Analysis by Software Trawl Vision for a Norwegian Trawler

The following document uses the Trawl Vision software to analyze a Norwegian trawler, as a demonstration for its evaluation and optimization of its efficiency.

AcruxSoft SRL

General characteristics of the trawler

Name of trawler: NOKASA

IMO : 8811247

Flag: Norway

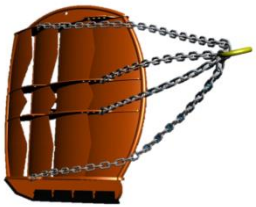
Power: 3.000 HP

Capacity: 445 tons DWT

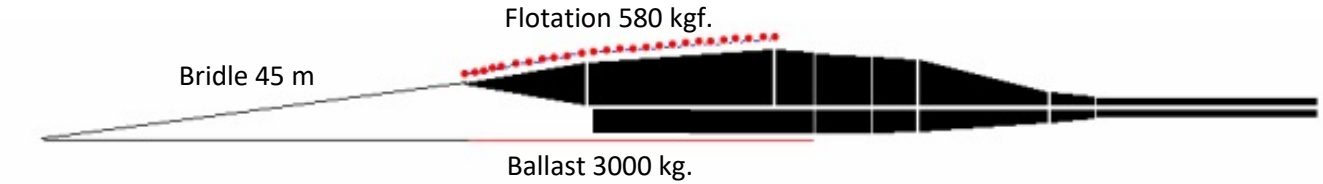
Length overall: 45 m

Fishing Gear

Doors Sea Master	8,5 m²
Door weight	2800 kg
CL/CD	3,7
Bridle	45 m
Sweepline	60 m



Sea Master



NET MORENOT 634 #

The codend, Cl and Cd doors and other data were estimated by AcruxSoft due to lack of information from the vessel.

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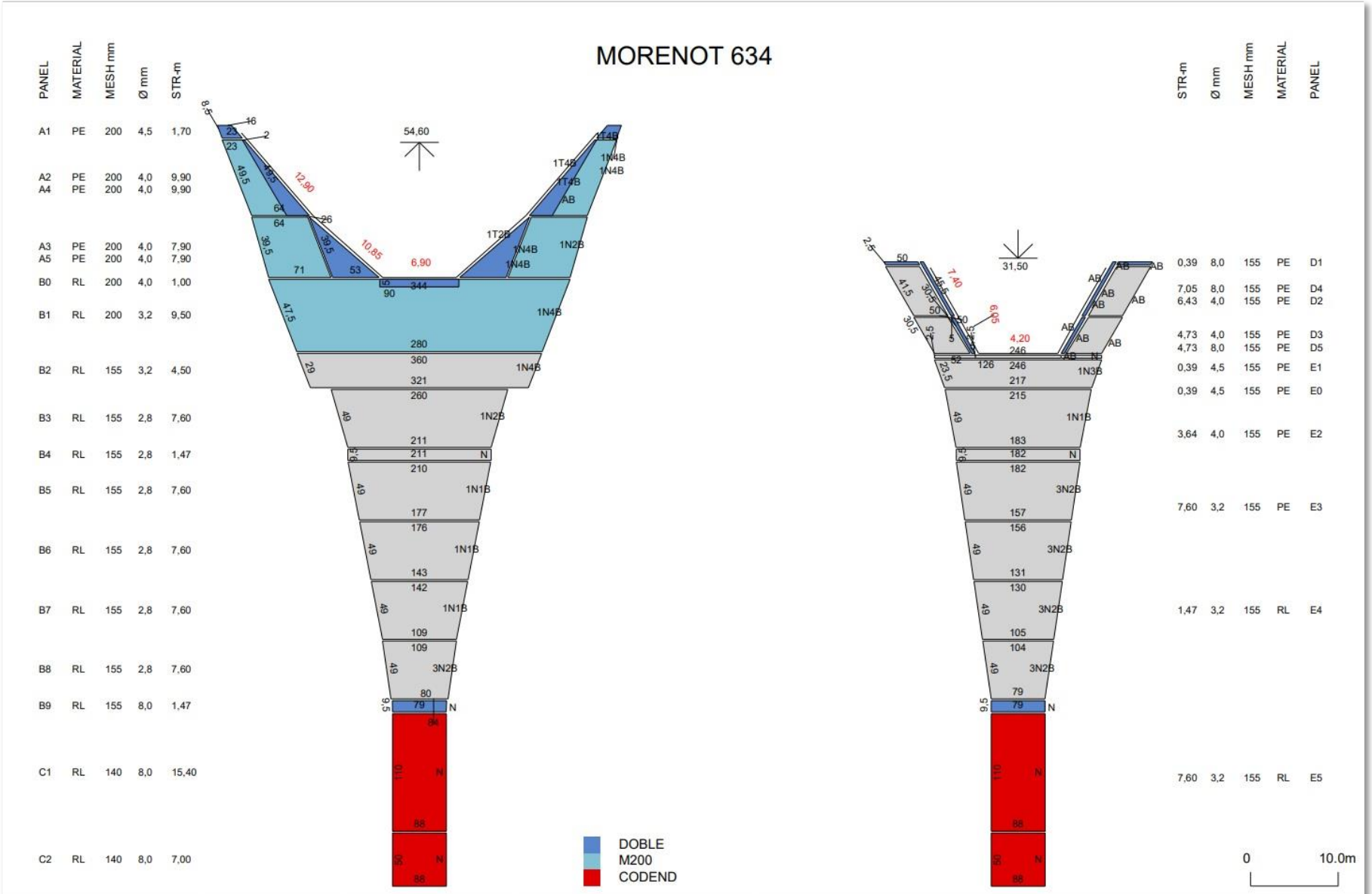
MORENOT 634



Company	NORWAY	Panel Area	1835,1m²	Headrope	54,6m	Floatation	580kgf	Sea master 8,5m2 Spread is 130m, swipline is 60m, and bridle is 45m. I haven't looked at the yet. SPEED . 3,2 kn
Ship	NOKASA	Twine Area	243,5m²	Footrope	31,5m	Ballast	3000kg	
HP	3000	Long. Net	74,4m	Extend Footrope	17,5 mm	Net Ap. H.	45m	
Net	Mørenot 634 #	Fishing circle	93,9m	Net ataque	16,1°	Net Ap. V.	6.2m	

Drawn with Software Trawl Vision Designer

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Description of the characteristics of the materials by section of the trawl net

PANEL	MATERIAL	RUNNAGE [m/Kg]	MESH [mm]	DIAMETER [mm]	TWINE LENGTH [m]	PANEL WEIGHT without KNOTS	TWINE AREA without KNOTS	PANEL WEIGHT with KNOTS [Kg]	TWINE AREA with KNOTS [m²]	WORK AREA [m²]
Upper view										
A1	PE	170	200	4,50	66	0,78	0,60	1,15	0,81	5,77
A2	PE	170	200	4,00	861	10,13	6,89	14,45	9,10	74,93
A3	PE	170	200	4,00	1067	12,55	8,53	17,89	11,26	92,79
A4	PE	170	200	4,00	277	3,26	2,22	4,65	2,93	24,12
A5	PE	170	200	4,00	419	4,93	3,35	7,02	4,42	36,43
B0	RL	170	200	4,00	180	1,06	0,72	1,51	0,95	7,83
B1	RL	200	200	3,20	5928	29,64	18,97	40,21	23,83	257,87
B2	RL	200	155	3,20	3061	15,31	9,80	21,99	13,03	103,20
B3	RL	200	155	2,80	3577	17,89	10,02	24,90	12,91	120,60
B4	RL	200	155	2,80	621	3,11	1,74	4,33	2,24	20,95
B5	RL	200	155	2,80	2939	14,70	8,23	20,46	10,61	99,09
B6	RL	200	155	2,80	2423	12,11	6,78	16,86	8,74	81,68
B7	RL	200	155	2,80	1906	9,53	5,34	13,27	6,88	64,27
B8	RL	200	155	2,80	1466	7,33	4,10	10,20	5,29	49,42
B9	RL	60	155	8,00	234	3,90	1,87	7,69	3,42	7,89
C1	RL	50	140	8,00	2710	54,21	21,68	112,07	41,51	82,53
C2	RL	50	140	8,00	1232	24,64	9,86	50,94	18,87	37,51
Lower view										
D1	PE	160	155	8,00	39	0,48	0,62	0,96	1,13	2,61
D2	PE	200	155	4,00	643	6,43	5,15	9,82	7,27	43,37
D3	PE	200	155	4,00	482	4,82	3,86	7,36	5,45	32,51
D4	PE	160	155	8,00	71	0,88	1,13	1,74	2,06	4,76
D5	PE	160	155	8,00	47	0,59	0,76	1,17	1,38	3,19
E0	PE	160	155	4,50	98	0,61	0,44	0,97	0,64	3,29
E1	PE	160	155	4,50	191	1,19	0,86	1,88	1,26	6,43
E2	PE	160	155	4,00	1686	10,54	6,75	16,08	9,53	56,86
E3	PE	155	155	3,20	3023	19,50	9,67	28,02	12,87	101,91
E4	RL	160	155	3,20	536	3,35	1,72	4,81	2,28	18,07
E5	RL	200	155	3,20	2575	12,87	8,24	18,50	10,96	86,80
E6	RL	200	155	3,20	2180	10,90	6,98	15,66	9,28	73,49
E7	RL	200	155	3,20	1785	8,92	5,71	12,82	7,60	60,17
E8	RL	200	155	3,20	1390	6,95	4,45	9,98	5,92	46,86
E9	RL	60	155	8,00	233	3,88	1,86	7,65	3,40	7,84
F3	RL	50	140	8,00	2710	54,21	21,68	112,07	41,51	82,53
F4	RL	50	140	8,00	1232	24,64	9,86	50,94	18,87	37,51

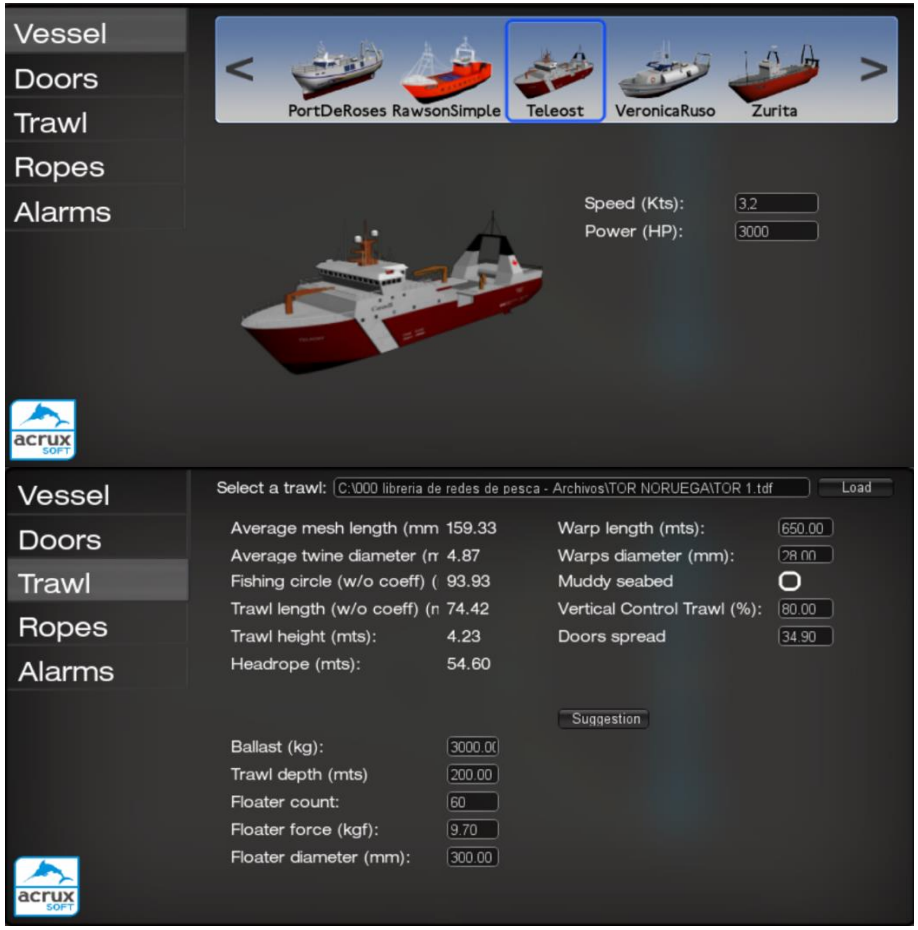
	SOLID SURFACE without KNOTS [m2]	WEIGHT without KNOTS
TOP PANELS	120,70	225,07
BOTTOM PANELS	89,71	170,78
TOTAL	210,41	395,84

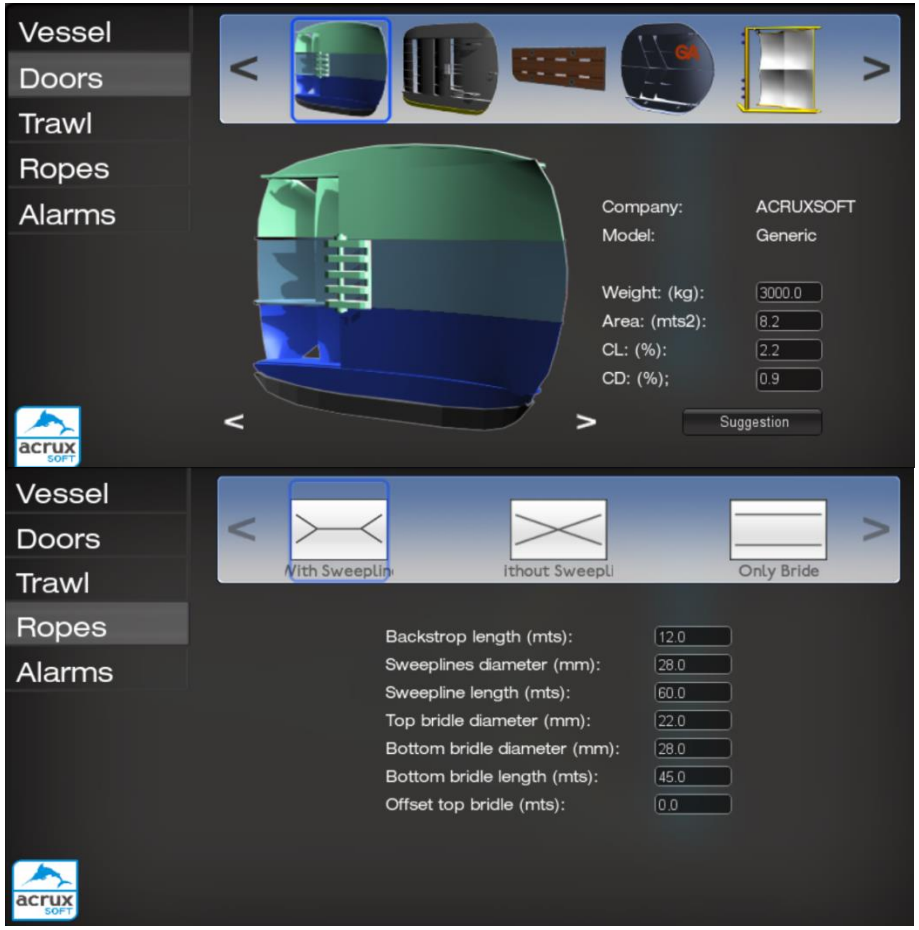
	SOLID SURFACE with KNOTS [m2]	PANEL WEIGHT with KNOTS [kg]
TOP PANELS	176,80	369,59
BOTTOM PANELS	141,40	300,42
TOTAL	318,20	670,00

Note: we did not have information on the runnage of the twines in the net, having to estimate their characteristics.

By Software Trawl Vision Designer

DATA ENTRY TO THE SIMULATOR





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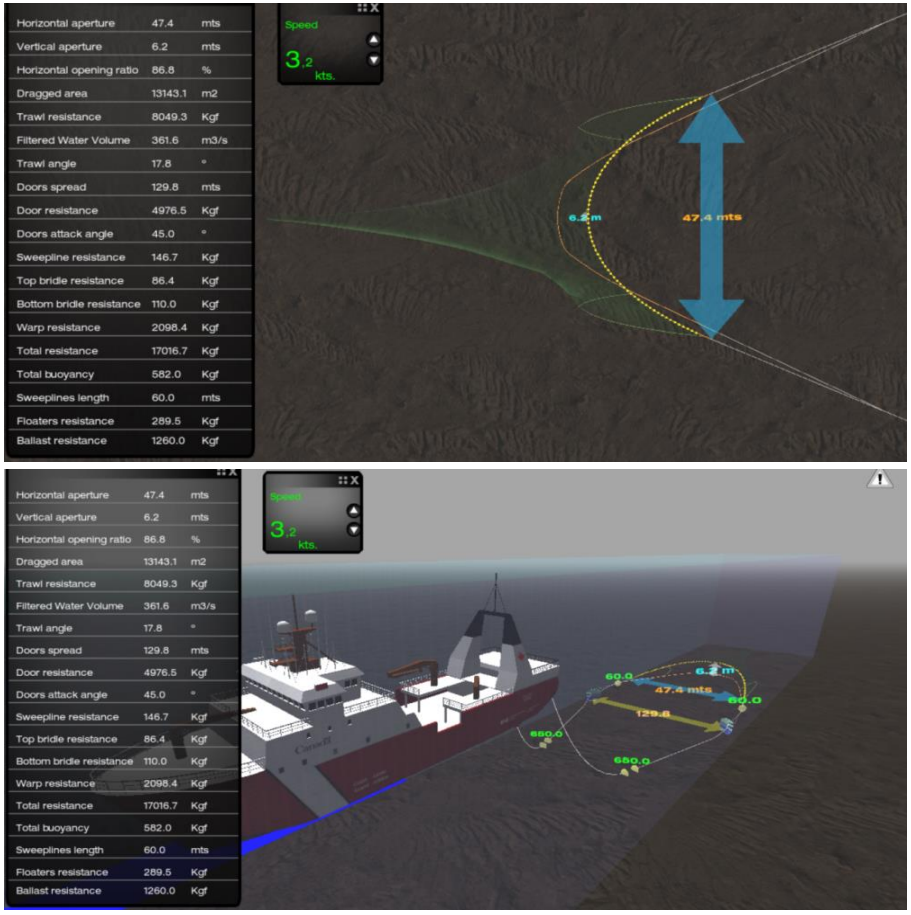
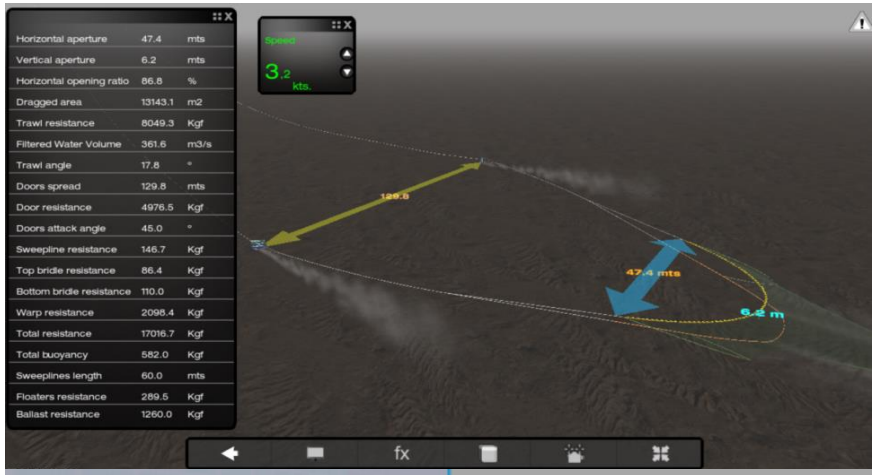
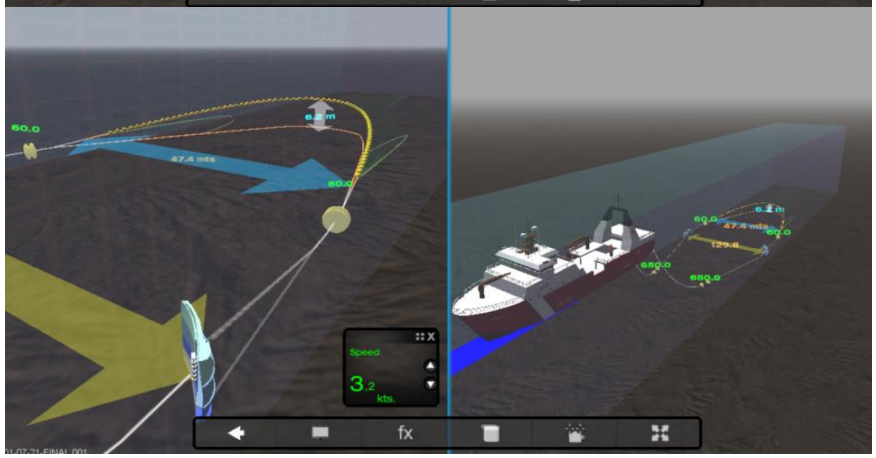
SIMULATION RESULTS AT 3.2 KNOTS | TVS







Software Trawl Vision Simulator

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Speed	3.2	kts.
Vertical aperture	6.2	mts
Horizontal aperture	47.4	mts
Doors spread	129.8	mts
Horizontal opening ratio	86.8	%
Filtered Water Volume	361.6	m3/s
Dragged area	13143.1	m2
Trawl angle	17.8	°
Trawl resistance	8049.3	Kgf
Door resistance	5092.7	Kgf
Warp resistance	2098.4	Kgf
Ballast resistance	1260.0	Kgf
Floaters resistance	289.5	Kgf
Sweepline resistance	146.7	Kgf
Bottom bridle resistance	110.0	Kgf
Top bridle resistance	86.4	Kgf
Total resistance	17132.9	Kgf

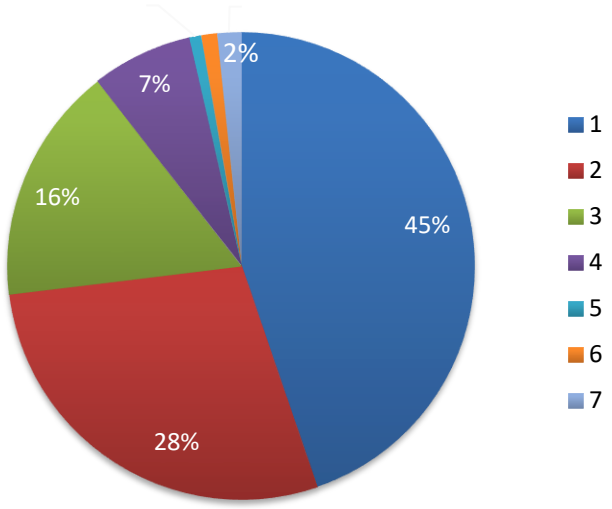
SIMULATION RESULTS | TVS

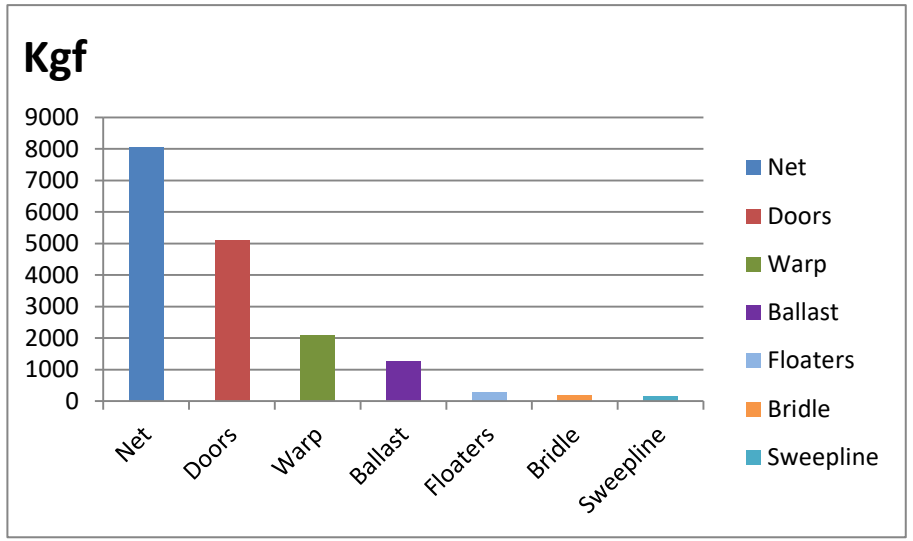
Average mesh length	159,33 m
Average twine diameter	4,87 mm
Fishing Circle of net	93,93 m
Trawl net length	74,42 m
Total twine area	243,50 m²
Total panel area	1835,06 m²
Attack net for designer	16,1°
Netting weight	670 kg
RESISTANCE | SPEED 3.2 kts.	
Net	8049 kgf
Doors	5093 kgf
Warp	2098 kgf
Ballast	1260 kgf
Floaters	290 kgf
Bridle	196 kgf
Sweepline	147 kgf
Total	17.133 kgf

Note: For the simulation a CL = 2.2 and CD = 0.9 of the doors was estimated.

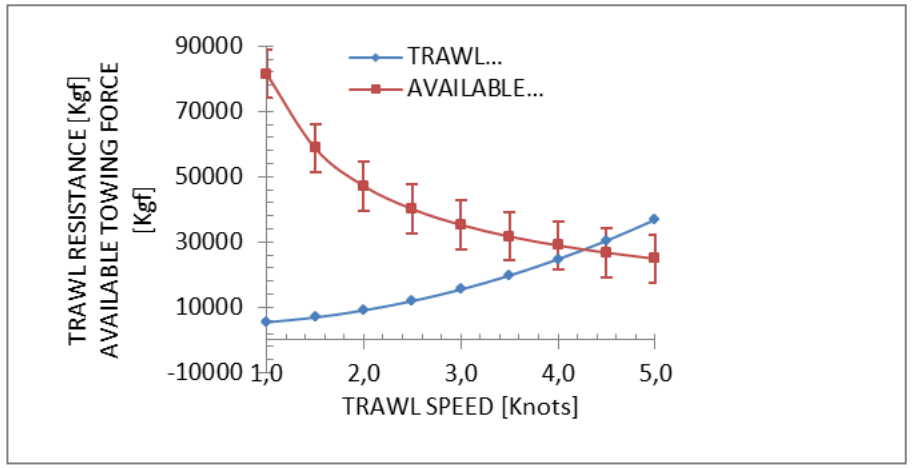
RESISTANCE ANALYSIS

Resistance analysis at a speed of 3.2 knots





Available Towing Force averaged based on four different estimates.



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DYNAMIC PERFORMANCE

Simulation in the range of speeds from 1.0 to 5.0 Kts. recommended by ICES (1982) is displayed in the Trawl Vision Simulator® (TVS® w.1.3.11.2023), on a screen where it is possible to evaluate 28 different variable parameters and modify them to maximize the efficiency of the trawl.

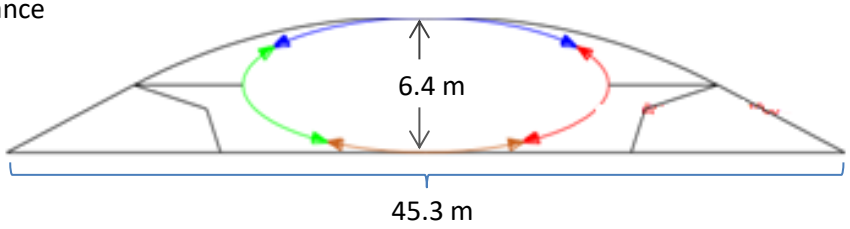
For this evaluation, only the registration of 9 variables was sufficient.

According to the results, the green row indicates the optimal performance of the trawl system, at a speed between 3.0 to 3.6 kts.

The rows identified with the red color indicate an inefficient operation between the catch system and the ship's traction.

Speed kts.	Vertical net	Wing Spread	Doors Spread	Headrope spread wing	Filtered Water volume m^3/s	Dragged Area	Trawl angle	Resistance total
1	9.1 m	19.7 m	54.0 m	36.1 %	69.0 m^3/s	5697.2 m^2	7.3°	5458.3 Kgf
2	7.7 m	35.4 m	96.9 m	64.8 %	209.5 m^3/s	10035.6 m^2	13.2°	3011.1 Kgf
3	6.4 m	45.7 m	125.3 m	83.8 %	340.5 m^3/s	12728 m^2	17.1°	15513.9 kgf
4	4.8 m	53.0 m	145.2 m	97.2 %	395.0 m^3/s	14515.3 m^2	20.0°	24751.0 kgf
5	2.9 m	58.4 m	159.9 m	100 %	352. 2 m^3/s	15757.0 m^2	22.1°	36869.0 kgf

Front view, optimal performance



Speed 3,0 kts

Filtered Water 340.5 m^3/s

Spread Doors 125.3 m

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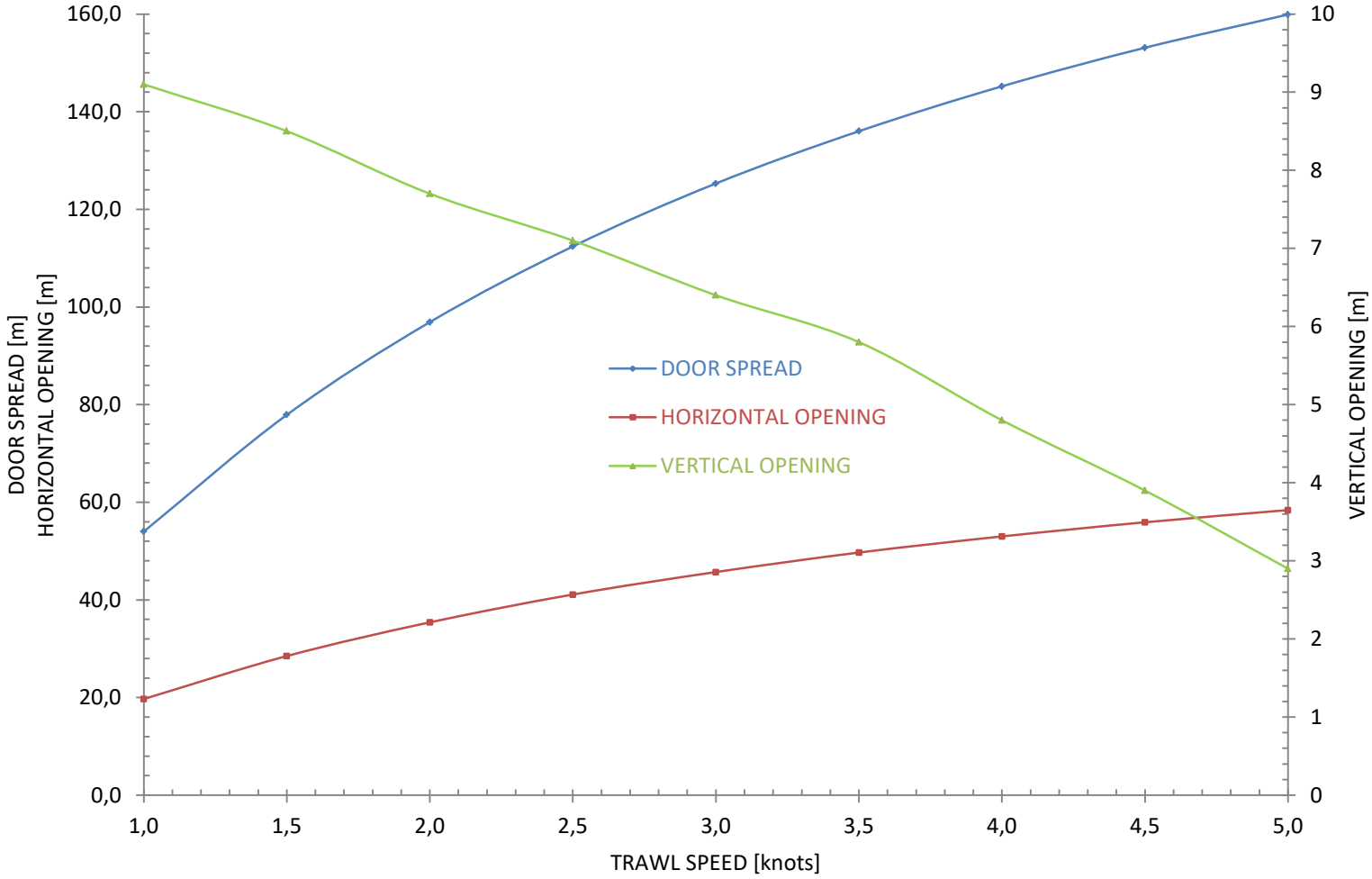
DYNAMIC PERFORMANCE



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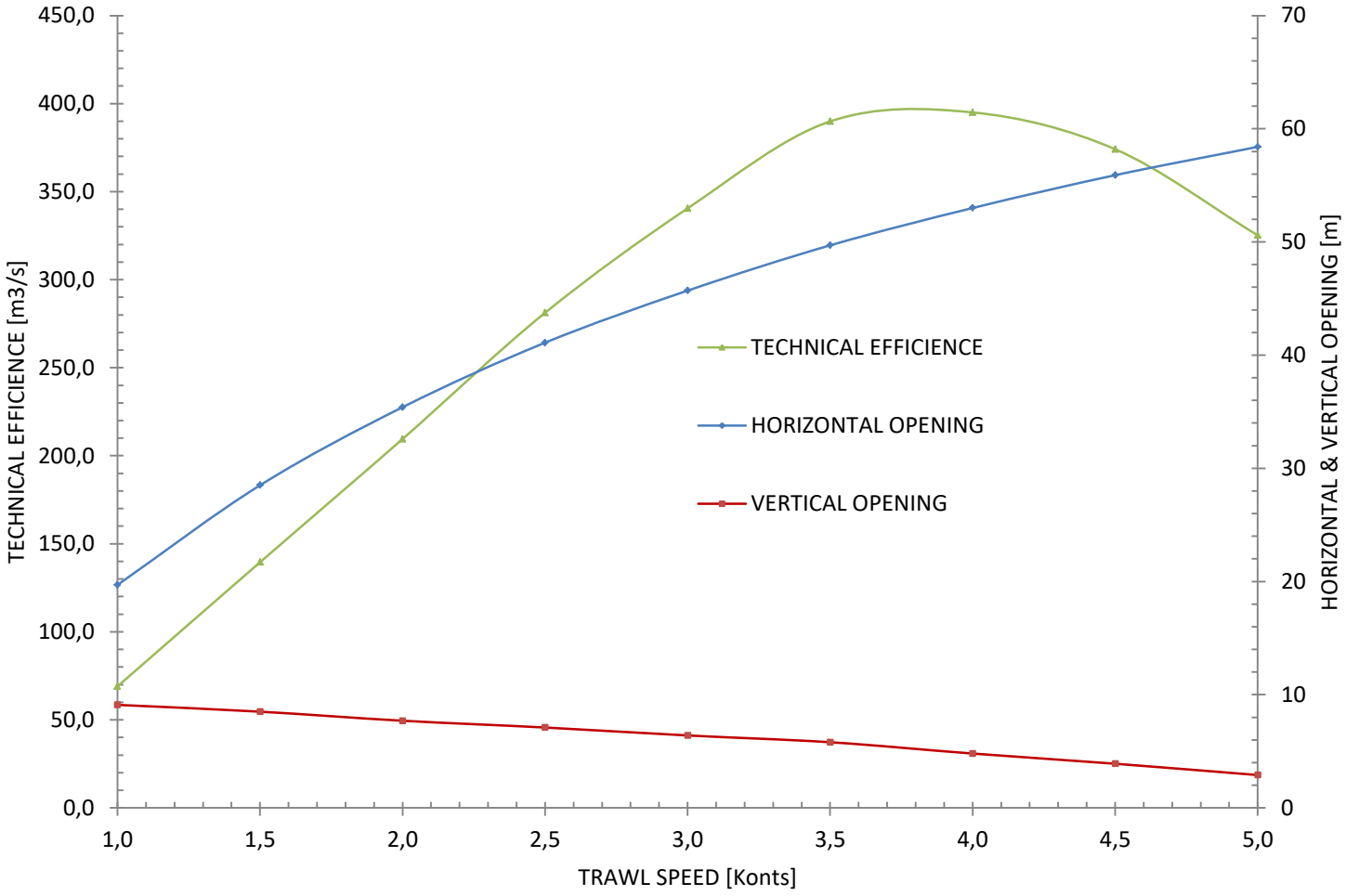
OPTIMAL TRAWLING SPEED



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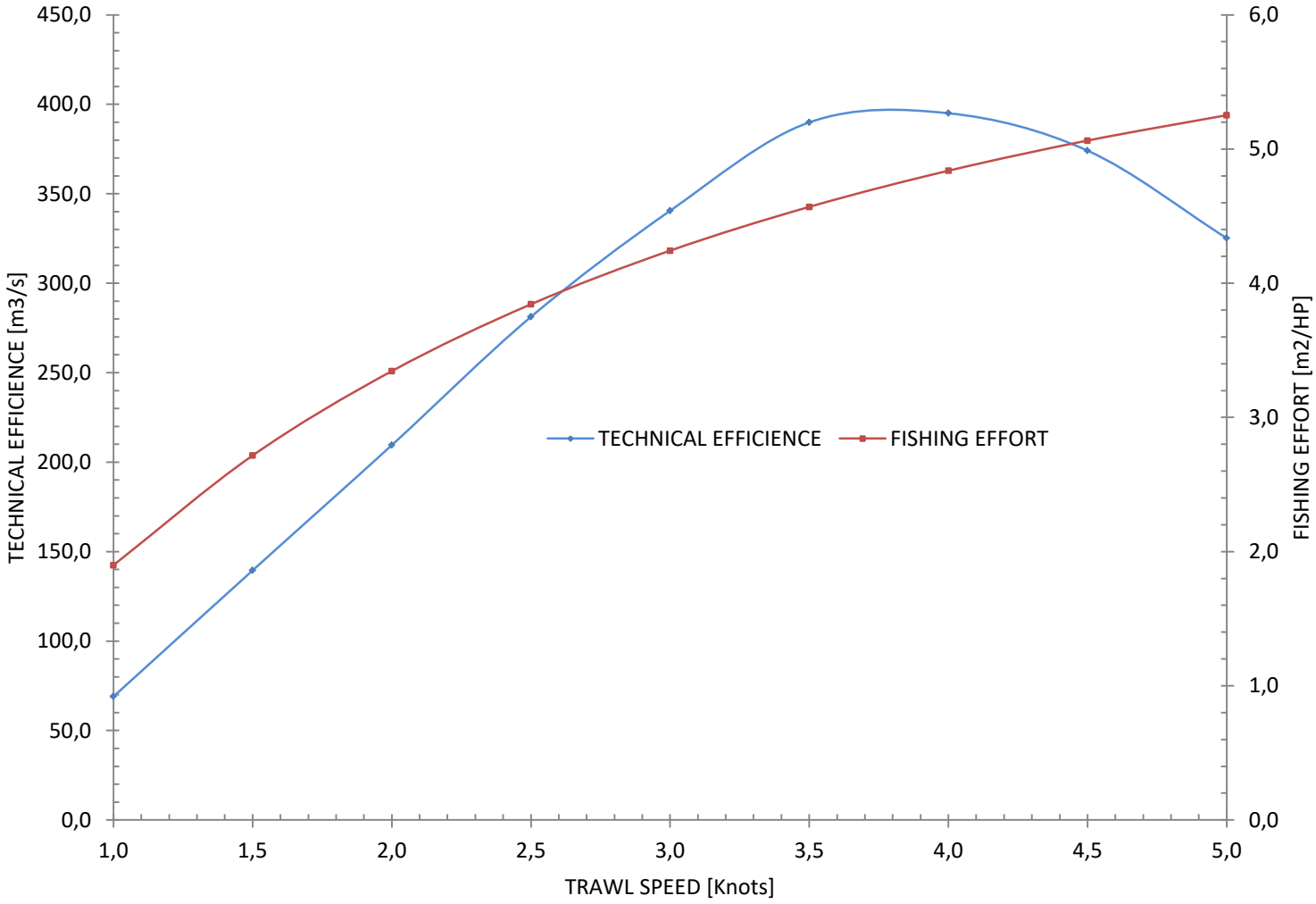
TECHNICAL EFFICIENCY



CONCLUSION

Due to the characteristics of the gear trawler, we think that it is designed for hard and irregular bottoms.

The headrope at a speed of 3.2 knots is at 88% of the spread between wings, according to the simulation, if we subject the system to higher speeds, the fishing system would lose technical efficiency, beginning to rapidly decrease the vertical opening of the net.

It is also observed that the trawl system at a speed of 4 knots would reach a limit resistance to the traction of the ship.

In summary, we observe a trawling system at the limit of the ship's power, with doors with excessive expansion force for the net.

The optimum technical efficiency of the analysed trawling system is reached between speeds of 3 to 3.6 knots.

The observations are not conclusive but a mere suggestion of what was analyzed using the Trawl Vision software and based on the trawl gear data provided by the vessel skipper.

We thank the Skipper, Pætur Mohr Leo and Tor Olav, for your support and information

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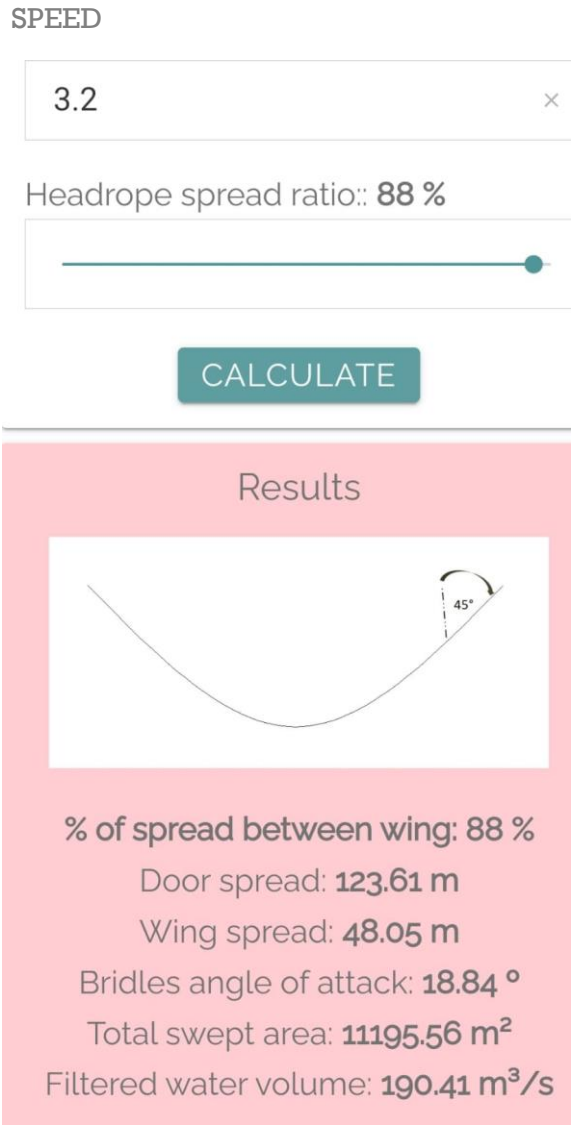

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