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Our 2018 predictive maintenance survey suggests that obstacles to PdM success are being overcome by motivated plant teams and their partners

Expand your
workforce for free!
P.17

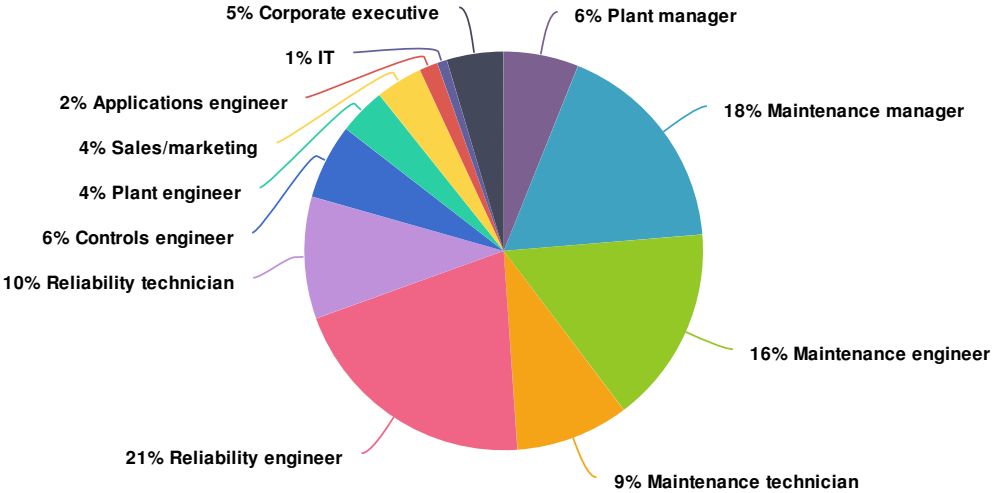
Mine like Mike
P.37

Your comprehensive
guide to power quality
P.38

Helping new hires succeed
P.50

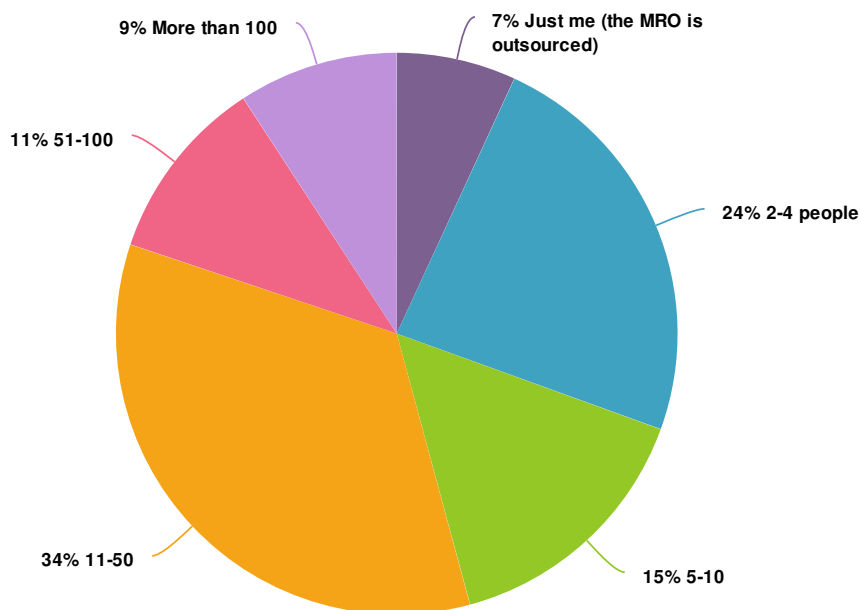
Report for PS PdM-RxM Survey 2018

1. What is your primary job function?



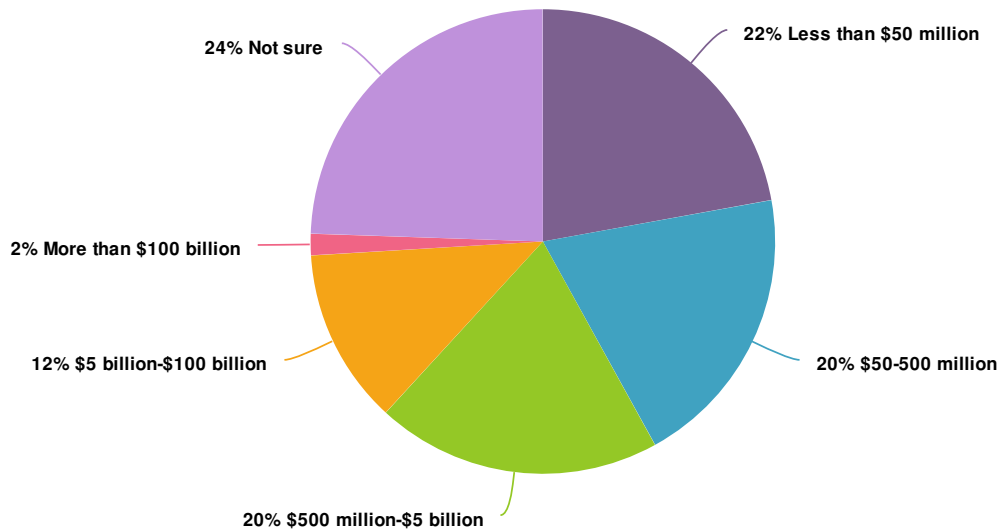
Value		Percent
Plant manager		6.1%
Maintenance manager		17.6%
Maintenance engineer		16.0%
Maintenance technician		9.2%
Reliability engineer		20.6%
Reliability technician		9.9%
Controls engineer		6.1%
Plant engineer		3.8%
Sales/marketing		3.8%
Applications engineer		1.5%
IT		0.8%
Corporate executive		4.6%

2. How big is the maintenance/reliability staff at your plant?



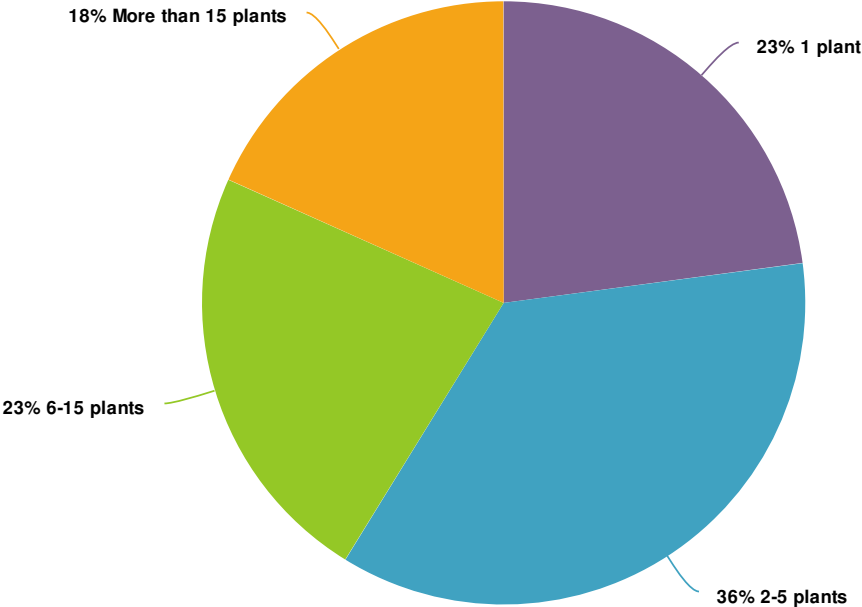
Value	Percent
Just me (the MRO is outsourced)	6.9%
2-4 people	23.7%
5-10	15.3%
11-50	34.4%
51-100	10.7%
More than 100	9.2%

3. What is the annual revenue of your organization?



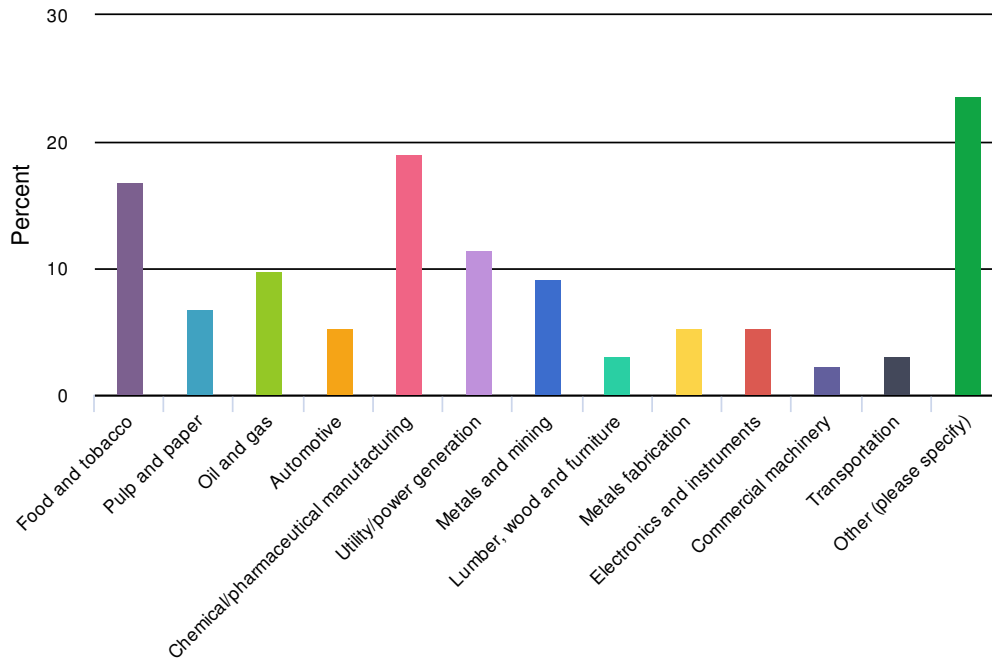
Value	Percent
Less than \$50 million	22.1%
\$50-500 million	19.8%
\$500 million-\$5 billion	19.8%
\$5 billion-\$100 billion	12.2%
More than \$100 billion	1.5%
Not sure	24.4%

4. How many total plants does your organization manage?



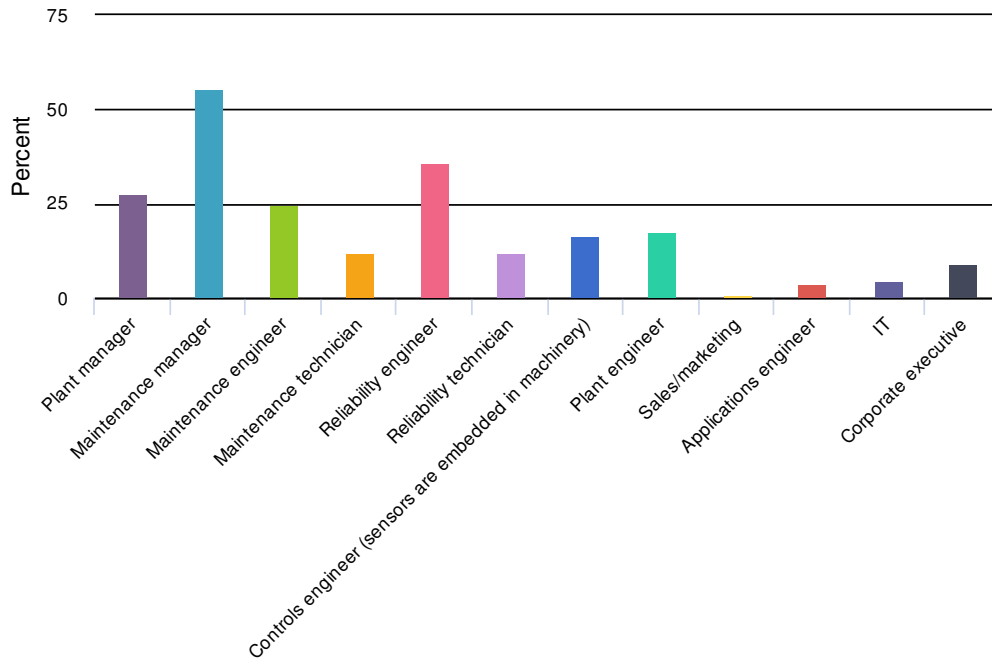
Value	Percent
1 plant	22.9%
2-5 plants	35.9%
6-15 plants	22.9%
More than 15 plants	18.3%

5. What vertical does your plant most closely align with? (Please check all that apply.)



Value	Percent
Food and tobacco	16.8%
Pulp and paper	6.9%
Oil and gas	9.9%
Automotive	5.3%
Chemical/pharmaceutical manufacturing	19.1%
Utility/power generation	11.5%
Metals and mining	9.2%
Lumber, wood and furniture	3.1%
Metals fabrication	5.3%
Electronics and instruments	5.3%
Commercial machinery	2.3%
Transportation	3.1%
Other (please specify)	23.7%

6. Who in your plant makes decisions on asset monitoring tools and configurations? (Please check all that apply.)

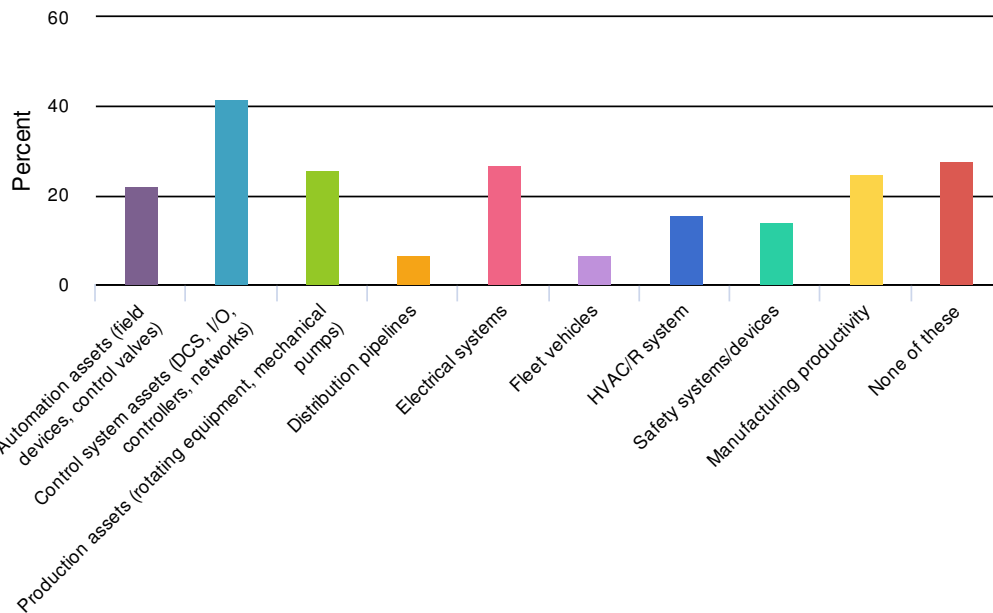


Value	Percent
Plant manager	27.8%
Maintenance manager	55.6%
Maintenance engineer	25.0%
Maintenance technician	12.0%
Reliability engineer	36.1%
Reliability technician	12.0%
Controls engineer (sensors are embedded in machinery)	16.7%
Plant engineer	17.6%
Sales/marketing	0.9%
Applications engineer	3.7%
IT	4.6%
Corporate executive	9.3%

7. Which of these technologies are you using to monitor assets?

	Using now	In 2019 budget	Within 3 years	No plans	Responses
Controls equipment (controllers, networks, software) Row %	78.1%	2.9%	7.6%	11.4%	105
Self-diagnostic (smart) instrumentation and final control elements (drives, valves) Row %	43.4%	6.6%	20.8%	29.2%	106
Specialized system control systems (combustion controls, steam trap monitors, water/wastewater, cooling systems, compressed air) Row %	46.6%	3.9%	11.7%	37.9%	103
Predictive maintenance (PdM) technologies for condition- monitoring (thermography, oil analysis, vibration, ultrasound, motor testing) Row %	76.6%	5.6%	10.3%	7.5%	107
Instrumentation (valve analysis, signal processing and alarm management software) Row %	49.1%	7.5%	13.2%	30.2%	106
Automation, data archiving, and reporting software Row %	56.7%	11.5%	12.5%	19.2%	104
Automation of work order generation (including repair history, diagnostics, procedure and parts information) Row %	50.0%	10.6%	20.2%	19.2%	104
Embedded remote monitoring devices Row %	28.6%	12.4%	21.0%	38.1%	105
Energy monitoring and control devices (drives, valve actuators) Row %	43.6%	6.9%	17.8%	31.7%	101
Totals Total Responses					107

8. Which of these are you using your Internet-enabled systems and sensors to monitor? (Please check all that apply.)

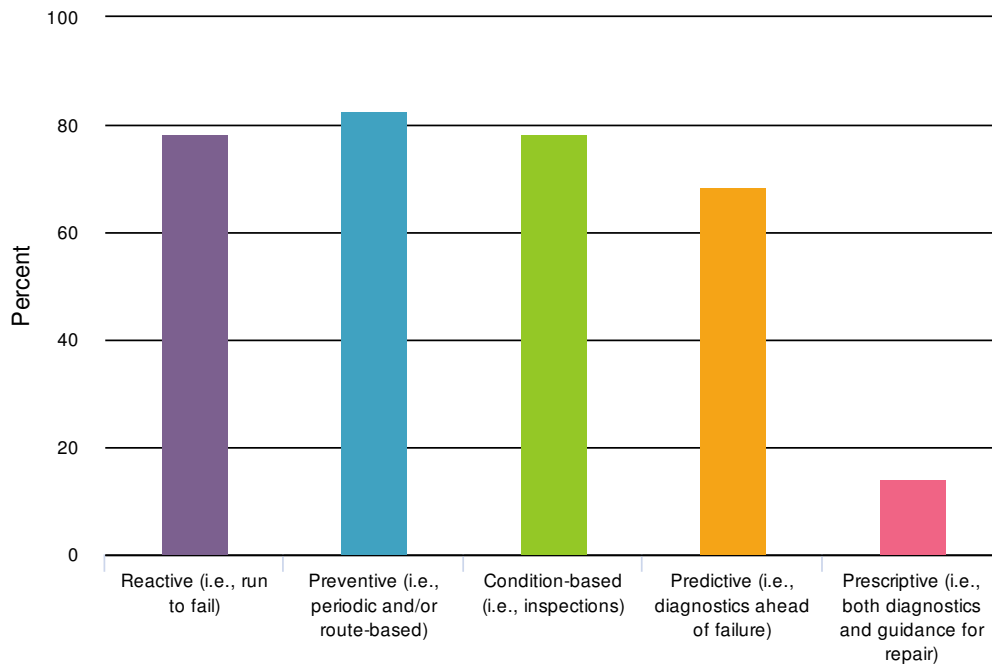


Value	Percent
Automation assets (field devices, control valves)	22.2%
Control system assets (DCS, I/O, controllers, networks)	41.7%
Production assets (rotating equipment, mechanical pumps)	25.9%
Distribution pipelines	6.5%
Electrical systems	26.9%
Fleet vehicles	6.5%
HVAC/R system	15.7%
Safety systems/devices	13.9%
Manufacturing productivity	25.0%
None of these	27.8%

9. To what extent has each item positively impacted the advancement of your reliability and maintainability processes over the last five years? Please rank each time from 1-8; duplicate rankings are not allowed.

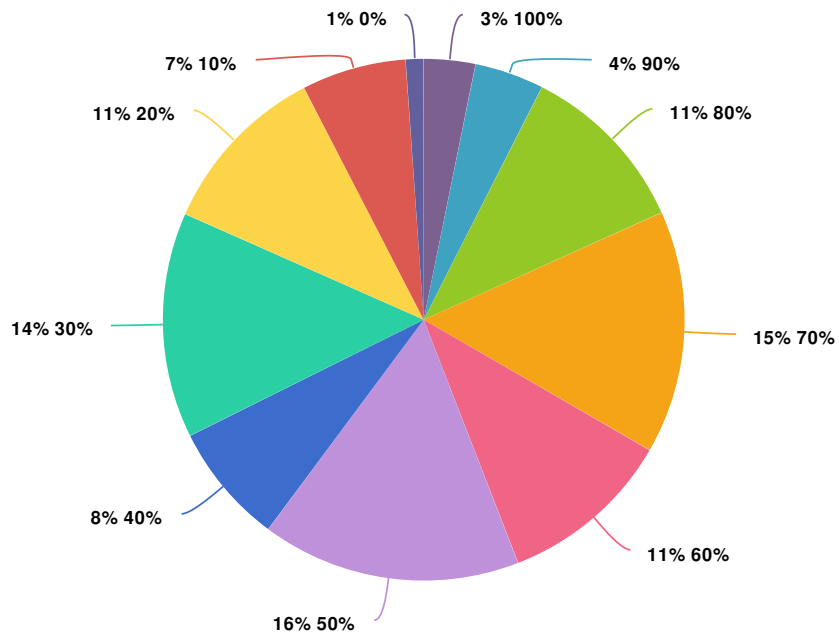
	1- No Impact	2 - Rarely	3 - Low	4 - Some	5 - Moderate	6 - High	7 - Very High	8 - Significant	Responses
More reliable machinery & equipment Row %	5.6%	3.7%	4.7%	10.3%	20.6%	21.5%	15.9%	17.8%	107
Better technology available Row %	4.8%	6.7%	6.7%	9.5%	23.8%	26.7%	16.2%	5.7%	105
More involvement by operators Row %	10.5%	2.9%	12.4%	10.5%	22.9%	21.9%	16.2%	2.9%	105
More designed-in maintainability Row %	10.5%	5.7%	8.6%	21.9%	14.3%	17.1%	14.3%	7.6%	105
Better management understanding/support of reliability & maintenance Row %	10.4%	1.9%	5.7%	13.2%	18.9%	19.8%	18.9%	11.3%	106
More involvement by trades/technicians Row %	6.6%	2.8%	8.5%	9.4%	23.6%	25.5%	15.1%	8.5%	106
Better/more training Row %	7.6%	5.7%	10.5%	13.3%	14.3%	23.8%	16.2%	8.6%	105
Totals Total Responses									107

10. Which types of maintenance approaches are currently employed by your plant? (Please check all that apply.)



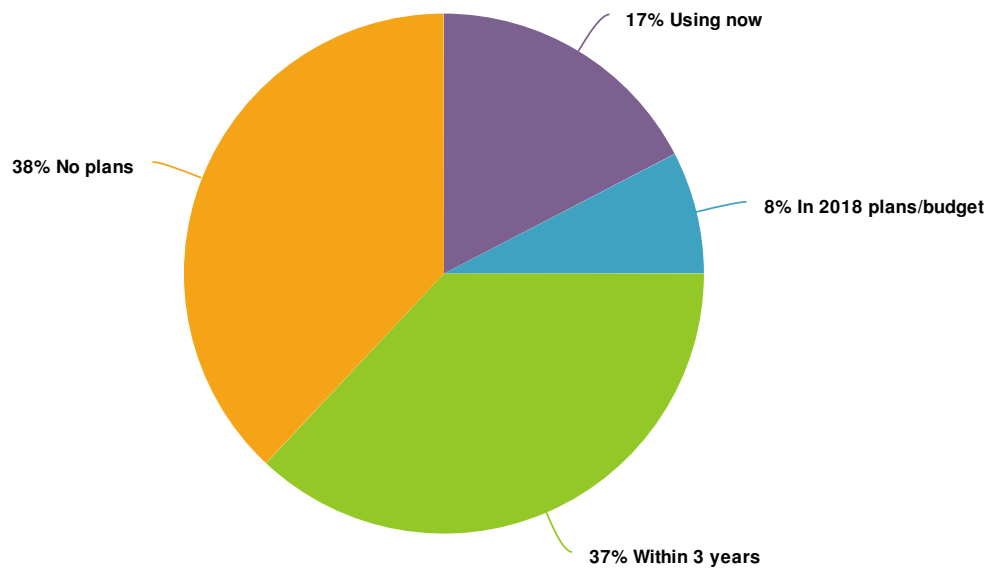
Value	Percent
Reactive (i.e., run to fail)	78.3%
Preventive (i.e., periodic and/or route-based)	82.6%
Condition-based (i.e., inspections)	78.3%
Predictive (i.e., diagnostics ahead of failure)	68.5%
Prescriptive (i.e., both diagnostics and guidance for repair)	14.1%

11. Approximately what percent of your maintenance work is reactive?



Value	Percent
100%	3.2%
90%	4.3%
80%	10.8%
70%	15.1%
60%	10.8%
50%	16.1%
40%	7.5%
30%	14.0%
20%	10.8%
10%	6.5%
0%	1.1%

12. To what degree does your team or organization currently engage in prescriptive maintenance?

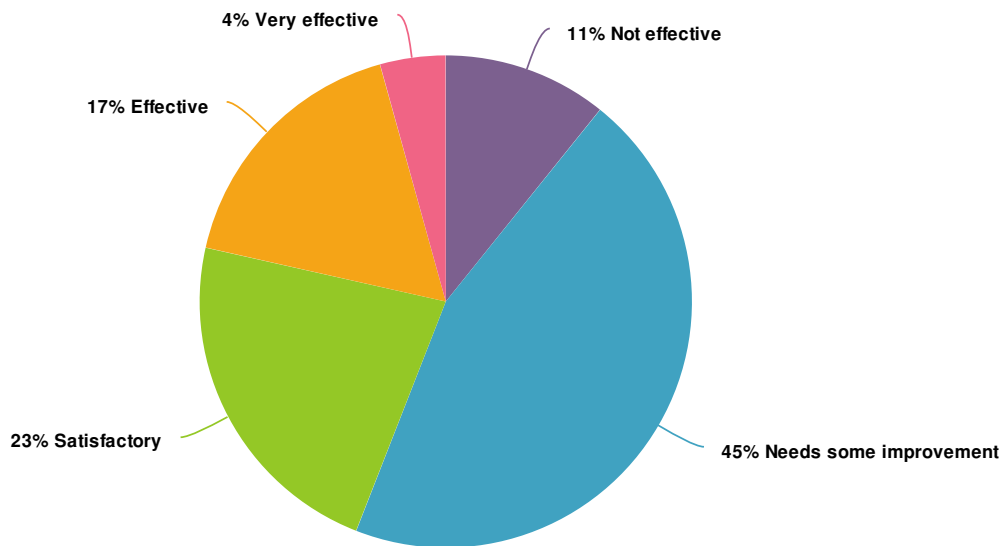


Value	Percent
Using now	17.4%
In 2018 plans/budget	7.6%
Within 3 years	37.0%
No plans	38.0%

13. Which predictive maintenance (PdM) technologies have you deployed or are you planning to deploy?

	Using now	In 2019 budget	Within 3 years	No plans	Responses
Vibration Row %	72.0%	6.5%	9.7%	11.8%	93
Ultrasonic Row %	63.4%	6.5%	5.4%	24.7%	93
Acoustic Row %	24.7%	3.2%	14.0%	58.1%	93
Corrosion Row %	28.6%	7.7%	12.1%	51.6%	91
Infrared Row %	76.1%	2.2%	5.4%	16.3%	92
Oil analysis Row %	73.9%	6.5%	6.5%	13.0%	92
Predictive modeling software Row %	9.9%	8.8%	31.9%	49.5%	91
Electric motor testing Row %	44.6%	8.7%	15.2%	31.5%	92
Totals Total Responses					93

14. Please rate the performance of your PdM program over the past 12 months.



Value		Percent
Not effective		10.8%
Needs some improvement		45.2%
Satisfactory		22.6%
Effective		17.2%
Very effective		4.3%

15. Please rate the obstacles limiting the success of your PdM initiatives.

	Not a factor	Low	Medium	High	Responses
No improvements needed Row %	47.3%	24.7%	19.4%	8.6%	93
Budget constraints Row %	9.7%	20.4%	45.2%	24.7%	93
Undefined financial benefits Row %	16.1%	25.8%	38.7%	19.4%	93
Limited IT resources Row %	18.3%	29.0%	33.3%	19.4%	93
Lack of executive support Row %	18.3%	29.0%	30.1%	22.6%	93
Limited engineering resources Row %	14.0%	28.0%	34.4%	23.7%	93
Undefined operational benefit Row %	14.0%	28.0%	40.9%	17.2%	93
Lack of EAM integration Row %	21.5%	34.4%	23.7%	20.4%	93
Poor program execution Row %	17.2%	36.6%	25.8%	20.4%	93
Totals Total Responses					93

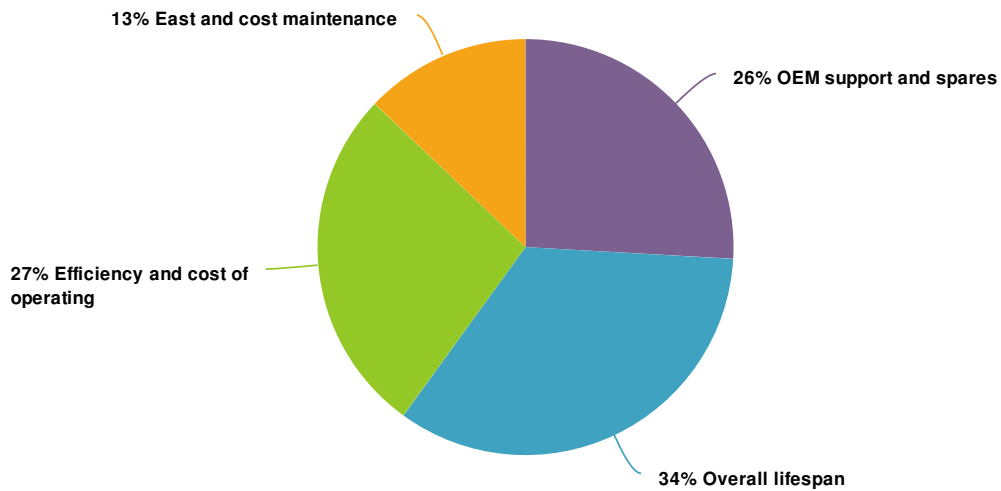
16. Which of these training methods do you use for PdM technologies?

	Using now	In 2019 budget	Within 3 years	No plans	Responses
On-site technical training Row %	58.1%	10.8%	9.7%	21.5%	93
On-site coaching (1-on-1) Row %	57.0%	5.4%	8.6%	29.0%	93
Offline courses (i.e., community college) Row %	38.7%	9.7%	11.8%	39.8%	93
Online courses Row %	36.6%	8.6%	17.2%	37.6%	93
Online webinars Row %	48.4%	5.4%	14.0%	32.3%	93
Online simulators Row %	11.8%	3.2%	17.2%	67.7%	93
Augmented / virtual reality simulations Row %	3.2%	4.3%	17.2%	75.3%	93
Totals Total Responses					93

17. What types of assets are managed by your PDM solutions?

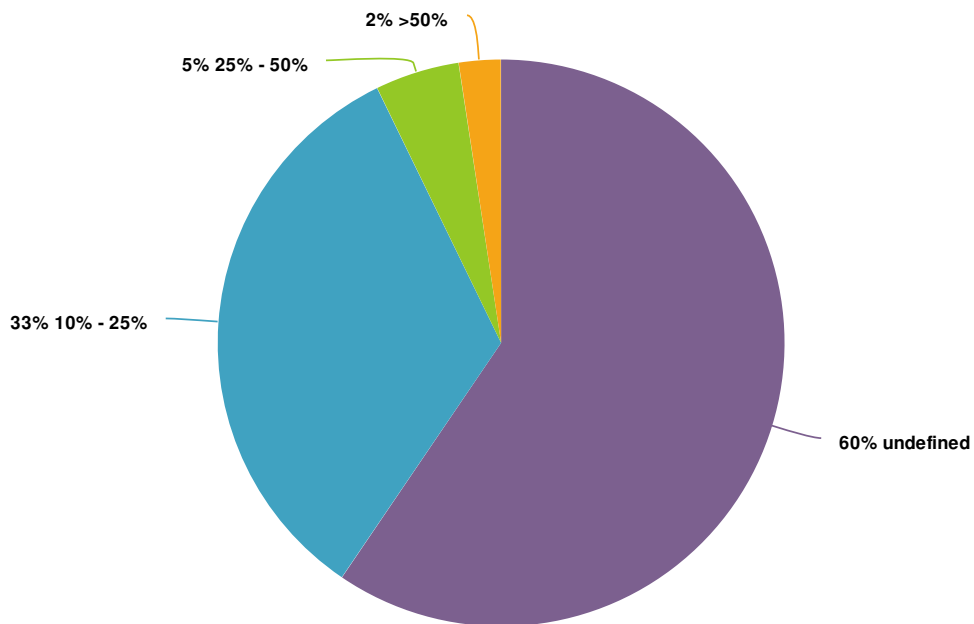
	Using now	In 2019 budget	Within 3 years	No plans	Asset type not installed	Responses
Automation assets (field devices, control valves) Row %	37.6%	4.7%	14.1%	30.6%	12.9%	85
Control system assets (DCS, I/O, controllers, networks) Row %	52.9%	3.5%	11.8%	21.2%	10.6%	85
Production assets (rotating equipment, mechanical pumps) Row %	72.9%	8.2%	5.9%	8.2%	4.7%	85
Distribution pipelines Row %	14.1%	3.5%	5.9%	37.6%	38.8%	85
Electrical systems Row %	54.1%	10.6%	11.8%	14.1%	9.4%	85
Fleet vehicles Row %	16.5%	3.5%	3.5%	42.4%	34.1%	85
HVAC/R system Row %	31.8%	4.7%	5.9%	41.2%	16.5%	85
Totals Total Responses						85

18. What is the most important aspect about your electrical motors? (Please select one.)



Value		Percent
OEM support and spares		25.9%
Overall lifespan		34.1%
Efficiency and cost of operating		27.1%
East and cost maintenance		12.9%

19. Motor repairs and unplanned failures account for what percent of lost production capacity and O&M budget?



Value		Percent
		59.5%
10% - 25%		33.3%
25% - 50%		4.8%
>50%		2.4%

20. Which types of assets are you using Internet-enabled / IIoT technologies to manage?

	Using now	In 2019 budget	Within 3 years	No plans	Asset type not installed	Responses
Automation assets (field devices, control valves) Row %	23.5%	4.7%	18.8%	34.1%	18.8%	85
Control system assets (DCS, I/O, controllers, networks) Row %	32.9%	4.7%	15.3%	29.4%	17.6%	85
Production assets (rotating equipment, mechanical pumps) Row %	29.4%	3.5%	21.2%	31.8%	14.1%	85
Distribution pipelines Row %	7.1%	2.4%	9.4%	37.6%	43.5%	85
Electrical systems Row %	24.7%	1.2%	27.1%	30.6%	16.5%	85
Fleet vehicles Row %	11.9%	2.4%	6.0%	47.6%	32.1%	84
HVAC/R system Row %	23.5%	2.4%	14.1%	42.4%	17.6%	85
Totals Total Responses						85

21. What data collection methods do you use with your PdM system?

	Using now	In 2019 budget	Within 3 years	No plans	Responses
Paper-based system Row %	68.2%	0.0%	0.0%	31.8%	85
Handheld data collector Row %	61.2%	2.4%	7.1%	29.4%	85
Embedded sensors/monitoring devices Row %	54.1%	1.2%	10.6%	34.1%	85
Wireless sensors/transmitters Row %	30.6%	2.4%	28.2%	38.8%	85
Internet-enabled sensors Row %	16.5%	4.7%	28.2%	50.6%	85
Industrial-grade smartphone Row %	10.6%	3.5%	20.0%	65.9%	85
Consumer-grade smartphone Row %	18.8%	2.4%	11.8%	67.1%	85
Industrial-grade tablet Row %	23.5%	2.4%	20.0%	54.1%	85
Consumer-grade tablet Row %	15.3%	3.5%	11.8%	69.4%	85
Industrial-grade PC Row %	30.6%	2.4%	15.3%	51.8%	85
Consumer-grade PC Row %	41.2%	3.5%	8.2%	47.1%	85
Totals Total Responses					85

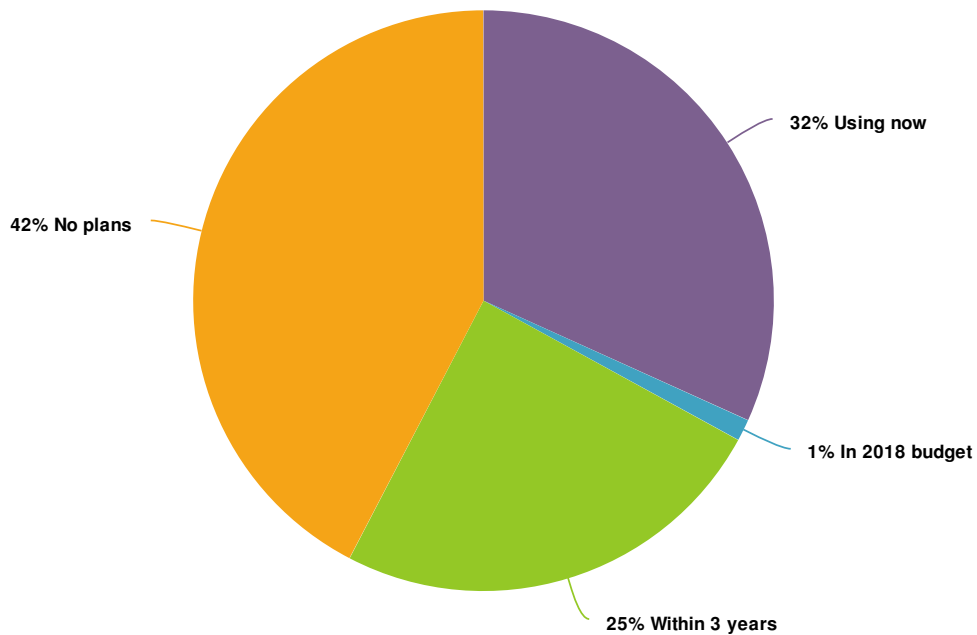
22. Who uses the information provided by your PdM systems and with what frequency?

	Never	Weekly	Monthly	Quarterly	Responses
In-house maintenance Row %	9.4%	41.2%	31.8%	17.6%	85
In-house operations Row %	35.3%	35.3%	18.8%	10.6%	85
In-house reliability engineers Row %	24.7%	45.9%	21.2%	8.2%	85
Totally outsourced to third-party maintenance and repair Row %	61.2%	8.2%	15.3%	15.3%	85
Third-party remote monitoring Row %	77.6%	7.1%	7.1%	8.2%	85
OEM supplier Row %	74.1%	8.2%	4.7%	12.9%	85
Totals Total Responses					85

23. Which emerging technologies are you considering for inclusion in your PdM initiative?

	Using now	In 2019 budget	Within 3 years	No plans	Responses
Embedded PdM intelligence from equipment suppliers Row %	15.3%	3.5%	24.7%	56.5%	85
Wireless connectivity to field workforce (work history info and manuals) Row %	11.8%	10.6%	37.6%	40.0%	85
Cloud web-based PdM deployment Row %	7.1%	9.4%	31.8%	51.8%	85
Smartphones Row %	21.2%	8.2%	24.7%	45.9%	85
Tablets Row %	21.2%	7.1%	36.5%	35.3%	85
RFID for asset identification Row %	14.1%	7.1%	21.2%	57.6%	85
GIS for asset location Row %	8.2%	7.1%	10.6%	74.1%	85
Remote monitoring and analysis Row %	25.9%	7.1%	34.1%	32.9%	85
Analytics software Row %	22.4%	10.6%	32.9%	34.1%	85
Totals Total Responses					85

24. Are you using OEM-enabled remote monitoring technologies and/or services?



Value	Percent
Using now	31.8%
In 2018 budget	1.2%
Within 3 years	24.7%
No plans	42.4%

25. Thank you for completing our survey. To be entered into the drawing to win an Apple Watch* or one of two \$100 American Express gift cards (3 winners in total) please provide your contact information. Also please indicate if you would like to be emailed a summary of the survey results, and/or would be willing to be called by a Plant Services editor for additional information. Winners will be contacted by October 31, 2018* Note: Prize will be rewarded in the form of an Apple Watch Series 3 GPS model with sport band, or \$350 Apple gift card.