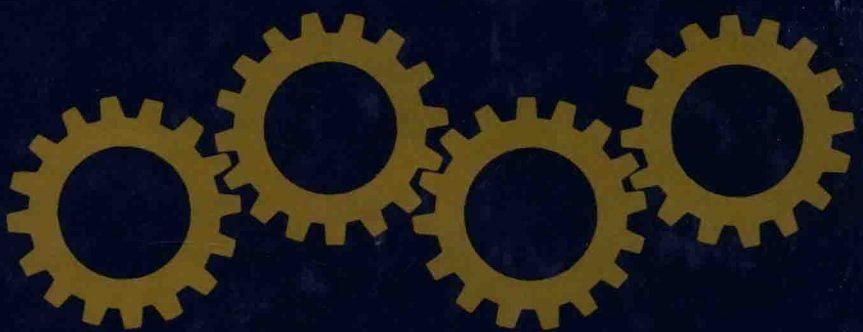
TPM

INTRODUCTION TO TPM

TOTAL PRODUCTIVE MAINTENANCE



Seiichi Nakajima

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Preface by Norman Bodek, President, Productivity, Inc.

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Publisher's Foreword

I am very grateful for the opportunity to publish the English version of *TPM: Introduction to Total Productive Maintenance* by Seiichi Nakajima, Vice Chairman of the Japan Institute of Plant Maintenance. TPM is an innovative approach to maintenance that optimizes equipment effectiveness, eliminates breakdowns, and promotes autonomous operator maintenance through day-to-day activities involving the total workforce. This book introduces those concepts for managers and outlines a three-year program for systematic TPM development and implementation.

The Japanese have a knack for turning good *ideas* into enormously successful *practices*. For example, many Japanese companies applied the ideas of Deming, Juran, and Crosby in innovative day-to-day management and improvement activities to achieve model quality control systems and unparalleled quality records. Similarly, Seiichi Nakajima introduced American maintenance practices in Japan; then, in the early 1970s, he combined those ideas with the concepts of total quality control and total employee involvement to develop Total Productive Maintenance, a system that is revolutionizing plant maintenance around the world.

The changes Nakajima proposes for manufacturing environments are long overdue. TPM promotes group activities throughout the organization for greater equipment effectiveness and trains operators to share responsibility for routine inspection, cleaning, maintenance, and minor repairs with maintenance personnel. Over time, this cooperative effort dramatically increases productivity and quality, optimizes equipment life cycle cost, and broadens the base of every employee's knowledge and skills.

Who can argue with these objectives? After all, the idea behind TPM is not revolutionary — it's just cooperating to get an important job done; for too long, however, we've tolerated some major obstacles to this goal. In many plants operators don't know how to maintain or repair their own equipment, and those who do know are not permitted to do the work because it's someone else's job.

We isolate workers and limit their development by creating exclusive job classifications. Moreover, we thoughtlessly accept the productivity losses that occur when skilled workers are unavailable to repair malfunctioning equipment or treat the first symptoms of imminent failure.

In today's competitive environment we cannot settle for less ambitious goals than the total elimination of breakdowns and other losses and continuous productive maintenance. This means more than periodic overhauls to prevent machine failure. Productive maintenance creatively combines preventive, predictive and maintainability improvement techniques with principles of design-to-life-cycle-cost (DTLCC) to assure reliability in function and ease of maintenance. This is especially important in our increasingly automated manufacturing environments. But this job is too big for a single group of workers and engineers, no matter how skilled they may be; and in attempting it, we lose the productive synergy that develops among people working toward a common goal.

Certainly, every team member has specialized skills, but in a truly cooperative venture, those skills are shared, and everyone grows in understanding and expertise. This approach, practiced by all departments at every stage in the TPM development program, is Japan's unique contribution to the field of plant maintenance.

TPM: Introduction to Total Productive Maintenance is the first book in English on this important subject; a more comprehensive volume on the practical application of total productive maintenance, *TPM Development Program*, will be available from Productivity Press early in 1989. We are proud to make these books available.

I am grateful to Seiichi Nakajima and his staff for their assistance in preparing the manuscripts. I would also like to thank the translator, Keiko Nakamura, and editors Connie Dyer, Camilla England, and Diane Asay for enhancing the original text and making it more accessible for an English-speaking audience. Thanks also to Esmé McTighe, our production manager, and the excellent production team at Rudra Press.

Norman Bodek
President
Productivity, Inc.

Preface

I began studying American preventive maintenance (PM) in 1950 and first visited the United States in 1962. Every year since then I have visited American and European manufacturers to study their manufacturing facilities and learn more about their PM systems. Based on my observations, I developed total productive maintenance (TPM) and introduced it in Japan in 1971.

In September 1987 I led a Japanese maintenance study mission to the United States. During the two-week stay, our team made presentations on TPM at several companies and at the Fourth International Maintenance Conference in Cincinnati, sponsored by the Institute of Industrial Engineers. After we completed the study mission, I left the group to speak in Pittsburgh at a TPM Executive Conference organized by Edward H. Hartmann, president of H.B. Maynard Management Institute. More than 150 executives from 80 companies attended those two conferences. I was impressed by the obvious enthusiasm for TPM in the United States and by the number of people eager to learn how to implement it in their companies.

Although planning for the English version of *Introduction to TPM* began two years ago, publication was delayed for several reasons. I believe, however, since American interest in

TPM expanded greatly in the recent past, that now may be the best time for the book to come out.

The basic concepts of TPM and of the TPM development program have not changed in the five years since the book was published in Japan, but the number and variety of industries implementing TPM has increased and the system is being applied outside Japan as well.

For example, the PM Prize for successful implementation of TPM was awarded to 51 factories in the 12 years between 1971 and 1982, and to 65 factories since then. This averages out to slightly more than three companies per year during the first 12 years, but more than three times as many in the last five years. Furthermore, the level of results achieved by companies has improved each year. Worker productivity increased by 60 percent, and accidental breakdowns were reduced to 1/100 or 1/500 — close to zero. Now *every* winner is clean enough to be called a "parlor" factory, like Aishin Seiki, the first outstanding winner in this category.

Sixty percent of the 116 plants awarded the prize in the last 17 years are Toyota group companies and their parts suppliers. This demonstrates the close relationship between just-in-time production and TPM. A survey of the past five years' prize-winning factories reveals, however, that while continuing to grow in the automobile industry, TPM is also spreading to other industries, such as the semiconductor, food, pharmaceutical, paper, printing, cement, ceramics, petrochemical, and oil refinery industries, with particularly significant development in the process industries.

Along with this expansion across industries, the scope of TPM implementation *within* companies has grown. It now involves everyone in the R & D and business divisions as well as in manufacturing. In effect, TPM improves the efficiency of the total organization, not just its manufacturing facilities. As the use of automation and unmanned operation increases, it becomes ever more important that

facilities function with optimum efficiency. Clearly, to achieve truly efficient production, product development must participate in the TPM effort and the business division must support it logistically with an efficient flow of information and resources.

The movement toward TPM development has also been evident in other countries. Southeast Asia was the first to import it because of geographic proximity. I have conducted seminars in Thailand, China, Korea, and Taiwan, and TPM is being implemented in factories in those countries. (This book was published in Korean in 1985 and in Chinese in 1986.) Communication with European manufacturers has continued since 1970, when the European Federation of National Maintenance Societies (EFNMS) was established. The Japan Institute of Plant Maintenance (JIPM) makes a presentation at every biannual EFNMS Maintenance Conference.

Of the 16 EFNMS member countries, France has made the most progress; currently several French companies are beginning TPM development programs. (This book was published in French in 1987.) Finally, in response to high demand, I have conducted TPM seminars in Brazil for the past two years, and this book will soon be available there. In Japan, we entertain many TPM study teams from these and other countries, which encourages us to believe that TPM is quickly becoming an internationally-recognized system.

Why is this happening? Let me give you my observations on why TPM is applicable to industries in the U.S. and other countries: The most important features of TPM are 1) activities to maximize equipment effectiveness; 2) autonomous maintenance by operators, and 3) company-led small group activities.

Maximizing equipment effectiveness requires the complete elimination of failures, defects and other negative phenomena — in other words, the wastes and losses incurred in equipment operation. This goal is consistent with Philip Crosby's philosophy of zero defects (ZD), an approach to quality

management that is gaining popularity throughout the world. Enterprises adopting the ZD philosophy should readily accept TPM.

The second concept, autonomous maintenance by operators, may be less acceptable in some companies, depending upon the prevailing labor organization. Even in Japan there was resistance to this aspect of TPM in plants where operation and maintenance were clearly separated. Although there may be some difficulty introducing TPM in American industries with strong labor unions, the traditional division of labor may change naturally as more companies implement factory automation systems. If labor unions accept these inevitable structural changes, TPM should not be difficult to introduce.

Company-led small group activity, now widely accepted in Japan, is consistent with Likert's participative management model, with Ouichi's Theory Z management, and with Peters' and Waterman's definition of the excellent company in *In Search of Excellence* (New York: Harper & Row, 1982). If such people-oriented management models are taking root in the United States, then American industries may well be ready to implement TPM.

I hope this book will serve as an introductory guide to those planning to implement TPM and that it will help readers find a new way to survive in these times of intense international economic competition.

My thanks to Steven C. Ott, general manager of Productivity Press, and to all the other staff members who helped produce the English version of this book.

Seiichi Nakajima
Vice Chairman
Japan Institute of Plant Maintenance

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