



MILLINGTON, TN

June 14, 2021

Tetra Technologies

Subject: June vibration service report

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Most of the machines surveyed were found to be in good condition with the exception of the following:  
Supporting data included.

**QualiTest®** uses a four-step rating system for defects.

**Class I:** Defect is present, but effect on reliability is not clear; no immediate action is required. Continue to normally monitor.

**Class II:** Defect (s) present that may cause problem in long term (2-6 months.). Repair during normal maintenance scheduling. Continue to monitor.

**Class III:** Defect (s) present that may cause failure in short term (less than 2 months.). This should be addressed as soon as practical, with a high maintenance priority. Increase monitoring frequency.

**Class IV:** Defect (s) present that makes continued reliability unpredictable, and possibility of secondary damage is high. Repairs should be made ASAP. An unscheduled shutdown should be considered for repairs

**Hi-Speed Industrial Service** tests and inspects industrial machinery and equipment and makes recommendations concerning maintenance and repairs based on its experience in the field of industrial repair and maintenance. The information contained herein is provided as an opinion only, not as a guaranty or warranty of the matters discussed herein.

This completes our assessment of your equipment for this survey. Thank you for your business and don't hesitate to call if you have any comments or questions.

Sincerely,

*David W Shook*

David W. Shook  
Senior Reliability Specialists

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## Reportable equipment

### **Pump 305**

Data shows low amplitude shaft speed harmonics and an elevated noise floor. We suspect recirculation and or cavitation. Check pump for proper operation. Motor data also shows non-synchronous harmonics which could indicate early distress in the bearings as well as rotor bar passing frequencies which are not an issue at this time. **Rated a Class I Defect.**

### **Pump 307**

Data shows a dominant shaft speed vibration in the pump input bearing. Check the fasteners, coupling and alignment as time allows. **Rated a Class I Defect.**

### **Pump 416**

Data shows a dominant 5x RPM vibration. (Most likely 5 vanes on pump impeller). Check pump for proper operational parameters. **Rated a Class I Defect.**

### **Pump 421**

Motor data shows non-synchronous harmonic vibrations that could be early bearing defects, and also what looks to be possible drive issues. There is one small peak at 2x line frequency and another one at just over 1 KHz. Both could be drive related. Check the drive for proper operation as time allows. **Rated a Class II Defect due to possible electrical issue.**

### **Pump 501**

Motor data shows non-synchronous harmonic vibrations that could be bearing defects. We will watch this unit for changes. Ensure the bearing are lubricated if applicable. **Rated a Class II Defect.**

### **Pump 706**

Data shows a dominant 5x RPM vibration. (Most likely 5 vanes on pump impeller). There is also two harmonics. Check pump for proper operational parameters. Pump could have some impeller wear or looseness. **Rated a Class I Defect.**

Abbreviated Last Measurement Summary  
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Database: TETRA TECHNOLOGIES.rbm  
Area: TETRA NEW  
Report Date: 14-Jun-21 13:39

MEASUREMENT POINT	OVERALL LEVEL	HFD / VHFD	EQUIPMENT SPEED
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300	- PUMP 300	(09-Jun-21)	
	OVERALL LEVEL	1 - 20 KHz	
MOH	.019 In/Sec	.284 G-s	1785.0 RPM
MOV	.080 In/Sec	1.065 G-s	
MIH	.018 In/Sec	.264 G-s	
MIV	.037 In/Sec	.097 G-s	
MIA	.032 In/Sec	.095 G-s	
EIA	.035 In/Sec	.084 G-s	
EIH	.037 In/Sec	.251 G-s	
EIV	.056 In/Sec	.097 G-s	
EOH	.022 In/Sec	.264 G-s	
EOV	.027 In/Sec	.171 G-s	
301	- PUMP 301	(09-Jun-21)	
	OVERALL LEVEL	1 - 20 KHz	
MOH	.015 In/Sec	.250 G-s	1785.0 RPM
MOV	.029 In/Sec	.197 G-s	
MIH	.020 In/Sec	.338 G-s	
MIV	.024 In/Sec	.059 G-s	
MIA	.012 In/Sec	.039 G-s	
EIA	.034 In/Sec	.154 G-s	
EIH	.046 In/Sec	.357 G-s	
EIV	.038 In/Sec	.175 G-s	
EOH	.024 In/Sec	.151 G-s	
EOV	.047 In/Sec	.066 G-s	
305	- PUMP 305	(09-Jun-21)	
	OVERALL LEVEL	1 - 20 KHz	
MOH	.068 In/Sec	1.201 G-s	1785.0 RPM
MOV	.062 In/Sec	.772 G-s	
MIH	.055 In/Sec	1.617 G-s	
MIV	.079 In/Sec	.713 G-s	
MIA	.042 In/Sec	1.038 G-s	
EIA	.156 In/Sec	.423 G-s	
EIH	.200 In/Sec	.296 G-s	
EIV	.100 In/Sec	.630 G-s	
EOH	.099 In/Sec	.218 G-s	
EOV	.078 In/Sec	.148 G-s	
307	- PUMP 307	(09-Jun-21)	
	OVERALL LEVEL	1 - 20 KHz	
MOH	.014 In/Sec	.186 G-s	1785.0 RPM
MOV	.027 In/Sec	.034 G-s	
MIH	.017 In/Sec	.223 G-s	

	MIV	.029 In/Sec	.069 G-s	
	MIA	.014 In/Sec	.095 G-s	
	EIA	.117 In/Sec	.315 G-s	
	EIH	.095 In/Sec	.268 G-s	
	EIV	.213 In/Sec	.203 G-s	
	EOH	.056 In/Sec	.318 G-s	
	EOV	.134 In/Sec	.209 G-s	
308	- PUMP 308		(09-Jun-21)	
	OVERALL LEVEL		1 - 20 KHz	
	MOH	.052 In/Sec	.376 G-s	1785.0 RPM
	MOV	.077 In/Sec	.101 G-s	
	MIH	.041 In/Sec	.250 G-s	
	MIV	.047 In/Sec	.150 G-s	
	MIA	.030 In/Sec	.087 G-s	
	EIA	.057 In/Sec	.142 G-s	
	EIH	.047 In/Sec	.260 G-s	
	EIV	.052 In/Sec	.137 G-s	
	EOH	.051 In/Sec	.702 G-s	
	EOV	.040 In/Sec	.223 G-s	
309	- PUMP 309		(09-Jun-21)	
	OVERALL LEVEL		1 - 20 KHz	
	MOH	.031 In/Sec	.288 G-s	1785.0 RPM
	MOV	.081 In/Sec	.690 G-s	
	MIH	.030 In/Sec	.938 G-s	
	MIV	.044 In/Sec	.211 G-s	
	MIA	.026 In/Sec	.224 G-s	
	EIA	.038 In/Sec	.134 G-s	
	EIH	.070 In/Sec	.259 G-s	
	EIV	.061 In/Sec	.087 G-s	
	EOH	.038 In/Sec	.186 G-s	
	EOV	.056 In/Sec	.104 G-s	
312	- PUMP 312		(09-Jun-21)	
	OVERALL LEVEL		1 - 20 KHz	
	MOH	.056 In/Sec	.634 G-s	1785.0 RPM
	MOV	.072 In/Sec	.471 G-s	
	MIH	.067 In/Sec	.807 G-s	
	MIV	.091 In/Sec	.710 G-s	
	MIA	.038 In/Sec	.372 G-s	
	EIA	.038 In/Sec	.020 G-s	
	EIH	.052 In/Sec	.102 G-s	
	EIV	.039 In/Sec	.028 G-s	
	EOH	.044 In/Sec	.108 G-s	
	EOV	.053 In/Sec	.059 G-s	
314	- PUMP 314		(09-Jun-21)	
	OVERALL LEVEL		1 - 20 KHz	
	MOH	.021 In/Sec	.154 G-s	1785.0 RPM
	MOV	.015 In/Sec	.041 G-s	
	MIH	.019 In/Sec	.183 G-s	
	MIV	.0095 In/Sec	.040 G-s	
	MIA	.0095 In/Sec	.043 G-s	
	EIA	.014 In/Sec	.019 G-s	
	EIH	.016 In/Sec	.080 G-s	
	EIV	.012 In/Sec	.034 G-s	

	EOH	.017 In/Sec	.054 G-s	
	EOV	.011 In/Sec	.023 G-s	
315	- PUMP 315		(09-Jun-21)	
	OVERALL LEVEL		1 - 20 KHz	
	MOH	.025 In/Sec	.126 G-s	1785.0 RPM
	MOV	.050 In/Sec	.122 G-s	
	MIH	.033 In/Sec	.092 G-s	
	MIV	.051 In/Sec	.057 G-s	
	MIA	.044 In/Sec	.075 G-s	
	EIA	.046 In/Sec	.187 G-s	
	EIH	.043 In/Sec	.262 G-s	
	EIV	.036 In/Sec	.132 G-s	
	EOH	.035 In/Sec	.331 G-s	
	EOV	.036 In/Sec	.231 G-s	
402	- PUMP 402		(09-Jun-21)	
	OVERALL LEVEL		1 - 20 KHz	
	MOH	.040 In/Sec	.599 G-s	1785.0 RPM
	MOV	.040 In/Sec	.266 G-s	
	MIH	.041 In/Sec	.479 G-s	
	MIV	.039 In/Sec	.148 G-s	
	MIA	.020 In/Sec	.381 G-s	
	EIA	.051 In/Sec	.115 G-s	
	EIH	.061 In/Sec	.162 G-s	
	EIV	.056 In/Sec	.087 G-s	
	EOH	.042 In/Sec	.117 G-s	
	EOV	.030 In/Sec	.092 G-s	
415	- PUMP 415		(09-Jun-21)	
	OVERALL LEVEL		1 - 20 KHz	
	MOH	.063 In/Sec	.325 G-s	1785.0 RPM
	MOV	.092 In/Sec	.088 G-s	
	MIH	.077 In/Sec	.434 G-s	
	MIV	.119 In/Sec	.159 G-s	
	MIA	.068 In/Sec	.206 G-s	
	EIA	.036 In/Sec	.138 G-s	
	EIH	.036 In/Sec	.171 G-s	
	EIV	.036 In/Sec	.310 G-s	
	EOH	.028 In/Sec	.254 G-s	
	EOV	.042 In/Sec	.490 G-s	
416	- PUMP 416		(09-Jun-21)	
	OVERALL LEVEL		1 - 20 KHz	
	MOH	.039 In/Sec	.829 G-s	1785.0 RPM
	MOV	.065 In/Sec	.152 G-s	
	MIH	.048 In/Sec	.580 G-s	
	MIV	.074 In/Sec	.123 G-s	
	MIA	.090 In/Sec	.436 G-s	
	EIA	.076 In/Sec	.118 G-s	
	EIH	.178 In/Sec	.251 G-s	
	EIV	.056 In/Sec	.161 G-s	
	EOH	.092 In/Sec	.362 G-s	
	EOV	.053 In/Sec	.092 G-s	
421	- PUMP 421		(09-Jun-21)	
	OVERALL LEVEL		1 - 20 KHz	

	MOH	.043 In/Sec	1.245 G-s	1785.0 RPM
	MOV	.068 In/Sec	.378 G-s	
	MIH	.040 In/Sec	.613 G-s	
	MIV	.089 In/Sec	.526 G-s	
	MIA	.043 In/Sec	.496 G-s	
	EIA	.075 In/Sec	.117 G-s	
	EIH	.061 In/Sec	.486 G-s	
	EIV	.078 In/Sec	.116 G-s	
	EOH	.042 In/Sec	.283 G-s	
	EOV	.060 In/Sec	.238 G-s	
424	- PUMP 424		(09-Jun-21)	
	OVERALL LEVEL		1 - 20 KHz	
	MOH	.032 In/Sec	.453 G-s	1785.0 RPM
	MOV	.033 In/Sec	.274 G-s	
	MIH	.028 In/Sec	.449 G-s	
	MIV	.034 In/Sec	.294 G-s	
	MIA	.013 In/Sec	.377 G-s	
	EIA	.063 In/Sec	.152 G-s	
	EIH	.056 In/Sec	.480 G-s	
	EIV	.049 In/Sec	.236 G-s	
	EOH	.035 In/Sec	.314 G-s	
	EOV	.031 In/Sec	.227 G-s	
501	- PUMP 501		(09-Jun-21)	
	OVERALL LEVEL		1 - 20 KHz	
	MOH	.033 In/Sec	2.020 G-s	1785.0 RPM
	MOV	.039 In/Sec	.526 G-s	
	MIH	.041 In/Sec	1.443 G-s	
	MIV	.044 In/Sec	.361 G-s	
	MIA	.041 In/Sec	1.158 G-s	
	EIA	.071 In/Sec	.060 G-s	
	EIH	.076 In/Sec	.118 G-s	
	EIV	.030 In/Sec	.119 G-s	
	EOH	.042 In/Sec	.089 G-s	
	EOV	.045 In/Sec	.056 G-s	
702	- PUMP 702		(09-Jun-21)	
	OVERALL LEVEL		1 - 20 KHz	
	MOH	.018 In/Sec	.136 G-s	1785.0 RPM
	MOV	.022 In/Sec	.037 G-s	
	MIH	.011 In/Sec	.079 G-s	
	MIV	.011 In/Sec	.025 G-s	
	MIA	.010 In/Sec	.030 G-s	
	EIA	.0073 In/Sec	.026 G-s	
	EIH	.0070 In/Sec	.050 G-s	
	EIV	.0087 In/Sec	.035 G-s	
	EOH	.0075 In/Sec	.073 G-s	
	EOV	.0093 In/Sec	.010 G-s	
704	- PUMP 704		(09-Jun-21)	
	OVERALL LEVEL		1 - 20 KHz	
	MOH	.042 In/Sec	.212 G-s	1785.0 RPM
	MOV	.039 In/Sec	.169 G-s	
	MIH	.027 In/Sec	.276 G-s	
	MIV	.022 In/Sec	.063 G-s	
	MIA	.014 In/Sec	.036 G-s	

EIA	.076 In/Sec	.100 G-s
EIH	.100 In/Sec	.357 G-s
EIV	.061 In/Sec	.265 G-s
EOH	.035 In/Sec	.285 G-s
EOV	.077 In/Sec	.209 G-s

706	- PUMP 706	(09-Jun-21)	
	OVERALL LEVEL	1 - 20 KHz	
MOH	.042 In/Sec	.745 G-s	1785.0 RPM
MOV	.038 In/Sec	.239 G-s	
MIH	.028 In/Sec	.394 G-s	
MIV	.043 In/Sec	.108 G-s	
MIA	.025 In/Sec	.133 G-s	
EIA	.078 In/Sec	.111 G-s	
EIH	.160 In/Sec	.239 G-s	
EIV	.100 In/Sec	.124 G-s	
EOH	.096 In/Sec	.266 G-s	
EOV	.115 In/Sec	.111 G-s	

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Clarification Of Vibration Units:

Acc	-->	G-s	RMS
Vel	-->	In/Sec	PK

Last Monitored Equipment List  
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Database: TETRA TECHNOLOGIES.rbm  
Area: TETRA NEW  
Report Date: 14-Jun-21 14:44  
Report Interval: 15-May-21 To 14-Jun-21

PERIODIC VIBRATION TECHNOLOGY

Collected Equipment...

EQUIPMENT ID	DESCRIPTION	NUMBER OF POINTS	LATEST DATE
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300	PUMP 300	10 OUT OF 10	09-Jun-21
301	PUMP 301	10 OUT OF 10	09-Jun-21
305	PUMP 305	10 OUT OF 10	09-Jun-21
307	PUMP 307	10 OUT OF 10	09-Jun-21
308	PUMP 308	10 OUT OF 10	09-Jun-21
309	PUMP 309	10 OUT OF 10	09-Jun-21
312	PUMP 312	10 OUT OF 10	09-Jun-21
314	PUMP 314	10 OUT OF 10	09-Jun-21
315	PUMP 315	10 OUT OF 10	09-Jun-21
402	PUMP 402	10 OUT OF 10	09-Jun-21
415	PUMP 415	10 OUT OF 10	09-Jun-21
416	PUMP 416	10 OUT OF 10	09-Jun-21
421	PUMP 421	10 OUT OF 10	09-Jun-21
424	PUMP 424	10 OUT OF 10	09-Jun-21
501	PUMP 501	10 OUT OF 10	09-Jun-21
702	PUMP 702	10 OUT OF 10	09-Jun-21
704	PUMP 704	10 OUT OF 10	09-Jun-21
706	PUMP 706	10 OUT OF 10	09-Jun-21

Monitored Point Total = 180 OUT OF 270

Monitored Equipment Total = 18 OUT OF 27

MISSED MEASUREMENT POINTS LIST  
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Database: TETRA TECHNOLOGIES.rbm  
Area: TETRA NEW  
Report Date: 14-Jun-21 14:44

EQUIPMENT ID	DESCRIPTION	MEAS. PT.	LAST SURVEY
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306	PUMP 306	A11	NEVER
602	AMMONIA PUMP 602	A11	NEVER
700	PUMP 700	A11	NEVER
701	PUMP 701	A11	NEVER
703	PUMP 703	A11	NEVER
X1	EXTRA PUMP 1	A11	NEVER
X2	EXTRA PUMP 2	A11	NEVER
X3	EXTRA PUMP 3	A11	NEVER
X4	EXTRA PUMP 4	A11	NEVER