard M. Feldman, 2010-11-10 This text presents the practical application of queueing theory results for the design and analysis of manufacturing and production systems This textbook makes accessible to undergraduates and beginning graduates many of the seemingly esoteric results of queueing theory In an effort to apply queueing theory to practical problems there has been considerable research over the previous few decades in developing reasonable approximations of queueing results This text takes full advantage of these results and indicates how to apply queueing approximations for the analysis of manufacturing systems Support is provided through the web site <http://msma.tamu.edu> Students will have access to the answers of odd numbered problems and instructors will be provided with a full solutions manual Excel files when needed for homework and computer programs using Mathematica that can be used to solve homework and develop additional problems or term projects In this second edition a separate appendix dealing with some of the basic event driven simulation concepts has been added

**The Factory System and the Factory Acts** Richard Whately Cooke-Taylor, 1894

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