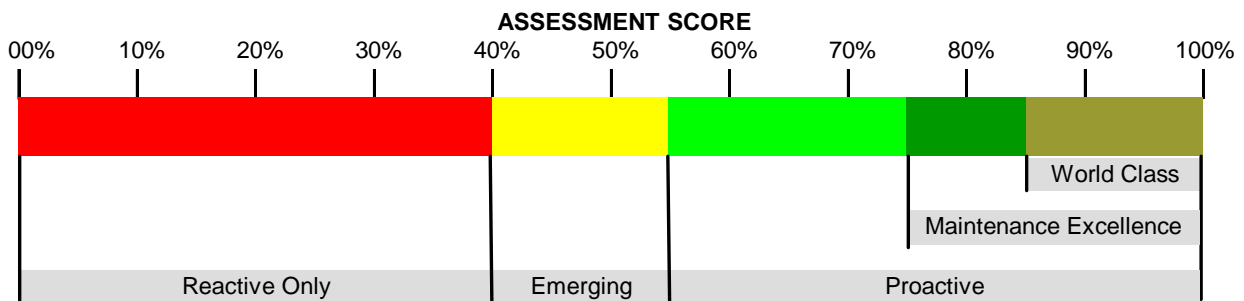


# BENCHMARKS MAINTENANCE ORGANIZATION EFFECTIVENESS

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At what level are the best Maintenance Organizations performing and how do they compare to the average maintenance operation . . . or to the worst? How well would your company score? Life Cycle Engineering, Inc. (LCE) has performed more than 170 assessments of maintenance organization effectiveness across a broad spectrum of plant and facility types. The assessments evaluate 21 essential elements, which are the building blocks of the “Maintenance Arch” in Figure 2, by objective scoring of more than 650 individual characteristics and factors, or data points. The path to **Maintenance Excellence™** is specifically defined for each organization that has a Maintenance Assessment performed by providing a basis for prioritization of improvement efforts. In addition, a maintenance assessment will define the improvement potential for the maintenance operation, which in turn can be used to define the dollar value potential for maintenance related cost reductions.

Maintenance Organization Effectiveness Assessments are performed in two phases. A Phase I assessment is an initial assessment to define a plant’s baseline position or starting point status. Following that, typically from eighteen months to two years, a Phase II follow-up assessment should be made to evaluate progress and to redirect, if necessary, continuing improvement efforts. Assessment scores will correlate the maintenance operation to its position on the “World Class Maintenance” *Achievement Bar* depicted in Figure 1.



**FIGURE 1**

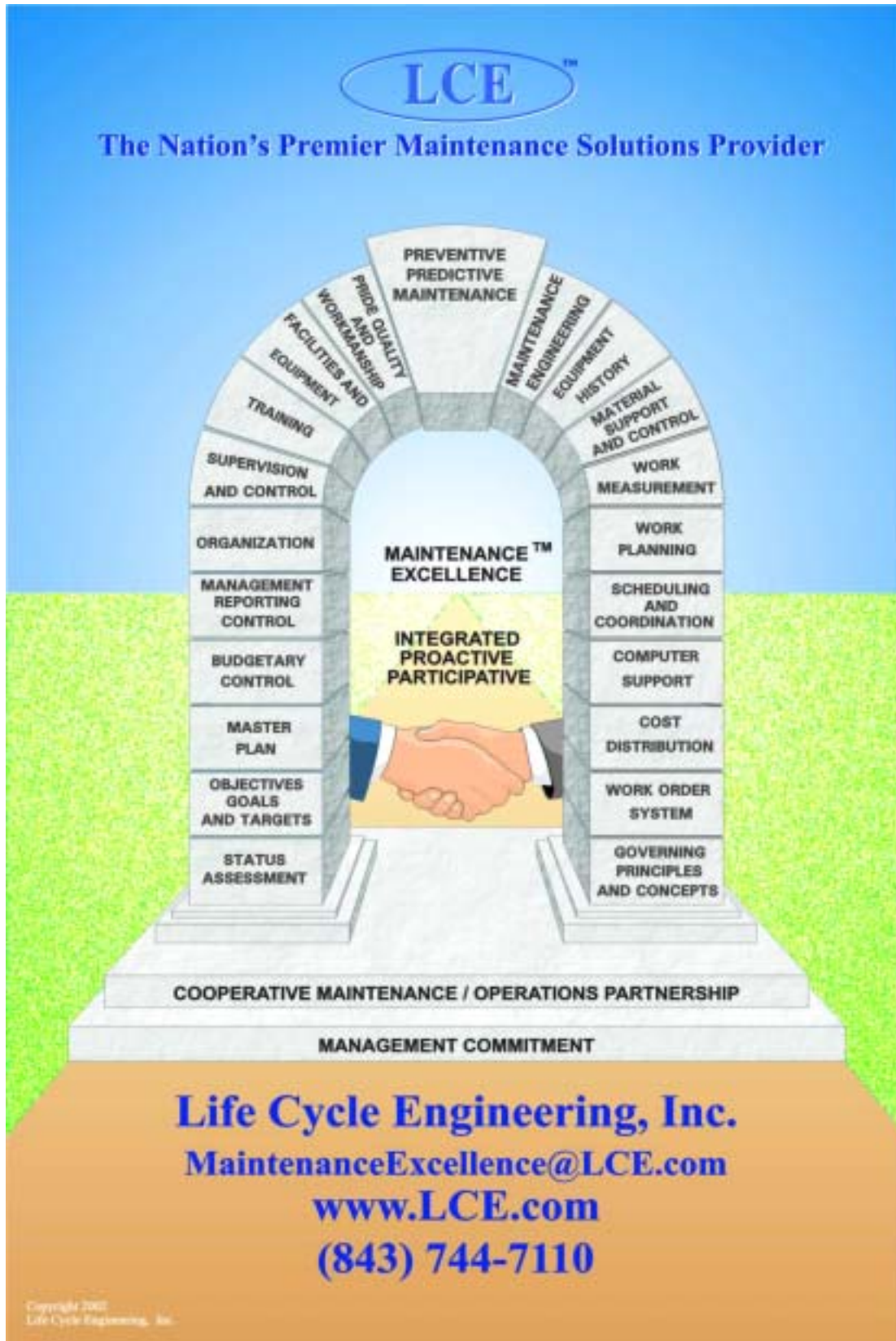
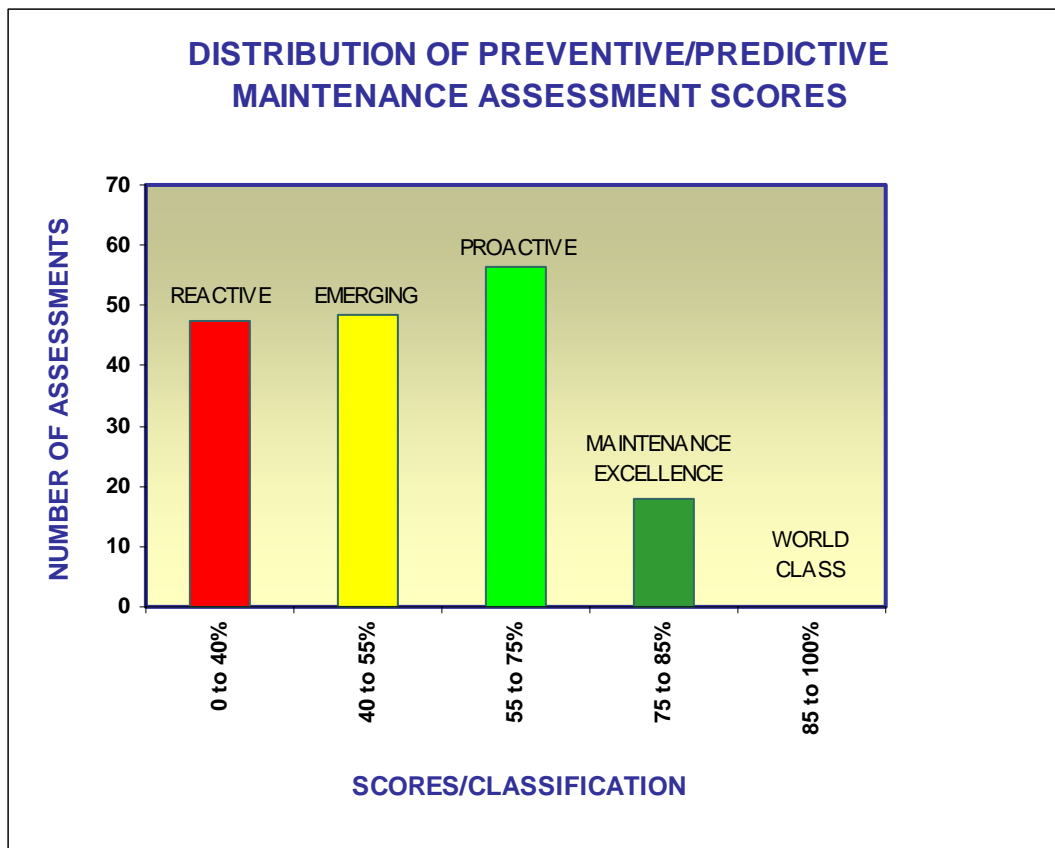


FIGURE 2

**About The Data**

The data results of the more than 170 assessments are compiled in Table 1 by highest, lowest, average and median scores. No assessment scores were excluded. The lowest and highest scores are not necessarily from one plant but are the composite scores specific to each element of the maintenance arch. A few maintenance organizations scored high in some areas but low in others. There is however, an overall trend toward higher scoring in all elements by the more effective maintenance organizations, while the less effective organizations tended to score low in all the elements.

Figure 3 illustrates a typical distribution of the scoring ranges of the assessments. As the keystone of the maintenance arch, preventive/predictive maintenance is chosen to illustrate the distribution of scores because it also represents how sound the basis for improvement is. With 76 evaluated data points combined to yield the total element score the Preventive/Predictive Maintenance assessment element is also the largest element relative to the number of data points.



**FIGURE 3**

The trend toward all low or all high scoring is due, in part, to each organization’s overall philosophy towards maintenance. It is also due to the interdependency between many of the elements. Thus the compiled assessment results demonstrate the pitfalls of trying to focus improvement efforts on one area and expect good results. Limiting your focus on one element of

maintenance will not provide the full results expected. You must focus on a group of elements with interdependency.

*Preventive/predictive maintenance* is the keystone of the maintenance arch. To ensure that the keystone is totally effective requires a strong *maintenance engineering* effort using as one of its resources a reliable *equipment history* database.

Preventive/predictive maintenance effectively requires competent and adequate craft staffing with proper attitude. Therefore, proper *organization* and a high level of *pride* and *quality assurance* are other elements linked to P/PdM.

Pride and quality assurance awareness are directly related to *supervisory skills* and *operating practices* along with adequate *facilities and equipment*.

Control of the work performed by maintenance forces is instituted through a strong *work order system*. Those elements which are interactive and which are a large portion of any successful work order system are *work planning, scheduling* and *coordination* as well as *work measurement*.

Effective work planning and work execution will not result without proper *material support* and *control*. Execution of various preventive maintenance tasks is dependent upon parts and supplies availability, which constitutes another linkage between the elements of the arch.

A well defined relationship exists between the elements of *management reporting* and *control, cost distribution* and *budgetary control*. Budgetary control can exist without the others, but by itself does not achieve the control level desired. Cost distribution and management reporting, and control are most effective when linked to a strong *work order system*. The management cycle must be completed by reliable information feedback on which managerial decisions and direction can be appropriately directed.

*Training* is linked to virtually every one of the elements discussed above and is the key link in the “educational process” previously emphasized. Management’s commitment to and support of a strong, on-going training program for crafts and supervision (particularly foremen) cannot be overemphasized.

To assure that progress is being made in many of the elements of the arch, *objectives, goals, and targets* are established, monitored, and reported on a regular basis.

The foundation for all of these elements is the establishment of *governing principles* and *concepts* that are set by facility and department management with input from members of maintenance supervision. Accordingly this element is linked essentially to all the others.

A *master plan* establishes the action steps, necessary resources, and time requirements to close the gap between current status and established objectives. The master plan element contains those action items determined to be necessary during implementation and progress towards “total maintenance integration” and maintains direction for the effort.

Finally, there is *status* assessment. This element defines the degree of maintenance effectiveness including strong points as well as areas which need to be improved.

Following then, in Table 1, are the compiled data from the maintenance effectiveness assessments. Where would your maintenance operation stand?

**TABLE 1**

<i>Scores</i>	Governing Principles	Status Assessment	Objectives	Master Plan	Budgetary Control	Management Control	Organization
<i>Lowest</i>	<b>0.000</b>	<b>0.000</b>	<b>0.040</b>	<b>0.000</b>	<b>0.100</b>	<b>0.033</b>	<b>0.160</b>
<i>Average</i>	0.468	0.273	0.388	0.279	0.526	0.471	0.614
<i>Highest</i>	<b>0.925</b>	<b>0.900</b>	<b>0.880</b>	<b>0.960</b>	<b>1.000</b>	<b>0.900</b>	<b>0.950</b>
<i>Median</i>	0.475	0.200	0.360	0.160	0.500	0.433	0.580

<i>Scores</i>	Training	Supervision	Pride & Quality	Facilities & Equipment	Work Order System	Cost Distribution	Computer Support
<i>Lowest</i>	<b>0.020</b>	<b>0.114</b>	<b>0.150</b>	<b>0.100</b>	<b>0.000</b>	<b>0.000</b>	<b>0.000</b>
<i>Average</i>	0.494	0.654	0.585	0.648	0.458	0.438	0.476
<i>Highest</i>	<b>0.950</b>	<b>0.929</b>	<b>0.875</b>	<b>0.982</b>	<b>0.883</b>	<b>1.000</b>	<b>0.943</b>
<i>Median</i>	0.440	0.657	0.600	0.673	0.467	0.450	0.500

<i>Scores</i>	Equipment History	Maintenance Engineering	Preventive/Predictive Maintenance	Work Planning	Work Measurements	Material Support and Control	Scheduling & Coordination
<i>Lowest</i>	<b>0.000</b>	<b>0.067</b>	<b>0.050</b>	<b>0.006</b>	<b>0.000</b>	<b>0.130</b>	<b>0.000</b>
<i>Average</i>	0.444	0.436	0.514	0.355	0.267	0.589	0.395
<i>Highest</i>	<b>0.900</b>	<b>0.857</b>	<b>0.865</b>	<b>0.850</b>	<b>0.717</b>	<b>0.890</b>	<b>0.880</b>
<i>Median</i>	0.475	0.414	0.500	0.280	0.233	0.595	0.390

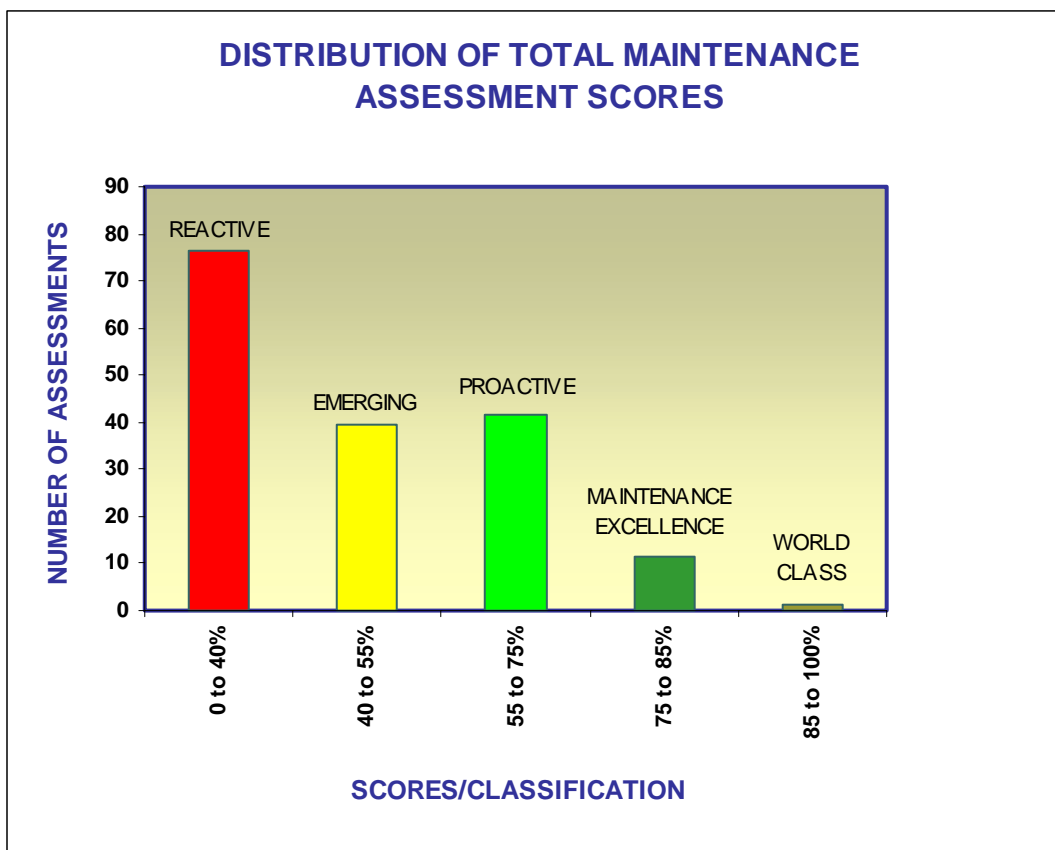
Doing some quick comparative analysis of the data in Table 1 we can see from the average scores that maintenance organizations do relatively well in the elements of *Organizational Structure*, *Supervision*, and providing craftsmen with adequate *Facilities and Equipment*. They also do well at *Materials Management*. These are all elements that don't necessarily require a well integrated process. The average scores are much lower in the elements of *Status Assessment*, *Master Planning*, *Work/Job Planning*, *Work Measurement*, and *Scheduling/Coordination*. These are elements that require a more sophisticated, well-designed process with the appropriate level of discipline to follow it.

Looking at the total aggregate scores – that is the total score for all 21 elements divided by 21 to yield the percent of maximum possible score - for each assessment, we again have compiled the lowest, average, highest and median scores achieved. The figures are presented in Table 2.

**TABLE 2**

<i>Scores</i>	Total Scores
<i>Lowest</i>	<b>0.181</b>
<i>Average</i>	<b>0.485</b>
<i>Highest</i>	<b>0.838</b>
<i>Median</i>	<b>0.459</b>

Figure 4 is a graphic illustration of the distribution of total assessment scores.



**FIGURE 4**

Comparing the total score distribution to the distribution of Preventive/Predictive Maintenance scores in Figure 3, it is quickly apparent that overall maintenance organization effectiveness is not as readily achieved as effective PM/PdM. However, PM/PdM is an excellent starting point on the path towards Maintenance Excellence and World Class recognition.

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