

Plant Maintenance Resource Center 2004 Maintenance Benchmarking Survey Results

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Overview

This Maintenance benchmarking survey was conducted on the Plant Maintenance Resource Center web site between March and May 2004. It was instigated by a query from Stephen Mundy, Lead Reliability Programs Engineer at Westinghouse Savannah River Company.

Summary of Key Findings

Voluntary responses were sought to the survey, and 180 valid responses were received from a wide range of individuals working across a variety of industries.

The key findings, based on a wide cross-section of respondents from a variety of countries, organization sizes, and industries are:

Breakdown of Personnel

- On average, the breakdown of personnel roles in the Maintenance Departments of those responding was:
 - Management/ Supervision - 13.3%
 - Engineering/ Technical Support - 11.3%
 - Planning, Work Management, Scheduling - 10.4%
 - Crafts, Technicians, Trades, Labor - 61.6%
 - Other - 3.4%
- In general, it appears that smaller organizations have a higher proportion of Management/Supervisory personnel in their Maintenance departments.

Maintenance Budget

- On average, 24% of sites' operating budgets were allocated to Maintenance. There appeared to be little correlation between this percentage and organization size.

Maintenance Activities

- The average organization allocates its maintenance budget to the following activities:
 - Reactive/Unplanned/Breakdown Maintenance - 25.8%
 - Planned Corrective Maintenance - 19.9%
 - Predictive/Preventive Maintenance - 21.7%
 - Proactive Maintenance/Modifications - 10.5%
 - Overhead Costs - 12.9%
 - Other - 9.2%
- Larger organizations tend to spend more money on Predictive/Preventive Maintenance than smaller organizations, and less money on Reactive/Unplanned/Breakdown Maintenance than smaller organizations.

Maintenance Maturity

- The programs that have the greatest maturity are those relating to Computerized Maintenance Management Systems (CMMS) and Maintenance Planning and Scheduling, although, even for these programs, as many as 20-30% of respondents considered their programs in these areas to be either Non-Existent or Infantile.

- The programs showing the overall lowest degree of maturity are those relating to Total Productive Maintenance (TPM), Design for Maintainability/Reliability, and Failure/Root Cause Analysis, where between 43% and 53% of respondents considered their programs to be Non-existent or Infantile.

Respondent Data

Of the 180 valid responses, almost 40% of respondents were based in the USA, with the remainder spread throughout the world.

Country	Responses	Percent
United States	69	38.33%
Australia	15	8.33%
Canada	12	6.67%
Other	9	5.00%
Thailand	8	4.44%
United Kingdom	7	3.89%
India	6	3.33%
Mexico	6	3.33%
South Africa	4	2.22%
New Zealand	3	1.67%
Saudi Arabia	3	1.67%
Bolivia	2	1.11%
Colombia	2	1.11%
Czech Republic	2	1.11%
Indonesia	2	1.11%
Iran	2	1.11%
Ireland	2	1.11%
Malaysia	2	1.11%
Netherlands	2	1.11%
Argentina	1	0.56%
Barbados	1	0.56%
Brazil	1	0.56%
China	1	0.56%
Egypt	1	0.56%
Finland	1	0.56%
Germany	1	0.56%
Ghana	1	0.56%
Kazakhstan	1	0.56%
Morocco	1	0.56%
Norway	1	0.56%
Pakistan	1	0.56%
Panama	1	0.56%
Peru	1	0.56%
Portugal	1	0.56%
Qatar	1	0.56%
Romania	1	0.56%
Russia	1	0.56%
Spain	1	0.56%
Sudan	1	0.56%
Venezuela	1	0.56%
Vietnam	1	0.56%

Respondents came from a wide range of industries, with Manufacturing industries being particularly well represented.

Industry	Responses	Percent
Agriculture-Other	1	0.56%
Manufacturing-Food, beverages, tobacco	14	7.78%
Manufacturing-Machinery and equipment	3	1.67%
Manufacturing-Metal products	30	16.67%
Manufacturing-Non-metallic mineral processing	5	2.78%
Manufacturing-Other	5	2.78%
Manufacturing-Petroleum refining, chemicals and associated products	23	12.78%
Manufacturing-Pharmaceuticals	3	1.67%
Manufacturing-Printing, publishing, and recorded media	3	1.67%
Manufacturing-Textiles, clothing, footwear, leather	2	1.11%
Manufacturing-Wood and paper products	14	7.78%
Mining-Coal	1	0.56%
Mining-Metal ore	6	3.33%
Mining-Other	2	1.11%
Mining-Services to Mining	1	0.56%
Oil and Gas-Oil and gas extraction	5	2.78%
Other	10	5.56%
Services-Business Services/Consulting	2	1.11%
Services-Contract Maintenance/Repairs	10	5.56%
Services-Education/Academia	8	4.44%
Services-Healthcare	4	2.22%
Services-Other	2	1.11%
Services-Property services/Building Maintenance	5	2.78%
Services-Telecommunications	4	2.22%
Services-Transport	5	2.78%
Utilities-Electricity Generation	9	5.00%
Utilities-Electricity Transmission and Distribution	1	0.56%
Utilities-Gas supply	1	0.56%
Utilities-Water, sewerage, drainage	1	0.56%

Respondents came from a wide range of organization sizes.

No of People in your Maintenance Organization	Responses	Percent
less than 10	26	14.44%
10-25	34	18.89%
25-50	31	17.22%
50-100	26	14.44%
100-200	13	7.22%
200-500	27	15.00%
500-1000	8	4.44%
more than 1000	9	5.00%
N/A	6	3.33%

Detailed Results

Breakdown of Personnel

The raw responses were as tabulated below.

% of Maintenance Personnel	Management/ Supervision		Engineering/ Technical Support		Planning, Work Management, Scheduling		Crafts, Technicians, Trades, Labor		Other	
	Responses	%	Responses	%	Responses	%	Responses	%	Responses	%
0%	1	0.56%	8	4.44%	7	3.89%			3	1.67%
0-2%	15	8.33%	23	12.78%	25	13.89%	1	0.56%	13	7.22%
2%-5%	36	20.00%	34	18.89%	36	20.00%	2	1.11%	13	7.22%
5%-10%	41	22.78%	26	14.44%	36	20.00%	6	3.33%	15	8.33%
10%-15%	26	14.44%	21	11.67%	23	12.78%	2	1.11%	2	1.11%
15%-20%	14	7.78%	10	5.56%	7	3.89%	1	0.56%	2	1.11%
20%-25%	14	7.78%	6	3.33%	2	1.11%	1	0.56%	2	1.11%
25%-30%	5	2.78%	9	5.00%	2	1.11%	1	0.56%		
30%-35%	2	1.11%	1	0.56%	1	0.56%	3	1.67%		
35%-40%			1	0.56%			4	2.22%	1	0.56%
40%-45%	1	0.56%			2	1.11%	7	3.89%	2	1.11%
45%-50%	1	0.56%			1	0.56%	6	3.33%		
50%-55%					2	1.11%	8	4.44%		
55%-60%	9	5.00%	4	2.22%	3	1.67%	15	8.33%	1	0.56%
60%-65%			1	0.56%			5	2.78%		
65%-70%	1	0.56%	1	0.56%			15	8.33%		
70%-75%	1	0.56%			1	0.56%	15	8.33%	1	0.56%
75%-80%	1	0.56%			3	1.67%	12	6.67%		
80%-85%			2	1.11%	2	1.11%	30	16.67%	1	0.56%
85%-90%			2	1.11%			18	10.00%		
90%-95%							9	5.00%		
95%-100%			1	0.56%			5	2.78%		
Don't Know	2	1.11%	1	0.56%	2	1.11%	2	1.11%	4	2.22%
N/A	10	5.56%	29	16.11%	25	13.89%	12	6.67%	120	66.67%

Using the data from the preceding table and assuming that:

- for each of the responses, the exact value is the midpoint of each range,
- the exact values for the N/A responses was zero.

and ignoring the “Don’t Know” responses gives the following approximate average distribution of personnel in the maintenance organisations of those who responded:

Function	% of Maintenance Personnel
Management/ Supervision	13.3%
Engineering/ Technical Support	11.3%
Planning, Work Management, Scheduling	10.4%
Crafts, Technicians, Trades, Labor	61.6%
Other	3.4%

Performing a similar analysis, by Maintenance organization size, yields the following results

Function	% of Maintenance Personnel							
	<10	10-25	25-50	50-100	100-200	200-500	500-1000	>1000
No of People in Maintenance Organization								
Management/ Supervision	19.0%	14.4%	10.9%	11.4%	8.4%	11.4%	19.1%	11.0%
Engineering/ Technical Support	9.1%	12.9%	10.4%	10.0%	11.0%	13.1%	12.9%	13.2%
Planning, Work Management, Scheduling	10.1%	8.5%	11.3%	6.6%	6.9%	11.7%	7.6%	19.6%
Crafts, Technicians, Trades, Labor	59.4%	59.6%	65.2%	65.4%	72.9%	60.8%	59.1%	52.6%
Other	2.3%	4.6%	2.2%	6.6%	0.8%	3.0%	1.3%	3.6%

One might expect that there would be a smaller proportion of Technical Support and/or Planning resources available in smaller organizations, but this does not, generally, seem to be born out by the survey results. It does appear, however, that smaller organizations do, generally, have a higher proportion of Management/Supervisory resources than larger organizations.

Maintenance Budget Allotted to Maintenance

On average, those that responded indicated that their organizations spent 24.4% of their sites allotted Operating Budget on Maintenance. This varied, by organization size, as follows:

No of People in Maintenance Organization	% of Site Operating Budget Allocated to Maintenance
<10	26.0%
10-25	26.0%
25-50	20.1%
50-100	31.6%
100-200	12.6%
200-500	22.5%
500-1000	23.2%
>1000	33.4%

Expenditure on Maintenance Activities

The distribution of expenditure by Maintenance Activity was as tabulated below.

% of Expenditure	Reactive/Unplanned/ Breakdown Maintenance		Planned Corrective Maintenance		Predictive/Preventive Maintenance		Proactive Maintenance/ Modifications		Overhead Costs		Other	
	Responses	%	Responses	%	Responses	%	Responses	%	Responses	%	Responses	%
0%			1	0.56%	3	1.67%	8	4.44%	4	2.22%	1	0.56%
0-2%	3	1.67%	3	1.67%	3	1.67%	10	5.56%	6	3.33%	9	5.00%
2%-5%	10	5.56%	6	3.33%	12	6.67%	22	12.22%	16	8.89%	5	2.78%
5%-10%	13	7.22%	20	11.11%	18	10.00%	33	18.33%	23	12.78%	7	3.89%
10%-15%	16	8.89%	18	10.00%	22	12.22%	17	9.44%	11	6.11%	1	0.56%
15%-20%	16	8.89%	16	8.89%	13	7.22%	12	6.67%	9	5.00%	1	0.56%
20%-25%	7	3.89%	16	8.89%	13	7.22%	9	5.00%	7	3.89%	1	0.56%
25%-30%	14	7.78%	24	13.33%	9	5.00%	6	3.33%	6	3.33%		
30%-35%	12	6.67%	11	6.11%	10	5.56%	1	0.56%	2	1.11%		
35%-40%	6	3.33%	4	2.22%	6	3.33%	2	1.11%	3	1.67%	2	1.11%
40%-45%	7	3.89%	6	3.33%	4	2.22%	2	1.11%	2	1.11%	1	0.56%
45%-50%	6	3.33%	5	2.78%	6	3.33%			1	0.56%		
50%-55%	4	2.22%	2	1.11%	3	1.67%			3	1.67%		
55%-60%	10	5.56%	4	2.22%	4	2.22%	3	1.67%	4	2.22%	2	1.11%
60%-65%	6	3.33%	2	1.11%	10	5.56%	1	0.56%	1	0.56%		
65%-70%	6	3.33%	1	0.56%	2	1.11%						
70%-75%	8	4.44%	4	2.22%	3	1.67%	2	1.11%	1	0.56%		
75%-80%	2	1.11%	1	0.56%								
80%-85%	5	2.78%	1	0.56%			1	0.56%				
85%-90%			2	1.11%	3	1.67%						
90%-95%					3	1.67%						
95%-100%	1	0.56%			1	0.56%						
Don't Know	9	5.00%	9	5.00%	9	5.00%	12	6.67%	19	10.56%	10	5.56%
N/A	19	10.56%	24	13.33%	23	12.78%	39	21.67%	62	34.44%	140	77.78%

Using the data from the preceding table and assuming that for each of the responses, the exact value is the midpoint of each range, and ignoring the "N/A " and "Don't Know" responses gives the following approximate average distribution of expenditure by Maintenance Activity:

Activity	% of Maintenance Expenditure
Reactive/Unplanned/Breakdown Maintenance	25.8%
Planned Corrective Maintenance	19.9%
Predictive/Preventive Maintenance	21.7%
Proactive Maintenance/Modifications	10.5%
Overhead Costs	12.9%
Other	9.2%

Performing a similar analysis, by Maintenance organization size, yields the following results

Function	% of Maintenance Expenditure							
No of People in Maintenance Organization	<10	10-25	25-50	50-100	100-200	200-500	500-1000	>1000
Reactive/Unplanned/Breakdown Maintenance	27.1%	28.3%	32.4%	25.4%	28.4%	21.9%	18.9%	15.1%
Planned Corrective Maintenance	18.0%	17.7%	21.0%	16.1%	26.1%	22.3%	18.3%	29.1%
Predictive/Preventive Maintenance	14.3%	18.3%	17.5%	27.4%	25.2%	29.4%	41.7%	24.0%
Proactive Maintenance/Modifications	9.3%	12.0%	12.8%	11.4%	6.1%	5.9%	9.2%	12.8%
Overhead Costs	15.7%	9.9%	10.4%	10.0%	11.1%	18.5%	11.9%	14.0%
Other	15.6%	13.9%	5.9%	9.6%	3.0%	1.9%	0.0%	5.0%

It would appear, from these figures, that larger organizations tend to spend more money on Predictive/Preventive Maintenance than smaller organizations, and less money on Reactive/Unplanned/Breakdown Maintenance than smaller organizations. This may make good business sense, as the consequences of failure for larger organizations may tend to be more severe than for smaller organizations.

Maintenance Maturity

The maturity of selected Maintenance programs within their organizations was assessed by respondents as tabulated below.

Maturity	Maintenance Planning and Scheduling		PM/Reliability Centered Maintenance		Total Productive Maintenance (TPM)		Failure Analysis/Root Cause Analysis		Computerized Maintenance Management System (CMMS)		Design for Maintainability/Reliability	
	Responses	%	Responses	%	Responses	%	Responses	%	Responses	%	Responses	%
Non-existent	6	3.33%	24	13.33%	44	24.44%	43	23.89%	25	13.89%	39	21.67%
Infantile	30	16.67%	47	26.11%	52	28.89%	49	27.22%	28	15.56%	39	21.67%
Adolescent	40	22.22%	39	21.67%	27	15.00%	32	17.78%	30	16.67%	40	22.22%
Young Adult	52	28.89%	29	16.11%	18	10.00%	20	11.11%	33	18.33%	26	14.44%
Mature	36	20.00%	22	12.22%	14	7.78%	15	8.33%	41	22.78%	8	4.44%
Don't Know	2	1.11%	2	1.11%	5	2.78%	1	0.56%	1	0.56%	2	1.11%
N/A	14	7.78%	17	9.44%	20	11.11%	20	11.11%	22	12.22%	25	13.89%

From this table, it can be seen that the programs that have the greatest maturity are those relating to Computerized Maintenance Management Systems (CMMS) and Maintenance Planning and Scheduling, although, even for these programs, as many as 20-30% of respondents considered their programs in these areas to be either Non-Existent or Infantile.

The programs showing the overall lowest degree of maturity are those relating to Total Productive Maintenance (TPM), Design for Maintainability/Reliability, and Failure/Root Cause Analysis, where between 43% and 53% of respondents considered their programs to be Non-existent or Infantile.

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