

# **Employee Training and Development with Standard Operating Procedures**

**Third Edition**

*How to write mistake proof job procedures, work instructions and inspection and test plans that deliver world class work quality every time.*



*Realise and release across your organisation the continuous improvement power of error proof Standard Operating Procedures.*

**By Mike Sondalini**

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## Preface to the Third Edition

The third edition of the book you hold is for your education and guidance. It will help you to greatly improving work outcomes by reducing the chance of making errors. If there was a sure way to stop mistakes we would already all be using it and we would be happily living in a world where no errors occur. That is clearly not the case, but a simple thing can be done to vastly improve the situation—use the 3Ts<sup>1</sup> in all your written instructions and workplace training. The 3Ts is an error proofing and mistake proofing technique that has reduced error rates by 10,000%.

The Accuracy Controlled Enterprise 3T technique of work quality control is a powerful mistake proof method that improves the outcomes in every situation where humans are involved. A 3T designed document uses system reliability principles to build work instructions that produce extremely low error rates.

This edition includes the use of checklists as a practical application of error proofing to confirm an activity has been done. As well as rewriting and updating sections of the book with the latest information, this third edition of Employee Training and Development with Standard Operating Procedures introduces a complete explanation of how the 3T method of mistake proofing work activities provides statistical process control to human work tasks. It details the use of two-sided quality limits that specify both world class performance and just passable performance to encourage high quality work outcomes. Useful explanatory diagrams have been added to the book to aid in illuminating various concepts and principles.

I hope that with this book in your hand as your guide you will firstly come to understand the process control benefits and psychological concepts behind the 3T error proofing methodology. Secondly, that you gain the confidence to experiment and trail the technique in your workplace in your most troublesome situations. Finally, that you gather the evidence, and thereby gain the belief you need, to make ACE 3T standard operating procedures the only way to control the work done throughout your business, departments and workplaces.

*Mike Sondalini*  
*May 2011*

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<sup>1</sup> 3T is Target – Tolerance – Test used to control the accuracy of each activity done in a work task.

## Preface to the Second Edition

During World War II British airmen referred to ongoing trouble with aircraft, in spite of aircraft mechanics' best efforts, as 'gremlins at work'. A gremlin is an imaginary creature that lives inside machinery and equipment causing trouble in devices and systems of all kinds. The gremlins are us.

Unless we are saboteurs none of us intentionally cause problems. Yet why do problems happen so regularly and, in far too many cases, so disastrously? The 'human element' is recognised as the single most uncontrolled cause of failure<sup>2</sup>. People cause most problems. The 'human element' is the uncertain, random nature of outcomes from peoples' actions and behaviours. Our technology has advanced the quality and properties of materials, equipment and machines to the point that they are highly unlikely to fail by themselves<sup>2</sup>. It is people that cannot be controlled, it is people who take on tasks they are incapable of doing well or who are incompetent in their jobs. When things go wrong it's most likely the 'human element' at work; we gremlins.

It has long entranced me as to what can be done to address the 'human element' in causes of failure; how can luck and chance, ignorance and incompetence, be turned into certainty of quality results. I believe the answer is surprisingly simple—describe exactly what world class performance looks like when doing a job. This means specifying the range of outcomes that are acceptable when doing a task so that the person doing the work has the best chance to get total control of what they do.

We call people 'expert' when they skillfully apply knowledge and method to deliver the right results. An expert does their work right the first time because they control it with great certainty to deliver the needed result. This definition of 'expert' gives us hope for solving the problem of the 'human element'. If people can become 'expert' they will do their work right and mostly without error. Everyone needs to be expert at their job. We all count on it. In a company of 'experts' all work is controlled to the highest probability of being done right the first time.

Experts focus on failure prevention and defect elimination to ensure their work is done right first time. They do not want to fix problems; rather, they put their effort into not having problems. They know that making mistakes, or doing work wrongly, is too wasteful and expensive in time, money, energy and resources. Experts do not repeat a job; they do it right the first time. Being expert is far from simple. Today there are far too few experts in the world and this book was written to help fix that problem.

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<sup>2</sup> Barringer, H. Paul P.E., Conference paper - *Use Crow-AMSAA Reliability Growth Plots To Forecast Future System Failures*, 2006

We need everyone to be expert at what they do if the frequency of failure in our businesses is to be reduced. The second edition of this book takes the 'target and test' method used in the first edition and improves it to more surely and quickly develop expertise in a job. As in the first edition the focus is on finding and using the hidden power of standard operating procedures to deliver quality output faster and with great certainty of success. The 'target and test' method now has tolerance bands about the target, as with an archery board, to make work a challenging, fun game that urges us to become expert faster.

To help explain the value and use of well constructed SOP's this edition includes new information on the causes of failure. It also includes new information on the reliability of human workmanship – we are not machines and 'failure' is often not a person's fault but is caused by poorly structured work and poor workplace environments condoned by management. A most beneficial inclusion in this edition is a new development to encourage the rapid creation of high skills and abilities throughout an organization. It is called the '3T failure prevention method' – 3T stands for 'Target, Tolerance and Test'. You will learn how to incorporate it into SOPs so that work quality sky-rockets as people quickly become highly skilled. Another addition worthy of mention is a revised way to layout SOPs horizontally for Value Stream Mapping to drive continually improve in job performance by identifying wasted time and resources.

The last major inclusion in this edition is to present the simplest corporate quality performance improvement program known. The Accuracy Controlled Enterprise, or ACE, represents an ideal to strive for in running organizations. Much simpler than establishing a quality management system like the ISO9000 series, or introducing Lean or Six Sigma, it still drives the achievement of excellence by focusing on improving individual performance. An ACE uses 3T failure prevention methodology in every task at every level of the organization. The Board members, CEO and senior managers lead from the front by first applying 3T rigor and VSM Kaizen SOP continuous improvement in their work to become 'experts' in their duties. Once they deliver 'expert' performance they cascade the 3T/Kaizen SOP concepts to middle management and the workforce. The ACE approach delivers quality by ensuring the knowledge, skills and methods are present in the right people, at the right time, to delivery expert accuracy. In an ACE everyone is an expert at their job and as a consequence the organisation cannot help but outperform the competition.

This second edition presents you with information on the best SOP methods yet devised to detect and stop errors in business processes – the Accuracy Controlled Enterprise, 3T failure prevention SOPs and Value Stream Mapping Kaizen SOP layout. Together they prevent failure, eliminate

defects and deliver quality performance faster by ensuring all work is done accurately the first time. With them in place, and in use, a business has the simplest quality system around to get maximum profits and customer satisfaction from the efforts of its people. The new methods of developing standard operating procedures shown in this book will help your organization to become the best and most expert in your industry, fast.

One final indulgence is to thank my wife and children for their years of patience with me. (Only an author and their family would know what I mean.)

*Mike Sondalini*  
*July 2007*

Sample via BIN95.COM

## **Preface to the First Edition**

This book is more than a 'how to' manual on writing Standard Operating Procedures. With this book you can take a new employee, or a poor-performer, and turn them into a successful, productive worker faster than any other way known to the business world. You will be astounded at their progress.

There is great power in a standard operating procedure or work instruction. It is the perfect training and development tool for mastering established jobs. With them you can continuously improve people's performance. Within 24-hours you can turn a poor performer into a master of the job! A standard operating procedure (SOP) gives total control over what a person learns. From the finest details, the most exact measurements, the most perfect of actions, a SOP can guide them all. Beyond personnel development, work control and setting standards, a SOP has another, perhaps more important role which is missed by many – it contains the total organizational knowledge base on that task. The secret power of a SOP, or work instruction, is the years of training, know-how, experience, learning, testing, research and discoveries imbedded within it. They are the working intellectual property of a business. They reflect the progression of many people's learning since the first version was written. Today's SOP should contain the best, fastest, most sure ways to successfully do a job. When you start new people, train them in all the experience of those that did the job before them.

A library of SOP's will make employee's working lives a breeze. They will consistently and reliably, produce the results that you want. You will gain belief and confidence in using SOP's when you read the case study in this book. You'll read how a SOP turned a difficult, seeming lost situation into the most productive result possible for the organization and the worker. Years of expertise and continuous improvement are forever captured in a SOP. With it people self-learn, self-manage, self-correct and successfully complete tasks unsupervised. Without a standard operating procedure, or work instruction, things are open to interpretation and guesswork, and many unnecessary problems will result! All of which takes someone's time (probably yours) to correct.

When a SOP is well written, and continually updated with the current best practice, you have a most powerful way to provide training, development, mentoring, guidance and certainty of job success.

*Mike Sondalini*  
2004

an aircraft. It is impossible to have 100,000 correct ways to properly build an airplane. There is only one best way to do any job. If every aircraft mechanic rebuilt a plane as they wish we would see a massive increase in flight disasters because there would be a huge variation in work quality. The failure rate of airplanes is as low as it is today because everyone in the aircraft industry has standardised and systematised their maintenance work processes down to one only way to rebuild planes. The right way is controlled and managed by the maker of the plane because they are the only ones that fully know how and why a plane is built as it is. Everyone else meets their standards.

As well as having a standardised work process, every aircraft mechanic is trained and skilled in doing the work correctly. To become an aircraft maintenance mechanic you must read and speak English fluently (English is the universal language spoken in the airline industry in order to reduce the chance of confusion). You must be licensed to work on an aircraft to a high standard of workmanship. Aircraft mechanics cannot maintain a plane unless they have proven, by passing certified tests, that they know exactly how to build that model of plane correctly to the required design specifications. The aircraft industry has gone to extraordinary ends to minimise the chance of error affecting the safety of airplanes. The same philosophy needs to be adopted by everyone who wants to markedly reduce error rates.

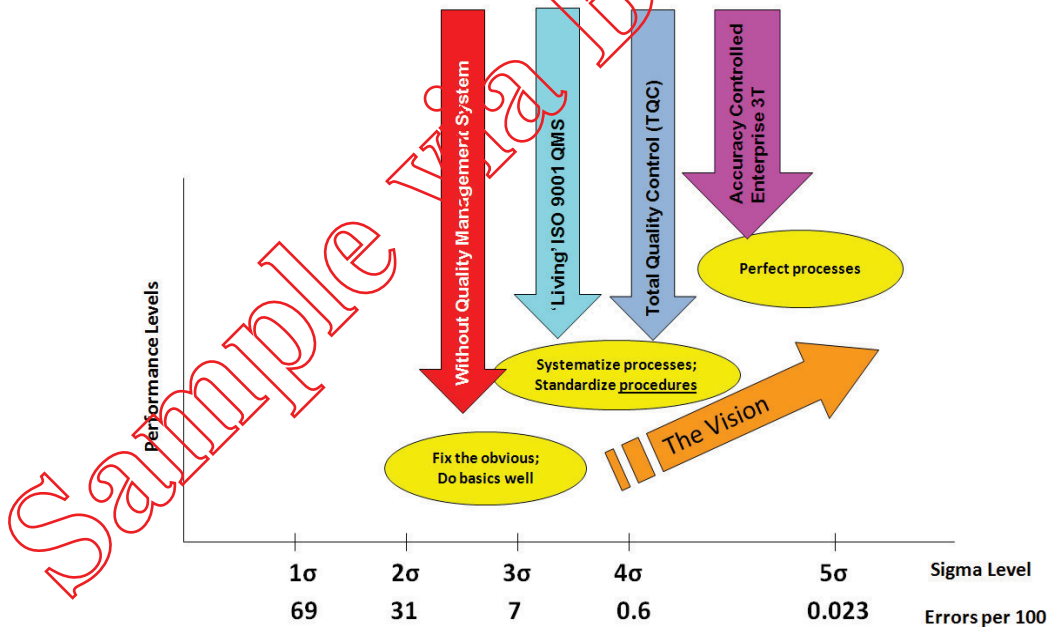


Figure 1.2 Work Quality Control Methods used to Reduce Error

Figure 1.2 overlays the various quality management techniques developed over the last few decades. Since the 1920's, when aircraft manufacturing boomed, there has been great strides made in developing work quality control methods. From simply using highly skilled people in engineered

them on the chart. The process is in control and capable when the results are randomly distributed closely about the target standard. When the results show a trend of three or more points, or persistently track toward the limits, or gyrate widely about the target, or are outside the tolerance limits, you have an unstable process. A control chart provides accurate information to make the decision to alter, change or stop the process or operation. Several control chart types and simple statistical techniques that can be used to monitor process and variable performance.

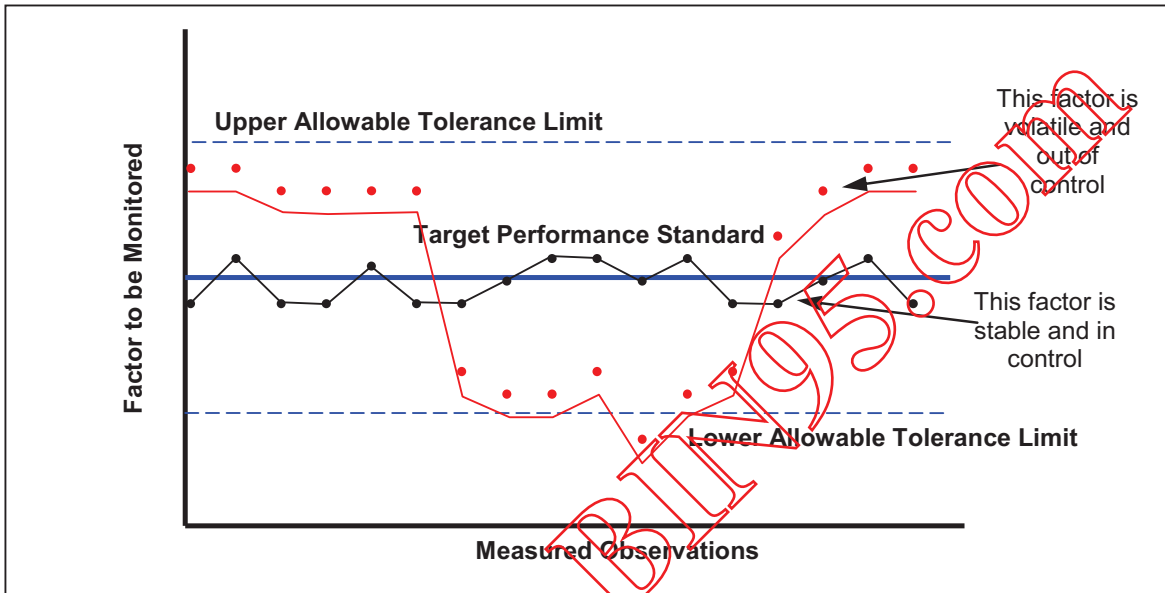


Figure 7.2 A Basic Control Chart

It is ideal if you can enlist the people at the 'workface' in the continual observation of variation. By giving front-line people the measuring tools and training them in their use they track process variations and so learn to identify and correct changes problems. Providing and teaching front-line people to use simple, hands-on diagnostic tools gives them the responsibility to find problems and to fix them before failure stops the operation. It hands ownership of the operation and its well-being to the people best placed to get the best performance from it – themselves!

### 7.1. Variability Causes Defects and Failures

Because variability exists in all processes a range of outcomes are possible. The cross-hair game and the shipping dilemma example highlight some of the bad results and effects that process variability causes organizations. When variability becomes excessive defects arise and catastrophic failures can result. A defect is a 'non-conformance to requirements or function'. It is a deficiency. It means that a non-conformance was produced by a process and accepted into service. Defects that escape correction lay hidden and may not become apparent until they cause a failure. A failure is

When a 3T procedure is being developed it is important to also create a visual control device that displays the results of the proof test for all to see. They need to be displayed openly at the workplace and made large enough so supervisors and upstream customers can go to the workstation and see how well the work is being performed.

### 13.1. Visual Control Measures for Continuous Processes

Often it is not possible to stop a production procedure to do a proof-test because it is not practical. The alternative is to take test samples from the process and trend them. To monitor the whole process the samples can be taken from selected representative points in the production cycle. The test samples are measured and the results graphed. The results of the tests are compared to the desired target result and if within tolerance they are passed and production can continue. If the results are not within specification the production process is adjusted and retested. Adjustment continues until the test values indicate the process is running correctly. Typically the results of testing are put on statistical control charts and the charts become the visual control measure. An example of a statistical process control chart from a continuous process operation is shown in Figure 13.2.

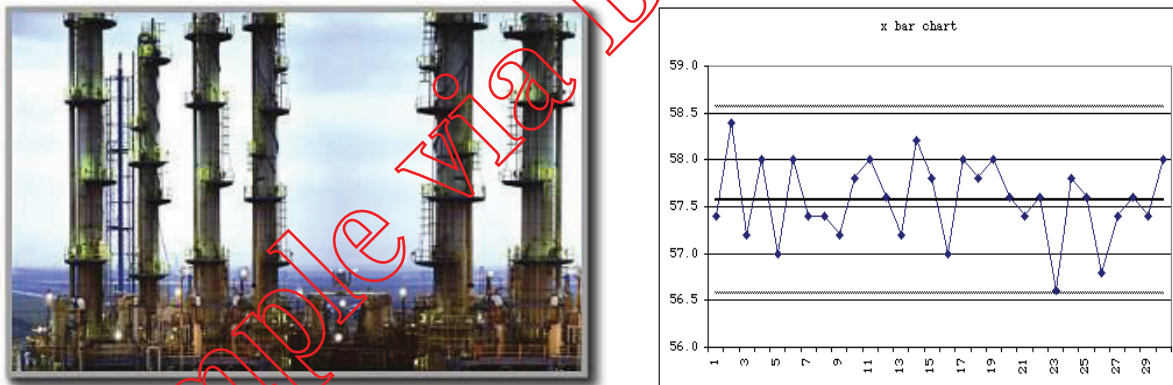
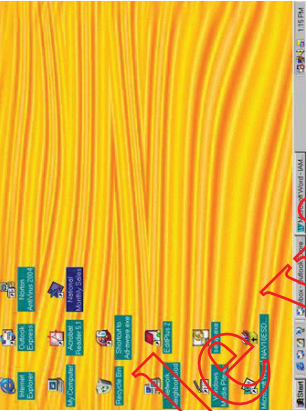
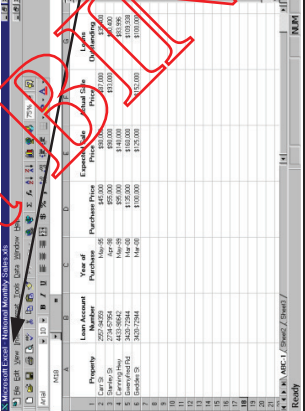
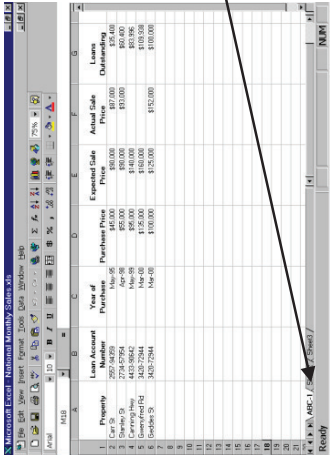


Figure 13.2 Statistical Process Control Chart Used to Monitor Continuous Processes

Task Step No.	Task Step Owner	Task Step Name	Full Description of Task	Test for Correctness	Record Actual Result	Initial After Complete
1.	Office clerk	Find spreadsheet	<p>Find the shortcut on the screen called 'National Monthly Sales'.</p> 	See the icon is called 'National Monthly Sales'.		
2.	Office clerk	Bring up spreadsheet	<p>Make spreadsheet 'ABC' active on my computer by 'double-clicking' the icon.</p> 	Note the name on the spreadsheet is 'National Monthly Sales'.	(Place spreadsheet name here.)	
3.	Office clerk	Select work-sheet	<p>Bring up the worksheet called 'ABC-1' to use.</p> 	See the name on the SOP and actual worksheet is 'ABC-1'.	(Place worksheet name here.)	

It requires a lot of work and consultation. It takes time and effort. It cannot be rushed. Don't bother trying if your company culture doesn't support such dedication.

Back when I was an apprentice I was fortunate for a few months to come under the care of a German toolmaker that made dies for punching holes in sheet steel. Such work requires extremely high precision to ensure the punch slides through the die closely to cut a clean hole without ragged edges. It requires a level of skill and workmanship that can only be achieved after years of dedicated effort and practice. He was a fanatic for perfection, knowing that anything less resulted in broken tools and mangled machinery. He knew that any errors were very expensive. Whether or not an error occurred was entirely in his control. He had taught himself to master his job so completely that he was in total control of it. His love of seeing work done well greatly influenced me.

Some tasks take years to master and to think that they can be done any faster is total foolishness. Do not think that you can rush through your career and reach the top quickly. If it happens to you then be weary, for it is highly likely that you will not be very good at what you do. Anything less than total mastery means one is still incompetent and your degree of incompetence will be displayed in the quality and soundness of the results you produce. Just like the person who did not put the truck filter on properly, if you are not a master of your duties and responsibilities you will leave behind you trouble and strife.

Doing a job well really is a life and death matter. Whether you are shoeing horses, changing engine filters, managing departments or leading organizations the quality of your work, the standards you set and live-by, will become the upper limit of your performance. If those standards are less than world best, your results will be no better.

If you want to do one thing that will hugely improve the future for yourself, your people and your company then set clear standards with the exact way to achieve them, document them, train to them, manage to them, discipline to them, encourage to them, reward by them, promote by them, and stand-by them until they are met through subconscious performance.

Do not accept performance below the standard required ... because kingdoms and lives depend on it!

Best regards,

*Mike Sondalini*

# Contents of an Inspection and Test Plan

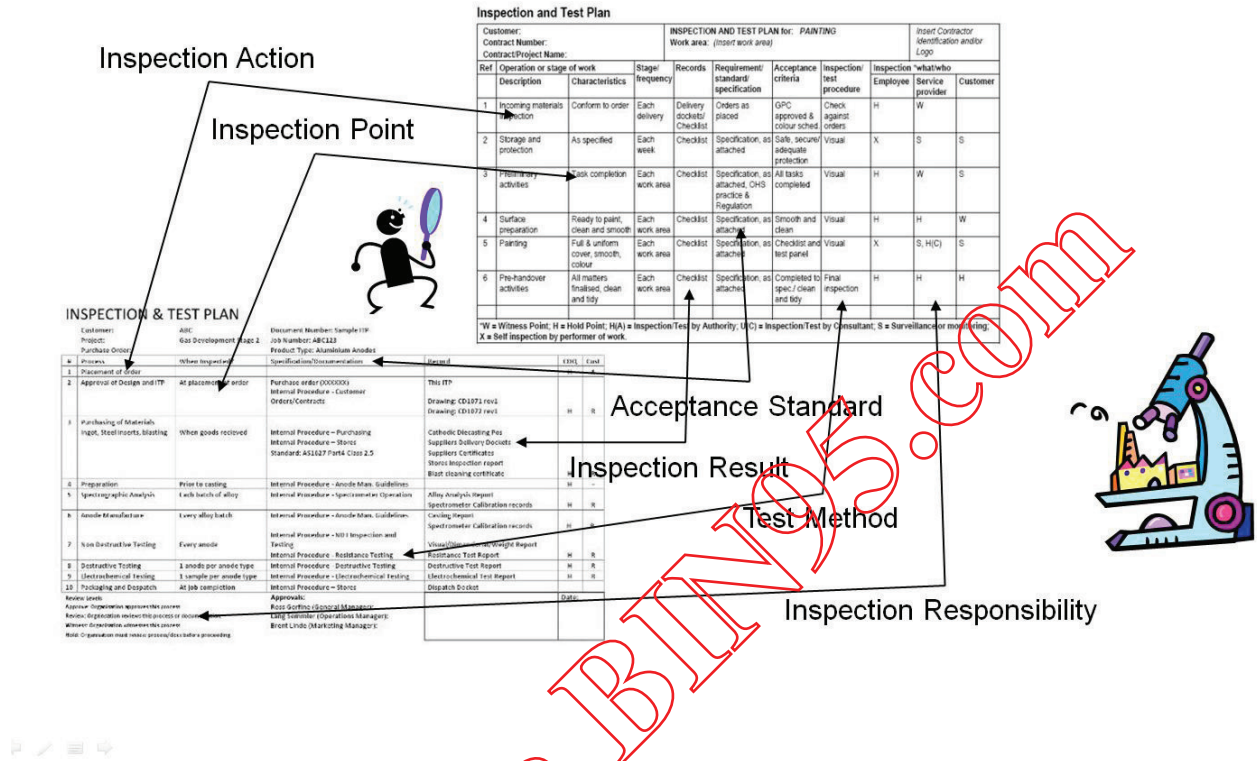


Figure 8 Inspection and Test Plan Contents

## Accuracy Controlled SOPs

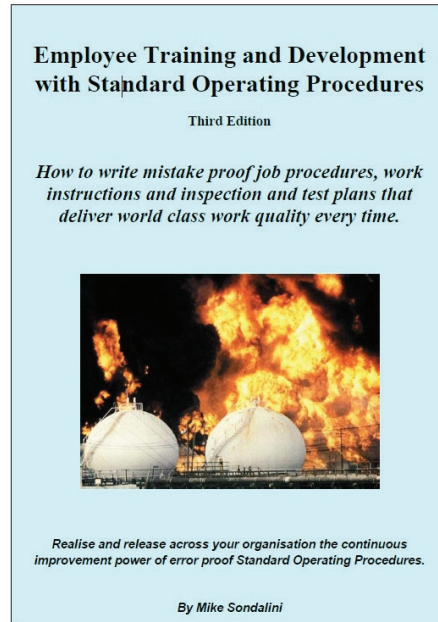
A feed-forward driven SOP would tell you immediately that you have done the task right or you have made a mistake. It makes you aware of an error and lets you correct it to the required standard before doing the next task in the job. To develop a reliability-building feed-forward SOP you need a world-class standard to hit and an idea of how close to the standard you need to be to still meet minimum quality. The upper and lower quality standards form ‘boundaries of excellence’. A proof-test confirms that the work produced acceptable quality. If the test shows the work is not within the quality boundary you fix it immediately and do not leave a defect. In this way all work is perfect because it always meets the necessary quality standard at every step of every task. When you write SOPs with each task given a Target, Tolerance and Test you create an Accuracy Controlled Enterprise (ACE) 3T procedure.

Figure 8 shows the upper and the lower quality limit for rotating equipment shaft alignment. It comes from John Piotrowski’s ‘Shaft Alignment Handbook’. It is the ideal input into an ACE 3T procedure because in one graph it provides the world-class quality target to strive for and the

The previous pages where just a sample of ...

## **Employee Training and Development with Standard Operating Procedures** Third Edition

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