What is guaranteed Maintainability?

It might seem trivial, but the best way to improve reliability is to choose equipment that doesn't breakdown! At the very least, choose designs that when they do fail they are easy, inexpensive and quick to fix. With the right choices in the beginning, maintenance departments can guarantee maintainability. The field of guaranteed maintainability was coined by Atlanta based consultant, Ed Feldman.

There are three enemy to the ability of the maintenance department to guarantee the maintainability of a plant or facility. The first enemy to guaranteed maintainability is buying low bid without regard for experience, specification, use or service. Low bid specifications are seldom designed to exclude major manufacturer's models just because they didn't perform in the past. The second enemy is mental laziness where the maintenance people never thought through performance of the assets and cannot identify the best brands of anything based on real data (but they do have opinions about everything). The third enemy is time. Where maintenance has input into the process of design it is usually a one or two day window and it might be too late in the design cycle for changes anyway.

When designing new plants, machines or processes, for example, there are thousands of decisions that will have an impact on maintainability.

Nine areas to consider in the design and specification of new assets

1. Access: Some factories are virtual rats nests of wires, pipes, ducts, chutes, and machines. Access impacts maintainability. Items that cannot be easily accessed will not be PMed. In the office of a plant in western Pennsylvania the HVAC subsystems including the filter locations were located in 11' ceilings above the hallways. The ceilings were drop-in tiles with no cat walks, and were filled with wires, pipes, supports and insulation. Changing filters and lubricating the units was a dangerous, time consuming and dirty ordeal. One of the rules of guaranteed maintainability is to make needed maintenance easy to perform.

2. Commissioning and turn-over: How is the asset turned over to the users and the maintenance department. When the asset is contracted for (to build a new building or machine) the purchase documents should spell out the conditions for turn-over.

In a building, the turn-over happens when the architect's punch list is completed. After that a warrantee period starts to allow latent defects to come to the surface. In a machine, turn-over might be completed when the production level reaches an agreed upon benchmark.

Consider the following as part of your turn-over process:

Documentation in an agreed upon form in the hands of maintenance department.

Videotaped walk through with maintenance personnel showing all adjustments, shut-offs, operation, etc.

Training sessions on or off site in repair, failure modes, and optimization.

Coupons for several future training sessions (we can dream, can't we?)

3. Components and parts: Are the parts needed to service the new asset the same as the parts already in stock. Secondly, are the parts available from vendors already known to be reliable to your company? When I computerized the delivery of products in an oil terminal I was told by the manager that I could use any motor controllers I wanted to as long as they were available from Square D. He had existing stock of Square D and a great relationship with the local dealer.

In a subsidized housing development the contractor submitted (and got approved) specs for an imported furnace as an equal to the one called for on the drawings. At the time no spare furnaces or spare parts were bought. Two years after the property was commissioned a unit broke down. The wait for parts was 9 months. The management company was forced to refit the apartments with new domestic units as the imported ones broke down.

4. Design: A manufacturer was having problems with bearing failure. He completed failure analysis and found some of the bearings were not getting greased and others were getting over greased. Only 1 out of 3 was getting proper greasing. He installed an automated greasing system and eliminated bearing failure. He has incorporated automated lubrication into his specifications for all new equipment.

Design is the most important single element of reliability. It is shocking how many competent manufacturers don't have _reliable data about failure on the components they rely on. Your CMMS is a great source of data when the categories are set-up correctly and the work orders are filled out and entered accurately.

5. Documentation: One of the aspects of guaranteed maintainability is the ability to get vital information when you need it. Equipment vendors are notoriously variable in the quality, organization and usability of their support documentation. See if the vendor maintains a site on the Internet where you can access technical data including parts lists, wiring diagrams, and get technical help. Web sites for maintenance and repair are more and more common and a real bonus for you if you have Internet access.

Lucent Technologies (formally AT&T) now specifies how the manual and support documentation should be constructed in their purchase orders for new equipment. This is part of their ISO 900X process. Even if you don't go this far it is important to make sure that the documentation will serve your needs and you will get adequate copies.

They specify the chapters and contents of the manual:

What is the asset? What does it do, including detailed functional specifications? Complete description of how the asset works. What are the components? What should be done if it is not working up to specification (broken up by component)? What are the safety and environmental considerations (how can it hurt me or the environment)?

6. Installation: When a contractor installs a piece of new equipment they might not look at the long term need for maintenance (this is one area where close liaison with the contractor that insures good maintenance techniques and standards are followed is essential). Simple things like well positioned shut off valves, convenient disconnects, and orientation of the unit to allow easy servicing and positioning the unit to avoid damage from lift trucks or cranes make a major difference in your ability to maintain the asset.

7. Skills needed to repair: Whenever you change models or manufacturers there will be a learning curve. It is important to evaluate the cost of the learning curve and see if the change in make or model is a justifiable improvement in production levels, reliability, efficiency, or use. In the absence of a good reason to change, why change? Does the vendor include training and retraining as part of the new equipment package?

8. Surfaces/finishes: This is very important for buildings and parts of machines that come in contact with product. Some surfaces are better (last longer, are easier to clean, etc.) than others. At Rutgers University in New Brunswick, New Jersey specified a solid surface material such as Corian© in the dorm bathrooms instead of tile. Solid surface material is more expensive but almost un-damageable (and it can be repaired if it is damaged).

9. Tools: Do you have the specialized tools needed to service this new type of asset. How much money will need to be spent for new tools. If a new class of asset is chosen be sure the new tools are included in the budget and acquired.

Guaranteed maintainability has other aspects that are important:

1. Maintenance needs to know how to operate the equipment as well as operators. At GE Engineered plastics, the maintenance department personnel were certified operators at the plant.

2. Unfortunately many maintenance professionals do not have good networks of maintenance people in other companies. Product intelligence, repair experience, re-engineering tips, can all come from a well cultivated network.

3. If your business depends on a manufacturer's equipment, be sure to visit the factory where the asset was built. Meet the behind the scenes engineers and shop people. These people can become a great resource. Be sure to let then know how important their equipment is to your operation. Bring pictures of their `babies' that you put to work.

4. When buying new equipment use the complete life cycle cost as the cost basis rather then the purchase price. Look at your operation, see how you need the asset to be used, try to imagine future uses and capacity needs and pick based on the complete picture. Assets should be purchased for the present value of their cost stream divided by the estimated output rather than just the acquisition price divided by the output.

5. Guaranteed maintainability requires experiments in new types of assets, new techniques and new materials.

Executive Summary

The field of guaranteed maintainability was coined by Atlanta based consultant, Ed Feldman. Basically, maintainability can be improved by choosing the right equipment that doesn’t\'t malfunction. And even if they do, choose designs that are easy, inexpensive and quick to fix. With the right choices from the beginning, maintenance departments can guarantee maintainability. There are 3 enemies of maintenance department. First is buying low bid without regard for experience, specification, use or service, second is mental laziness where the maintenance people never thought through performance of the assets and cannot identify the best brands of anything based on real data, and the third one is time. There are nine areas to consider in the design and specification of new assets.

JLEVITT@LCE.COM
Life Cycle Engineering | 4360 Corporate Road Office | Charleston, SC 29405
843.744.7110
Mobile +1-267-254-0061
www.LCE.com