

# New Directions for



Tokutarō Suzuki

# **NEW DIRECTIONS FOR TPM**

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Tokutarō Suzuki

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## **NEW DIRECTIONS FOR TPM**

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## Publisher's Message

Nearly every week my business requires me to travel somewhere on an airplane. The plane is a sophisticated machine, and I have confidence in it; I trust that it will take off, fly, and land without accident or even minor stoppages of its mechanisms. In the air, with human lives at stake, there is no acceptable percentage of failure. Airplanes are rigorously maintained with that blunt fact in mind.

When it comes to manufacturing equipment on the factory floor, however, a different mind-set usually holds sway. We think it's *natural* for machines to go down. We take for granted that equipment will break down, produce defects, or suffer minor stoppages.

Total productive maintenance (TPM) has evolved from a shift in that mind-set, a new view that a factory can be maintained as impeccably as an airplane must be. In many industries, such as chemical processing or nuclear power generation, the consequences of maintenance failures are in fact no less dangerous than a breakdown in midair.

What does it take to develop this new perspective? A wonderful service of Tokutarō Suzuki's book, *New Directions for*

*TPM*, is the information it shares about how companies have changed their thinking about maintenance and developed new methodologies. Dr. Suzuki is vice chairman of the prestigious Japan Institute of Plant Maintenance, the source of the world's most advanced approaches in TPM. He has years of experience with many companies in Japan and around the world as they pursued the transition to TPM. Productivity Press has been privileged to publish a number of books on TPM as it is carried out in discrete parts manufacturing industries. Dr. Suzuki's book brings together important examples of TPM conversions and activities at companies in several industries not previously described in English, notably the process industry, equipment manufacturing, and office support areas.

In the chapter on process industry applications, Dr. Suzuki presents unique and valuable information on the adaptation of TPM to the special needs of this wide-ranging industry, addressing concerns that include equipment deterioration and periodic shut-down maintenance. He also describes the serious losses that TPM can help eradicate. In implementing autonomous maintenance activities involving the production workers, Dr. Suzuki stresses the importance of allowing enough time for workers to manage maintenance tasks, since employees are typically responsible for operating several pieces of equipment.

As you learn about TPM, you will find that it has as much to do with attitude as it does with maintenance skills. In our factories we tend to draw lines, with maintenance staff on one side and production workers on the other. The attitude is *I run it, you fix it*. There is little notion of shared responsibilities.

TPM institutes a new perspective. Yes, it builds skills, but more important, it gives production people a new sense of ownership and pride in the equipment as they learn the importance of cleaning and inspection. Moreover, a partnership develops between maintenance staff and the equipment operators, so that together they can detect early warnings of failure and take corrective action.

This new attitude is described particularly well in Chapter 3, in the example of Toyoda Machine Works, a production equipment manufacturer that won a coveted PM Prize in 1988. We in the West have the notion that a factory, by definition, is smelly, dirty, and inhospitable. As part of its drive to improve maintenance, Toyoda Machine Works instituted a campaign to turn each of its workplaces into a "showroom" — a clean, smooth-running shop that a customer would be glad to visit. The book describes the showroom certification program developed at Toyoda to create this atmosphere. Of course, it is not only the customers who benefit from such activity. The employees make the effort for themselves, for the pride they develop in their workplace when it is always kept spotless and visit-ready.

At the heart of this transformation lie order, simplification, and a disciplined commitment to putting equipment in its optimum condition. In the West, we see a new piece of equipment and think that at that point it is in the best condition of its service life; deterioration is assumed. In Japanese companies practicing TPM, that new piece of equipment is actually in its *worst* condition — a starting point for continuous upgrading and improvement during its service life. Continuous improvement applies not just to products and to processes, but to the machines themselves.

Chapter 4 of the book describes how world-class companies such as Toyoda Machine Works and the Aisin Group are spreading the TPM approach companywide, to encompass non-production areas like clerical support, design and development, and sales work. This approach involves more than just maintaining equipment like typewriters or computers, although that is part of it. Rather, it is a larger view of the entire work system as a "machine" for processing information. The conversion to an "information factory" emphasizes improvement of processes as well as the physical layout for smooth-running systems. It is an intriguing approach that has the potential to revolutionize the way we organize office work.

Dr. Suzuki's book offers valuable tips for every forward-thinking company striving to best its competitors. TPM is an essential weapon in the economic battles of the 1990s and beyond. As the examples in this book show, there is virtually no industry and no workplace that cannot benefit from its principles.

We sincerely appreciate the opportunity to work with Dr. Suzuki in producing this book. Our thanks also to Yoshiki Takahashi, executive vice president and secretary general of the Japan Institute of Plant Maintenance, for granting permission to produce this English edition. We are grateful to John Loftus for his excellent translation.

Thanks also to many people at Productivity Press who participated in creating this book: Bruce Graham and Karen Jones, developmental editing; Mugi Hanao, translation and correspondence; Dorothy Lohmann, management of manuscript editing, with Laura St. Clair, word processing and proofreading; Christine Carvajal, copyediting; and Jennifer Cross (indexing); Gayle Joyce, production management and typesetting; Gayle Joyce, Michele Saar, and Carla Tolbert, art preparation; and Gary Ragaglia, cover design.

Norman Bodek  
President, Productivity, Inc.



# Foreword

My first contact with TPM was in 1977. The Japan Institute of Plant Engineering (JIPE, the predecessor of JIPM) organized a maintenance management study tour to Europe. As part of the tour, JIPE members spent a few days at Manchester University exchanging views on maintenance management with my colleagues and me and, among other things, presented an explanatory case study, based on the expertise of Toyoda Gosei Ltd., of the ideas of TPM. I was greatly impressed with what appeared to be a new and different approach to industrial maintenance management. Shortly afterwards I had the opportunity of visiting Japan to study TPM in a number of companies. These visits confirmed my initial enthusiasm for TPM. In particular, I was interested in why the many initiatives to promote a proactive maintenance approach had failed in Europe but succeeded, via TPM, in Japan. I came to the conclusion that TPM had succeeded for the following main reasons:

- A belief by corporate management in the importance of maintenance and the realization that some resources have to be expended for long-term gain.

- The use of the “small group” approach, superimposed on the existing organization, to initiate and establish the ideas, concepts, and acceptance of TPM. As the Japanese say, “it will not work without the participation of all concerned.”
- The traditional structures of Japanese organization, which tend to break down organizational polarization and create the ideal environment for TPM, i.e.,
  - overlapping groups to enhance horizontal and diagonal communication
  - empowered shop-floor groups further subdivided into teams
  - the extraordinarily high level of “indoctrination” in company values and of conventional training

At that time it appeared that the technique would be difficult to apply in the United Kingdom because of that country's very different industrial environment. In addition I felt that, even if industrial relations improved, the U.K.'s social culture would inhibit transferability of the technique. I need not have been concerned, as the many successful European applications of TPM over the last 10 years have shown (e.g., Renault [France], Volvo [Belgium], Nissan [U.K.]).

It should be noted that the above companies are all from *manufacturing* industry. Can TPM be applied in the very different maintenance environment of the process industry (oil refineries, steelworks, aluminum smelters, etc.)? The answer to this question is *undoubtedly* yes, and again there are European examples: Hoechst (chemicals), Usinor Sacilor (steel). However, one of the difficulties of introducing TPM in the process industries has been the lack of a relevant textbook with industrial examples. I believe that *New Directions for TPM* answers this need.

The opening chapter outlines and reviews the definition, concept, principles, and procedures of TPM. It provides an excellent foundation for the main thrust of the book, which comes in Chapter 2, “TPM in the Process Industry.” This chapter is the

only written work I have come across that provides a clear and concise description of how TPM can be applied in the process industries, and in this sense it is definitive. It will be of considerable value to those engineering managers who wish to put TPM into practice in their companies.

The uniqueness of the text does not end there. Chapter 3 considers the application of TPM at companies that design and build plant for the process and manufacturing industries. It points out that such companies are in a unique position to influence the effect of maintenance on life-cycle costs. Chapter 4 shows that TPM is most effective when all the departments within a company, and not only production, are involved in its application. In both these chapters, Dr. Suzuki shows how TPM can be applied in practice and backs this up with excellent industrial examples.

I consider that this book provides a major advance in the literature on this topic. Most important, it is an invaluable text for all of those practicing engineers and students of engineering and management who are (or will be) directly or indirectly involved in industrial management.

Dr. Suzuki's readers will be fortunate in having such a book written by a man with such comprehensive and detailed knowledge of this important subject area. For my part, I am pleased to be his friend and honored to have had the opportunity to write this foreword.

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*An expert on maintenance management, Dr. Kelly held several industrial positions before joining the University of Manchester. He is the author of numerous papers, as well as two maintenance management textbooks that have been translated into several languages.*

# Preface

The promotion of TPM to Japanese industry began in 1971. Since then, thanks to the many corporations that have poured their energies and resources into TPM, this system is now spreading to all levels of industry.

The number of companies that the Japan Institute of Plant Maintenance (JIPM) directly supports in introducing and establishing TPM has reached approximately 200. In addition, the number of applicants for the PM Distinguished Plant Prize (PM Prize) has increased dramatically in recent years. In 1988, 21 businesses were awarded a PM Prize (including one Special Prize winner). In 1989, 51 took up the PM Prize challenge.

JIPM continues to work in many ways to support the introduction of TPM into companies and the achievement of concrete results. Methods used include counseling by TPM General Research Institute consultants, education and training programs, publications, services to corporate JIPM members, services to companies by regional JIPM branches, and informal managerial discussion groups hosted by top executives.

In addition, JIPM has published a wide range of books and journals with the help of corporate members and other companies practicing TPM. However, the materials published so far

focus on the use of TPM in the fabrication and assembly industries and do not necessarily address current trends.

Thus, this book emerged in response to recent developments in TPM and as a guide to companies embarking on TPM, currently implementing it, or wishing to build on their success as PM Prize winners.

This book not only reflects current trends in TPM dissemination but describes various directions in which TPM should move. It is now developing in a number of different ways.

The first of these is its expansion into the process industry, which differs from the fabrication and assembly industries in that most of the reactions and processes from introduction of raw materials to output of final product cannot be observed. The TPM approach and the types of activities practiced must be adapted to the unique characteristics of this industry, taking into account the particular factors affecting production, types of loss, control systems, diagnostic techniques, safety and pollution considerations, and so on.

The second direction TPM is taking is its implementation by equipment manufacturers. This is an appropriate direction for TPM, since it properly covers the entire life span of plant and equipment.

The third direction is its increasing use on a companywide basis. Whereas TPM used to be the exclusive province of the production department, it is now rippling out to every other corporate department, including product development, sales, administration, and support. The philosophy of TPM is helping companies grow by involving all employees from top managers to front-line workers, encouraging the hands-on approach, meshing the top-down and bottom-up management styles, changing people and equipment, reforming the company's organizational base, and creating efficient and rewarding workplaces. This philosophy pertains equally to all departments, so when TPM does develop into a companywide activity practiced by all, it brings incalculable benefits. This development indi-

cates that TPM is no longer limited to equipment maintenance but is expanding into an activity designed to optimize the maintenance of entire production or management systems.

The fourth direction that TPM is taking is internationalization. Interest in TPM is growing rapidly, not only in Japan but also in North America, Europe, China, and the rest of Asia. As a result, there is an increasing number of mutual visits made and training courses held among companies in these regions.

Drawing on these trends, this book outlines a basic philosophy of TPM and puts forward specific promotional methods, with the aim of helping new TPM developments to proceed as smoothly and efficiently as possible. In writing this book, I made use of valuable materials from many firms, including Ajinomoto, Daicel Chemical Industries, Sekisui Chemical, Aisin Seiki, Aisin AW, Aisin Takaoka, Toyoda Machine Works, Toyoda Automatic Loom Works, Toyota Auto Body, Tokyo Foundry, Nippon Steel, Dai Nippon Printing, Daihatsu Motor, and Nissan Motor. I offer my sincere gratitude to all those concerned for their assistance.

The book starts with an overview of TPM, its current state of development, and directions in which it is headed. It then treats the application of TPM in the process industry, focusing on the unique characteristics of that industry. Next, it takes up the implementation of TPM by equipment manufacturers, in a discussion that is relevant to the process industry as well as the fabrication and assembly industry. It then deals with the companywide deployment of TPM, describing methods of applying it to departments such as product development, sales, administration, and support. Finally, it reviews the problems of introducing TPM into non-Japanese countries and stresses the need to tailor TPM introduction to particular cultures.

I strongly urge top company executives and managers in all departments to read this book. Front-line supervisors will find the book useful for its specific examples of TPM implementation methods.

To apply TPM, you must first identify the particular characteristics of the industry or department where it is to be applied, then establish its basic concepts and philosophy and adopt specific approaches. I hope this book will prove useful for this purpose.

Every company has its own unique culture and atmosphere, formed gradually over the years through the efforts of its entire work force, and these distinctive traits will, of course, affect the way in which the company applies TPM. For that reason, this book is intended as a general reference tool only; the application of TPM should indeed incorporate the best of these individual characteristics.

Many Japanese companies have already established themselves overseas and are contributing to their host countries through their remarkable activity. TPM implementation by such companies will play a major role in spreading TPM to countries outside of Japan.

I shall be happy if this book contributes in some small way to the future dissemination and development of TPM. As I have mentioned, it could not have been produced without the generous cooperation of people from many companies. Its publication marks a milestone in TPM development, a development I hope continues to take different directions. At the same time, I remain confident that companies now practicing TPM will continue to find it an essential tool in the achievement of business success.

Tokutarō Suzuki

Director, TPM General Research Institute

Vice Chairman, Japan Institute of Plant Maintenance

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