Building a sustainable training advantage
Managers want more than just training; they want bottom-line, value added, “Take no prisoners,” results. They want enhanced performance from their people and increased production from their equipment. They want it NOW, at little or no cost in terms of time, money, and availability. But what training should employees receive? And how should we go about it?

Training can be like a dust devil. It swirls and moves with a motive force all its own, disturbing everything in its path, before disappearing, leaving only a slight impression in the dust to mark its passage. Historically, industry has used training to try and resolve targeted problem areas, generally related to equipment or software-specific technical training or new process startups. Other times, training is seen as a panacea for any number of general or unrealized woes. What training is needed, who goes to the training, and what benefits accrue as a result of a particular workshop have been left to individual supervisors or the trainees themselves. When the training is complete, the knowledge and skills disappear like our proverbial dust devil, with only a manual or books left on a shelf, unopened and unused. Managers and supervisors feel cheated; the student feels let down, unsupported, and de-motivated; and the company does not see a return on its investment. Everyone is back to doing things the way that they’ve always done it.

The cost to reliability of wasted training
What many managers fail to see is that training has a direct and material effect on plant reliability and therefore output.

The profitability of the plant depends significantly on how well its production equipment is maintained and operated. The more time and funds expended on training the operators and maintainers, the lower repair costs become until a break even point is reached.

Costs are lowered through:
- Increased efficiency of craftspeople, which decreases Mean Time To Repair (MTTR)
- Increased effectiveness of condition monitoring technicians, enabling plants to anticipate and forestall costly repairs, increasing Mean Time Between Failure (MTBF)
- Improved asset utilization with subsequent decreases in lost opportunity costs
- Improved safety, which can be directly linked to improved reliability

Over the years, ABB has conducted analysis of hundreds of plants and found that on average 44 percent of completed maintenance tasks did not need to happen. Broken down in more detail, 78 percent of those preventable actions could be attributed to human performance deficiencies. That includes a lack of or improper training, failed or non existent processes or procedures or inadequate human factors (job aids, incentives, and environment). When you further analyze the data you discover that when expressed in terms of hours worked or cost, the completed unnecessary work exceeds required work by a margin of three to one. No matter how you slice it, unnecessary maintenance caused by training deficiencies is expensive.

Optimizing equipment repair and reliability training
Reactive training, like reactive maintenance, is costly, labor intensive and largely ineffective. The key to maximizing your “human capital” as a sustainable competitive resource is to provide a consistent strategy for performance and productivity enhancement. The figure to the left depicts the “training pyramid” for improving plant repair and reliability training.

In the three tiered process, the pyramid’s foundation is craft and operators skill training. The rapid development of new equipment and new technologies, combined with a downsized workforce has forced organizations to operate with smaller, more effective crews. To meet these demands, maintenance crafts in particular must be trained not only in multi-craft skills, but also on work control processes, the fundamentals of preventive and predictive maintenance, how to operate independently, and to function in a team environment in support of the overall maintenance program.
In order to increase retention of this broadened content, ABB has found the best method for transferring knowledge from classroom to plant floor is an active training environment. When developing any training program, ensure that you use hands-on models, simulations and activities, not just the common lecture format. This will provide for a more interactive environment, keeping participants engaged and not just seeing, but also doing.

Well-trained craftspeople and operators provide the foundation for the next level of the training pyramid, management and reliability. Supervisors, technical experts and mid-level managers occupy the next tier (maintenance, production, reliability engineers).

Supervisors are on the front lines, interacting moment-by-moment with employees to accomplish the company’s work. They are the tip of the spear, the point of the sword, or any other analogy that comes to mind. They are the force that translates management’s dreams into reality. They are the creators of corporate culture. Each day the supervisor’s job becomes more challenging as plants strive to maintain the high performance levels essential to survival in a fiercely competitive global economy.

Highly-trained supervision pulls diverse contributors together into a cohesive team committed to achieving the company’s vision. At the same time, highly-trained supervision enables each individual to perform at his or her personal best. Too often we promote supervisors and planners from the craft ranks because they are the best craftsperson. Once in salaried positions, they find that they are on their own with little or no training provided. The skills that make for a great craftsperson are not the same as the skills that make for a great supervisor. These new skills must be provided in the form of quality training. It is at this level that training enhances individual skills, furthers organizational reliability, and reinforces and pushes reliability enhancement.

For example:
- Maintenance planning and scheduling (improves ‘time-on-tools,’ reduces costly break-in work, and reduces ‘lost time’ searching for parts, tools or procedures)
- Root Cause Analysis (eliminates repetitive failures, increasing MTBF)
- Shutdown management (in some facilities as much as 50% of maintenance budgets are allocated to annual shutdowns, proper shutdown management maximizes the return on this investment)

The chart below shows a representative sample of the training required to achieve increased maintenance performance and enhanced plant reliability at the three levels delineated by the “training pyramid” tiers.

The last tier in the training pyramid, “Ongoing Professional Development,” recognizes that maintenance and reliability education are an ongoing facet of plant life. Because maintenance costs can account for 15 to 40 percent of total production costs, and up to 75 percent of equipment or system life cycle costs are attributable to maintenance and production activities that directly affect production cost, it becomes incumbent on upper and senior management to learn all they can to build reliability and maintainability into the organization. For example, leaders who install and teach their senior managers corporate-wide reliability strategies typically find a 20 to 35 percent reduction in maintenance costs accompanied by a 15 to 25 percent increase in production with no capital investment in new equipment.

<table>
<thead>
<tr>
<th>Reliability and maintenance training matrix</th>
<th>Fundamentals</th>
<th>Basic</th>
<th>Intermediate</th>
<th>Advanced</th>
<th>Professional</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operations &amp; Craft Skills</td>
<td>Specific job requirements (i.e. computer usage, tool usage, welding, etc.)</td>
<td>Specific equipment or software knowledge (i.e. Enterprise Asset Management, kilns, etc)</td>
<td>Fundamental problem solving; PM/PdM</td>
<td>Use of condition monitoring technology</td>
<td>Failure elimination</td>
</tr>
<tr>
<td>Management &amp; Reliability</td>
<td>Supervision skills, Communication; Conflict management</td>
<td>Planning &amp; Scheduling; Root Cause Analysis</td>
<td>Shutdown Management; Managerial Accounting; Reliability Engineering</td>
<td>Reliability Centered Maintenance; Project Management</td>
<td>Supply Chain Management; Advanced information systems utilization</td>
</tr>
<tr>
<td>Ongoing Professional Development</td>
<td>Organizational communication &amp; Management</td>
<td>Productivity development</td>
<td>Design of reliability strategies</td>
<td>Life Cycle Costing</td>
<td>Total enterprise reliability strategies</td>
</tr>
</tbody>
</table>
Ensuring sustainable benefits from training

The training pyramid matrix provides the basis for establishing a learning environment within any plant. But the difference between a learning environment and one that understands and applies is a result from augmenting classroom training with real world coaching. This means teaching the trainee in their own environment so he or she can convert their classroom knowledge into a new behavior.

If you skip the coaching step, you can lose a large portion of your training benefits. For example, a study of Enterprise Asset Management systems (EAMs) found that 90% failed to yield the expected results at the three-year mark. Why? Think back to your last implementation and training. Did it feel coached and tailored for you, or more like a drive-by shooting? The drive-by shooting approach to EAM training or any other training will not deliver the kind of results you’re looking for.

Implementation without follow-up will also leave you lacking in results. By conducting a post-training audit, you’ll be able to discover if goals were met. To accomplish this, identify metrics for trainees that measure behaviors you want to change. This isn’t just a post-training test for the student, but provides proof that the business has changed and the real world has been affected.

Lastly, make sure you implement training with a process and a plan. Your process should sustain the learned training and encourage the development of improved behaviors while your plan will keep you on track as you progress through the “training pyramid”. The key is that you make the new practices a lifestyle and use every success from your new skill set to further your plan. This allows you to sustain the changes and maximize the return on the investment.

Conclusion

Consistent and logical investment in human capital returns not only reliability and maintenance improvements, but also broader profit gains.

A study by the American Society for Training and Development (ASTD) revealed:

- An increase of $680 in a company’s training expenditures per employee generates, on average, a 6% point improvement in Total Shareholder Return (TSR).

Ultimately, successful training provides for improved employee productivity and enhanced performance, which positively affects a company’s equipment reliability and bottom line.

(source: Laurie J. Bassi et al., “Profiting From Learning: Do Firms’ Investments in Education and Training Pay Off?”)