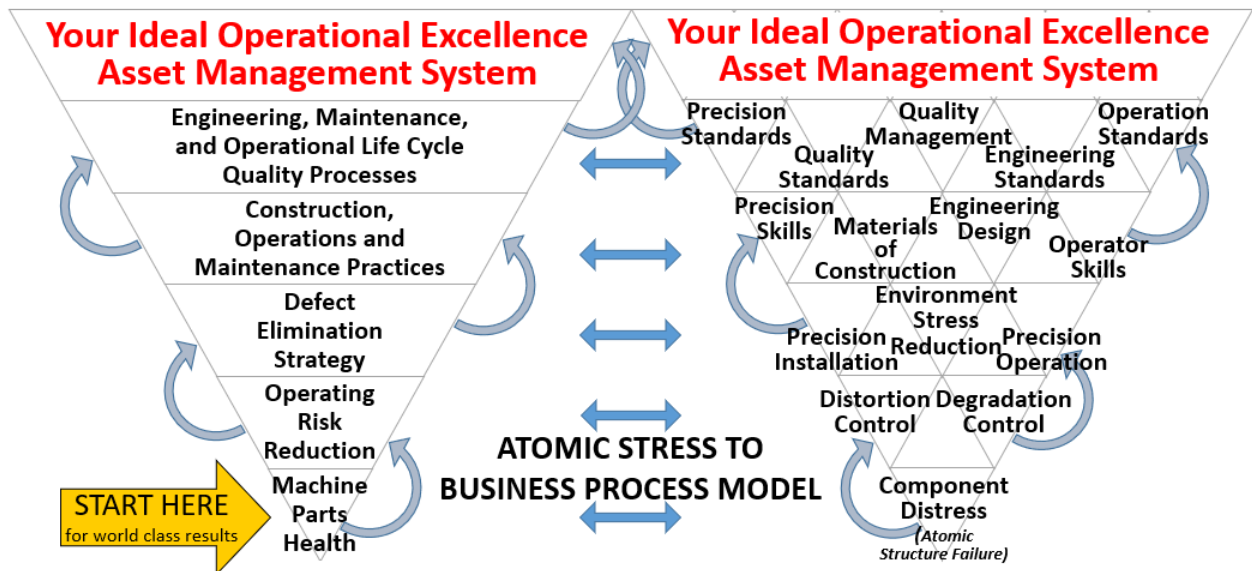


The Plant and Equipment Wellness Way EAM Manual

An Overview of the Foundational Concepts and Approaches
Used in the Plant Wellness Way EAM Methodology

Let a Plant Wellness Way EAM System-of-Reliability End Your Business Risks Forever

Plant Wellness Way Enterprise Asset Management System-of-Reliability



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The Plant Wellness Way EAM to Life Cycle Asset Management Excellence

Let a Plant Wellness Way EAM System-of-Reliability End Your Business Risks Forever

Plant and Equipment Wellness EAM is a holistic, life cycle asset management methodology. It shows you how to build the processes, people, capital, and culture for world class operational excellence performance. The Plant Wellness Way (PWW) is a standardised process useable across all industries for finding and delivering the simplest activities needed for outstanding Enterprise Asset Management and Maintenance Management results.

The driving philosophy behind Plant and Equipment Wellness EAM is the realisation that machinery and equipment is made of individual components strung together in a series that creates a 'chain of parts'. Once a 'link' in the chain breaks (i.e., when a part fails) the machine stops. If your machines perform badly, then your business will too. To have a highly profitable and competitive operation every working part in all your plant and equipment must first be exceptionally reliable. Plant Wellness Way EAM does that for your operation and makes all equipment and machines outstandingly reliable for their whole service life.

PWW EAM focuses on delivering long, failure-free lives to the parts in machinery and thereby the equipment becomes exceptionally reliable forevermore. You start up the Plant Wellness Way by identifying the business risk from equipment failure and costing the business-wide impact should an asset fail. The size of a business risk then drives the actions used to reduce the chance that a failure event will happen. These reliability-building requirements percolate throughout an operation, affecting the policies, procedures, and activities that happen within the business.

You design and build a PWW EAM System-of-Reliability with the ideal the asset management strategy and the right maintenance and operating practices that will surely deliver outstanding plant and equipment reliability. This vision and understanding are used to develop a business with the life cycle processes, skills, and culture needed to reach world class operational excellence.

Figure 1 provides a graphic representation of the Plant Wellness Way Enterprise Asset Management Framework in the system-of-reliability you create to get world class operational success.

The remaining pages summarise the contents of the PWW EAM framework, and the responsibilities that companies commit to when they create a Plant Wellness Way EAM System-of-Reliability.

Please contact us to answer any questions.

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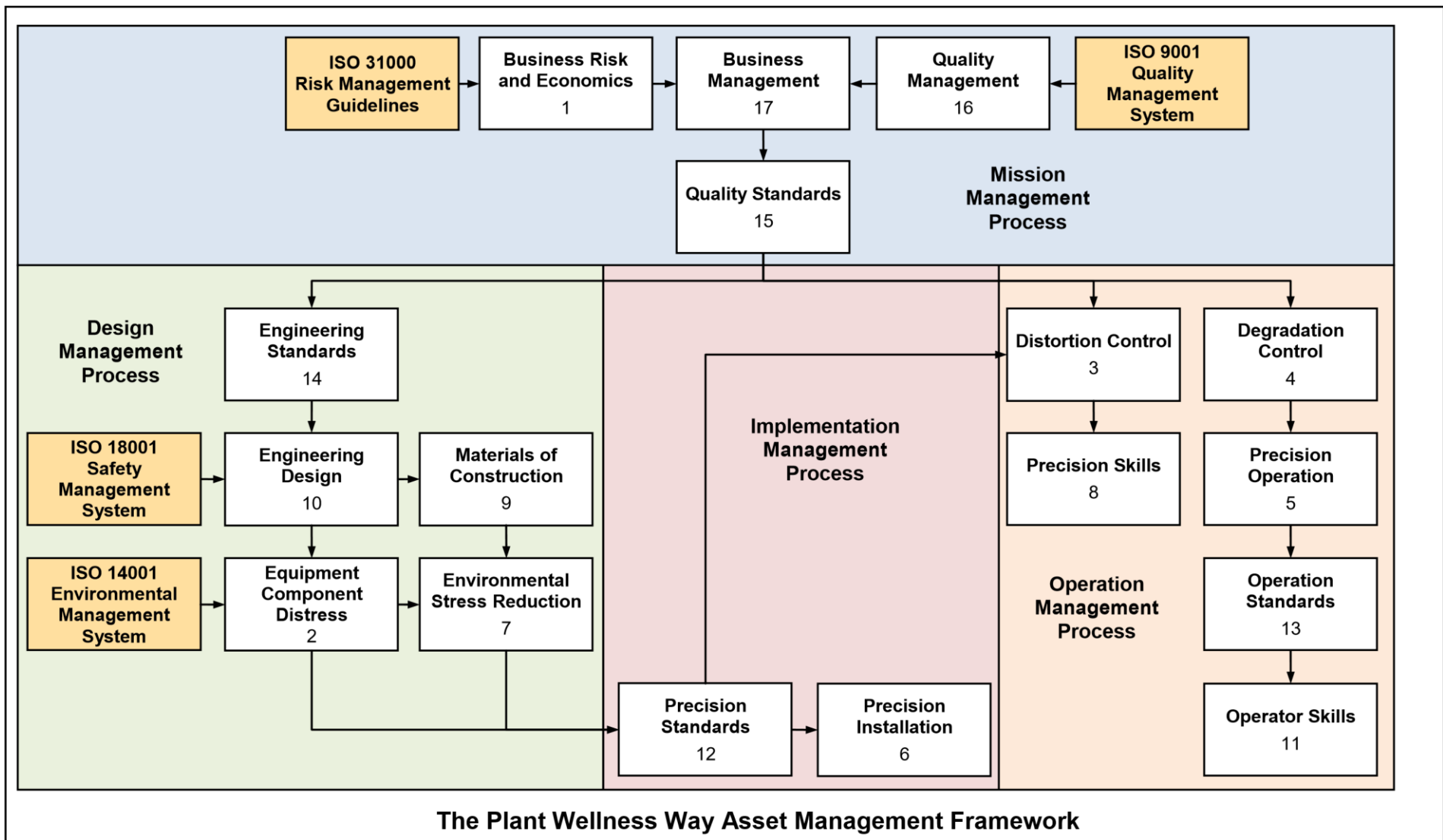


Figure 1

Steps of the Plant Wellness Way EAM Methodology

Below is an overview of the requirements and responsibilities you adopt when you build a PWW EAM System-of-Reliability. It summarises the key strategies and the associated actions that must be performed by those that use the methodology.

1. Business Risk and Economics

- 1.1. Develop calibrated business risk matrix
- 1.2. Determine total business-wide costs and losses to $\pm 20\%$ accuracy if an equipment item fails
- 1.3. Identify business risk from equipment failure on the calibrated risk matrix
- 1.4. Equipment above the risk boundary is analysed for operational risk reduction strategies to prevent parts failure
- 1.5. Equipment below the risk boundary goes on operator ITCL¹ during operating life and new replacement prior end-of-parts-life

2. Equipment Component Distress

- 2.1. Categorise all operational equipment items by risk level
- 2.2. In priority equipment order identify those assemblies and their parts that stop the equipment if they fail
- 2.3. For each critical part perform a Physics of Failure (PoF) atomic stress cause analysis to identify causes and organisational factors contributing to failure
- 2.4. Indicate the phases in the life cycle that the causes can occur

3. Distortion Control

This is the prevention of critical parts deformation beyond their design stress envelop.

- 3.1. Specify how each cause will be prevented during its life cycle
- 3.2. Delegate control to the most senior person in the groups involved for each cause at each life cycle stage
- 3.3. The most senior persons are responsible to deliver the strategy, plans, documents, performance monitoring, training and implementation to prevent parts failing from distortion

4. Degradation Control

This is the prevention of critical parts failing by degrading during operation.

- 4.1. Specify how each cause will be prevented during its life cycle
- 4.2. Delegate control to the most senior person in the groups involved for each cause at each life cycle stage

¹ Inspect, Tighten, Clean, Lubricate

- 4.3. The most senior persons are responsible to deliver the strategy, plans, documents, performance monitoring, training and implementation to prevent parts failing from degradation

5. Precision Operation

The most senior person in the operations group is responsible to:

- 5.1. Develop standardised operating procedures that control parts distortion and degradation
- 5.2. Ensure the procedures are continually followed and improved
- 5.3. Each shift measure and report to all persons in the operation and senior managers in the company on equipment parts operating health

6. Precision Installation

The most senior person in the project group and engineering group is responsible to:

- 6.1. Develop standardised installation procedures that control parts distortion and degradation
- 6.2. Ensure the procedures are continually followed and improved
- 6.3. Each project of any size measure and report to most senior operations and maintenance management on equipment parts installed condition

The most senior person in the maintenance group is responsible to:

- 6.4. Develop standardised maintenance procedures that control parts distortion and degradation
- 6.5. Ensure the procedures are continually followed and improved
- 6.6. Each intrusion measure and report to most senior operations management on equipment parts installed condition, maintained health and operating health

7. Environment Stress Reduction

The most senior project, engineering, operations and maintenance persons are responsible to:

- 7.1. Ensure the local environment and conditions around each critical part throughout its life cycle stages promotes its health and the delivery of long service life

8. Precision Skills

The most senior person in the project group and engineering group is responsible to:

- 8.1. Ensure manufacturer activities on critical parts are done with precision skills
- 8.2. Ensure installation activities on critical parts are done with precision skills

The most senior person in the maintenance group and procurement group is responsible to:

- 8.3. Ensure external servicing and rebuilds of critical parts are done with precision skills
- 8.4. Ensure maintenance activities on critical parts are done with precision skills
- 8.5. Ensure the maintainer understands how the equipment works and how the process works

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9. Materials of Construction

The most senior person in the project, engineering and procurement groups is responsible to:

- 9.1. Ensure materials of construction for critical parts are fit for the stresses and neighbouring environmental conditions to surely achieve the required operating life

The most senior person in the procurement and maintenance groups is responsible to:

- 9.2. Ensure replacement parts meet the design requirements

10. Engineering Design

The most senior person in the project group and engineering group is responsible to:

- 10.1. Ensure designs for critical parts are fit for the stresses and neighbouring environmental conditions to surely achieve the required operating life

The most senior person in the operations and maintenance groups is responsible to:

- 10.2. Ensure modifications to critical parts meet the design requirements

11. Operator Skills

The most senior person in the operations group is responsible to:

- 11.1. Ensure the operator understands how the equipment works and how the process works
- 11.2. Ensure the operator can competently provide Total Productive Maintenance level of care to the equipment

12. Precision Standards

The most senior person in the project group and engineering group is responsible to:

- 12.1. Ensure manufacturing activities on critical parts are done to agreed precision standards
- 12.2. Ensure installation activities on critical parts are done to precision standards

The most senior person in the maintenance group is responsible to:

- 12.3. Ensure servicing and repair activities on critical parts are done to agreed precision standards
- 12.4. Ensure maintenance activities on critical parts are done to precision standards
- 12.5. Ensure the maintainer competently delivers the precision standards

13. Operation Standards

The most senior person in the operations group is responsible to:

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- 13.1. Ensure critical equipment is always operated to standard operating procedures
- 13.2. Ensure the operator competently delivers the standard operating procedures

14. Engineering Standards

The most senior person in the project group and engineering group is responsible to:

- 14.1. Ensure critical equipment are selected and built to the engineering requirements that provide the required service duty for the required operating life
- 14.2. Ensure critical equipment parts have known operating envelopes that provide the required service duty for the parts' operating life
- 14.3. Ensure the operating envelop parameters are easily available throughout the operation

The most senior person in the operations group and maintenance group is responsible to:

- 14.1. Ensure critical equipment parts are kept within the operating envelopes that provide the required service duty for the parts' operating life
- 14.2. Ensure replacement and repaired equipment meet the engineering requirements required for the service duty for the required operating life

15. Quality Standards

The most senior person in the financial, project, engineering, operations and maintenance groups are responsible to:

- 15.1. Ensure the business processes and practices used during all phases of the life cycle on critical equipment parts meet the standards that produce low individual part stress and deliver low operational risk
- 15.2. Ensure the standards are controlled, standardised across the organisation, competently delivered and improved
- 15.3. Measure weekly and report monthly to all management and supervisory levels in the operation and to senior management in the Company on the achievement of the standards across the phases of the life cycle

16. Quality Management

The most senior person in the financial, project, engineering, operations and maintenance groups are responsible to:

- 16.1. Establish the business processes and practices that deliver the required equipment operating risk to meet the required business operating performance
- 16.2. Support the competent, error-free delivery of the processes and practices
- 16.3. Continually improve the processes and practices daily
- 16.4. Measure weekly and report monthly to all in the organisation on the achievement of the required business operating performance

17. Business Management

The Chief Executive and the Board are responsible to:

- 17.1. Set the outcomes required from the operation
- 17.2. Set performance standards at all levels in the organisation needed to deliver each of the outcomes
- 17.3. Ensure adoption and use of the standards into the processes and practices of the Plant Wellness Way
- 17.4. Measure weekly and report monthly to all management and supervisory levels in the operation and senior management in the company on the performance of the PWW in achieving the business objectives.

Please contact us to answer any questions.

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