(1)

Shaft HP VS Speed Calculator

Enter input values into Blue cells. Computed values are displayed in yellow cells.
Two engines with up to four gear ratios may be entered.

			Gas					Gas				
	Fuel Type											
	Brake Horsepower	**BHP**	185					325				
	Max RPM	**RPM**	4000					5200				
	Gear Ratio	**RATIO**	0.88	1.00	1.25	1.50		0.88	1.00	1.25	1.50	
	Hull Constant. (See *Table (5) at bottom of page)*	**C**	150					150				
(1.1)	Displacement of vessel (Pounds)	**LB**	3200					3400				
	Required maximum speed (MPH) < 41 MPH	**MPH**	45					45				
	Shaft Horsepower available at propeller	**SHP**	179					315				
	Propeller Shaft RPM	**SRPM**	4545	4000	3200	2667		5909	5200	4160	3467	
(1.2)	Required maximum speed (Knots)	**Kts**	39					39				
(1.3)	Approximate maximum speed attainable	**Kts**	36					46				
		MPH	41					53				
	SHP available at propeller	**SHP**	179					315				
(1.4)	SHP required to reach desired speed of 45 MPH	**RSHP**	217				38 Add	217				98 Res

(2)

Recommended Propellers (C = 150)

	Gear Ratio	**RATIO**	0.88	1.00	1.25	1.50	0.88	1.00	1.25	1.50
(2.1)			11x15	12x17	14x22	16x26	11x12	12x13	13x17	15x20
	Recommended 3 Blade Propeller (Inches)	**DIAM**	11	12	14	16	11	12	13	15
		PITCH	15	17	22	26	12	13	17	20
	Pitch Ratio (P/D)		1.34	1.41	1.55	1.66	1.08	1.14	1.24	1.34
(2.2)	Pitch Ratio Test (Min:0.91 Avg:1.19 Max:1.45)		OK	OK	Fail	Fail	OK	OK	OK	OK
	Estimated prop slip at required top speed	**SLIP %**	17	17	17	17	17	17	17	17
	Recommended propeller for maximum speed	**DIAM**	10	11	13	15	10	11	12	14
		PITCH	18	20	24	29	14	16	19	23
	Recommended 4 Blade Propeller (Inches)	**DIAM**	11	12	13	15	10	11	13	14
		PITCH	15	17	21	26	12	13	16	20
	Pitch Ratio (P/D)		1.40	1.47	1.61	1.73	1.13	1.19	1.30	1.39
	Pitch Ratio Test (Min:0.91 Avg:1.19 Max:1.45)		OK	Fail	#N/A	#N/A	OK	OK	OK	OK

(3) **Recommended Ratios and 3 Blade Propellers**

Required speed 45 MPH, 185 HP @ 4000 RPM : .88 / 11x15, 1.00 / 12x17
Required speed 45 MPH, 325 HP @ 5200 RPM : .88 / 11x12, 1.00 / 12x13, 1.25 / 13x17, 1.50 / 15x20

(4)

Shaft HP required for a given speed

Shaft HP required for given speed SHP = (Kts / C)^2 * LB			Pitch Ratio P / D		
MPH	**Kts**	**SHP**	**MINPR**	**MAXPR**	**AVGPR**
10	9	11	0.64	0.95	0.81
15	13	24	0.70	1.07	0.90
20	17	43	0.75	1.16	0.97
25	22	67	0.79	1.23	1.02
30	26	97	0.83	1.30	1.07
35	30	132	0.86	1.35	1.12
40	35	172	0.88	1.40	1.16
45	39	217	0.91	1.45	1.19
50	43	268	0.93	1.49	1.23
55	48	325	0.95	1.54	1.26
60	52	387	0.97	1.57	1.29
65	56	454	0.99	1.61	1.31
70	61	526	1.00	1.64	1.34
75	65	604	1.02	1.67	1.36
80	70	687	1.03	1.71	1.39
85	74	776	1.05	1.73	1.41
90	78	870	1.06	1.76	1.43

Shaft HP required for given speed SHP = (Kts / C)^2 * LB			Pitch Ratio P / D		
MPH	**Kts**	**SHP**	**MINPR**	**MAXPR**	**AVGPR**
10	9	11	0.64	0.95	0.81
15	13	26	0.70	1.07	0.90
20	17	46	0.75	1.16	0.97
25	22	71	0.79	1.23	1.02
30	26	103	0.83	1.30	1.07
35	30	140	0.86	1.35	1.12
40	35	183	0.88	1.40	1.16
45	39	231	0.91	1.45	1.19
50	43	285	0.93	1.49	1.23
55	48	345	0.95	1.54	1.26
60	52	411	0.97	1.57	1.29
65	56	482	0.99	1.61	1.31
70	61	559	1.00	1.64	1.34
75	65	642	1.02	1.67	1.36
80	70	730	1.03	1.71	1.39
85	74	824	1.05	1.73	1.41
90	78	924	1.06	1.76	1.43

(5)

Crouch's Hull Constant	
150	Average runabouts, Cruisers, passenger vessels
190	High speed runabouts, very light high speed cruisers
210	Race boat types
220	Three-point hydroplanes, stepped hydroplanes
230	Racing power catamarans and sea sleds

Min	Max	Pitch Ratio (P/D)
.55	.80	Tugs and trawlers
.65	1.0	Heavy and average cruisers
.80	1.2	Medium and fast cruisers
.90	1.5	Fast cruisers and runabouts

(6)

Equations

$SHP = (Kts / C)^2 * LB$

$Kts = C / (LB / SHP)^{0.5}$

$D = 632.7 * SHP^{0.2} / SRPM^{0.6}$

$P = ((Kts * 101.3) / (RPM / RATIO * .8) * 12) * (1+(1.4*Knts^{0.57}))$

Kts = Desired Speed (Knots) C = Hull Constant

1 Mile per Hour = 0.8689 Knots
1 knots = 1.1507 MPH

(7)

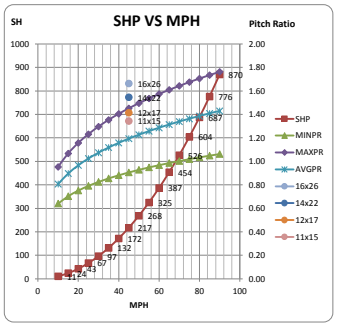
Effect of Hull Constant (C)

	Gear Ratio	**RATIO**	0.88	1.00	1.25	1.50	0.88	1.00	1.00	1.25
	Hull Constant. (See Hull Constant table above)	**C**	150	160	170	180	150	160	170	180
	Approximate maximum speed attainable	**Kts**	36	38	40	43	46	49	52	55
		MPH	41	44	46	49	53	56	60	63

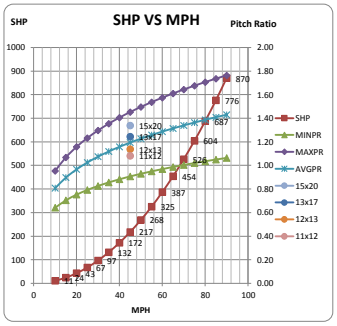
(8)

Pitch-Diameter Graphs

185 HP @ 4000 RPM - Required speed 45 MPH, Attainable 41 MPH



325 HP @ 5200 RPM - Required speed 45 MPH, Attainable 53 MPH



Optimum Pitch Ratio Formula

Generally, the best performance and efficiency will be obtained with pitch ratios close to the average pitch ratio curve (see ***Average Pitch Ratio***). Performance will be satisfactory, however, as long as the pitch ratio of the specified propeller does not fall above or below the recommended maximum or minimum curves. *If the pitch ratio does fall outside these curves, the shaft speed is unsuited to the boat and must be changed using either a different reduction gear and/or an engine of a different rated RPM.*

Source : ***Propeller Handbook*** by Dave Gerr, International Marine. See ***Checking Pitch Ratio and Minimum Diameter***, Page 57