

**Appendix B**  
**Audit Forms**  
**for**  
**PdM Program Assessment**

**Contents include audit forms for assessing the following elements of a PdM Program:**

**Overall Program (OP)**

**Vibration Analysis (including Spike Energy & Shock Pulse Analysis) (VA) Technology**

**Infra Red Thermography & Temperature (IRT) Analysis**

**Lubricant, Hydraulic Fluid & Wear Particle (LWP) Analysis**

**Motor Current/Power Analysis (MCA/MPA)**

**Electrical Insulation Testing (EIT)**

**Transformer Predictive Analysis (TPA)**

**Electrical Circuit Analysis (ECrA)**

**Ultrasonic Analysis (Passive - for Leaks & Other Applications - UA)**

**Breakaway & Coast-down Analysis (BCA)**

**Filtration & Debris Analysis (FDA)**

**Make assessment of elements of a PdM Program using applicable audit forms included in this appendix for scoring, adding explanatory comments or recommendations as appropriate under questions that are applicable. Assign an assessment category using the rating criteria table below for each PdM program element audited.**

**Rating Criteria**

<b>Score</b>	<b>Assessment Category</b>
<b>&gt;/=90%</b>	<b>Among World's Best</b>
<b>80-89.9%</b>	<b>Superior</b>
<b>70-79.9%</b>	<b>Above Average</b>
<b>60-69.9%</b>	<b>Average</b>
<b>&lt;60%</b>	<b>Candidate for Substantial Improvement</b>

### Overall PdM Program

Facility audited \_\_\_\_\_

Person(s) contacted \_\_\_\_\_

Date(s) \_\_\_\_\_

<b>OP 1 Is the program based on a formally prepared long range plan?</b>		
	Yes (5 years at least)	6
	Yes (2-3 years)	3
	No	0
<b>OP 2 Does the program have a well established set of goals and objectives?</b>		
	Yes	6
	Yes (Some)	3
	No	0
<b>OP 3 Is there a formal plan for succession to assure program continuity?</b>		
	Yes	3
	No	0
<b>OP 4 Is there a formal long range plan for training and certification of PdM Technicians?</b>		
	Yes (3-5 years reviewed annually)	6
	Year-to-year decisions only	3
	No	0
<b>OP 5 Are there provisions for orienting new managers, supervisors and operators in the basic capabilities of the PdM technologies employed?</b>		
	Yes	3
	No	0
<b>OP 6 How good is feedback from operators and maintenance personnel on work completed as a result of PdM recommendations?</b>		
	Excellent (High % of cases)	6
	Good (Over 50% of cases)	3
	Poor (requires effort to obtain)	0

<b>OP 7 Identify the metrics established and monitored to determine the effectiveness of the PdM program. 3 = Yes, 0 = No, N/A = Not Applicable</b>		
<b>Percent of Repair Man Hours driven by PdM</b>		<b>0/3</b>
<b>PdM Compliance</b>		<b>0/3</b>
<b>PdM Labor Hours</b>		<b>0/3</b>
<b>PdM Labor Hours as a Percent of Total Maintenance Labor Hours</b>		<b>0/3</b>
<b>Trend in Mean Times Between Failures in critical systems</b>		<b>0/3</b>
<b>Trend in Overall Maintenance Costs</b>		<b>0/3</b>
<b>Trend in Overall Availability for systems critical to production</b>		<b>0/3</b>
<b>PdM Hit Rate by Technology Employed</b>		<b>0/3</b>
<b>Percentage of PdM recommendations acted upon promptly</b>		<b>0/3</b>
<b>Percentage of PdM actions where any feedback received</b>		<b>0/3</b>
<b>Other _____</b>		<b>0/3</b>
<b>Other _____</b>		<b>0/3</b>
<b>OP 8 Are operators equipped with technologies to conduct basic PdM tasks?</b>		
	<b>Yes, with two or more</b>	<b>3</b>
	<b>Yes with one</b>	<b>1</b>
	<b>No</b>	<b>0</b>
<b>OP 9 Is there frequent routine information exchange between PdM Technicians and operators concerning findings from PdM</b>		
	<b>Yes</b>	<b>3</b>
	<b>No</b>	<b>0</b>
<b>OP 10 Is there a formal process for application and selection of candidates for PdM positions?</b>		
	<b>Yes</b>	<b>3</b>
	<b>No</b>	<b>0</b>
<b>OP 11 Are there opportunities made available and supported for ad hoc training of PdM Technicians (PdM Conferences &amp; Exhibitions, preparation and presentation of papers and articles on program successes, participation in local professional society chapter functions, locally available video and on-line training courses on-the-job, benchmarking programs at other facilities, etc., )?</b>		
	<b>Yes, most of the above</b>	<b>6</b>
	<b>Yes but very limited</b>	<b>3</b>
	<b>No</b>	<b>0</b>

<b>OP 12 Are PdM technicians supported in their efforts to become trained and certified in more than one technology?</b>	<b>Yes</b>	<b>3</b>
	<b>No</b>	<b>0</b>
<b>OP 13 Do PdM Technicians' assignments to second and third technologies make sense in terms of synergy?</b>	<b>Yes</b>	<b>3</b>
	<b>No</b>	<b>0</b>
<b>OP 14 Are PdM Technicians routinely involved with Root Cause Failure Analysis and/or Failure Modes and Effects Analysis of systems monitored with technologies for which they are responsible?</b>	<b>Yes, trained and involved</b>	<b>6</b>
	<b>Yes, trained but not used</b>	<b>3</b>
	<b>No</b>	<b>0</b>
<b>OP 15 Are PdM Technicians involved with specification development for new production equipment?</b>	<b>Yes</b>	<b>3</b>
	<b>No</b>	<b>0</b>
<b>OP 16 Is there a set of formal written procedures for application of PdM technologies?</b>	<b>Yes</b>	<b>3</b>
	<b>No</b>	<b>0</b>
<b>OP 17 Are the processes of PdM and their relationship with other Maintenance and Reliability processes in use at the facility clearly documented and understood?</b>	<b>Yes</b>	<b>3</b>
	<b>No</b>	<b>0</b>
<b>OP 18 How old are the computer hardware and software and operating systems upon which the PdM Technicians are doing analysis?</b>	<b>Less than 2-3 years old</b>	<b>6</b>
	<b>More than 4 years old</b>	<b>3</b>
	<b>More than 6 years old</b>	<b>0</b>

<b>OP 19 With respect to OP 18, is there a plan for replacement of equipment and/or operating systems over 4 years old?</b>	<b>Yes</b>	<b>3</b>
	<b>No</b>	<b>0</b>
<b>OP 20 Does the PdM Program have an identified advocate, “champion” and/or other strong management support to assure its future?</b>	<b>Yes</b>	<b>3</b>
	<b>No</b>	<b>0</b>
<b>OP 21 Does the plant have a well documented Master Equipment List?</b>	<b>Yes</b>	<b>3</b>
	<b>No</b>	<b>0</b>
<b>OP 22 Has the PdM group analyzed the Master Equipment List and documented the criticality and applicable technologies for each item on it?</b>	<b>Yes</b>	<b>6</b>
	<b>Partially</b>	<b>3</b>
	<b>No</b>	<b>0</b>
<b>OP 23 Are PdM Group members encouraged to experiment to find new ways of employing PdM technologies in support of the organization’s goals and to solve difficult problems?</b>	<b>Yes</b>	<b>3</b>
	<b>No</b>	<b>0</b>
<b>OP 24 Are PdM Group members encouraged in any way to recommend modifications to plant equipment that would reveal “hidden failures” and/or make earlier detection of degradation more likely?</b>	<b>Yes</b>	<b>3</b>
	<b>No</b>	<b>0</b>
<b>OP 25 Are PdM reports on findings and summaries of results getting to the right Personnel in the organization so they know what recent accomplishments of The PdM group are?</b>	<b>Yes</b>	<b>3</b>
	<b>No</b>	<b>0</b>

<b>OP 26 When was the last inquiry made of report recipients as to the usefulness of PdM reports?</b>	<b>Within the past year</b>	<b>3</b>
	<b>Over two years ago</b>	<b>1</b>
	<b>Never</b>	<b>0</b>
<b>OP 27 When was the last assessment made as to productivity of the PdM Suites (hardware and/or software in use) and was it acted upon favorably?</b>	<b>Done every 3-4 years and upgrades acquired</b>	<b>6</b>
	<b>Done only when prompted (e.g., OEM abandons)</b>	<b>3</b>
	<b>Never done</b>	<b>0</b>
<b>OP 28 Does the budget for PdM provide for periodic upgrade of PdM capability?</b>	<b>Yes</b>	<b>3</b>
	<b>No</b>	<b>0</b>
<b>OP 29 How strong is mutual support and information sharing between PdM Analysts?</b>	<b>Excellent (Co-located, cross trained etc.,)</b>	<b>6</b>
	<b>OK, but could be better</b>	<b>3</b>
	<b>Poor to non-existent</b>	<b>0</b>
<b>OP 30 Have correlation tables for PdM Technologies been prepared?</b>	<b>Yes to Level 3</b>	<b>6</b>
	<b>Yes, but only to Level 1 or 2</b>	<b>3</b>
	<b>No</b>	<b>0</b>
<b>OP 31 If all or part of the PdM Program is outsourced does the contract have incentives for performance included in it and are the performance criteria renegotiated each year?</b>	<b>Yes</b>	<b>3</b>
	<b>No</b>	<b>0</b>
	<b>Not Applicable</b>	<b>N/A</b>
<b>OP 32 Are parts replaced as a result of PdM recommendations routinely made available for PdM Technicians for analysis so they can refine their knowledge of machinery degradation and failure as defined by the technologies they are applying?</b>	<b>Yes</b>	<b>3</b>
	<b>No</b>	<b>0</b>

**OP 33 Have selected parts, samples, photographs of other items reflecting Predictive Condition Monitoring been placed on display for all to see and learn from?**

Yes	3
No	0

**OP 34 Which of the following PdM Analysis methods are actually being used in the current program (besides Trend Analysis, Pattern Recognition and Correlation Analysis, (Covered in OP 30)? 3 = Used, 0 = Not Used**

Tests against limits or Ranges	3/0
Relative Comparisons	3/0
Statistical Analysis	3/0

**Overall Program**

**Possible Max Score (with or without parts of OP 7 & OP 31)** \_\_\_\_\_

**Assessed Score** \_\_\_\_\_

**Assessed Score/Max Score x 100% = Assessment** \_\_\_\_\_

**Rating (From Rating Criteria Table)** \_\_\_\_\_

## Vibration Analysis (VA)

Facility audited \_\_\_\_\_

Person(s) contacted \_\_\_\_\_

Date(s) \_\_\_\_\_

### VA 1 Periodicity and thoroughness of vibration surveys:

a. Periodicity determined by machinery failure history or other solid basis	6
Periodicity based on best estimates of early detection of degradation	3
No basis	0
b. Some equipment of functional significance not surveyed regularly	
	0-10% 8-9
	11-20% 6-7
	21-30% 4-5\
	31-40% 2-3
	41-50% 0-1
	>50%

Rationale for irregular periodicity \_\_\_\_\_

### VA 2 Analyst's time dedicated to PdM Program.

As needed to complete all functionally significant point on schedule	6
Available to complete < 80% of programmed point on schedule	3
Available to complete <50% of programmed points on schedule	0

### VA 3 Reporting method used:

Predominately by exception	6
Other, less effective method (evaluate)	3
No set method	0

### VA 4 Frequency range(s) used for analysis:

Selected based on machine type and speed	6
Constant for all equipment	3
No formal method	0

<b>VA 5 Use of alarm levels:</b>		
	<b>Narrow band and selected overall (evaluate)</b>	<b>6</b>
	<b>Overall only</b>	<b>3</b>
	<b>No alarm levels used</b>	<b>0</b>
<b>VA 6 Guidelines used for alarm levels for narrow band analysis</b>		
	<b>Varies with machine type, functional application and configuration</b>	<b>6</b>
	<b>Uses a single criterion</b>	<b>3</b>
	<b>No guidelines or single level for all machines</b>	<b>0</b>
	<b>Not Applicable (No alarm levels used per VA 5 above)</b>	<b>N/A</b>
<b>VA 7 Are phase readings used in vibration problem resolution?</b>		
	<b>Yes where applicable</b>	<b>6</b>
	<b>On occasion</b>	<b>3</b>
	<b>Never</b>	<b>0</b>
<b>VA 8 Are time domain data used in vibration problem resolution?</b>		
	<b>Yes where applicable</b>	<b>6</b>
	<b>On occasion</b>	<b>3</b>
	<b>Never</b>	<b>0</b>
<b>VA 9 Is analysis performed using an up-to-date analysis software?</b>		
	<b>Yes for all equipment in the program</b>	<b>6</b>
	<b>Only used when problem suspected</b>	<b>3</b>
	<b>No</b>	<b>0</b>
<b>VA 10 Are other than narrow band FFT analyses used to monitor vibration?</b>		
	<b>Yes where appropriate</b>	<b>6</b>
	<b>Method(s)_____</b>	
	<b>No</b>	<b>0</b>
<b>VA 11 Are there any continuous vibration devices used?</b>		
	<b>Yes, narrow band on all critical machines</b>	<b>6</b>
	<b>Yes, but not narrow band on all critical machines</b>	<b>3-5</b>
	<b>Vibration levels only (switches)</b>	<b>1-2</b>
	<b>No</b>	<b>0</b>

<b>VA 12 Is higher level consulting/technical/analysis assistance available and used?</b>	
Yes, available and used	6
Source? _____	
Available but not used	3
No	0
<b>VA 13 Are machines marked to show data collections points positively?</b>	
Yes, without exception, permanently marked	6
Yes, but with some exception (Painted vice mounted or other easily lost points)	3
No consistent marking system	0
<b>VA 14 Are data collection “routes” arranged to optimize data collection time?</b>	
Yes, on detail	6
Loosely arranged by geographic area	3
No routes established	0
<b>VA 15 Is there a reliable method for the analyst to find out about repairs on equipment in the program upon which calls have been made?</b>	
Yes, an all cases with minimal effort	6
Yes, but with some difficulty and exceptions	1-5
No	0
<b>VA 16 Are the results of the vibration analysis program made known in a formal manner to customers and managers regularly?</b>	
Yes, periodic summaries are published regularly	6
Selectively with variable detail	1-5
No	0
<b>VA 17 Who initiates work orders for vibration problem related repairs?</b>	
Vibration Analyst	3
Machinery area maintenance planner	2
Machinery area maintenance supervisor	1
Plant Manager	0

<b>VA 18 Is there a reliable, formal method for documenting cost benefits of the Vibration Analysis Program?</b>	
Yes, using a variety of cost & savings algorithms	6
Yes, but not widely used	1-3
No	0
<b>VA 19 Does the Vibration analysis software have an “expert system” module that is in use at this facility?</b>	
Yes, completely operational	6
Yes, but with some machine data not entered	3
No	0
<b>VA 20 Are the vibration data sensors routinely calibrated?</b>	
Yes, using “shaker” on site and documented	6
Yes, periodically off site by qualified vendor	2-5
No	0
<b>VA 21 Is the vibration analysis data logger and/or analysis software or reported data EFFECTIVELY linked with any other condition based analysis program (e.g, Thermography, Lubricant or Wear Particle Analysis)?</b>	
Yes automatically linked	6
Yes manually linked through reports	3
No	0
<b>VA 22 What is the level of training/qualification of your senior vibration analyst?</b>	
At least two weeks formal analysis training & at least one year on the job experience	6
1 week formal analysis training and at least 6 months on the job experience	3
No formal training; some on the job experience	1
None	0
<b>VA 23 Does the Vibration Analyst use Breakaway and Coast-down information to support analysis “calls” and recommendations?</b>	
Yes	3
No	0

**Vibration Analysis**

**Possible Max Score (with or without VA 6) \_\_\_\_\_**

**Assessed Score \_\_\_\_\_**

**Assessed Score/Max Score x 100% = Assessment \_\_\_\_\_**

**Rating (From Rating Criteria Table) \_\_\_\_\_**

## Infra Red Thermography & Temperature (IRT) Analysis

Facility audited \_\_\_\_\_

Person(s) contacted \_\_\_\_\_

Date(s) \_\_\_\_\_

<b>IR 1 To what extent is Infra Red Thermography used at this facility?</b>	
All candidate monitoring points are surveyed at least annually	<b>9</b>
A percentage of candidate monitoring points is surveyed annually	<b>2-8</b>
On request only – without formal routes	<b>1</b>
Not done or scanned at no specific interval	<b>0</b>
 <b>IR 2 What items in the facility are surveyed with Infra Red Thermography or temperature monitoring instruments? 3 = annually or on condition 1 = no specific frequency 0 = Not surveyed. N/A = Not Applicable</b>	
Electrical panels, motor controllers, generator and supply busses, Transformers	<b>0/1/3</b>
Process pipelines for insulation deterioration or other anomalies	<b>0/1/3</b>
Thermal gradients on or in process/ production equipment or materials	<b>0/1/3</b>
Tank levels, underground leaks, other heat emitting hidden anomalies	<b>0/1/3</b>
Roofs and window/door exits of facility buildings	<b>0/1/3</b>
 <b>IR 3 Are possible heat related problem areas identified during surveys in an effective way?</b>	
Yes, with visual spectrum photo annotated with arrows and thermogram	<b>9</b>
Thermogram only or visual image only	<b>3</b>
Yes with local tag or detailed description in report as to location	<b>1</b>
No	<b>0</b>
 <b>IR 4 Do Infra Red survey reports describe severity of suspected faults, suspected causes and recommendations effectively?</b>	
Yes, all including temperature differentials are included	<b>3</b>
Yes, some but not all of the above are included	<b>1</b>
No	<b>0</b>
 <b>IR 5 How are potential faults presented in Infra Red inspection reports?</b>	
Grouped in order of severity	<b>3</b>
Grouped by location	<b>1</b>
Random or presented in order of the route	<b>0</b>
 <b>IR 6 Are thermographic surveys performed as part of post repair and new installation startup checks?</b>	
Yes	<b>3</b>
No	<b>0</b>

<b>IR 7</b>	<b>What is the basis/periodicity for “overhaul” of electrical components such as those mentioned above?</b>	
	Done “on condition”	<b>3</b>
	Done on a reasonable scheduled basis	<b>1</b>
	Not done	<b>0</b>
<b>IR 8</b>	<b>Is a consistent severity scale used to classify potential faults?</b>	
	Yes, based on temperature differential appropriate to the system monitored	<b>3</b>
	No	<b>0</b>
<b>IR 9</b>	<b>How often are accessible parts of motor controllers, major supply busses, distribution panels and transformers visually inspected for discoloration, corrosion, and other potential defects and/or electrically tested to determine if grounds, high resistance joints or increasing capacitance is present?</b>	
	Annually or more frequently, depending on environment	<b>3</b>
	Less frequently than annually	<b>1</b>
	None of the above are performed	<b>0</b>
<b>IR 10</b>	<b>Does the IR program use analysis software to support it and to assist in report writing?</b>	
	Yes	<b>3</b>
	No	<b>0</b>
<b>IR 11</b>	<b>Is the thermographers notified when repairs based on his/her are completed?</b>	
	Yes, at least 90% of the time or more	<b>3</b>
	No, less than 90% of the time or just sometimes	<b>1</b>
	Not usually	<b>0</b>
<b>IR 12</b>	<b>What is the level of qualification/training of the person performing infra red survey and analysis in this program?</b>	
	Quantitative IR Specialist (Level II) based on formal Training, experience, and exam	<b>6</b>
	Qualitative IR Specialist (Level I) based on formal training, experience and exam	<b>3</b>
	Individual with on-the-job training and experience	<b>1</b>
	Individual with no training and less than 3 months on-the-job experience	<b>0</b>
<b>IR 13</b>	<b>Does the person assigned to do IR surveys and analysis have access to a qualified Level III IR Thermographer?</b>	
	Yes, within the organization and has been consulted	<b>3</b>
	Yes, on a contract basis and has been consulted	<b>2</b>
	No	<b>0</b>

<b>IR 14</b>	<b>Does the person assigned to do IR surveys and analysis have access to an electrical engineering/technical group to obtain help in researching heat related problems?</b>	
	Yes	<b>3</b>
	No	<b>0</b>
<b>IR 15</b>	<b>Is IR data linked EFFECTIVELY with one or more condition based analysis program technologies?</b>	
	Yes (Name the technologies _____)	<b>3-6</b>
	No	<b>0</b>
<b>IR 16</b>	<b>Is light enhancing IR analysis being used for detection of Corona in High Voltage components (e.g., transformers or switchgear)?</b>	
	Yes	<b>3</b>
	No	<b>0</b>
	Not Applicable	<b>N/A</b>
<b>IR 17</b>	<b>Is IRT applied effectively to cranes?</b>	
	Yes	<b>3</b>
	No	<b>0</b>
	Not Applicable	<b>N/A</b>

Possible Max Score (with or without IR 16 & IR 17) \_\_\_\_\_

Assessed Score \_\_\_\_\_

Assessed Score/Max Score x 100% = Assessment \_\_\_\_\_

Rating (From Rating Criteria Table) \_\_\_\_\_

## Lubricant, Hydraulic Fluids and Wear Particle Analysis (LWP)

Facility audited \_\_\_\_\_

Person(s) contacted \_\_\_\_\_

Date(s) \_\_\_\_\_

**LWP 1 Define the extent of the Lubricant, Hydraulic Fluid and Wear Particle Analysis Program by indicating whether or not the following are applicable and are Analyzed. 3 = Yes, 0 = No, N/A = Not Applicable**

SYSTEM or MAJOR COMPONENT	QUALITY TESTS*/WEAR PARTICLE#
Circulating Lubrication Systems	0/3
Hydraulic Systems	0/3
Gear Boxes (Indicate application(s))	0/3
Other _____	0/3
Other _____	0/3

\*Tests appropriate to the lubricant or fluid being used # As appropriate

**LWP 2 What is the level of expertise of the person who administers the Lubricant, Hydraulic Fluids and Wear Particle Analysis Program?**

PdM Program Manager or Lubrication Specialist	6
Person with no special training in the field of lubrication or wear analysis	2
No individual or group assigned	0

**LWP 3 Who receives and analyzes Lubricant, Fluids Analysis and Wear Particle analysis results?**

PdM Program Manager or Lubrication Specialist	6
Maintenance or Reliability Engineer trained in meaning of the results	4
Another PdM Specialist (such as a Vibration Analyst)	3
Person with no special training in the field of lubrication or wear analysis	1
No individual or group assigned	0

**LWP 4 Are lubrication and sampling tasks formally scheduled for periodic accomplishment?**

Yes with provision for special sampling “on condition” (e.g., vibration Analysis or adverse LWP report)	6
Yes, but with no formal “on condition” scheduling	3
No	0

<b>LWP 5</b>	<b>When scheduling is overdue, is there formal notification?</b>	
	Yes, with weekly updates which are accounted for	<b>3</b>
	Yes with monthly updates which are accounted for	<b>1</b>
	No	<b>0</b>
<b>LWP 6</b>	<b>Is a formal basis documented for lubricants, hydraulic fluids and grease Type, levels, addition amounts and sampling methods (where applicable)?</b>	
	Yes, and easily available, used and understood	<b>6</b>
	Yes, but not available, used or referred to effectively	<b>3</b>
	No	<b>0</b>
<b>LWP 7</b>	<b>Have personnel assigned to perform lubrication and fluids addition been formally trained on implications of what can go wrong if not done correctly?</b>	
	Yes, with a formal training reference(s) or course that is readily available	<b>3</b>
	Yes, on the job	<b>2</b>
	No	<b>0</b>
<b>LWP 8</b>	<b>Are lubricants, hydraulic fluids and greases required in the facility formally specified in such a way that applicable alternatives can be procured when needed?</b>	
	Yes, in addition to manufacturer's ID, National or International generic Grade data are provided in readily available purchase specifications	<b>3</b>
	No, but lubricant specialist is consulted when change is needed	<b>1</b>
	No	<b>0</b>
<b>LWP 9</b>	<b>Have lubricants, hydraulic fluids and greases been surveyed to determine if a smaller number of generic types can be used to meet most or all applications in the facility?</b>	
	Yes	<b>3</b>
	No	<b>0</b>
<b>LWP 10</b>	<b>Is analysis done on the amounts of lubricants, hydraulic fluids and greases used?</b>	
	Yes	<b>3</b>
	No	<b>0</b>

**LWP 11 Have all personnel responsible for lubricant and fluids addition and filter change been given formal training on in-situ analysis of debris and visual observations and reporting techniques for abnormal conditions?**

**Yes 6**  
**No 0**

**LWP 12 Have all personnel responsible for sampling been trained on proper sampling techniques needed for equipment in the area and are the needed tools available for their use?**

**Yes, training has been given and tools are in use 6**  
**Yes, tools are available but no formal training has been given or vice versa 3**  
**No 0**

**LWP 13 Are Wear Particle Analysis results EFFECTIVELY linked to other PdM technologies for purposes of correlation analysis?**

**Yes (Name the technologies \_\_\_\_\_) 3-6**  
**No 0**

**LWP 14 Is a lubrication expert available to plant personnel for consultation when needed?**

**Yes, in house or under contract as needed 6**  
**Yes from lubricant suppliers 4**  
**No 0**

**Possible Max Score \_\_\_\_\_**

**Assessed Score \_\_\_\_\_**

**Assessed Score/Max Score x 100% = Assessment \_\_\_\_\_**

**Rating (From Rating Criteria Table) \_\_\_\_\_**

**Motor Current Analysis/Motor Power Analysis (MCA/MPA)**

**Facility audited** \_\_\_\_\_

**Person(s) contacted** \_\_\_\_\_

**Date(s)** \_\_\_\_\_

**MCA/MPA 1 What Motor Current/Power Analysis methods are used at this facility?**

- Current balance & Current/Power Signature Analysis both used** **6**
- Current balance or Current Signature Analysis only** **3**
- Neither in use** **0**

**MCA/MPA 2 Is the Current/Power Analysis supported by up-to-date computer software?**

- Yes (Identify Vendor \_\_\_\_\_)** **6**
- Yes, but not up to date** **3**
- No** **0**

**MCA/MPA 3 Is scheduled MCA/MPA performed on motors having a solid basis for being monitored regularly?**

- Yes, there is a solid basis and regular schedule** **6**
- Yes, regular schedule but no documented basis or vice versa** **3**
- No** **0**

**MCA/MPA 4 Are MCA/MPA results EFFECTIVELY linked with other PdM technologies for purposes of correlation analysis?**

- Yes (Identify technologies \_\_\_\_\_)** **3-6**
- No** **0**

**MCA/MPA 5 Do baseline current/power signatures exist for all critical motors in the facility?**

- Yes** **6**
- No** **0**

**Possible Max Score** **30**

**Assessed Score** \_\_\_\_\_

**Assessed Score/Max Score x 100% = Assessment** \_\_\_\_\_

**Rating (From Rating Criteria Table)** \_\_\_\_\_

**Electrical Insulation Testing (EIT)**

**Facility audited** \_\_\_\_\_

**Person(s) contacted** \_\_\_\_\_

**Date(s)** \_\_\_\_\_

**EIT 1 Is some form of electrical insulation testing routinely scheduled and performed?**

Yes, scheduled and performed **6**

Yes, Scheduled but not performed or vice versa **3**

No **0**

**EIT 2 Are insulation resistance to ground readings temperature corrected and always taken after a consistent time after application of test voltage?**

Yes, readings are t4emperature corrected and time consistent **6**

Yes, but only one of the above **3**

No **0**

**EIT 3 If polarization Index, Polarization Index Profile or other ratio method of insulation resistance condition assessment is used, are results analyzed using a recognized predictive analysis method (e.g, Trend Analysis, Pattern Recognition, etc., )?**

Yes (List methods used \_\_\_\_\_) **3-6**

No **0**

**EIT 4 Are baseline values of insulation condition (Resistance-to Ground & Capacitance-to-Ground) available for all circuits in the plant and are they used as a basis for judgment of present condition?**

Yes, both available and used **6**

Yes but only Resistance-to-Ground available and used **3**

No **0**

**Possible Max Score 24**

**Assessed Score** \_\_\_\_\_

**Assessed Score/Max Score x 100% = Assessment** \_\_\_\_\_

**Rating (From Rating Criteria Table)** \_\_\_\_\_

**Transformer Predictive Analysis (TPA)**

**Facility audited** \_\_\_\_\_

**Person(s) contacted** \_\_\_\_\_

**Date(s)** \_\_\_\_\_

**TPA 1 For large oil filled transformers, which of the following analysis are performed on a regularly scheduled basis? 3 = Yes, 0 = No, N/A = Not Applicable**

<b>Oil quality (Water content, dielectric strength, color, etc.,)</b>	<b>0/3</b>
<b>Gasses</b>	<b>0/3</b>
<b>Winding resistance, using all possible internal tap and switch positions</b>	<b>0/3</b>
<b>Gas blanket pressure, oil temperature and level</b>	<b>0/3</b>
<b>Furol analysis</b>	<b>0/3</b>
<b>Partial Discharge analysis</b>	<b>0/3</b>

**TPA 2 Are results of the last such tests analyzed using a recognized predictive analysis method (e.g., Trend analysis, Pattern Recognition, Test Against Limits or Ranges?**

<b>Yes (identify the method(s) _____</b>	<b>3-6</b>
<b>Yes, but not all that are available are analyzed in a predictive manner</b>	<b>2</b>
<b>No</b>	<b>0</b>

**TPA 3 Which of the following electrical tests are regularly scheduled and performed on major transformers in this facility? 3 = Yes, 0 = No,**

<b>Resistance-to-Ground</b>	<b>0/3</b>
<b>Capacitance-to-Ground</b>	<b>0/3</b>
<b>Doble (Power Factor)</b>	<b>0/3</b>

**Possible Max Score** **33**

**Assessed Score** \_\_\_\_\_

**Assessed Score/Max Score x 100% = Assessment** \_\_\_\_\_

**Rating (From Rating Criteria Table)** \_\_\_\_\_

## Electrical Circuit Analysis (ECrA)

Facility audited \_\_\_\_\_

Person(s) contacted \_\_\_\_\_

Date(s) \_\_\_\_\_

**ECrA 1 Which of the following analyses/tests are routinely scheduled and performed on circuits in and critical to rotating AC electrical machines in the facility?**

Conductor path resistance & percent unbalance	0/3
Inductance & Inductive percent unbalance	0/3
Rotor-Stator Inductive Influence Analysis	0/3

**ECrA 2 Were the results of the last such tests analyzed using a recognized predictive analysis method (e.g, Trend Analysis or Pattern Recognition)?**

Yes, all that are taken are	6
Yes, but not all that are available are analyzed in a predictive manner	3
No	0

**ECrA 3 Which of the following analyses/tests are routinely scheduled and performed on critical DC circuits in AC (synchronous) machines and DC machines in the facility, if applicable? 3 = Yes, 0 = No, N/A = Not Applicable**

Conductor Path Resistance	0/3
Inductance	0/3
Capacitance to Ground	0/3
Bar-to-Bar Resistance	0/3
Voltage Drop (Synchronous Rotor Poles)	0/3

**ECrA 4 Are baseline values of the above tests recorded and readily available for all critical machines in the facility and are they used as a basis for judgment of present condition?**

Yes, recorded, available and used	6
Yes, recorded, but not used	3
No	0

**ECrA 5 Are ECrA analysis results used EFFECTIVELY with any data from any other predictive technology for correlation analysis?**

Yes (Identify technologies _____)	3-6
No	0

Possible Max Score \_\_\_\_\_

Assessed Score \_\_\_\_\_

Assessed Score/Max Score x 100% = Assessment \_\_\_\_\_

Rating (From Rating Criteria Table) \_\_\_\_\_

**Ultrasonic Analysis (Passive - for Leaks & Other Applications - UA)**

**Facility audited** \_\_\_\_\_

**Person(s) contacted** \_\_\_\_\_

**Date(s)** \_\_\_\_\_

**UA 1 Define the extent of the Ultrasonic Analysis program at this facility by indicating whether or not the following are routinely monitored using this technology.**

**3 = Yes, 0 = No, N/A = Not Applicable**

<b>Steam Traps</b>	<b>3/0</b>
<b>Bearings</b>	<b>3/0</b>
<b>Gear Boxes</b>	<b>3/0</b>
<b>Compressors</b>	<b>3/0</b>
<b>High Voltage Electrical Components (for Corona or other arcing phenomena)</b>	<b>3/0</b>
<b>Piping Systems, Pressure and Vacuum vessels for internal &amp; external leaks</b>	<b>3/0</b>
<b>Heat Exchanger tube leaks (using tone generator)</b>	<b>3/0</b>

**UA 2 Are UA results EFFECTIVELY linked with any other predictive technology for purposes of correlation analysis?**

<b>Yes (Identify _____, _____, _____)</b>	<b>6/3</b>
<b>No</b>	<b>0</b>

**UA 3 Are the results of the last such tests analyzed using a recognized predictive analysis method (e.g., Trend analysis, pattern recognition)?**

<b>Yes, all that were taken</b>	<b>6</b>
<b>Yes, but not all that are available were analyzed in a predictive manner</b>	<b>3</b>
<b>No</b>	<b>0</b>

**UA 4 Is Ultrasonic Analysis used as part of an energy, cost avoidance and/or machine wear conservation program?**

<b>Yes (Identify programs _____, _____)</b>	<b>6</b>
<b>No</b>	<b>0</b>

**UA 5 When problems are detected is there an effective means of reporting them and is the follow-up action taken promptly?**

<b>Yes, reporting and follow-up are effective</b>	<b>6</b>
<b>Yes, reporting is good but follow-up needs improvement or vice-versa</b>	<b>3</b>
<b>No</b>	<b>0</b>

<b>UA 6</b>	<b>Is there a reliable, formal method for documenting cost benefit of the Ultrasonic Analysis program?</b>	
	<b>Yes, using a variety of cost and savings algorithms</b>	<b>6</b>
	<b>Yes, but not widely applied</b>	<b>3</b>
	<b>No</b>	<b>0</b>

**Possible Max Score** \_\_\_\_\_

**Assessed Score** \_\_\_\_\_

**Assessed Score/Max Score x 100% = Assessment** \_\_\_\_\_

**Rating (From Rating Criteria Table)** \_\_\_\_\_

**Breakaway & Coast-down Analysis (BCA)**

Facility audited \_\_\_\_\_

Person(s) contacted \_\_\_\_\_

Date(s) \_\_\_\_\_

**BCA 1 Is Breakaway and/or Coast-down analysis performed as part of the PdM Program?**

- Yes, both are used 6
- Yes, but only one is used (Specify \_\_\_\_\_) 3
- No 0

**BCA 2 Are results from these tests consistently recorded for analysis purposes?**

- Yes 6
- Partially 3
- No 0

**BCA 3 Are equipment operators knowledgeable about the value of this type of testing and are they routinely performing and recording results?**

- Yes, operators are performing, recording and supplying results to the PdM team. 6
- Yes they are performing but not providing results consistently 3
- No 0

**BCA 4 Are results of Breakaway and Coast-down tests correlated with other PdM Technology results (e.g., Vibration Analysis, Lubricant Wear Particle Analysis, Infra red Analysis)?**

- Yes (Identify \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_) 6/3
- No 0

**Possible Max Score 24**

**Assessed Score \_\_\_\_\_**

**Assessed Score/Max Score x 100% = Assessment \_\_\_\_\_**

**Rating (From Rating Criteria Table) \_\_\_\_\_**

**Filtration & Debris Analysis (FDA)**

**FACILITY SURVEYED** \_\_\_\_\_

**PERSONS CONTACTED** \_\_\_\_\_

**DATE(s)** \_\_\_\_\_

**FDA-1 Are filtration and/or Debris Analysis performed as part of the PdM Program?**

- Yes, both are used** **6**
- Yes, but only one is used (Specify \_\_\_\_\_)** **3**
- No** **0**

**FDA-2 Are results from these tests consistently recorded for analysis purposes?**

- Yes** **6**
- Partially** **3**
- No** **0**

**FDA-3 Are equipment operators knowledgeable about the value of this type of testing and are they routinely performing and recording results?**

- Yes, operators are performing, recording and supplying results to the PdM team.** **6**
- Yes they are performing but not providing results consistently** **3**
- No** **0**

**FDA-4 Are results of Filtration and Debris analysis correlated with other PdM Technology results (e.g., Vibration Analysis, Lubricant Wear Particle Analysis, Infra red Analysis, etc.)?**

- Yes** **6**
- No** **0**

**Possible Max Score** **24**

**Assessed Score** \_\_\_\_\_

**Assessed Score/Max Score x 100% = Assessment** \_\_\_\_\_

**Rating (From Rating Criteria Table)** \_\_\_\_\_