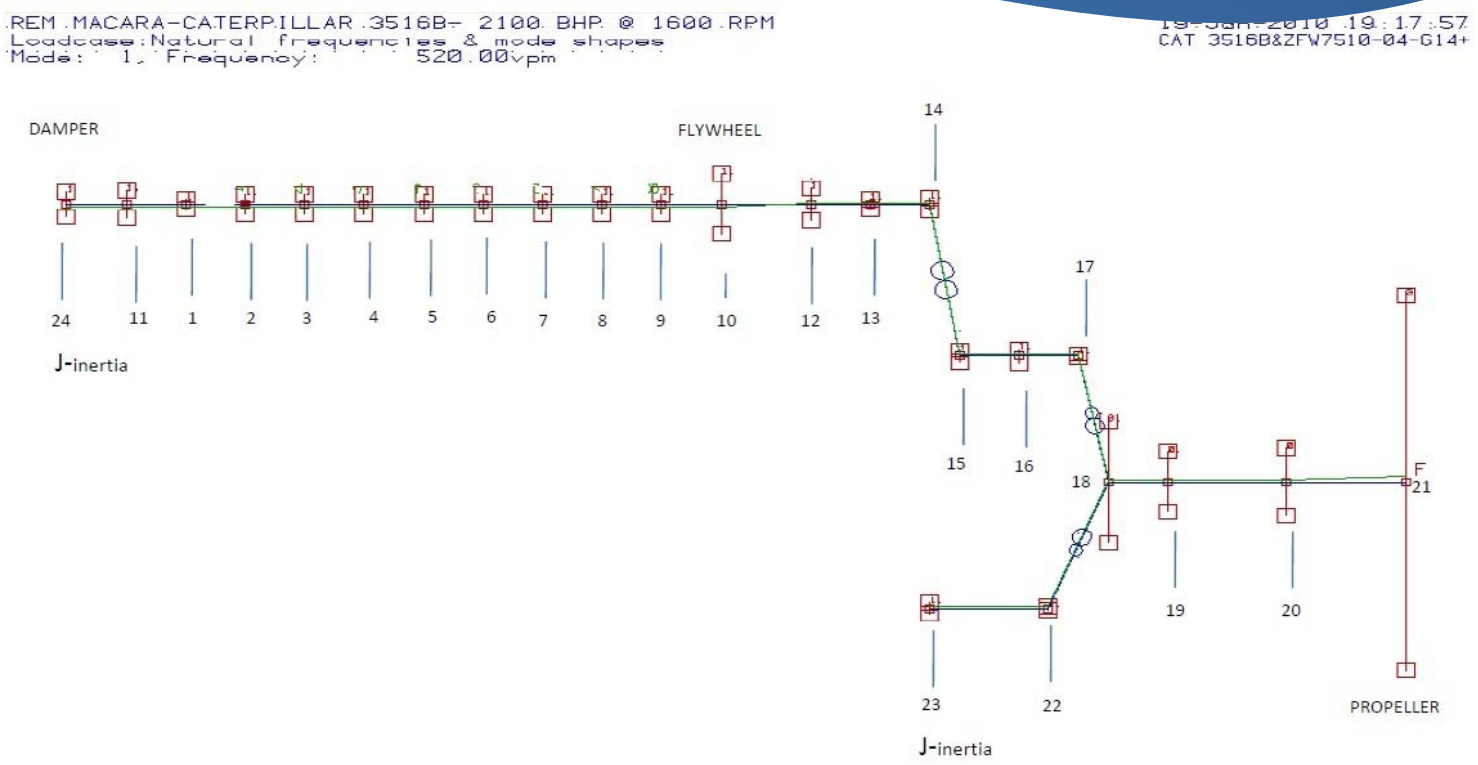
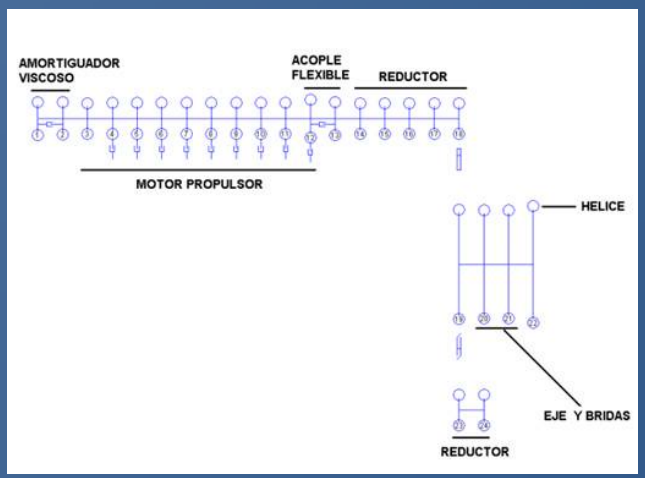
Vibration Analysis of a Tugboat

Axial, lateral & torsional vibration analysis

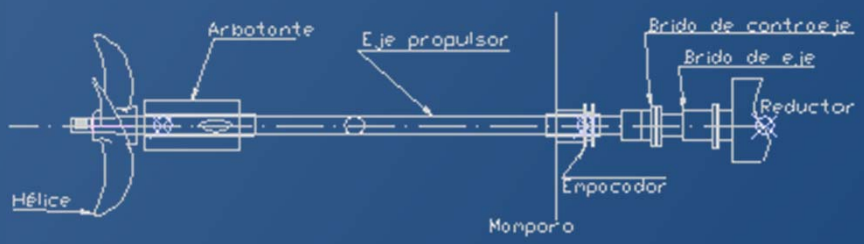


Type:	Tugboat
Overall length:	34.90 m
Overall Beam:	7.70 m
Engine:	2xCaterpillar 3516B
MCR:	2100 BHP

Vibration analysis report.
High vibration level presence on a tugboat at 1500 rpm operation and noise between 650 & 700 rpm.
Analysis detect bad position of bearing and possible teeth wear on gearbox



Torsional model done in TORCAL
TECNAVIN S.A. Software



Propulsion system representation
for lateral vibration analysis

TECNAVIN S.A
Naval Projects

Vibration Analysis of a Tugboat

Lateral analysis results for original system

Modo	Frecuencia
	Hz
1	17.96
2	39.82
3	85.16

Modo de vibración I					
Armónicos	2Z	1Z+1	1Z-1	2Z+1	2Z-1
RPM motor	802	1283	2138	713	916
Modo de vibración II					
Armónicos	2Z+1				
RPM motor	1580				

Lateral analysis results assumed system – bearing at bad position

Modo	Frecuencia
	Hz
1	17.11
2	37.56
3	84.36

Modo de vibración I						
Armónicos	1Z	2Z	1Z+1	1Z-1	2Z+1	2Z-1
RPM motor	1527	764	1222	2036	679	873
Modo de vibración II						
Armónicos	2Z+1					
RPM motor	1491					

Torsional analysis results for original system

Modo	Frecuencia	
	Hz	RPM Motor
1	8.50	510.21
2	21.67	1300.07
3	42.10	2525.74
4	66.61	3996.49
5	79.95	4796.87
6	138.97	8337.95
7	150.89	9053.33
8	175.88	10552.55
9	197.77	11866.36
10	288.06	17283.70
11	326.70	19601.72
12	398.81	23928.71

Torsional analysis results assumed system – gearbox teeth wear

MODO	FRECUENCIA	
	HZ	RPM MOTOR
1	7.98	478.81
2	21.29	1277.17
3	42.06	2523.57
4	47.15	2829.26
5	79.94	4796.25
6	95.37	5722.14
7	138.92	8335.40
8	164.37	9862.35
9	175.88	10552.54
10	288.06	17283.70
11	325.21	19512.75
12	398.81	23928.71

TECNAVIN S.A.

navser@gye.satnet.net

Phone: 593-4-2441022
593-9-84166936

Skype:
Franklin.johnny.dominguez.ruiz.1

Garcia Goyena 600 & Chimborazo
Guayaquil – Ecuador

www.tecnavin.com

Coupling analysis between lateral and torsional frequencies for lateral and torsional assumed system

RPM torsional	706	-	-	1130	1431	-
RPM lateral	679	764	873	1222	1491	1527

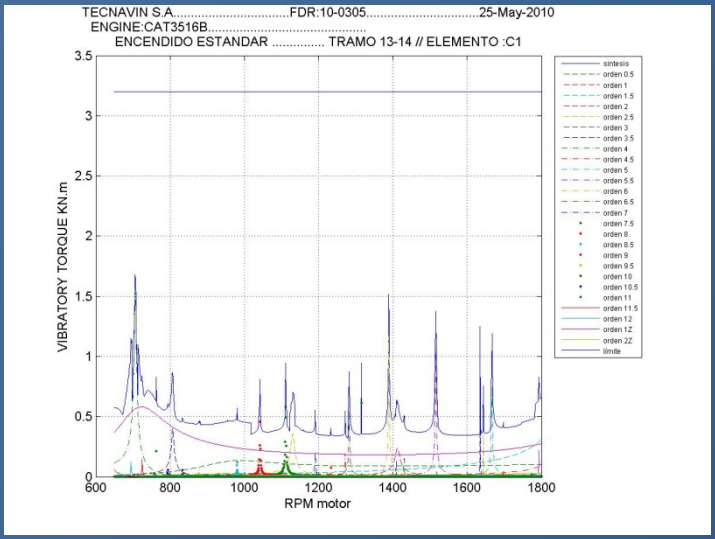
It is found that possible coupling at 700 RPM is causing noise and lateral vibration at 1527 RPM cause vibration

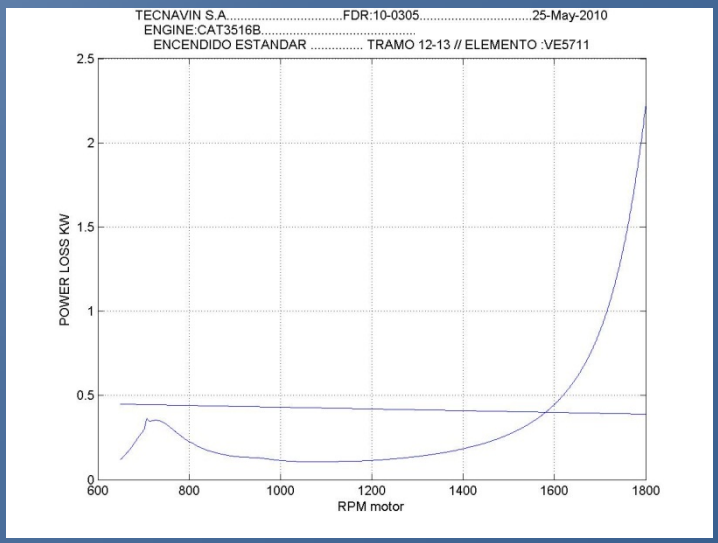
Vibration Analysis of a Tugboat

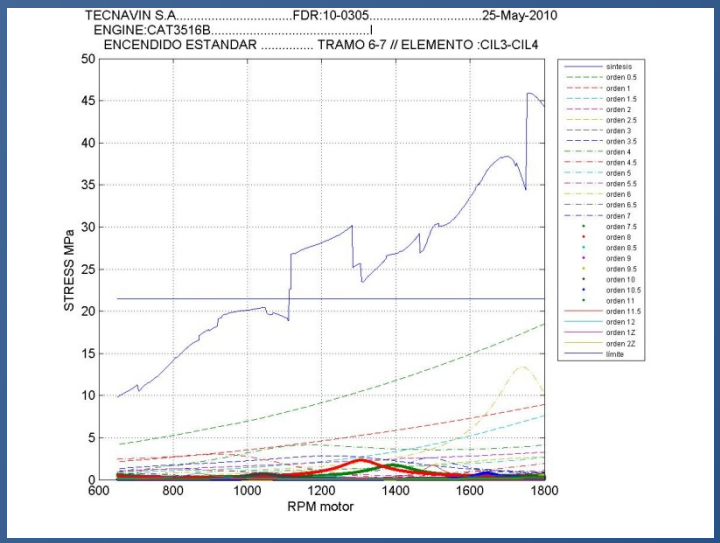
Torsional vibration results from TORCAL software

- Vibratory stresses
- Vibratory torque
- Power loss
- Angular deformation

- Analysis of all propulsion components including engine, damper, couplings, gearbox, shafts, etc.
- Analysis of standard and misfiring condition
- Analysis of Classification Societies compliance







TECNAVIN S.A.

navser@gye.satnet.net

Phone: 593-4-2441022
593-9-84166936

Skype:
Franklin.johnny.dominguez.ruiz.1

Garcia Goyena 600 & Chimborazo
Guayaquil – Ecuador

www.tecnavin.com

After ship corrections recommended by this report, the presence of vibration and sound were eliminated.