

# DATA REQUIRED FOR TORSIONAL VIBRATION CALCULATIONS

## ENGINE PARTICULARS

BUILDER - THE NEWBURY DIESEL CO. LTD

TYPE - F

NUMBER OF CYLINDERS - 6

BORE OF CYLINDERS - 240 mm.

STROKE - 345 mm.

R.P.M. - 330

B.H.P. - 300

M.I.P. - 80 LBS-IN<sup>2</sup>

FLYWHEEL WEIGHT - 600 LBS (FOR'D)  
465 LBS (AFT)

FLYWHEEL DIAMETER - 23.6" (FOR'D)  
32.3" (AFT)

DETAILS OF DAMPER IF FITTED - NIL

## SHAFT PARTICULARS (MINIMUM DIAMETERS)

CRANKPIN - 150 mm (5.9")

CRANK JOURNAL - 130 mm (5.1")

THRUST SHAFT - 6"

FLYWHEEL SHAFT -

INTERMEDIATE SHAFT - 5 1/2"

GENERATOR & OTHER

POWER TRANSMISSION

SHAFTS - TAILSHAFT - 6"

PROPELLER WEIGHT - 720 LBS.

PROPELLER DIAMETER - 5'3"

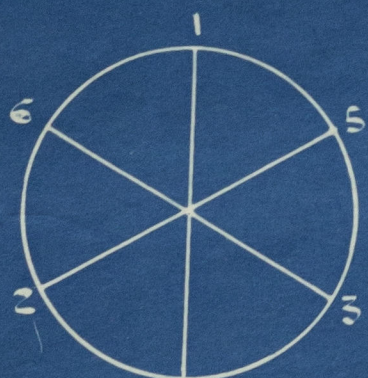
## TABULATIONS FOR NATURAL FREQUENCIES

MASS	$\frac{J}{32}$ MOMENT OF INERTIA LB-IN <sup>2</sup>	$\frac{J}{32}$ MOMENT OF INERTIA LB-IN-SEC	$\frac{J}{32} P^2$ LB-INS.	$\theta$ RADIAN	$\frac{J}{32} P^2 \theta$ TORQUE LB-IN	$\frac{J}{32} F^2 \theta$ TORQUE LB-INS.	C STIFFNESS LB-IN/RAD	TWIST IN SHAFT BETWEEN MASSES RADIAN	REMARKS
ONE NODE TABULATION (BS-INCH UNITS)									
FOR'D FLYWHEEL	5.78x10 <sup>4</sup>	150	3.69x10 <sup>6</sup>	1	3.69x10 <sup>6</sup>	3.69x10 <sup>6</sup>	130x10 <sup>6</sup>	0.0284	$P^2 = \left(\frac{2\pi F}{60}\right)^2$ $= 2.46 \times 10^4$ $F = 9.55 \times 157$ $= 1500 \text{ RPM}$ AHEAD FIRING ORDER 1.5.3.4.2.6
SCAVENGE PUMP	2x10 <sup>4</sup>	52	1.28x10 <sup>6</sup>	0.9716	1.24x10 <sup>6</sup>	4.93x10 <sup>5</sup>	47.6x10 <sup>6</sup>	0.1033	
CYLINDER N° 1	1.91x10 <sup>4</sup>	49.5	1.22x10 <sup>6</sup>	0.9683	1.06x10 <sup>6</sup>	5.99x10 <sup>5</sup>	71.5x10 <sup>6</sup>	0.0832	
" 2	1.91x10 <sup>4</sup>	49.5	1.22x10 <sup>6</sup>	0.7845	0.956x10 <sup>6</sup>	6.946x10 <sup>5</sup>	71.5x10 <sup>6</sup>	0.0970	
" 3	1.91x10 <sup>4</sup>	49.5	1.22x10 <sup>6</sup>	0.6875	0.833x10 <sup>6</sup>	7.78x10 <sup>5</sup>	71.5x10 <sup>6</sup>	0.1082	
" 4	1.91x10 <sup>4</sup>	49.5	1.22x10 <sup>6</sup>	0.5727	0.705x10 <sup>6</sup>	8.489x10 <sup>5</sup>	71.5x10 <sup>6</sup>	0.1185	
" 5	1.91x10 <sup>4</sup>	49.5	1.22x10 <sup>6</sup>	0.4602	0.561x10 <sup>6</sup>	9.050x10 <sup>5</sup>	71.5x10 <sup>6</sup>	0.1265	
" 6	1.91x10 <sup>4</sup>	49.5	1.22x10 <sup>6</sup>	0.3337	0.406x10 <sup>6</sup>	9.456x10 <sup>5</sup>	71.5x10 <sup>6</sup>	0.1322	
AFT FLYWHEEL	6.84x10 <sup>4</sup>	177	4.35x10 <sup>6</sup>	0.2015	0.875x10 <sup>6</sup>	10.33x10 <sup>6</sup>	9.3x10 <sup>6</sup>	1.112	
PROPELLER	18.15x10 <sup>4</sup>	470	11.55x10 <sup>6</sup>	-0.911	-10.5x10 <sup>6</sup>				
TWO NODE TABULATION (BS-INCH UNITS)									
FOR'D FLYWHEEL	5.78x10 <sup>4</sup>	150	16.6x10 <sup>6</sup>	1	16.6x10 <sup>6</sup>	16.6x10 <sup>6</sup>	130x10 <sup>6</sup>	0.1278	$P^2 = 11.05 \times 10^4$ $F = 9.55 \times 333$ $= 3180 \text{ RPM}$ MODULUS OF RIGIDITY $= 12 \times 10^6$ LBS-IN <sup>2</sup>
SCAVENGE PUMP	2x10 <sup>4</sup>	52	5.75x10 <sup>6</sup>	0.9722	5.01x10 <sup>6</sup>	21.61x10 <sup>6</sup>	47.6x10 <sup>6</sup>	0.4540	
CYLINDER N° 1	1.91x10 <sup>4</sup>	49.5	5.46x10 <sup>6</sup>	0.4182	3.28x10 <sup>6</sup>	23.89x10 <sup>6</sup>	71.5x10 <sup>6</sup>	0.2340	
" 2	1.91x10 <sup>4</sup>	49.5	5.46x10 <sup>6</sup>	0.0842	0.46x10 <sup>6</sup>	24.35x10 <sup>6</sup>	71.5x10 <sup>6</sup>	0.3400	
" 3	1.91x10 <sup>4</sup>	49.5	5.46x10 <sup>6</sup>	0.2558	-1.4x10 <sup>6</sup>	23.95x10 <sup>6</sup>	71.5x10 <sup>6</sup>	0.3205	
" 4	1.91x10 <sup>4</sup>	49.5	5.46x10 <sup>6</sup>	0.5763	-3.15x10 <sup>6</sup>	19.80x10 <sup>6</sup>	71.5x10 <sup>6</sup>	0.2770	
" 5	1.91x10 <sup>4</sup>	49.5	5.46x10 <sup>6</sup>	0.8533	-4.66x10 <sup>6</sup>	15.14x10 <sup>6</sup>	71.5x10 <sup>6</sup>	0.2120	
" 6	1.91x10 <sup>4</sup>	49.5	5.46x10 <sup>6</sup>	1.0653	-5.84x10 <sup>6</sup>	9.30x10 <sup>6</sup>	71.5x10 <sup>6</sup>	0.1300	
AFT FLYWHEEL	6.84x10 <sup>4</sup>	177	19.0x10 <sup>6</sup>	1.1953	-23.4x10 <sup>6</sup>	-14.1x10 <sup>6</sup>	9.3x10 <sup>6</sup>	-1.518	
PROPELLER	18.15x10 <sup>4</sup>	470	53x10 <sup>6</sup>	0.323	16.8x10 <sup>6</sup>				

## VECTOR SUMMATION

ORDERS	RESULTANT FOR 1 RADIAN AT N° 1 MASS	
	1-NODE	2-NODE
1-5-7-11-13	0.063	0.15
2-4-8-10	0.375	1
3-9-15	0.97	2.75
6-12-18	3.72	2.24

EQUIVALENT DIAM. OF SHAFTING 5.9"



CRANK ARRANGEMENT

## ANALYSIS OF STRESSES

ONE NODE VIBRATIONS PROPELLER DAMPING + HYSTERESIS DAMPING				
ORDER R.P.M.	MAXIMUM STRESS LB-IN <sup>2</sup> INTER SHAFT	LLOYD'S LIMIT (INTER SHAFT) fc	MAXIMUM STRESS LB-IN <sup>2</sup> TAIL SHAFT	LLOYD'S LIMIT (TAIL SHAFT) fc
6TH AT 250 RPM.	±5600	±6680	±4320	±5650
TWO NODE VIBRATIONS HYSTERESIS DAMPING				
ORDER R.P.M.	MAXIMUM STRESS LB-IN <sup>2</sup> CRANKSHAFT	LLOYD'S LIMIT CRANKSHAFT fc		
9TH AT 354 RPM.	±1840	±3980		
10TH AT 318 RPM.	±450	±3980		

RESTRICTED RANGE 232 RPM TO 269 RPM.

6 CYLINDER SIRON TYPE F  
ENGINE N° 822 M.V. "ASSIDUITY"  
FREQUENCY TABLES

THE NEWBURY DIESEL CO. LTD.  
NEWBURY  
ENGLAND



Lloyd's Register  
5964.E



"assiduity"

Frequency tables.

Lon rept No. 116912.



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