



SAElettrica srl
Sicurezza, Affidabilità, Energetica
Castelnuovo del Garda (VR) Tel. 045/6450856

**VERIFICA FREQUENZE CRITICHE VIBRAZIONI
GRUPPO**

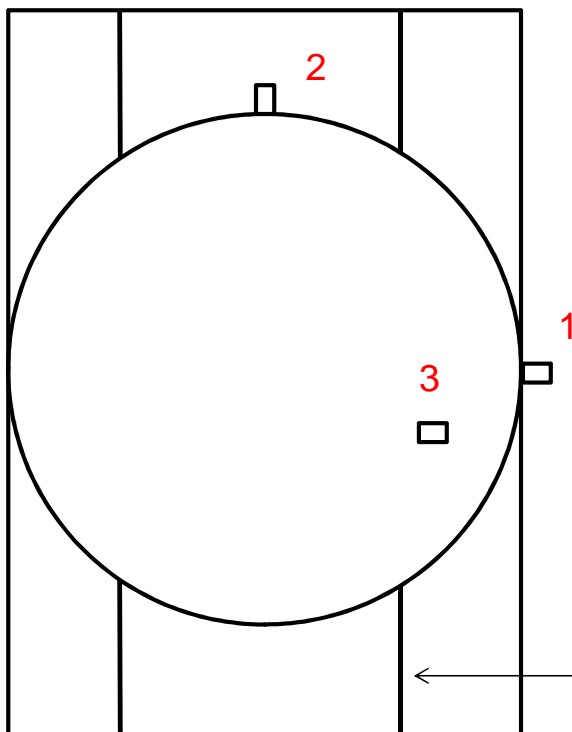
COMMESSA: A12702

DATA: 24-giu-13

DATI DELL'IMPIANTO

CLIENTE:	<i>EHR s.r.l.</i>
IMPIANTO:	<i>Centrale idroelettrica di Sgurgola</i>
LUOGO:	<i>Sgurgola</i>
UTENZA IN PROVA:	GRUPPO

1 - ORIZZONTALE
DX SX - Radiale
2 - ORIZZONTALE
Monte Valle - Radiale
3 - VERTICALE
Assiale



**TEST
MARTELLO**

SONDE: VELOCIMETRI CEMB

Mod: T1-40/BF/00/0

21,1 mV - mm/s

3/2000 Hz

STRUMENTO: CSI 2130 - Mod B213A2 - n°00120353 - Analizzatore bicanale di vibrazioni

SONDA: Accelerometro CSI A0760 GP n°P45629

NOTE:

RIFERIMENTO ISO 10816-5



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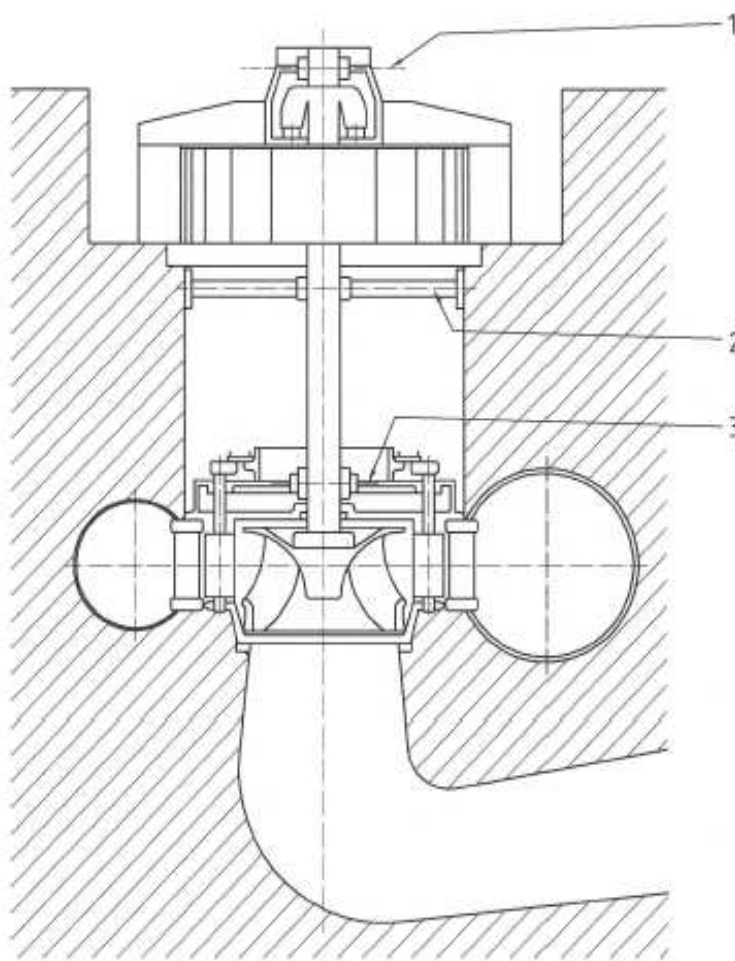
CLIENTE:	<i>EHR s.r.l.</i>
IMPIANTO:	<i>Centrale idroelettrica di Sgurgola</i>
LUOGO:	<i>Sgurgola</i>
UTENZA IN PROVA:	GRUPPO

INTERNATIONAL
 STANDARD

ISO
 10816-5

**Mechanical vibration — Evaluation
 of machine vibration by measurements
 on non-rotating parts —
 Part 5:
 Machine sets in hydraulic power generating
 and pumping plants**

ISO 10816-5:2000(E)



NOTE 1 The numbers indicate measurement locations.

NOTE 2 Umbrella-type machines belong to this group.

Figure 4 — Measurement locations for a Group 4 machine set with vertical shaft, lower bearing housings braced against the foundation and upper bearing housing braced against the generator stator only, usually with operational speeds of between 60 r/min and 1 000 r/min

NOTE:

RIFERIMENTO ISO 10816-5

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UTENZA IN PROVA:	GRUPPO

Table A.4 — Recommended evaluation zone boundaries for machines of Group 4: Vertical machine sets with lower bearing housings braced against the foundation and upper bearing housings braced against the generator stator only, usually with operational speeds of between 60 r/min and 1 000 r/min

Zone boundary	At measurement location 1		At all other main bearings	
	Peak-to-peak displacement μm	R.m.s. velocity mm/s	Peak-to-peak displacement μm	R.m.s. velocity mm/s
A/B	65	2,5	30	1,6
B/C	100	4,0	50	2,5
C/D	160	6,4	80	4,0

NOTE 1 If a machine has a lower generator bearing without bracing against the foundation, the vibration should be evaluated according to measurement location 1.

NOTE 2 Umbrella-type machines belong to this group, evaluation zone boundaries are those for the main bearings.

Zone A: The vibration of newly commissioned machines would normally fall within this zone.

Zone B: Machines with vibration within this zone are normally considered acceptable for unrestricted long-term operation.

Zone C: Machines with vibration within this zone are normally considered unsatisfactory for long-term continuous operation. Generally, the machine may be operated for a limited period in this condition until a suitable opportunity arises for remedial action.

Zone D: Vibration values within this zone are normally considered to be of sufficient severity to cause damage to the machine.

NOTE:

RIFERIMENTO ISO 10816-5

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CLIENTE:		EHR s.r.l.		
IMPIANTO:		Centrale idroelettrica di Sgurgola		
LUOGO:		Sgurgola		
UTENZA IN PROVA:		GRUPPO		
INDICE				
FOGLIO N°	VIBRAZIONE CANALE N°	VIBRAZIONE mm/s	POTENZA EROGATA	NOTE
1				DISLOCAZIONE SONDE
2				NORMA APPLICATA
3				NORMA APPLICATA
4				INDICE
5	1A	1,248	A GIRI SENZA ECCITAZIONE	DX SX - RADIALE
6	2A	1,333	A GIRI SENZA ECCITAZIONE	MONTE VALLE - RADIALE
7	3A	0,75	A GIRI SENZA ECCITAZIONE	ASSIALE
8	1B	3,836	A GIRI CON ECCITAZIONE	DX SX - RADIALE
9	2B	1,425	A GIRI CON ECCITAZIONE	MONTE VALLE - RADIALE
10	3B	0,77	A GIRI CON ECCITAZIONE	ASSIALE
11	1C	1,571	100kW	DX SX - RADIALE
12	2C	1,405	100kW	MONTE VALLE - RADIALE
13	3C	0,702	100kW	ASSIALE
14	1D	1,56	250kW	DX SX - RADIALE
15	2D	1,3	250kW	MONTE VALLE - RADIALE
16	3D	0,633	250kW	ASSIALE
17	1E	1,284	400kW	DX SX - RADIALE
18	2E	2,238	400kW	MONTE VALLE - RADIALE
19	3E	0,827	400kW	ASSIALE
20	1F	1,681	530kW	DX SX - RADIALE
21	2F	2,634	530kW	MONTE VALLE - RADIALE
22	3F	0,977	530kW	ASSIALE
23	TEST MARTELLO	0,115	MACCHINA FERMA	SOSTEGNO (VEDI DISEGNO)
NOTE:				
RIFERIMENTO ISO 10816-5				



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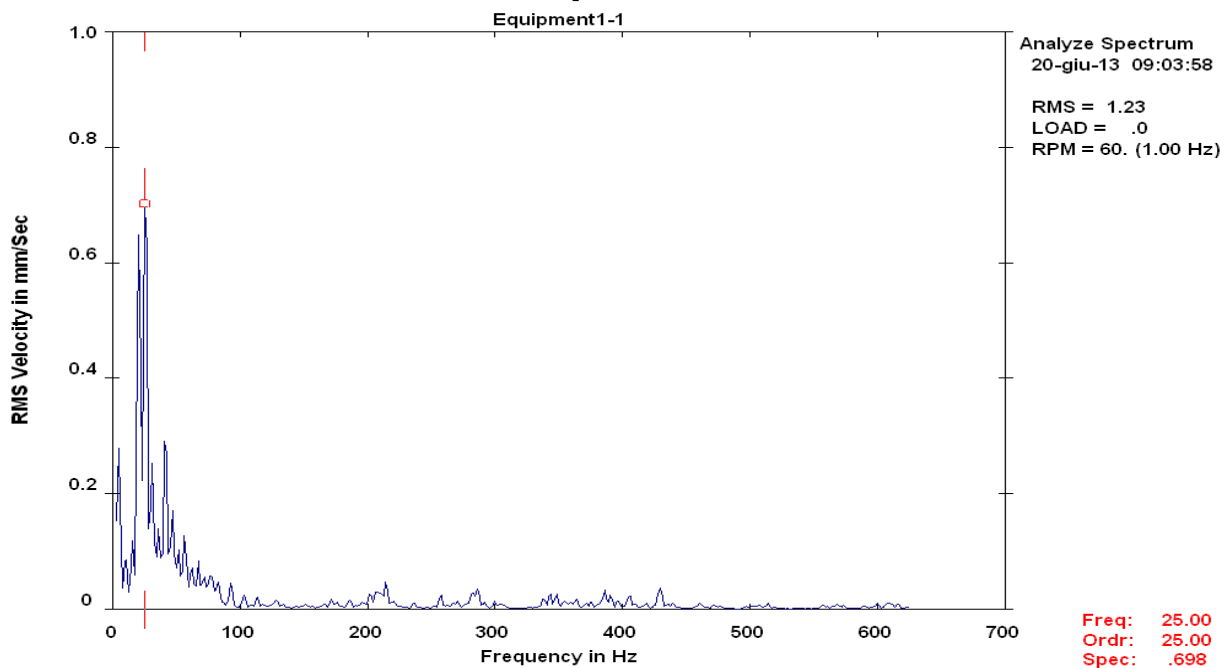
VERIFICA FREQUENZE CRITICHE VIBRAZIONI GRUPPO

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DATI DELL'IMPIANTO

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LUOGO:	Sgurgola
UTENZA IN PROVA:	GRUPPO

VELOCIMETRO 1 - A GIRI SENZA ECCITAZIONE



LIST OF SPECTRAL PEAKS

Equipment: ()
Meas. Point: Equipment1-1 -->
Date/Time: 20-giu-13 09:03:58 RPS= 1.00 Units=mm/Sec RMS

PEAK NO.	FREQUENCY (Hz)	PEAK VALUE	ORDER VALUE	PEAK NO.	FREQUENCY (Hz)	PEAK VALUE	ORDER VALUE
1	5.30	.2729	5.302	13	67.19	.0841	67.188
2	10.36	.0988	10.363	14	71.44	.0582	71.442
3	15.51	.1200	15.506	15	77.30	.0667	77.304
4	20.65	.6569	20.648	16	82.47	.0496	82.465
5	25.73	.7810	25.727	17	92.80	.0496	92.799
6	30.93	.2622	30.931	18	214.43	.0481	214.432
7	36.25	.1411	36.247	19	286.62	.0392	286.623
8	41.36	.3310	41.360	20	857.39	.0553	857.390
9	46.65	.1737	46.652	21	900.47	.0579	900.468
10	51.23	.1069	51.230	22	912.64	.0399	912.638
11	56.64	.1306	56.638	23	918.29	.0437	918.289
12	61.95	.0789	61.946	24	923.21	.0423	923.210

TOTAL MAG 1.1995
(ELECTRICAL= 0.00E+00/ 0%

SUBSYNCHRONOUS 0.0 / 0%

SYNCHRONOUS 0.0 / 0%

FLOOR= .8137

NONSYNCHRONOUS 1.1995 /100%

SPEC CREST= 4.00)

NOTE:

RIFERIMENTO ISO 10816-5



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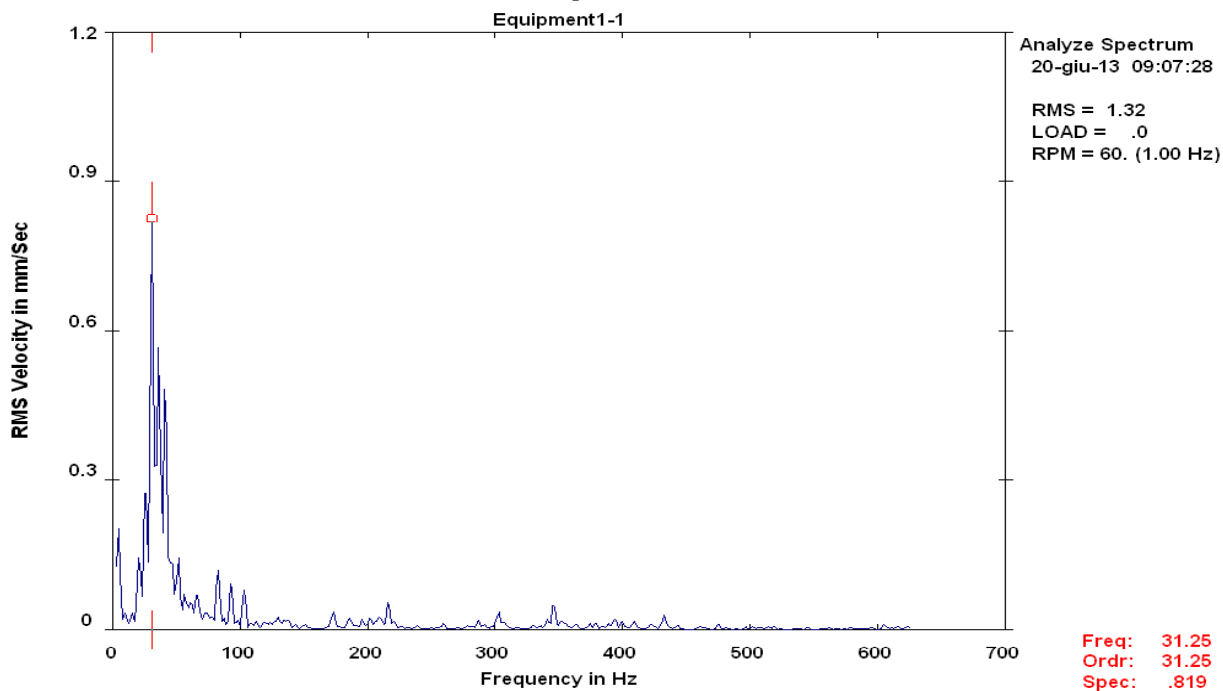
VERIFICA FREQUENZE CRITICHE VIBRAZIONI GRUPPO

COMMESSA: A12702
DATA: 24-giu-13

DATI DELL'IMPIANTO

CLIENTE:	EHR s.r.l.
IMPIANTO:	Centrale idroelettrica di Sgurgola
LUOGO:	Sgurgola
UTENZA IN PROVA:	GRUPPO

VELOCIMETRO 2 - A GIRI SENZA ECCITAZIONE



LIST OF SPECTRAL PEAKS

Equipment: ()
Meas. Point: Equipment1-1 -->
Date/Time: 20-giu-13 09:07:28 RPS= 1.00 Units=mm/Sec RMS

PEAK NO.	FREQUENCY (Hz)	PEAK VALUE	ORDER VALUE	PEAK NO.	FREQUENCY (Hz)	PEAK VALUE	ORDER VALUE
1	5.10	.1953	5.100	13	66.42	.0813	66.420
2	10.36	.0389	10.363	14	74.20	.0397	74.203
3	15.30	.0344	15.305	15	77.46	.0292	77.463
4	20.86	.1520	20.857	16	82.49	.1239	82.492
5	25.85	.3227	25.852	17	92.84	.1032	92.843
6	30.87	.8603	30.873	18	103.17	.0803	103.172
7	36.21	.5745	36.208	19	173.13	.0358	173.130
8	41.22	.5235	41.215	20	216.34	.0619	216.337
9	46.11	.1561	46.106	21	302.73	.0372	302.726
10	51.25	.1495	51.255	22	346.05	.0561	346.047
11	56.75	.0756	56.754	23	670.45	.0350	670.449
12	61.65	.0615	61.653	24	918.13	.0316	918.132

TOTAL MAG 1.2735
(ELECTRICAL= 0.00E+00/ 0%

SUBSYNCHRONOUS 0.0 / 0%

SYNCHRONOUS 0.0 / 0%
FLOOR= .5384

NONSYNCHRONOUS 1.2735 /100%
SPEC CREST= 6.17)

NOTE:

RIFERIMENTO ISO 10816-5



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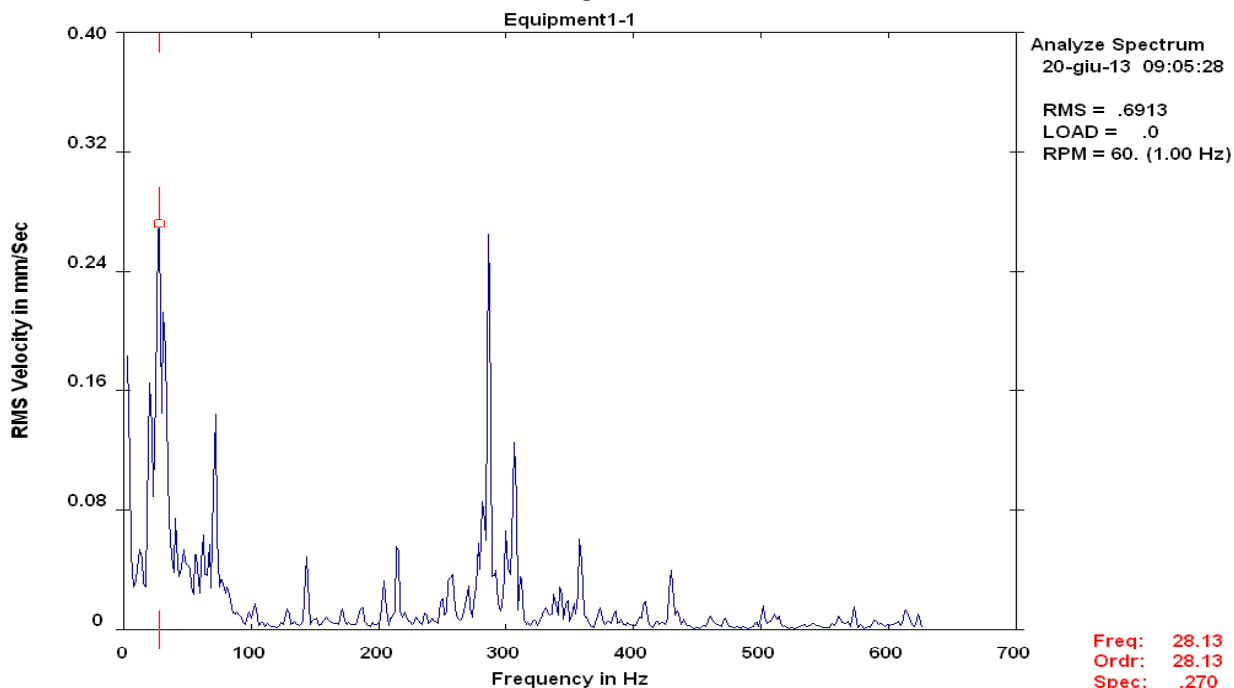
VERIFICA FREQUENZE CRITICHE VIBRAZIONI GRUPPO

COMMESSA: A12702
 DATA: 24-giu-13

DATI DELL'IMPIANTO

CLIENTE:	EHR s.r.l.
IMPIANTO:	Centrale idroelettrica di Sgurgola
LUOGO:	Sgurgola
UTENZA IN PROVA:	GRUPPO

VELOCIMETRO 3 - A GIRI SENZA ECCITAZIONE



Freq: 28.13
 Ordr: 28.13
 Spec: .270

LIST OF SPECTRAL PEAKS

Equipment: ()
 Meas. Point: Equipment1-1 -->
 Date/Time: 20-giu-13 09:05:28 RPS= 1.00 Units=mm/Sec RMS

PEAK NO.	FREQUENCY (Hz)	PEAK VALUE	ORDER VALUE	PEAK NO.	FREQUENCY (Hz)	PEAK VALUE	ORDER VALUE
1	13.28	.0594	13.284	13	278.51	.0599	278.507
2	20.94	.1782	20.944	14	281.85	.0941	281.849
3	27.42	.3154	27.424	15	286.54	.2917	286.541
4	31.94	.2359	31.939	16	291.52	.0449	291.519
5	40.85	.0754	40.845	17	300.24	.0673	300.243
6	47.52	.0590	47.522	18	306.62	.1300	306.615
7	57.06	.0594	57.063	19	358.26	.0637	358.260
8	62.13	.0659	62.127	20	973.55	.0704	973.546
9	66.96	.0580	66.959	21	1128.85	.0497	1128.849
10	71.59	.1479	71.591	22	1277.57	.0526	1277.571
11	143.30	.0517	143.297	23	1351.04	.0471	1351.041
12	214.79	.0640	214.786	24	1482.02	.0432	1482.020

TOTAL MAG .6154 SUBSYNCHRONOUS 0.0 / 0% SYNCHRONOUS .0682 / 1% NONSYNCHRONOUS .6116 / 99%
 (ELECTRICAL= 0.00E+00/ 0% FLOOR= .3465 SPEC CREST= 5.03)

NOTE:

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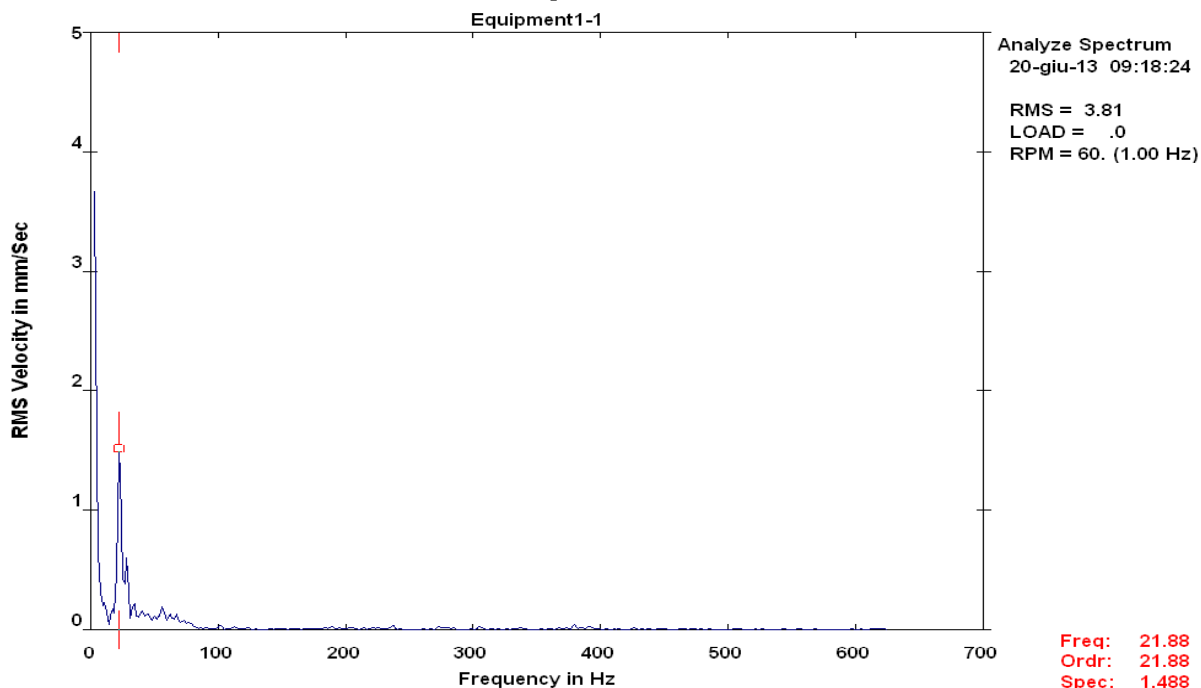
VERIFICA FREQUENZE CRITICHE VIBRAZIONI GRUPPO

COMMESSA: A12702
 DATA: 24-giu-13

DATI DELL'IMPIANTO

CLIENTE:	EHR s.r.l.
IMPIANTO:	Centrale idroelettrica di Sgurgola
LUOGO:	Sgurgola
UTENZA IN PROVA:	GRUPPO

VELOCIMETRO 1 - A GIRI CON ECCITAZIONE



LIST OF SPECTRAL PEAKS

Equipment: ()
 Meas. Point: Equipment1-1 -->
 Date/Time: 20-giu-13 09:18:24 RPS= 1.00 Units=mm/Sec RMS

PEAK NO.	FREQUENCY (Hz)	PEAK VALUE	ORDER VALUE	PEAK NO.	FREQUENCY (Hz)	PEAK VALUE	ORDER VALUE
1	10.44	.2502	10.437	13	77.34	.0671	77.336
2	17.80	.1864	17.803	14	101.76	.0383	101.760
3	22.59	1.6538	22.592	15	236.91	.0388	236.914
4	27.93	.6089	27.930	16	379.25	.0419	379.251
5	33.83	.2439	33.829	17	391.28	.0332	391.282
6	39.93	.1776	39.931	18	747.25	.0362	747.254
7	44.64	.1481	44.644	19	843.27	.0307	843.267
8	50.57	.1188	50.571	20	853.42	.0498	853.424
9	56.70	.2003	56.696	21	859.05	.0413	859.048
10	62.00	.1421	61.999	22	900.38	.0745	900.383
11	67.64	.1333	67.638	23	906.49	.0307	906.493
12	72.87	.0890	72.869	24	948.97	.0316	948.972

TOTAL MAG 1.8549
 (ELECTRICAL= 0.00E+00/ 0%)
 SUBSYNCHRONOUS 0.0 / 0%
 SYNCHRONOUS .1455 / 1%
 FLOOR= 1.3807
 NONSYNCHRONOUS 1.8491 / 99%
 SPEC CREST= 3.75)

NOTE:

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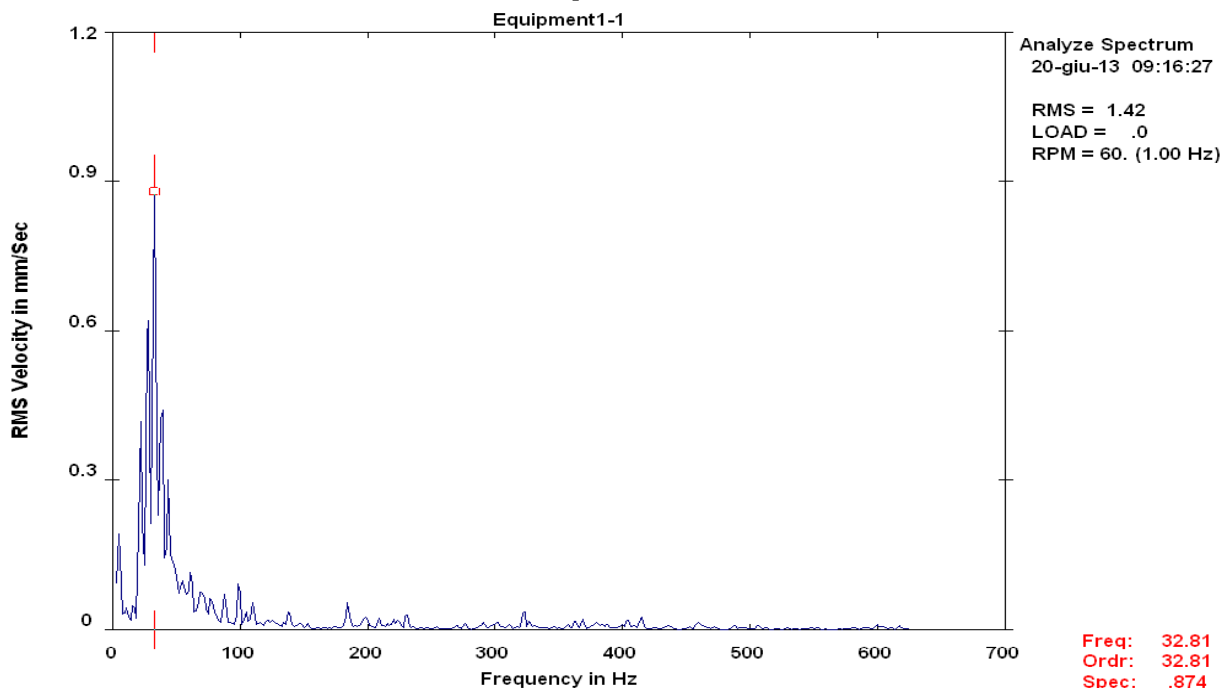
VERIFICA FREQUENZE CRITICHE VIBRAZIONI GRUPPO

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DATI DELL'IMPIANTO

CLIENTE:	EHR s.r.l.
IMPIANTO:	Centrale idroelettrica di Sgurgola
LUOGO:	Sgurgola
UTENZA IN PROVA:	GRUPPO

VELOCIMETRO 2 - A GIRI CON ECCITAZIONE



LIST OF SPECTRAL PEAKS

Equipment: ()
 Meas. Point: Equipment1-1 -->
 Date/Time: 20-giu-13 09:16:27 RPS= 1.00 Units=mm/Sec RMS

PEAK NO.	FREQUENCY (Hz)	PEAK VALUE	ORDER VALUE	PEAK NO.	FREQUENCY (Hz)	PEAK VALUE	ORDER VALUE
1	5.50	.1949	5.498	13	77.26	.0704	77.261
2	10.62	.0455	10.623	14	87.99	.0743	87.986
3	16.41	.0544	16.410	15	98.97	.0991	98.974
4	21.98	.4180	21.980	16	104.61	.0348	104.608
5	27.47	.7123	27.470	17	109.84	.0568	109.841
6	32.81	.8744	32.813	18	138.24	.0409	138.243
7	38.38	.5078	38.379	19	184.43	.0539	184.429
8	43.69	.3016	43.689	20	230.58	.0333	230.581
9	47.66	.1575	47.661	21	322.73	.0414	322.726
10	55.32	.1093	55.325	22	714.94	.0339	714.941
11	61.49	.1240	61.486	23	820.69	.0390	820.693
12	69.53	.0872	69.533	24	984.38	.0471	984.375

TOTAL MAG 1.3911
 (ELECTRICAL= 0.00E+00/ 0%)

SUBSYNCHRONOUS 0.0 / 0%

SYNCHRONOUS .4359 / 10%
 FLOOR= .6259

NONSYNCHRONOUS 1.3211 / 90%
 SPEC CREST= 4.09

NOTE:

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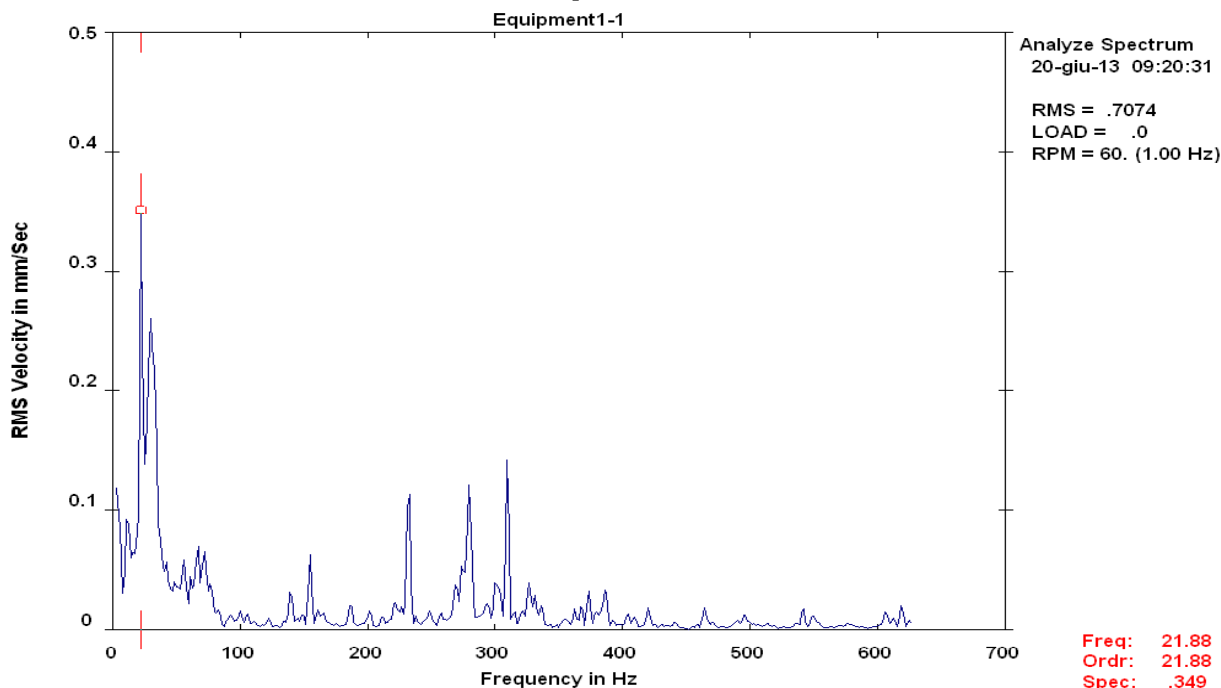
VERIFICA FREQUENZE CRITICHE VIBRAZIONI GRUPPO

COMMESSA: A12702
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DATI DELL'IMPIANTO

CLIENTE:	EHR s.r.l.
IMPIANTO:	Centrale idroelettrica di Sgurgola
LUOGO:	Sgurgola
UTENZA IN PROVA:	GRUPPO

VELOCIMETRO 3 - A GIRI CON ECCITAZIONE



Freq: 21.88
 Ordr: 21.88
 Spec: .349

LIST OF SPECTRAL PEAKS

Equipment: ()
 Meas. Point: Equipment1-1 -->
 Date/Time: 20-giu-13 09:20:31 RPS= 1.00 Units=mm/Sec RMS

PEAK NO.	FREQUENCY (Hz)	PEAK VALUE	ORDER VALUE	PEAK NO.	FREQUENCY (Hz)	PEAK VALUE	ORDER VALUE
1	5.67	.1031	5.674	13	269.41	.0423	269.405
2	11.82	.1056	11.824	14	274.15	.0603	274.155
3	22.27	.3573	22.273	15	279.27	.1270	279.266
4	30.42	.2935	30.420	16	300.75	.0452	300.752
5	41.63	.0623	41.632	17	309.54	.1427	309.537
6	49.12	.0448	49.119	18	933.51	.0488	933.513
7	55.68	.0641	55.677	19	941.32	.0440	941.317
8	61.47	.0479	61.470	20	989.96	.0669	989.957
9	66.66	.0754	66.655	21	1272.96	.0590	1272.958
10	71.37	.0706	71.372	22	1325.96	.0770	1325.957
11	154.81	.0630	154.811	23	1381.72	.0520	1381.724
12	232.16	.1274	232.156	24	1435.52	.0420	1435.523

TOTAL MAG .5877 SUBSYNCHRONOUS 0.0 / 0% SYNCHRONOUS .0833 / 2% NONSYNCHRONOUS .5818 / 98%
 (ELECTRICAL= 0.00E+00 / 0% FLOOR= .4437 SPEC CREST= 4.46)

NOTE:

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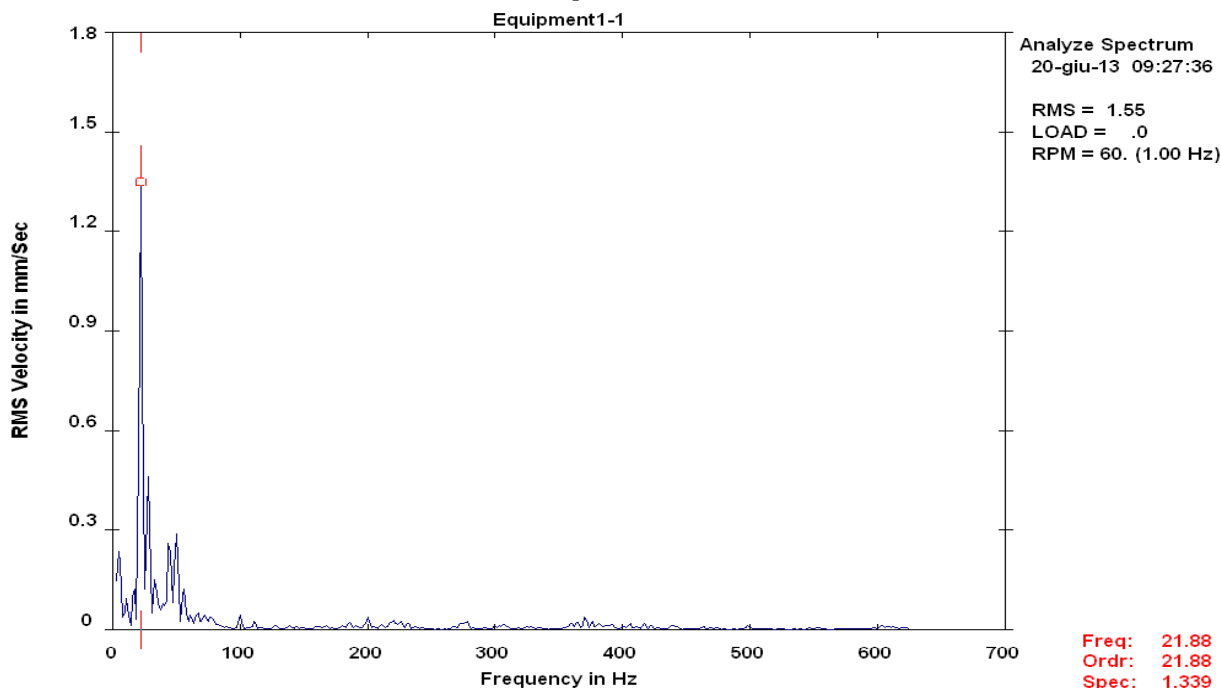
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LUOGO:	Sgurgola
UTENZA IN PROVA:	GRUPPO

VELOCIMETRO 1 - 100kW



LIST OF SPECTRAL PEAKS

Equipment: ()
 Meas. Point: Equipment1-1 -->
 Date/Time: 20-giu-13 09:27:36 RPS= 1.00 Units=mm/Sec RMS

PEAK NO.	FREQUENCY (Hz)	PEAK VALUE	ORDER VALUE	PEAK NO.	FREQUENCY (Hz)	PEAK VALUE	ORDER VALUE
1	5.64	.2506	5.640	13	72.48	.0489	72.478
2	11.03	.0925	11.029	14	77.35	.0425	77.354
3	16.77	.1306	16.772	15	100.00	.0432	100.000
4	22.12	1.3465	22.120	16	200.32	.0401	200.316
5	27.76	.4848	27.761	17	370.82	.0404	370.817
6	33.32	.1577	33.315	18	722.29	.0468	722.289
7	39.79	.0880	39.787	19	833.96	.0418	833.964
8	44.44	.2894	44.439	20	855.25	.0350	855.247
9	49.77	.2953	49.774	21	880.52	.0364	880.522
10	55.70	.1325	55.697	22	921.43	.0341	921.432
11	61.35	.0470	61.355	23	934.88	.0547	934.875
12	66.61	.0560	66.611	24	989.75	.0349	989.746

TOTAL MAG 1.5441 SUBSYNCHRONOUS 0.0 / 0% SYNCHRONOUS .0838 / 0% NONSYNCHRONOUS 1.5418 /100%
 (ELECTRICAL= 0.00E+00/ 0% FLOOR= .3304 SPEC CREST= 4.30)

NOTE:

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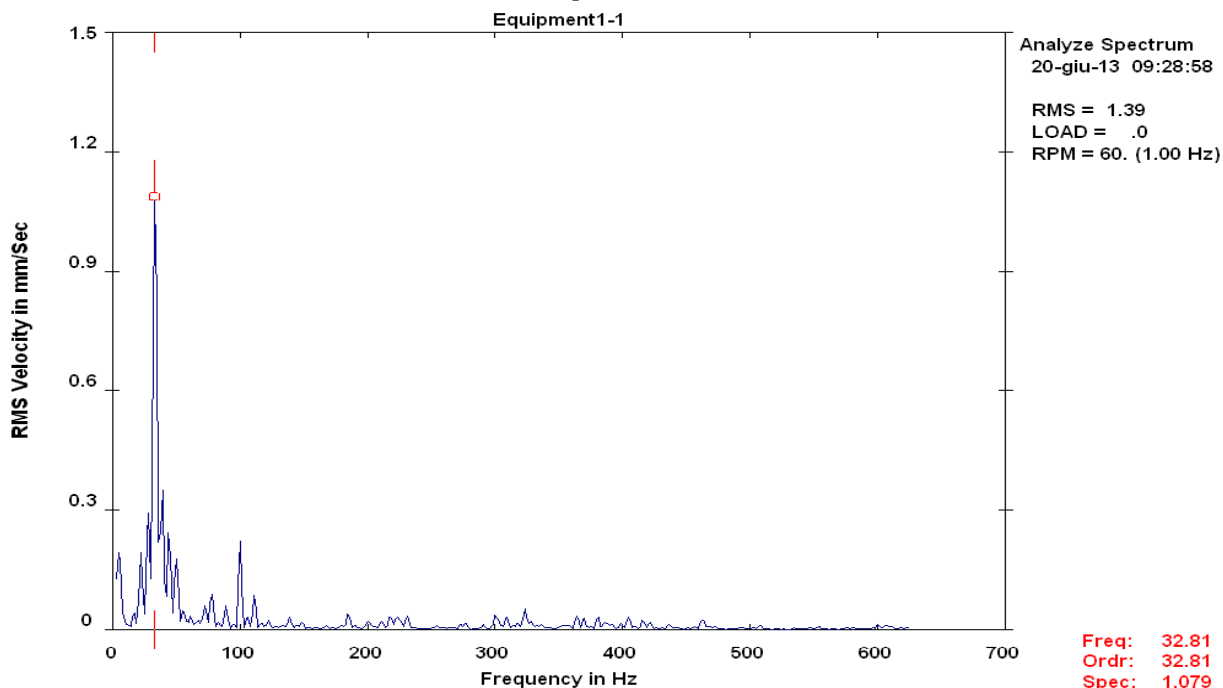
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DATI DELL'IMPIANTO

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LUOGO:	Sgurgola
UTENZA IN PROVA:	GRUPPO

VELOCIMETRO 2 - 100kW



LIST OF SPECTRAL PEAKS

Equipment: ()
Meas. Point: Equipment1-1 -->
Date/Time: 20-giu-13 09:28:58 RPS= 1.00 Units=mm/Sec RMS

PEAK NO.	FREQUENCY (Hz)	PEAK VALUE	ORDER VALUE	PEAK NO.	FREQUENCY (Hz)	PEAK VALUE	ORDER VALUE
1	5.67	.2071	5.675	13	100.00	.2232	100.000
2	16.70	.0453	16.700	14	105.60	.0349	105.601
3	22.23	.1980	22.230	15	111.09	.0872	111.095
4	27.69	.3116	27.688	16	184.88	.0414	184.877
5	33.34	1.1450	33.343	17	231.09	.0353	231.089
6	38.73	.3635	38.735	18	300.54	.0391	300.538
7	44.24	.2566	44.240	19	323.59	.0538	323.593
8	49.71	.1817	49.715	20	722.31	.0358	722.307
9	55.40	.0546	55.404	21	830.07	.0368	830.066
10	72.37	.0641	72.371	22	879.05	.0393	879.051
11	77.75	.0931	77.745	23	934.46	.0398	934.456
12	88.85	.0617	88.854	24	939.48	.0406	939.481

TOTAL MAG 1.3477 SUBSYNCHRONOUS 0.0 / 0% SYNCHRONOUS .2232 / 3% NONSYNCHRONOUS 1.3291 / 97%
(ELECTRICAL= 0.00E+00/ 0% FLOOR= .4588 SPEC CREST= 5.69)

NOTE:

RIFERIMENTO ISO 10816-5



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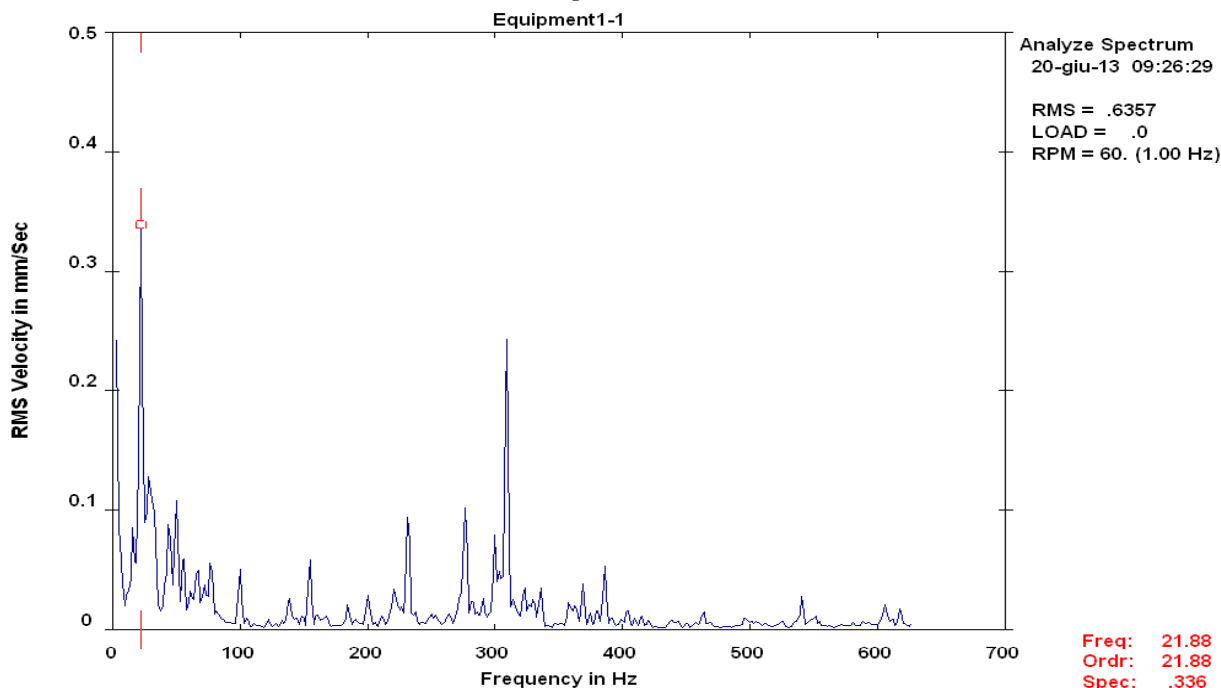
VERIFICA FREQUENZE CRITICHE VIBRAZIONI GRUPPO

COMMESSA: A12702
DATA: 24-giu-13

DATI DELL'IMPIANTO

CLIENTE:	EHR s.r.l.
IMPIANTO:	Centrale idroelettrica di Sgurgola
LUOGO:	Sgurgola
UTENZA IN PROVA:	GRUPPO

VELOCIMETRO 3 - 100kW



LIST OF SPECTRAL PEAKS

Equipment: ()
Meas. Point: Equipment1-1 -->
Date/Time: 20-giu-13 09:26:29 RPS= 1.00 Units=mm/Sec RMS

PEAK NO.	FREQUENCY (Hz)	PEAK VALUE	ORDER VALUE	PEAK NO.	FREQUENCY (Hz)	PEAK VALUE	ORDER VALUE
1	5.64	.0895	5.643	13	276.80	.1030	276.797
2	16.06	.0876	16.059	14	299.82	.0798	299.818
3	22.24	.3427	22.237	15	303.75	.0539	303.753
4	28.85	.1436	28.851	16	308.89	.2594	308.893
5	44.39	.0972	44.390	17	386.07	.0530	386.074
6	49.82	.1090	49.825	18	881.83	.0455	881.826
7	55.52	.0690	55.517	19	933.78	.0473	933.783
8	66.52	.0570	66.518	20	1044.50	.0557	1044.505
9	77.22	.0621	77.216	21	1322.73	.0820	1322.729
10	99.91	.0510	99.909	22	1377.76	.0740	1377.756
11	154.48	.0589	154.484	23	1487.93	.0468	1487.925
12	231.75	.1006	231.753	24	1542.84	.0446	1542.844

TOTAL MAG .5629
(ELECTRICAL= 0.00E+00/ 0%

SUBSYNCHRONOUS 0.0 / 0%

SYNCHRONOUS 0.0 / 0%

FLOOR= .3303

NONSYNCHRONOUS .5629 /100%

SPEC CREST= 3.85)

NOTE:

RIFERIMENTO ISO 10816-5



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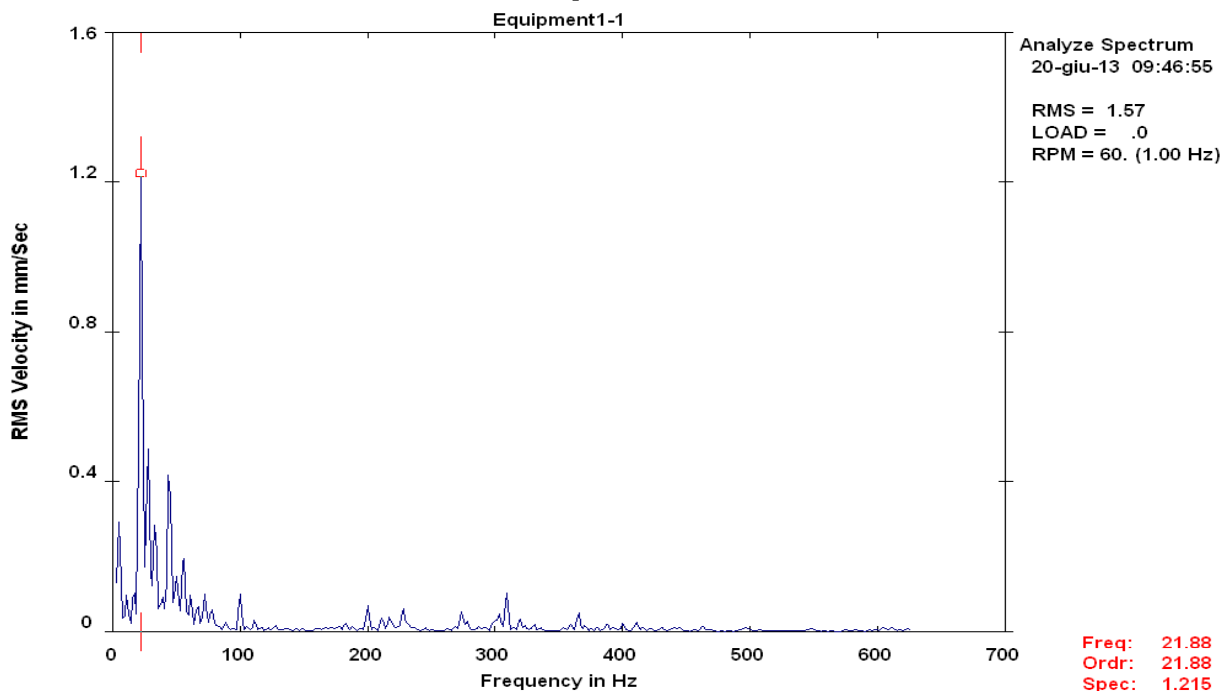
VERIFICA FREQUENZE CRITICHE VIBRAZIONI GRUPPO

COMMESSA: A12702
 DATA: 24-giu-13

DATI DELL'IMPIANTO

CLIENTE:	EHR s.r.l.
IMPIANTO:	Centrale idroelettrica di Sgurgola
LUOGO:	Sgurgola
UTENZA IN PROVA:	GRUPPO

VELOCIMETRO 1 -250kW



LIST OF SPECTRAL PEAKS

Equipment: ()
 Meas. Point: Equipment1-1 -->
 Date/Time: 20-giu-13 09:46:55 RPS= 1.00 Units=mm/Sec RMS

PEAK NO.	FREQUENCY (Hz)	PEAK VALUE	ORDER VALUE	PEAK NO.	FREQUENCY (Hz)	PEAK VALUE	ORDER VALUE
1	5.48	.2950	5.477	13	72.19	.1014	72.187
2	11.04	.0971	11.041	14	77.67	.0627	77.666
3	16.69	.1127	16.688	15	99.94	.0994	99.937
4	22.21	1.2328	22.207	16	200.07	.0687	200.066
5	27.65	.5261	27.648	17	227.82	.0624	227.822
6	33.31	.2987	33.311	18	273.98	.0561	273.979
7	38.62	.0990	38.624	19	302.88	.0487	302.878
8	44.40	.4612	44.395	20	308.91	.1094	308.908
9	49.76	.1511	49.761	21	365.31	.0522	365.309
10	55.58	.2237	55.582	22	722.34	.0590	722.335
11	61.10	.0984	61.095	23	934.02	.0718	934.016
12	66.59	.0741	66.585	24	989.43	.0432	989.429

TOTAL MAG 1.5392
 (ELECTRICAL= 0.00E+00/ 0%
 SUBSYNCHRONOUS 0.0 / 0%
 SYNCHRONOUS .0911 / 0% FLOOR= .4781
 NONSYNCHRONOUS 1.5365 /100%
 SPEC CREST= 3.40)

NOTE:

RIFERIMENTO ISO 10816-5



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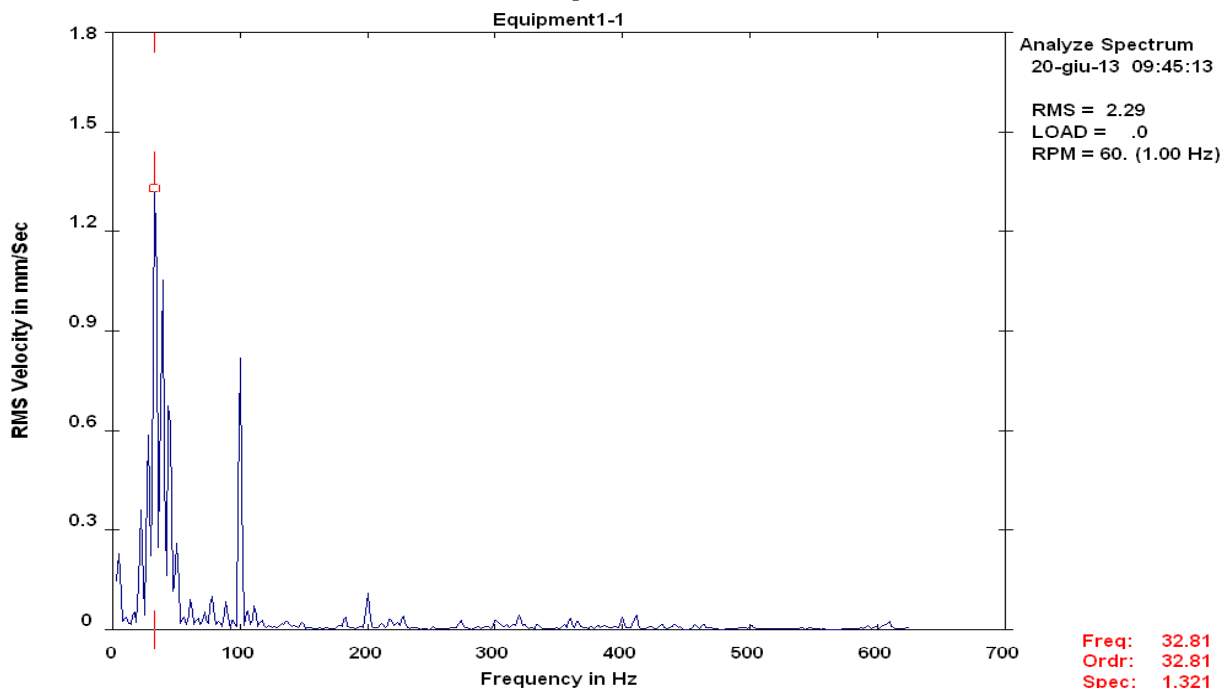
VERIFICA FREQUENZE CRITICHE VIBRAZIONI GRUPPO

COMMESSA: A12702
DATA: 24-giu-13

DATI DELL'IMPIANTO

CLIENTE:	EHR s.r.l.
IMPIANTO:	Centrale idroelettrica di Sgurgola
LUOGO:	Sgurgola
UTENZA IN PROVA:	GRUPPO

VELOCIMETRO 2 - 250kW



LIST OF SPECTRAL PEAKS

Equipment: ()
Meas. Point: Equipment1-1 -->
Date/Time: 20-giu-13 09:45:13 RPS= 1.00 Units=mm/Sec RMS

PEAK NO.	FREQUENCY (Hz)	PEAK VALUE	ORDER VALUE	PEAK NO.	FREQUENCY (Hz)	PEAK VALUE	ORDER VALUE
1	5.46	.2314	5.464	13	77.75	.1060	77.746
2	10.39	.0431	10.392	14	88.93	.0866	88.929
3	16.68	.0573	16.680	15	100.04	.8191	100.041
4	22.28	.3703	22.278	16	105.62	.0646	105.619
5	27.76	.6155	27.757	17	111.22	.0739	111.224
6	33.39	1.4203	33.392	18	200.16	.1099	200.156
7	38.84	1.0749	38.838	19	227.84	.0424	227.841
8	44.47	.7610	44.471	20	319.35	.0476	319.345
9	50.12	.2594	50.125	21	410.58	.0445	410.584
10	55.68	.0413	55.677	22	722.46	.0488	722.460
11	61.21	.0937	61.209	23	824.62	.0536	824.617
12	72.09	.0548	72.088	24	989.90	.0435	989.900

TOTAL MAG 2.2653
(ELECTRICAL= 0.00E+00/ 0%

SUBSYNCHRONOUS 0.0 / 0%

SYNCHRONOUS .5792 / 7%
FLOOR= .5565

NONSYNCHRONOUS 2.1900 / 93%
SPEC CREST= 2.78)

NOTE:

RIFERIMENTO ISO 10816-5



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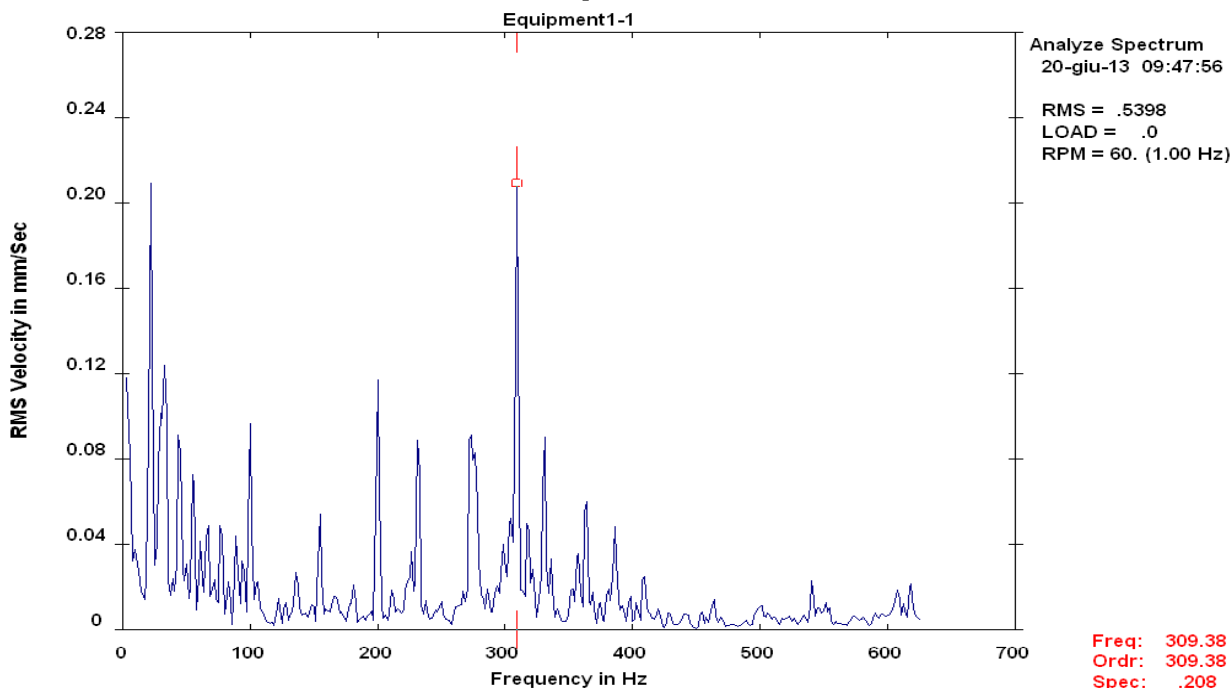
VERIFICA FREQUENZE CRITICHE VIBRAZIONI GRUPPO

COMMESSA: A12702
DATA: 24-giu-13

DATI DELL'IMPIANTO

CLIENTE:	EHR s.r.l.
IMPIANTO:	Centrale idroelettrica di Sgurgola
LUOGO:	Sgurgola
UTENZA IN PROVA:	GRUPPO

VELOCIMETRO 3 - 250kW



Freq: 309.38
Ordr: 309.38
Spec: .208

LIST OF SPECTRAL PEAKS

Equipment: ()
Meas. Point: Equipment1-1 -->
Date/Time: 20-giu-13 09:47:56 RPS= 1.00 Units=mm/Sec RMS

PEAK NO.	FREQUENCY (Hz)	PEAK VALUE	ORDER VALUE	PEAK NO.	FREQUENCY (Hz)	PEAK VALUE	ORDER VALUE
1	5.66	.09990	5.664	13	272.69	.1060	272.693
2	22.17	.2113	22.168	14	275.84	.0957	275.838
3	33.40	.1336	33.397	15	303.97	.0601	303.974
4	44.47	.1029	44.469	16	309.12	.2115	309.123
5	55.42	.0828	55.425	17	317.89	.0566	317.894
6	66.58	.0544	66.581	18	330.84	.0946	330.840
7	77.25	.0547	77.250	19	363.39	.0680	363.388
8	89.27	.0444	89.268	20	386.27	.0494	386.266
9	100.01	.0965	100.008	21	827.14	.0563	827.140
10	154.54	.0546	154.543	22	1105.28	.0459	1105.277
11	200.10	.1174	200.103	23	1286.34	.0502	1286.342
12	231.82	.0966	231.821	24	1323.24	.1137	1323.236

TOTAL MAG .4917 SUBSYNCHRONOUS 0.0 / 0% SYNCHRONOUS .1137 / 5% NONSYNCHRONOUS .4784 / 95%
(ELECTRICAL= 0.00E+00 / 0% FLOOR= .2608 SPEC CREST= 3.37)

NOTE:

RIFERIMENTO ISO 10816-5



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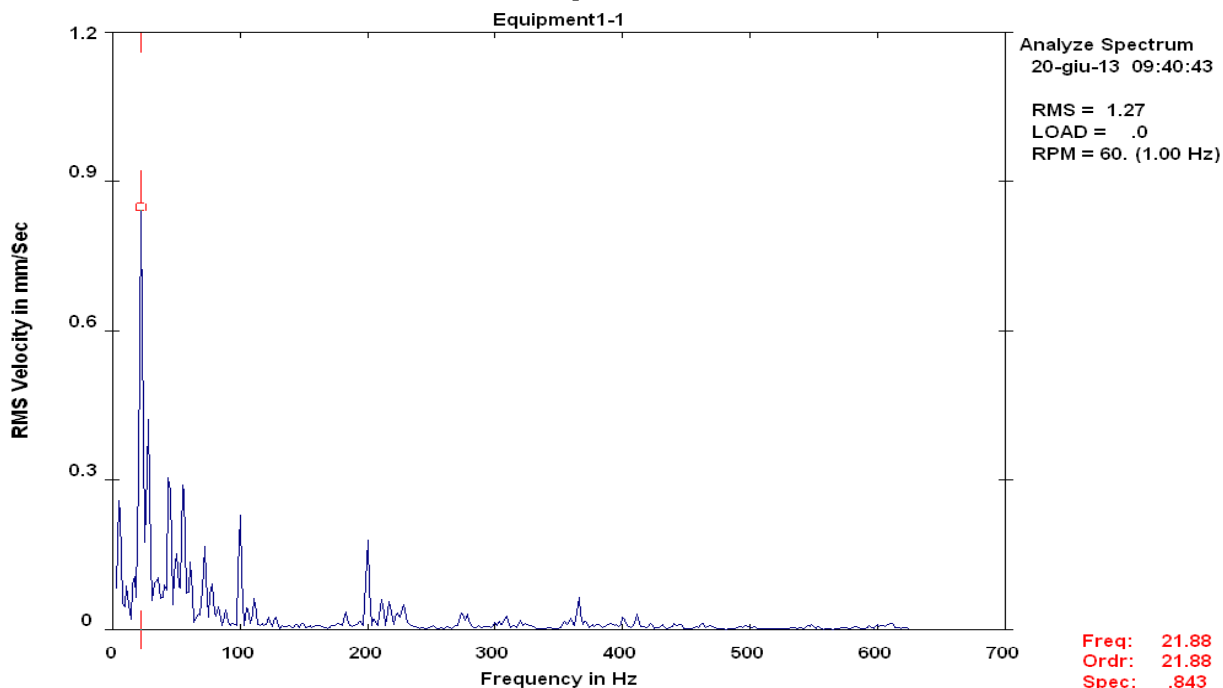
VERIFICA FREQUENZE CRITICHE VIBRAZIONI GRUPPO

COMMESSA: A12702
DATA: 24-giu-13

DATI DELL'IMPIANTO

CLIENTE:	EHR s.r.l.
IMPIANTO:	Centrale idroelettrica di Sgurgola
LUOGO:	Sgurgola
UTENZA IN PROVA:	GRUPPO

VELOCIMETRO 1 - 400kW



LIST OF SPECTRAL PEAKS

Equipment: ()
Meas. Point: Equipment1-1 -->
Date/Time: 20-giu-13 09:40:43 RPS= 1.00 Units=mm/Sec RMS

PEAK NO.	FREQUENCY (Hz)	PEAK VALUE	ORDER VALUE	PEAK NO.	FREQUENCY (Hz)	PEAK VALUE	ORDER VALUE
1	5.68	.2793	5.679	13	77.66	.0986	77.665
2	11.23	.0873	11.235	14	99.98	.2296	99.981
3	16.71	.1162	16.706	15	105.45	.0507	105.455
4	22.36	.8776	22.355	16	111.08	.0623	111.084
5	27.74	.4442	27.744	17	199.93	.1802	199.933
6	35.28	.1195	35.284	18	211.14	.0615	211.139
7	41.31	.0999	41.311	19	217.43	.0578	217.426
8	44.46	.3439	44.460	20	228.62	.0541	228.623
9	49.60	.1599	49.597	21	365.55	.0653	365.545
10	55.46	.3352	55.457	22	722.04	.0698	722.038
11	61.05	.1359	61.047	23	826.94	.0627	826.936
12	72.14	.1692	72.137	24	934.63	.0479	934.634

TOTAL MAG 1.2333
(ELECTRICAL= 0.00E+00/ 0%

SUBSYNCHRONOUS 0.0 / 0%

SYNCHRONOUS .2348 / 4%
FLOOR= .6425

NONSYNCHRONOUS 1.2107 / 96%
SPEC CREST= 4.86)

NOTE:

RIFERIMENTO ISO 10816-5



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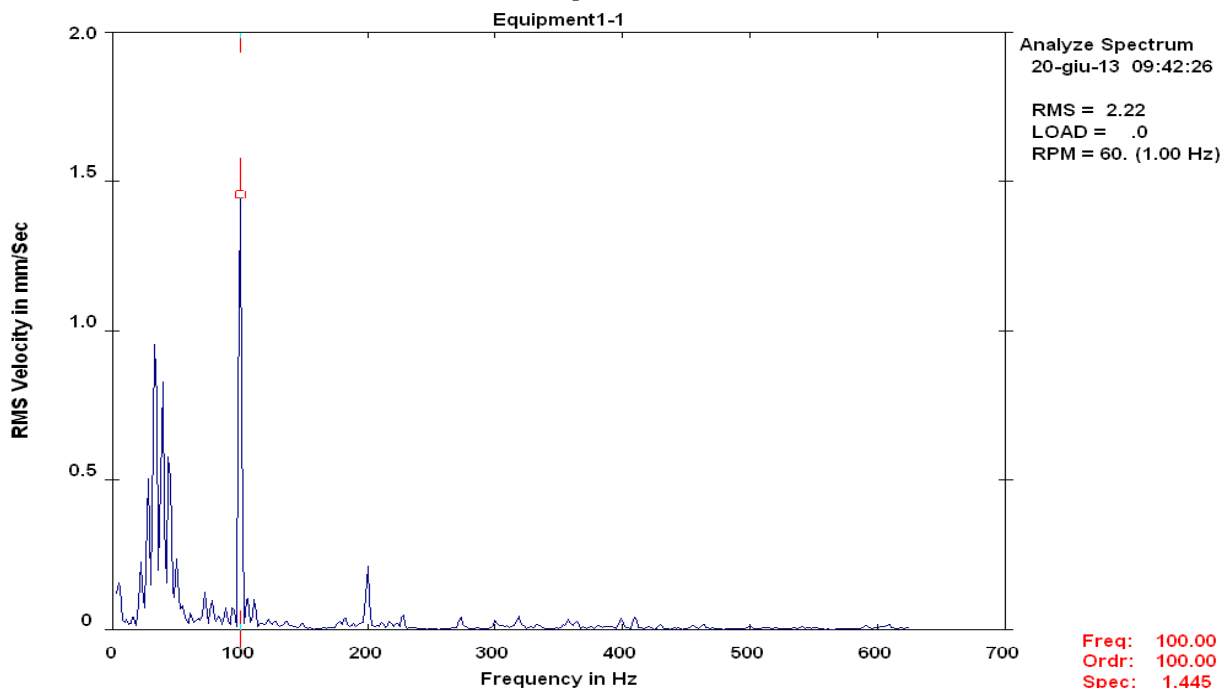
VERIFICA FREQUENZE CRITICHE VIBRAZIONI GRUPPO

COMMESSA: A12702
 DATA: 24-giu-13

DATI DELL'IMPIANTO

CLIENTE:	EHR s.r.l.
IMPIANTO:	Centrale idroelettrica di Sgurgola
LUOGO:	Sgurgola
UTENZA IN PROVA:	GRUPPO

VELOCIMETRO 2 - 400kW



LIST OF SPECTRAL PEAKS

Equipment: ()
 Meas. Point: Equipment1-1 -->
 Date/Time: 20-giu-13 09:42:26 RPS= 1.00 Units=mm/Sec RMS

PEAK NO.	FREQUENCY (Hz)	PEAK VALUE	ORDER VALUE	PEAK NO.	FREQUENCY (Hz)	PEAK VALUE	ORDER VALUE
1	5.67	.1692	5.670	13	83.36	.0473	83.357
2	16.56	.0490	16.555	14	88.74	.0743	88.743
3	22.21	.2312	22.207	15	94.42	.0830	94.422
4	27.76	.5300	27.764	16	99.99	1.4452	99.994
5	33.40	1.0307	33.405	17	105.54	.1185	105.545
6	38.92	.8382	38.924	18	111.16	.1012	111.164
7	44.42	.6440	44.419	19	199.96	.2126	199.962
8	50.00	.2356	50.000	20	227.50	.0538	227.496
9	54.06	.0888	54.061	21	318.48	.0453	318.477
10	61.18	.0557	61.178	22	722.19	.0521	722.192
11	72.23	.1301	72.231	23	824.08	.0541	824.083
12	77.87	.0981	77.871	24	934.72	.0450	934.720

TOTAL MAG 2.1962 SUBSYNCHRONOUS 0.0 / 0% SYNCHRONOUS 1.4720 / 45% NONSYNCHRONOUS 1.6299 / 55%
 (ELECTRICAL= 0.00E+00 / 0% FLOOR= .6282 SPEC CREST= 1.75)

NOTE:

RIFERIMENTO ISO 10816-5



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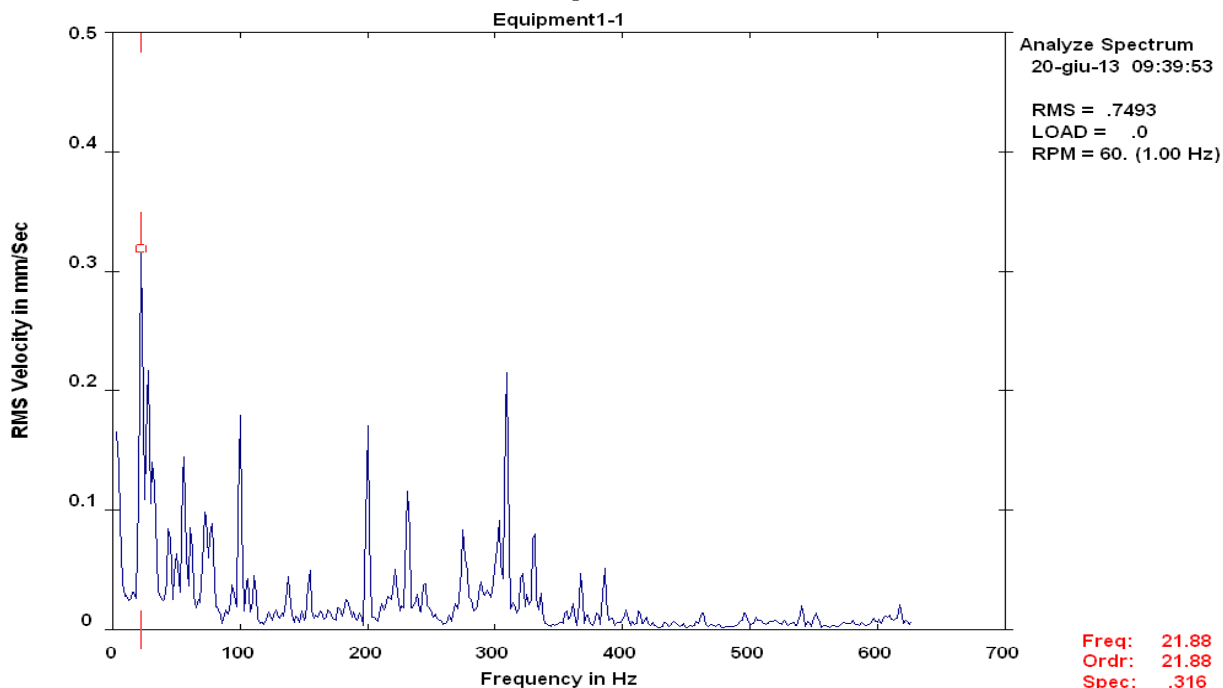
VERIFICA FREQUENZE CRITICHE VIBRAZIONI GRUPPO

COMMESSA: A12702
DATA: 24-giu-13

DATI DELL'IMPIANTO

CLIENTE:	EHR s.r.l.
IMPIANTO:	Centrale idroelettrica di Sgurgola
LUOGO:	Sgurgola
UTENZA IN PROVA:	GRUPPO

VELOCIMETRO 3 - 400kW



LIST OF SPECTRAL PEAKS

Equipment: ()
Meas. Point: Equipment1-1 -->
Date/Time: 20-giu-13 09:39:53 RPS= 1.00 Units=mm/Sec RMS

PEAK NO.	FREQUENCY (Hz)	PEAK VALUE	ORDER VALUE	PEAK NO.	FREQUENCY (Hz)	PEAK VALUE	ORDER VALUE
1	5.32	.1354	5.325	13	221.35	.0548	221.349
2	22.50	.3409	22.496	14	231.64	.1200	231.638
3	27.55	.2420	27.552	15	275.41	.0870	275.408
4	31.92	.1547	31.915	16	302.70	.0965	302.702
5	44.45	.0944	44.453	17	308.82	.2347	308.816
6	49.60	.0665	49.597	18	330.54	.0916	330.538
7	55.65	.1615	55.647	19	939.20	.0849	939.202
8	61.46	.0910	61.462	20	1099.29	.0554	1099.293
9	72.64	.1144	72.640	21	1104.27	.0650	1104.266
10	77.51	.0989	77.514	22	1154.29	.0712	1154.286
11	99.87	.1801	99.874	23	1322.64	.0795	1322.645
12	199.96	.1707	199.961	24	1377.15	.0603	1377.149

TOTAL MAG .6903
(ELECTRICAL= 0.00E+00/ 0%

SUBSYNCHRONOUS 0.0 / 0%

SYNCHRONOUS .1207 / 3%
FLOOR= .4907

NONSYNCHRONOUS .6796 / 97%
SPEC CREST= 4.79)

NOTE:

RIFERIMENTO ISO 10816-5



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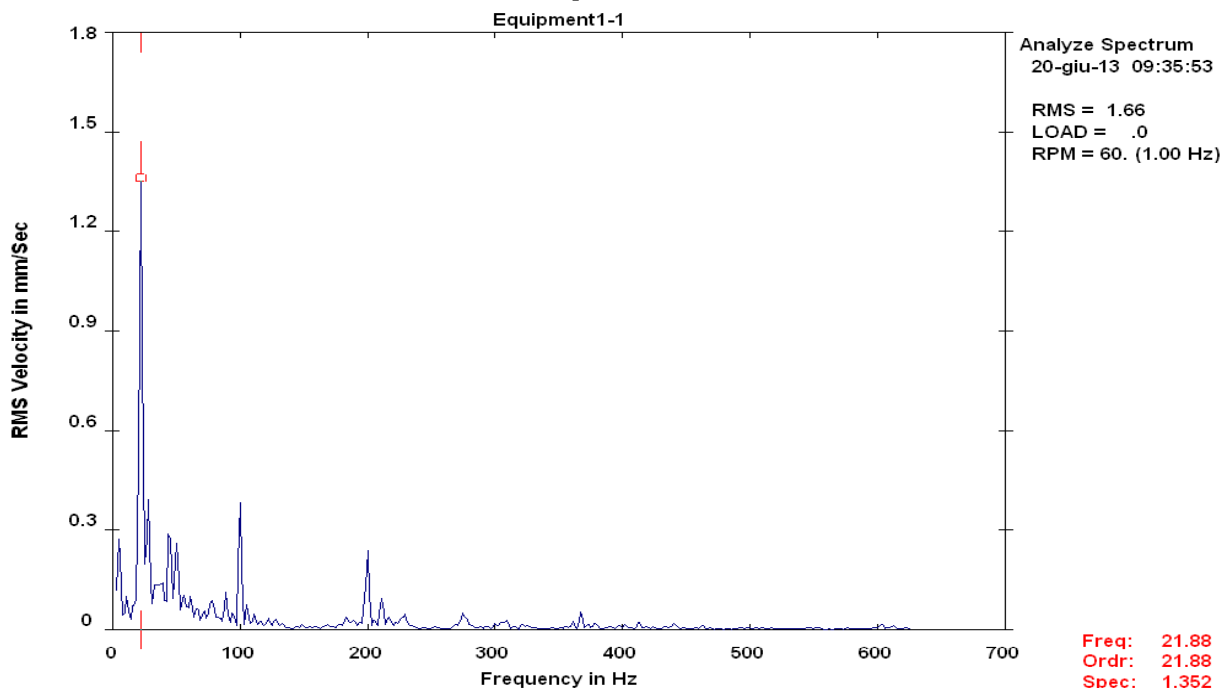
VERIFICA FREQUENZE CRITICHE VIBRAZIONI GRUPPO

COMMESSA: A12702
DATA: 24-giu-13

DATI DELL'IMPIANTO

CLIENTE: EHR s.r.l.
IMPIANTO: Centrale idroelettrica di Sgurgola
LUOGO: Sgurgola
UTENZA IN PROVA: GRUPPO

VELOCIMETRO 1 - 530kW



LIST OF SPECTRAL PEAKS

Equipment: ()
Meas. Point: Equipment1-1 -->
Date/Time: 20-giu-13 09:35:53 RPS= 1.00 Units=mm/Sec RMS

PEAK NO.	FREQUENCY (Hz)	PEAK VALUE	ORDER VALUE	PEAK NO.	FREQUENCY (Hz)	PEAK VALUE	ORDER VALUE
1	5.55	.2812	5.546	13	88.89	.1135	88.893
2	11.21	.0984	11.207	14	94.27	.0543	94.271
3	22.19	1.3681	22.191	15	99.97	.3833	99.970
4	27.82	.4063	27.822	16	105.49	.0882	105.486
5	38.41	.1628	38.407	17	111.09	.0467	111.093
6	44.50	.3300	44.502	18	199.90	.2381	199.896
7	50.19	.2620	50.188	19	211.05	.0941	211.054
8	55.67	.1147	55.675	20	229.18	.0516	229.182
9	61.29	.1021	61.295	21	275.43	.0529	275.430
10	66.40	.0721	66.404	22	367.40	.0541	367.398
11	71.40	.0617	71.401	23	722.16	.0919	722.164
12	77.47	.0980	77.465	24	829.17	.0671	829.166

TOTAL MAG 1.6221 **SUBSYNCHRONOUS 0.0 / 0%** **SYNCHRONOUS .3833 / 6%** **NONSYNCHRONOUS 1.5761 / 94%**
(ELECTRICAL= 0.00E+00 / 0% **FLOOR= .4864** **SPEC CREST= 3.48)**

NOTE:

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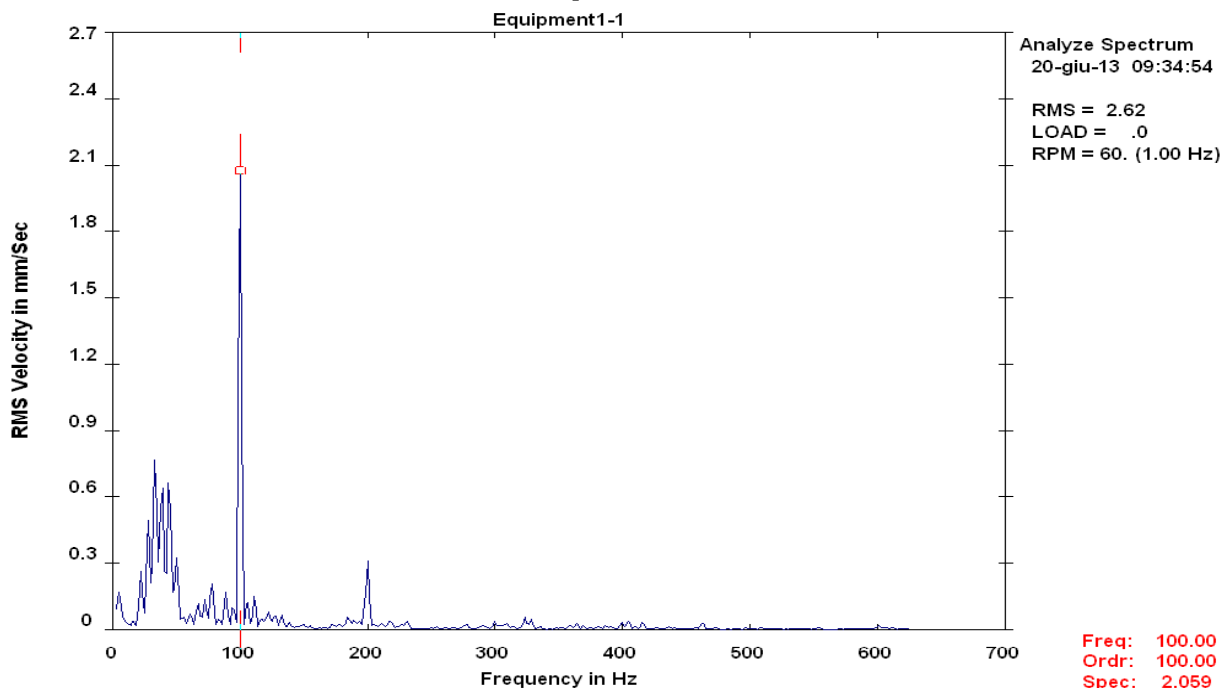
VERIFICA FREQUENZE CRITICHE VIBRAZIONI GRUPPO

COMMESSA: A12702
DATA: 24-giu-13

DATI DELL'IMPIANTO

CLIENTE:	EHR s.r.l.
IMPIANTO:	Centrale idroelettrica di Sgurgola
LUOGO:	Sgurgola
UTENZA IN PROVA:	GRUPPO

VELOCIMETRO 2 - 530kW



LIST OF SPECTRAL PEAKS

Equipment: ()
Meas. Point: Equipment1-1 -->
Date/Time: 20-giu-13 09:34:54 RPS= 1.00 Units=mm/Sec RMS

PEAK NO.	FREQUENCY (Hz)	PEAK VALUE	ORDER VALUE	PEAK NO.	FREQUENCY (Hz)	PEAK VALUE	ORDER VALUE
1	5.62	.1770	5.624	13	88.79	.1737	88.792
2	22.23	.2683	22.232	14	94.45	.1116	94.455
3	27.75	.5221	27.748	15	99.97	2.0608	99.972
4	33.24	.7940	33.241	16	105.53	.1398	105.532
5	38.52	.7044	38.518	17	111.17	.1547	111.174
6	44.33	.7169	44.331	18	116.52	.0516	116.520
7	49.91	.3238	49.913	19	122.29	.0833	122.287
8	55.54	.0630	55.535	20	127.49	.0708	127.487
9	60.44	.0738	60.443	21	133.06	.0645	133.055
10	66.83	.1233	66.831	22	184.80	.0597	184.803
11	72.24	.1391	72.241	23	199.94	.3107	199.937
12	77.81	.2124	77.812	24	323.52	.0567	323.519

TOTAL MAG 2.5817
(ELECTRICAL= 0.00E+00/ 0%)
SUBSYNCHRONOUS 0.0 / 0%
SYNCHRONOUS 2.0608 / 64%
FLOOR= .7969
NONSYNCHRONOUS 1.5551 / 36%
SPEC CREST= 1.46)

NOTE:

RIFERIMENTO ISO 10816-5



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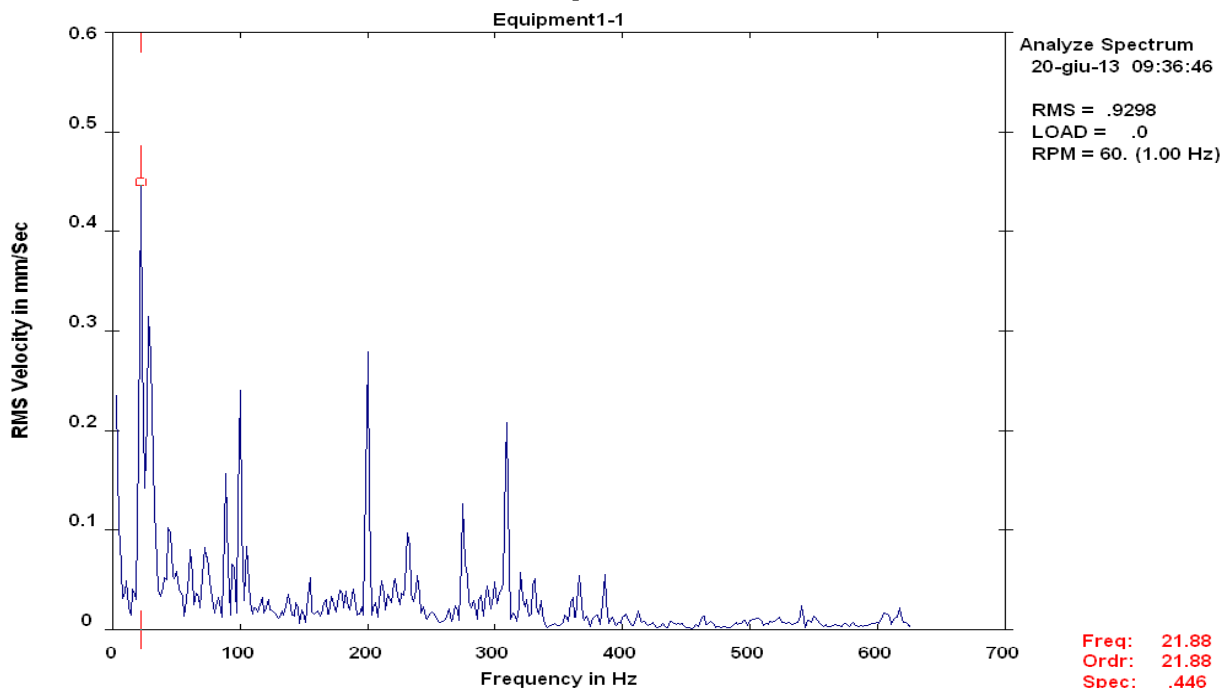
VERIFICA FREQUENZE CRITICHE VIBRAZIONI GRUPPO

COMMESSA: A12702
DATA: 24-giu-13

DATI DELL'IMPIANTO

CLIENTE:	EHR s.r.l.
IMPIANTO:	Centrale idroelettrica di Sgurgola
LUOGO:	Sgurgola
UTENZA IN PROVA:	GRUPPO

VELOCIMETRO 3 - 530kW



Freq: 21.88
Ordr: 21.88
Spec: .446

LIST OF SPECTRAL PEAKS

Equipment: ()
Meas. Point: Equipment1-1 -->
Date/Time: 20-giu-13 09:36:46 RPS= 1.00 Units=mm/Sec RMS

PEAK NO.	FREQUENCY (Hz)	PEAK VALUE	ORDER VALUE	PEAK NO.	FREQUENCY (Hz)	PEAK VALUE	ORDER VALUE
1	5.65	.1085	5.652	13	199.94	.2796	199.940
2	22.21	.4532	22.212	14	221.21	.0578	221.208
3	28.81	.3483	28.810	15	231.88	.1074	231.879
4	44.52	.1180	44.523	16	238.67	.0570	238.670
5	49.43	.0650	49.429	17	274.91	.1267	274.907
6	61.28	.0832	61.285	18	308.84	.2246	308.840
7	72.55	.0919	72.548	19	320.41	.0579	320.406
8	74.24	.0863	74.243	20	330.61	.0567	330.611
9	88.87	.1586	88.865	21	366.41	.0635	366.411
10	94.49	.0759	94.495	22	829.05	.0571	829.049
11	99.94	.2408	99.944	23	1104.98	.0642	1104.976
12	105.49	.0987	105.486	24	1154.77	.0563	1154.773

TOTAL MAG .8136 SUBSYNCHRONOUS 0.0 / 0% SYNCHRONOUS .0642 / 1% NONSYNCHRONOUS .8111 / 99%
(ELECTRICAL= 0.00E+00/ 0% FLOOR= .4130 SPEC CREST= 6.24)

NOTE:

RIFERIMENTO ISO 10816-5



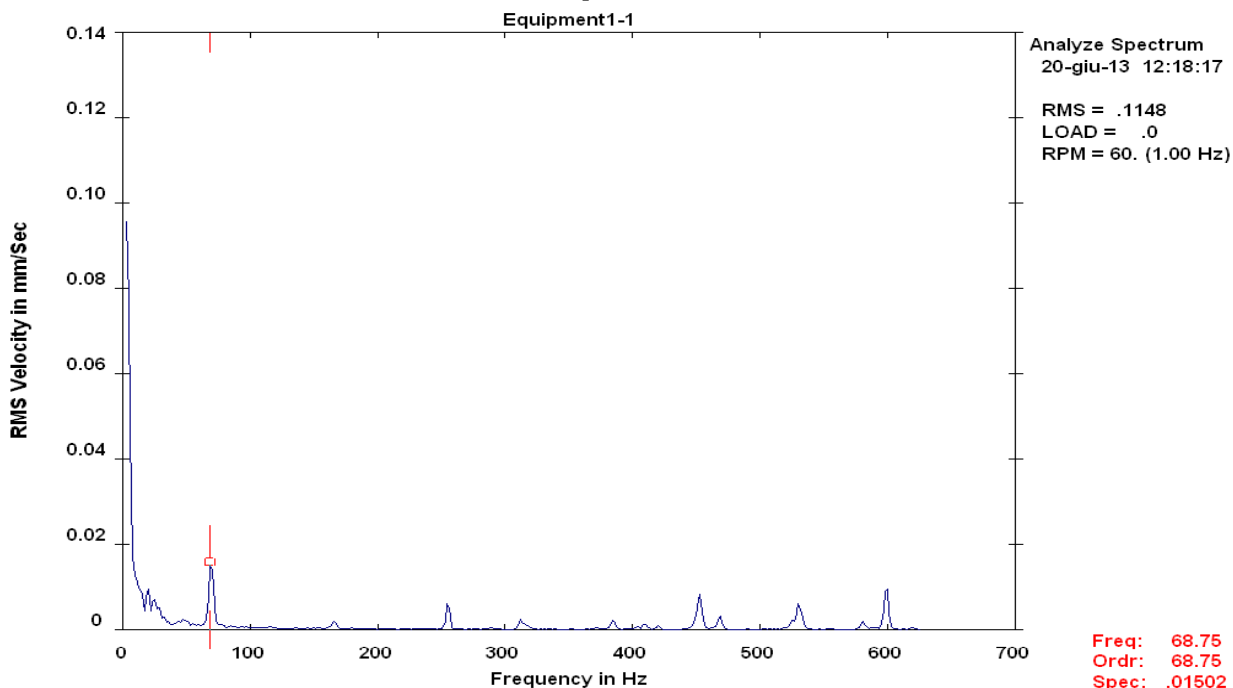
SAElettrica srl
Sicurezza, Affidabilità, Energetica
Castelnuovo del Garda (VR) Tel. 045/6450856

VERIFICA FREQUENZE CRITICHE VIBRAZIONI GRUPPO

COMMESSA: A12702
DATA: 24-giu-13

DATI DELL'IMPIANTO

CLIENTE:	EHR s.r.l.
IMPIANTO:	Centrale idroelettrica di Sgurgola
LUOGO:	Sgurgola
UTENZA IN PROVA:	GRUPPO



LIST OF SPECTRAL PEAKS

Equipment: ()
Meas. Point: Equipment1-1 -->
Date/Time: 20-giu-13 12:18:17 RPS= 1.00 Units=mm/Sec RMS

PEAK NO.	FREQUENCY (Hz)	PEAK VALUE	ORDER VALUE	PEAK NO.	FREQUENCY (Hz)	PEAK VALUE	ORDER VALUE
1	4.13	.0954	4.133	13	312.21	.0026	312.211
2	11.60	.0130	11.601	14	384.84	.0023	384.844
3	14.85	.0101	14.855	15	452.52	.0092	452.523
4	19.88	.0102	19.876	16	468.39	.0032	468.386
5	24.38	.0081	24.377	17	525.71	.0024	525.709
6	28.95	.0061	28.952	18	530.48	.0071	530.481
7	32.15	.0033	32.154	19	580.76	.0022	580.763
8	35.29	.0021	35.294	20	599.28	.0110	599.282
9	44.28	.0022	44.282	21	639.84	.0026	639.840
10	47.51	.0027	47.515	22	791.13	.0029	791.133
11	69.47	.0171	69.472	23	799.16	.0028	799.161
12	255.28	.0066	255.281	24	839.96	.0026	839.962

TOTAL MAG .1013 SUBSYNCHRONOUS 0.0 / 0% SYNCHRONOUS .0018 / 0% NONSYNCHRONOUS .1013 /100%
(ELECTRICAL= 0.00E+00/ 0% FLOOR= .0134 SPEC CREST= 2.33)

NOTE:

RIFERIMENTO ISO 10816-5