Continuous Reliability Improvement of Rotating Equipment

Increasing Productivity and Reducing Maintenance Costs Through Outstanding Equipment Reliability

On-Site Training Opportunities

Put TMEII's expertise in maintenance and reliability training to work in your organization

TMEII is a results-oriented resource and provider of maintenance and reliability initiatives. You can benefit from our experience of presenting hundreds of on-site training and consulting sessions for large and small companies world-wide.

Contact Pete Peters at 919-270-1173 or Pete@PRIDE-in-Maintenance.com for more information!

100% Guarantee

A complete refund is provided if you cannot achieve a 10 to 1 return on investment from this training.

Ralph W. Peters

Key Benefits of Attending this TrueWorkShop™

1. **Continuous Reliability Improvement (CRI^{SM})** and optimization of Rotating has been widely investigated by world-class process companies during the last decade. Concentrating exclusively on redundancy allocation, as per the old fashion maintenance, is not the answer.

   The modern approach requires that minimum reliability for each component be established to achieve the total equipment reliability goal with minimum cost. This newly philosophy allocates reliability to a component according to the risk of failure and cost of increasing its reliability.

2. **Continuous Reliability Improvement (CRI^{SM})** of plant reliability by optimizing predictive maintenance for rotating equipment is one of the most important challenges plants face today. To know how to effectively prevent equipment failures, conduct a successful root cause failure analysis and improve condition monitoring for rotating equipment are continuing challenges for engineers. Proper analysis and solving of chronic problems at the source saves time and money.

Most importantly, **Continuous Reliability Improvement (CRI^{SM})** goes well beyond traditional **Reliability-Centered Maintenance (RCM)** practices. **CRI^{SM}**, as developed by your instructor, Founder of The Maintenance Excellence Institute, will help improve the total maintenance operation for *total operations success and profit*. This intensive course focuses **CRI^{SM}** on rotating equipment but you will learn to apply much, much more for improving all maintenance resources via a *profit-centered approach*.

TMEII CONTACTS:

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Anne at 919-896-5368 (Anne@PRIDE-in-Maintenance.com)
to coordinate a custom in-house session.

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This intensive and interactive **TrueWorkShop™** will concentrate on the problems and solutions surrounding equipment failures, diagnostics and effective methods to prevent them. This will help achieve measurable results in more efficient plant maintenance, increased operational efficiency, lower operating costs, and improved plant availability. Upon your successful completion of this **TrueWorkShop™**, you will be able to gain the knowledge on the following:

- Organizing for World Class Operations and Total Operations Success
- Using The Scoreboard for Maintenance Excellence
- Key Elements of Reliability Centered Maintenance (RCM)
- Important Risk-Based Maintenance Concepts
- Equipment Failure Patterns
- Maintenance Affect on Reliability
- Root Cause Failure Analysis (RCFA)
- Predictive Maintenance
- Component Condition Monitoring Techniques
- Optimizing Reliability – Condition Monitoring and Predictive Maintenance
- Measuring Results and Return on Maintenance Investments (ROMI)

This TrueWorkShop™ is designed to explain the following

1. Effective methods of component condition monitoring for use as both a predictive maintenance
2. The Root Cause Analysis tool
3. Major failure causes
4. World-Class proven Root Cause Analysis procedure with exercises and case histories
5. Installation, pre-commissioning planning, functional testing, and commissioning
6. Preventive maintenance strategies and more…

Who Should Attend

- VPs / Directors
- Division Heads / Managers
- Superintendents
- Specialists / Leaders
- Supervisors / Foremen
- Planners / Technicians
- Engineers from the following departments:
  - Maintenance, Operations
  - Plant, Production
  - Process, Preventative Maintenance
  - Reliability, Rotating

We Personally Guarantee This TrueWorkShop™!

We will give you the firepower and knowledge needed to implement a successful PM program, to use the Predictive Maintenance and Conditioned-Based maintenance technologies that apply to your operation. We will reinforce your current maintenance needs to the top leaders in your organization. We will help you be "the maintenance messenger" to get action from Top Leaders.

We can personally help you make a difference in the total operations success of your organization after you attend this event! Top Leaders must clearly understand your needs and the consequences of gambling with maintenance costs and a bad PM and PdM program.

Even in Good Economic Times Maintenance is Forever!

Training is Not Over When it's Over!

Your company will benefit most if you attend with a 3 or 4 person company team which will work together. You return to your organization with the new knowledge and team support for PM and PdM along with your new plans for reliability and maintenance excellence. We invite your Top Leaders, Maintenance Leaders and Craft Leaders to attend as a team. The workshop **"is definitely not over when it's over."** **Yogi Berra once said, "It ain't over until it's over!"**

Your session is definitely not over when it's over! Following completion of this **TrueWorkShop™** a personalized follow-up will be scheduled for each attending organization. Our one-on-one coaching is to help you apply the key topics and to implement your plan of action. Implementation is your key to results and we want to help you make that happen!

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Important Course Work

To wrap-up this **TrueWorkShop™** delegates will draw up specific improvement plans to address their Top 5 Areas for Improvements in power point format. The goal is to achieve implementation when they return to their organizations. Furthermore, after the workshop is over, complimentary follow-up support is provided from TMEII via phone, email or Go To Meeting virtual sessions when needed.

Very Important Pre-Course Work

Each company will be guided through a self assessment audit of their current operation using **The Scoreboard for Maintenance Excellence™.** This will become part of the course practical exercise and also becomes an important baseline as to where a company stands with today's best practices. It is equivalent to an ISO 55000 audit. Attendees will be guided through this self-assessment. Attendees are also asked to define their Top 5 Areas for Improvement.

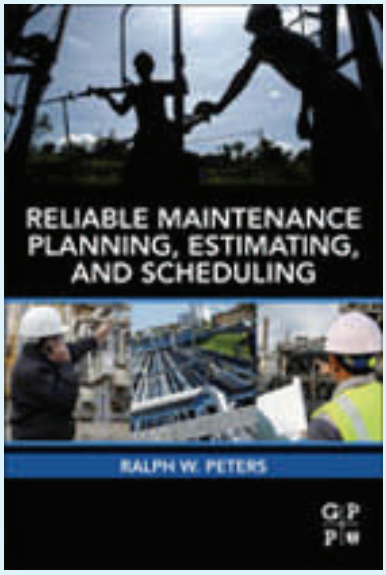
Other TrueWorkShop™ Deliverables

We also provide many *very* important deliverables in an easy to use Excel format in addition to the program outlined below.

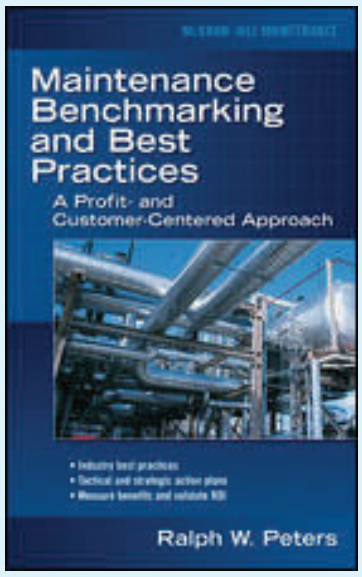
1. **The Scoreboard for Maintenance Excellence** - Today's most comprehensive benchmarking tool for each attendee's operation that benchmarks your site against today's best practices.
2. **The CMMS Benchmarking System** - For gaining maximum value from an existing CMMS
3. **The Reliability & Maintenance Excellence Index** - A powerful measurement process to validate shop level results.
4. Electronic copies of TMEII two major books; **Maintenance Benchmarking and Best Practices (McGraw-Hill-2006) and Reliable Maintenance Planning, Estimating and Scheduling (Elsevier-2015)**

Extensive Knowledge base of References to Take Home:

This workshop is based on Pete's two books:



Reliable Maintenance Planning, Estimating and Scheduling



Maintenance Benchmarking and Best Practices

TMEII provides more electronic references for all TrueWorkShops™ than any other series of courses now being offered from around the world.

Each attendee will receive e-book copies of these two major books plus many, many more valuable topic references on CD. The electronic versions are included to allow easy application and duplication of all course materials. Attendees receive all PowerPoint's used and "one of the largest Maintenance, Reliability and MRO Materials Management Glossary" currently available.

TMEII believes in providing each attendee an extensive knowledge base to support professional development well beyond actual class time.

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TrueWorkShop™ Agenda

On-site TrueWorkShops™ are customized to meet your specific goals and objectives. Below is a sample outline which can be modified as needed to ensure the results you are looking for.

Day One:

- **Introductions**
- **TrueWorkShop Objectives**
  - Exercise: Review Top 5 Priorities by Attendees
  - Overview
- **Discussions**
  - Does your plant have a strong reliability improvement culture?
  - Continuous Reliability Improvement (CRIsm)
  - How CRIsm goes well beyond RCM
  - What areas do you see needing improvement that impacts reliability?
  - What concerns and obstacles do you have in your current organization?
- **Organizing for a World Class Maintenance Operation**
  - Steps towards achieving maintenance excellence
  - Your Scoreboard for Maintenance Excellence
  - Framework for reliability and maintenance excellence
- **Exercise: Review of Attendees' Scoreboard for Maintenance Excellence Results**
  - List 10 characteristics of a reliability centered organization
  - Is your organization doing any of them?
- **Characteristics of Being World Class**
- **Best Reliability Practices: Seven Key Reliability-Centered Maintenance (RCM) Steps**
- **Discussions**
  - How well did we list characteristics?
  - Are we practicing elements of RCM or CRIsm?
- **Are There Any Other Missed Characteristics?**
- **Equipment Failure Patterns**
  - Distinguishing between repairable and non-repairable equipment
  - Types of equipment failures
  - Review why equipment fails
  - Areas of the Bath-Tub curve
  - Actual equipment failure patterns
  - Actions to minimize failure effect
- **Discussions**
  - How does most of your equipment fail?
- **Maintenance Practices and Their Impact on Reliability**
  - Today's maintenance issues
  - The CMMS benchmarking system for reliable information
  - Different types of maintenance and organizational structures
  - How maintenance influences equipment performance and reliability
  - Introduction to condition-based maintenance
  - Factors contributing to excessive maintenance
- **Discussions**
  - Where is your plant on the maintenance strategy pyramid?
  - Has your plant implemented basic best practices?
  - **Wrap-Up of Day One and Assignment for Day Two**

Day Two:

- **Review of Day One and Introduction to Day Two: Continually Reliability Improving Maintenance & Reliability Results**
- **Root Cause Failure Analysis (RCFA)**
  - Structured problem solving and RCFA
  - Cause analysis
  - Two-track approach
  - Failure types
  - The three levels of cause
  - Collecting failure data
- **Root Cause Failure Analysis (RCFA)**
  - Parts and position
  - The analysis process
  - Describing the process
  - Data Analysis I
  - Data Analysis II
  - Data Analysis III
  - Human root causes
  - Solutions to human root cause
  - Stewardship of RCFA Results
- **Exercise: RCFA Practical Exercise**
- **Rotating Equipment Operating Problems**
  - 6 major rotating equipment problems
  - Vibration and its control
  - Balance and its control
  - Lubrication and its control
- **Exercise: Operating Problems with Case Studies on Gearboxes, Axial and Centrifugal Fans, Compressors**
  - Looseness and Its Control
  - Distortion and Its Control
  - Alignment and Its Control
- **Exercise: Operating Problems with Case Studies on Pumps, Bearings, Valves, Bucket Elevators**

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Day Two (Cont'd):

- **Predictive Maintenance**
  - A proven strategy to get started or to renew a current program
  - Classification of plant machinery
  - Maintenance strategies as adopted to each class of machinery
  - Identification of critical machinery and adoption of condition-based maintenance
  - Principles of predictive maintenance
  - Detection and diagnosis
  - Classical risk analysis methods
  - How to base maintenance on operating risk matrix
  - Risk identification and removal
- **Exercise: Risk Analysis and Maintenance Strategy**
- **Exercise: Developing a Format for Defining Your Asset Criticality**
- **Wrap-Up of Day Two and Assignment for Day Three**

Day Three:

- **Review of Day Two and Introduction to Day Three**
- **Predictive Maintenance Techniques**
  - Vibration analysis
  - Oil particle and wear debris analysis
  - Thermography and its uses
  - Thermography case studies
  - Ultrasonics
  - Performance evaluation
- **Component Condition Monitoring Techniques**
  - Types of condition-based monitoring
  - Vibration monitoring
  - Pump monitoring frequency
  - Temperature based monitoring
  - Infrared monitoring
  - Tribology, ferrography and lube oil analysis
- **Discussions**
  - What monitoring techniques are employed at your plant?
  - Have they proven effective?
  - CBM case studies
- **Analytical Case Tools**
- **Data Analysis**
- **Weibul Analysis**
- **Discussions**
  - Is CMMS providing data or true reliability information?
  - Is data routinely analyzed and used for decision-making?
  - What kind of analysis is done?
- **Measuring Results from Continuous Reliability Improvement – Changing to a Reliability Focus Operation**

Day Three (Cont'd):

- **The Scoreboard for Maintenance Excellence**
  - Defining global best practices and your baseline
  - Defines "where you are"
- **Case Study: Marathon Oil**
- **The CMMS Benchmarking System**
  - Evaluates existing CMMS' support to reliability of rotating equipment
  - Why CMMS implementations fail to achieve planned benefits
- **The Maintenance Excellence Index: A Proven Method to Define Your Results to Top Leaders**
- **Key Metrics and KPIs to Consider for Your Maintenance Excellence Index**
- **Other Measures to Validate Reliability**
- **Exercise:** Developing Metrics and KPI's for your Operation Using the Maintenance Excellence Index
- **Case Study: Steel Mill Operation**
- **Measuring Results from Continuous Reliability Improvement – Changing to Reliability Focus Operation**
- **Final Exercise: Attendees presentations of their team's recommended Plan of Action for improving maintenance and reliability in their organizations**
- **Presentation of Certifications and Wrap-Up of Day Three**

Your Instructor and Coach

Ralph W. (Pete) Peters the Founder/ President of The Maintenance Excellence Institute International is your primary instructor. His experience of over 40 years has included being a manufacturing plant manager at two sites; director of facilities management. He has had extensive maintenance experience within the US Army beginning in Vietnam (1970) and with the US Army Corps of Engineers building what is now called, the National Highway. He consults and provides maintenance best practice training in over 30 countries, written maintenance chapters in four books as well as a book on *Maximizing the Value of Your CMMS*. In 2006, he wrote and published *Maintenance Benchmarking & Best* Practices for McGraw-Hill's professional book division. In 2015 he completed Reliable Maintenance Planning, Estimating and Scheduling for Elsevier's Gulf Publishing Division. Pete's positive approach and his experience from consulting, allows him to be an excellent coach for today's top leaders, maintenance leaders and craft leaders. His worldwide ***PRIDE-in-Maintenance*** initiative will be highlighted in his next book with key topics from this universal book included in all of his worldwide **TrueWorkShops™**.

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