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OSK-ShipTech



2.1 Skrogformer og Modeller

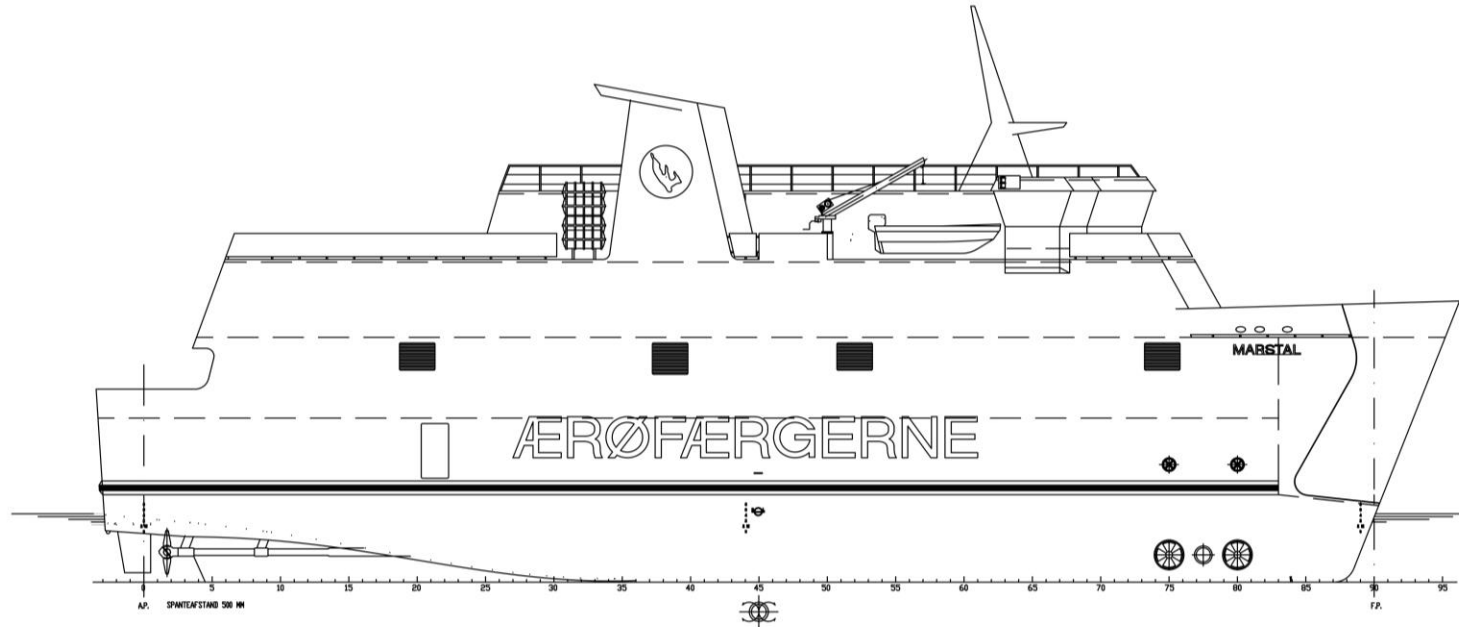


Reference



Tvillingefærgerne

Længde o.a	49,90 m
Bredde mld.	13,10 m
Bilkapacitet	42
Lastbil/Bilkapacitet	6 + 13



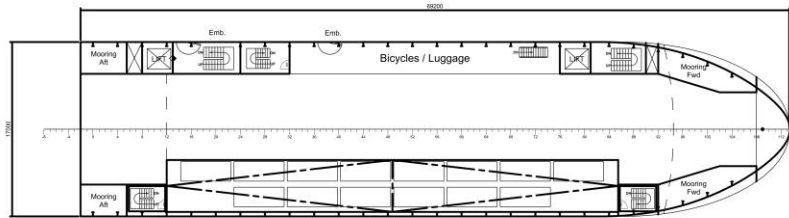
Dækslayout og Dødvægt



Dækslayout for modellerne er udført med samme hoveddimensioner for at bestemme sammenligningsgrundlaget på bilkapacitet ved design dybgang på ca. 2,40 m, og samtidig bestemme den maksimale lastekapacitet ved maksimal dybgang på 2,60 m

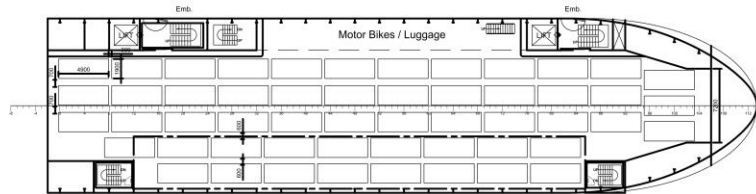
Enkeltender

Længde o.a 69.20 m
Bredde mld. 17.00 m
Bilkapacitet **67**
Lastbil/Bilkapacitet **8 + 36**



Upper Deck

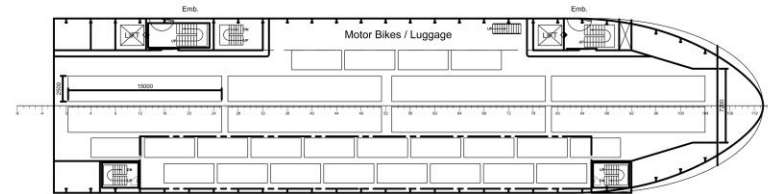
14 PCUs
Hoistable Decks



Pure Car Configuration

Main Deck

53 PCUs



Max Dwt

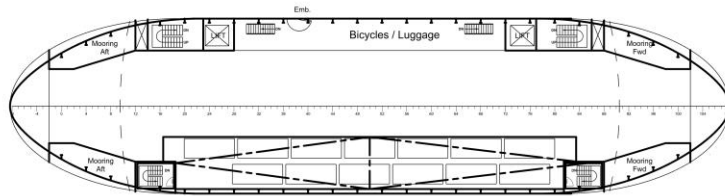
Main Deck

8 Trucks
22 PCUs



Dobbeltender

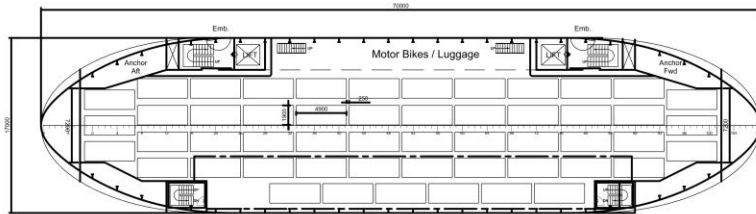
Længde o.a 70.00 m
Bredde mld. 17.00 m
Bilkapacitet **65**
Lastbil/Bilkapacitet **8 + 33**



Max Dwt

Upper Deck

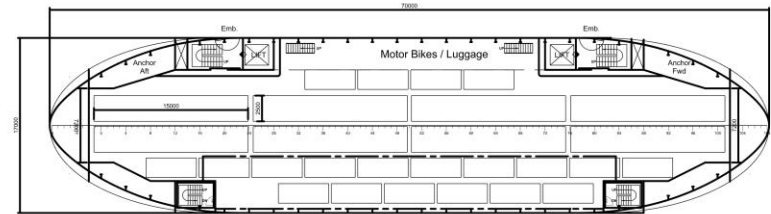
13 PCUs
Hoistable Decks



Pure Car Configuration

Main Deck

52 PCUs



Max Dwt

Main Deck

8 Trucks
20 PCUs



Deadweight Single and Double Ender

DWT - Pure Pax and PCU

		Qty	Unit (kg)	Weight (ton)
1	Pax	400	82.5	33.00
2	Crew	4	100	0.40
3	PCU	67	1500	100.50
4	Truck	0	0	-
5	Stores	Lumpsum		15.00
6	FW/sewage	Lumpsum		25.00
7	Heeling Water	Lumpsum		20.00
8	Miscellaneous			20.00
	Payload (1+3+4)			133.5
	DWT (1 - 8)			213.9

DWT - Max truck, Pax and PCU

		Qty	Unit (kg)	Weight (ton)
1	Pax	250	82.5	20.63
2	Crew	4	100	0.40
3	PCU	36	1500	54.00
4	Truck	8	32500	260.00
5	Stores	Lumpsum		15.00
6	FW/sewage	Lumpsum		25.00
7	Heeling Water	Lumpsum		20.00
8	Miscellaneous			20.00
	Payload (1+3+4)			334.6
	DWT			415.0

Vægt modeller

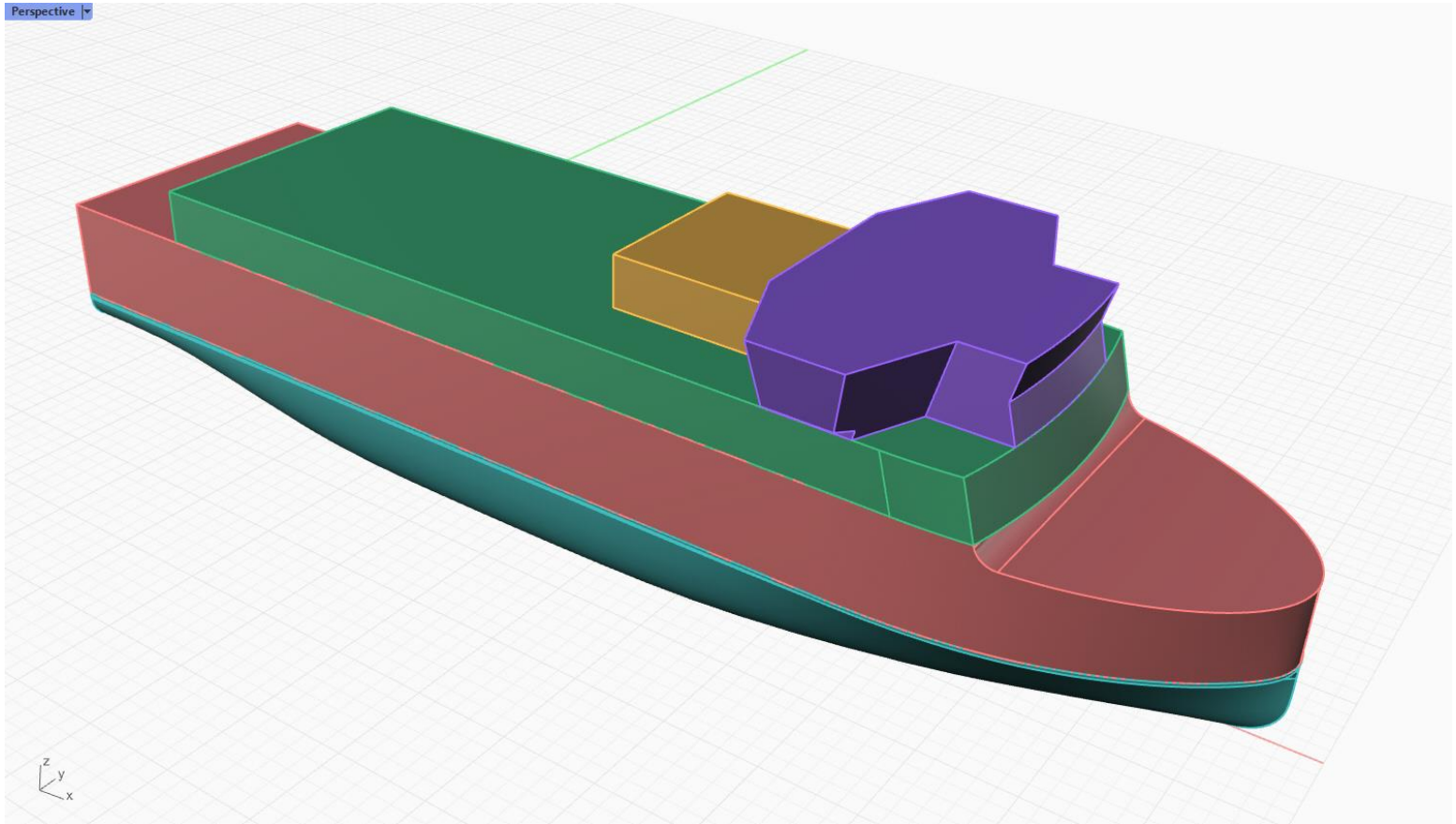


Vægtmodellerne er **ikke** et design forslag.

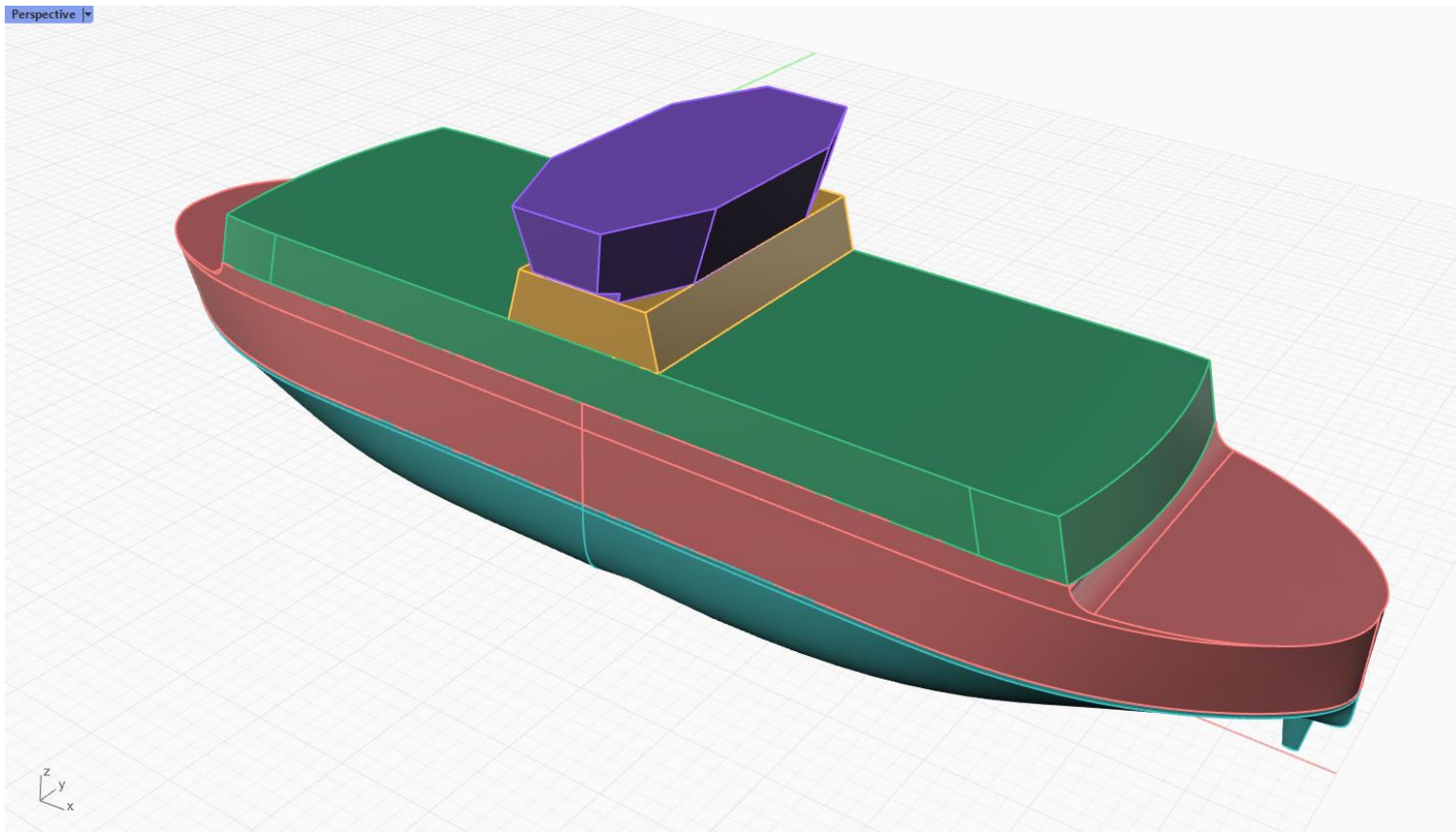
Det er præliminære volumen modeller, hvor volumener for passager afsnit, besætningsafsnit og styrehus er afsat med samme størrelse for alle modeller for at få et repræsentativt sammenlignings grundlag.

Lastdæk voluminet følger dækslayoutet der giver sammenligningsgrundlaget på 67/65 biler.

Enkeltender



Dobbeltender



Vægt beregning



Vægt-overslag Stål modeller

	Aeroe STEEL SE	Aeroe STEEL DE 70	ISABELLA	ALGERIAN	GOTLAND	AEROESKOEHING
Lpp	68.00	68.00	88.82	183.36	183.60	45.00
B	17.00	17.00	18.50	30.00	25.20	13.10
D	4.60	4.60	5.20	9.50	9.30	3.70

Lightship	1520.0	1485.0	2508.5	19381.0	13434.6	847.7
Lcg	31.00	35.00	-0.38	85.57	84.13	21.73
Vcg	6.25	6.25	6.60	15.87	12.48	6.06

Profile - Area	894.00	864.00	1345.70	6555.93	5644.01	611.91
Area-LCG	34.15	35.00	-0.38	89.81	91.64	22.80
Area-VCG	7.00	7.00	7.49	17.20	15.34	6.87

Volume	13490	13023				
LBD	5318	5318	8544	52256	43028	2181
Tonnage GT	3812	3676	5478	48028	32447	1617
Max DWt	415	415	1000	4825	4589	201
PCU DWt	215	215				

Lcg/Alcg	0.91	1.00	1.00	0.95	0.92	0.95
Vcg/Avcg	0.89	0.89	0.88	0.92	0.81	0.88
Tons/LBD	0.29	0.28	0.28	0.37	0.31	0.39
Tons / GT	0.40	0.40	0.46	0.40	0.41	0.52
Tons / Area	1.70	1.72	1.86	2.96	2.38	1.39

Batteries	50.0	50.0
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Total LW	1570.0	1535.0	t
Max Disp	1985.0	1950.0	t
Max Draft	2.600	2.600	m
Calc Disp	1984.3	1949.8	t
PCU Disp	1785.0	1750.0	t
PCU Draft	2.399	2.381	m
Calc Disp	1785.6	1750.3	t



Vægt-overslag Aluminium dobbeltender

	Aeroe ALU DE 70	INCAT 112	LILLEØRE
Lpp	68.00	112.00	35.40
B	17.00	30.60	10.00
D	4.60	7.40	2.70

Lightship	800.0	1520.0	100.3
Lcg	35.00	38.97	14.46
Vcg	6.50	8.50	3.34

Profile - Area	863.55	1945.62	206.16
Area-LC	35.00	49.37	17.38
Area-VC	7.00	10.45	3.39

LBD	5318	25361	956
Volume	12279	41957	1451
Volume-LC	35.00	45.83	16.70
Volume-VC	7.80	11.50	3.87
Max DWt	415	1480	37
PCU DWt	215		

Volume Eq. %

Tons / Area	0.93	0.78	0.49
Lcg/Alc	1.00	0.79	0.83
Vcg/Avc	0.93	0.81	0.98
Tons/Volume	0.0651	0.0362	0.0691
Lcg/Vlc	1.00	0.85	0.87
Vcg/Vvc	0.83	0.74	0.86

Batteries 50.0 t

Total LW	850.0 t
Max Disp	1265.0 t
Max Draft	2.600 m
Calc Disp	1265.2 t
PCU Disp	1065.0 t
PCU Draft	2.347 m
Calc Disp	1065.7 t



Vægt-overslag, opsummering af metode

For hver skibsmodel udregnes en estimeret letvægt. Hertil lægges den maksimale dødvægt, hvor lasten er en kombination af lastbiler og biler. Dette giver displacements kravet ved den maksimale dybgang, der er bestemt til at være 2.60 m.

De 3 skrogmodeller udformes så displacement er så tæt på målet som praktisk muligt ved den maksimale dybgang 2.60 m.

Herefter udregnes den præcise dybgang for hver skrogmodel der svarer til det displacement der er lig med letvægt plus den dødvægt på 215 t der svarer til personbil kapaciteten.

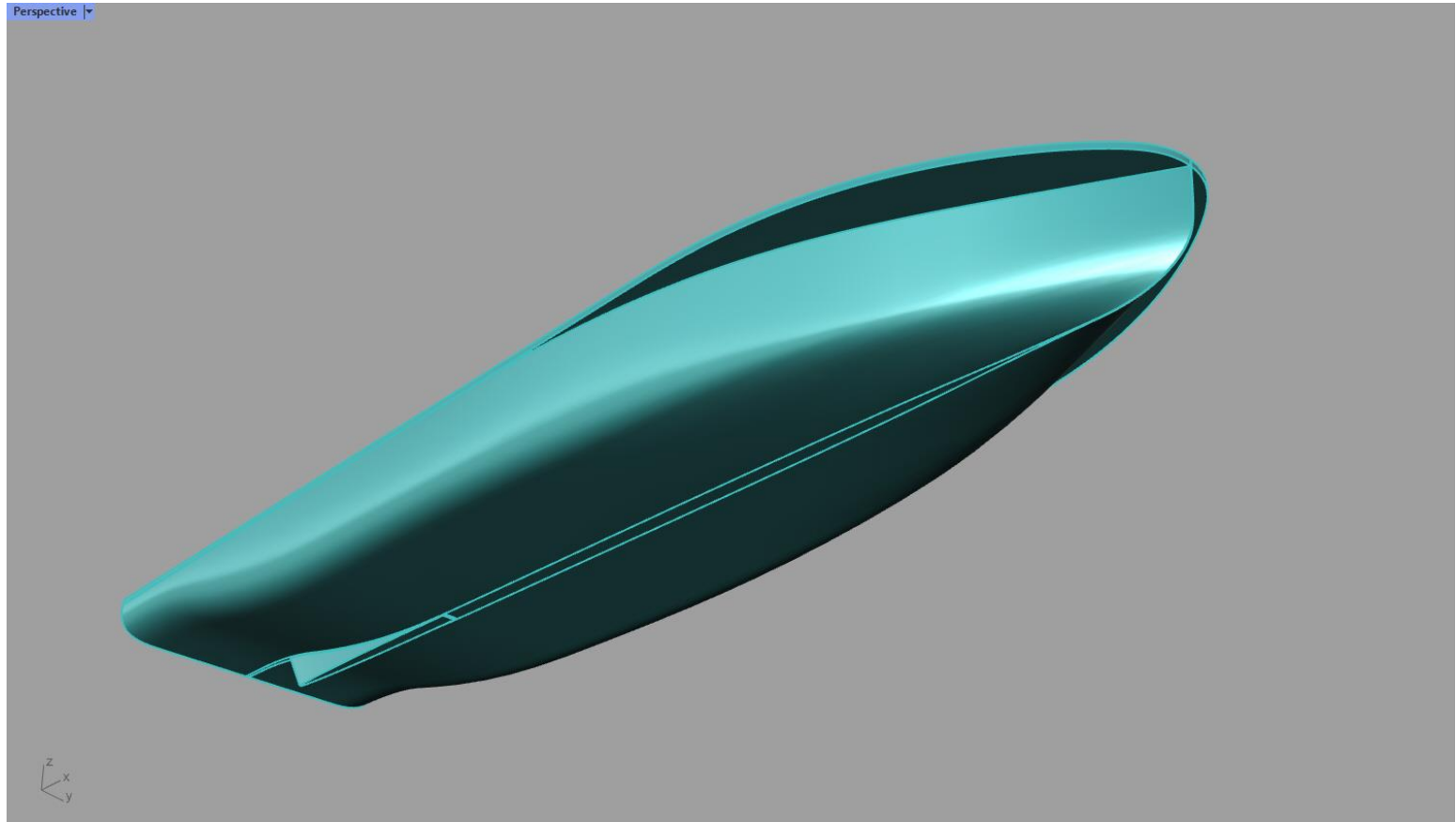
Den beregnede dybgang for hver model anvendes ved alle energiberegninger. Dette sikrer et sammenligningsgrundlag hvor alle har præcis samme dødvægt på 215 t.



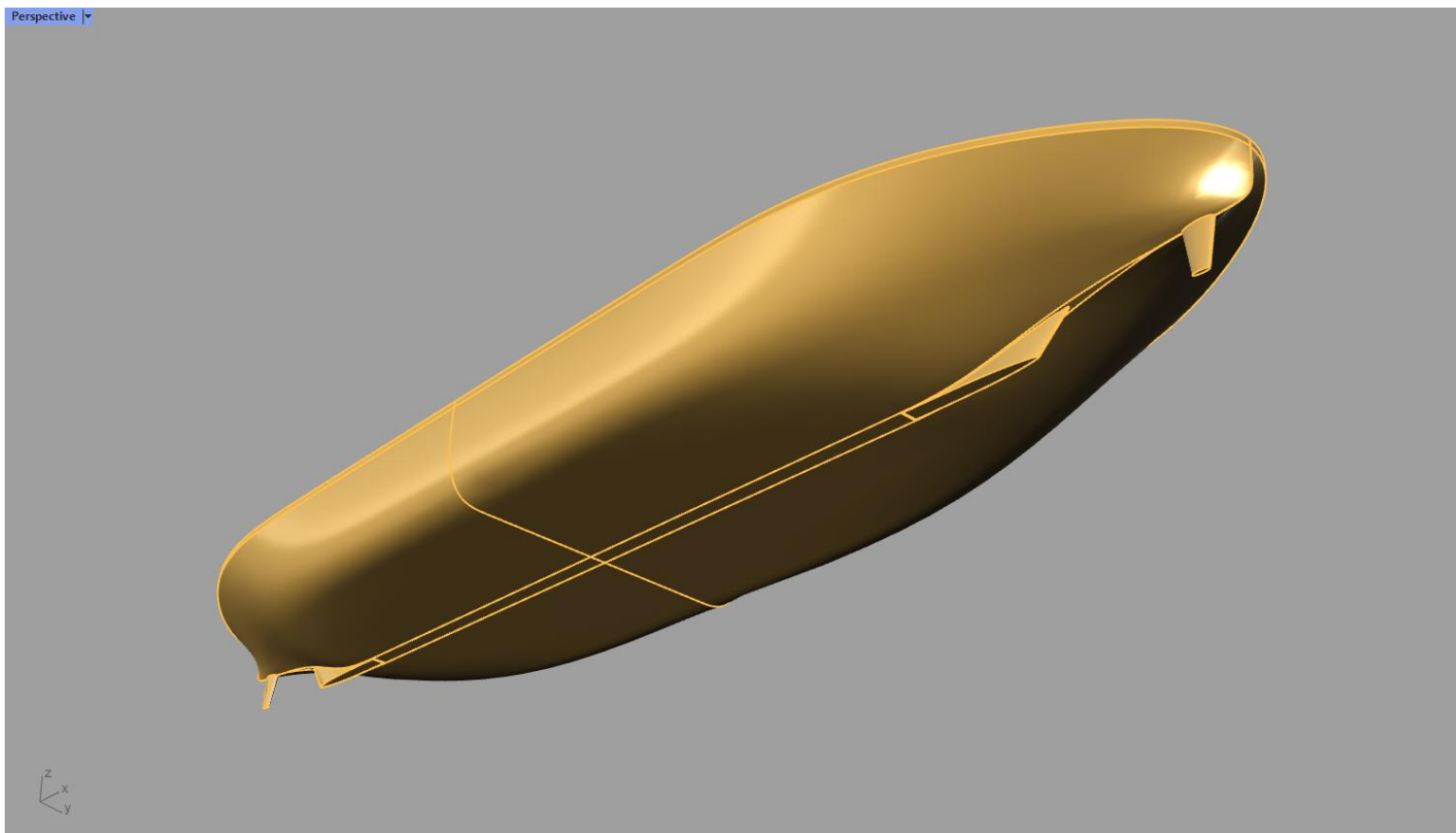
Skrogformer



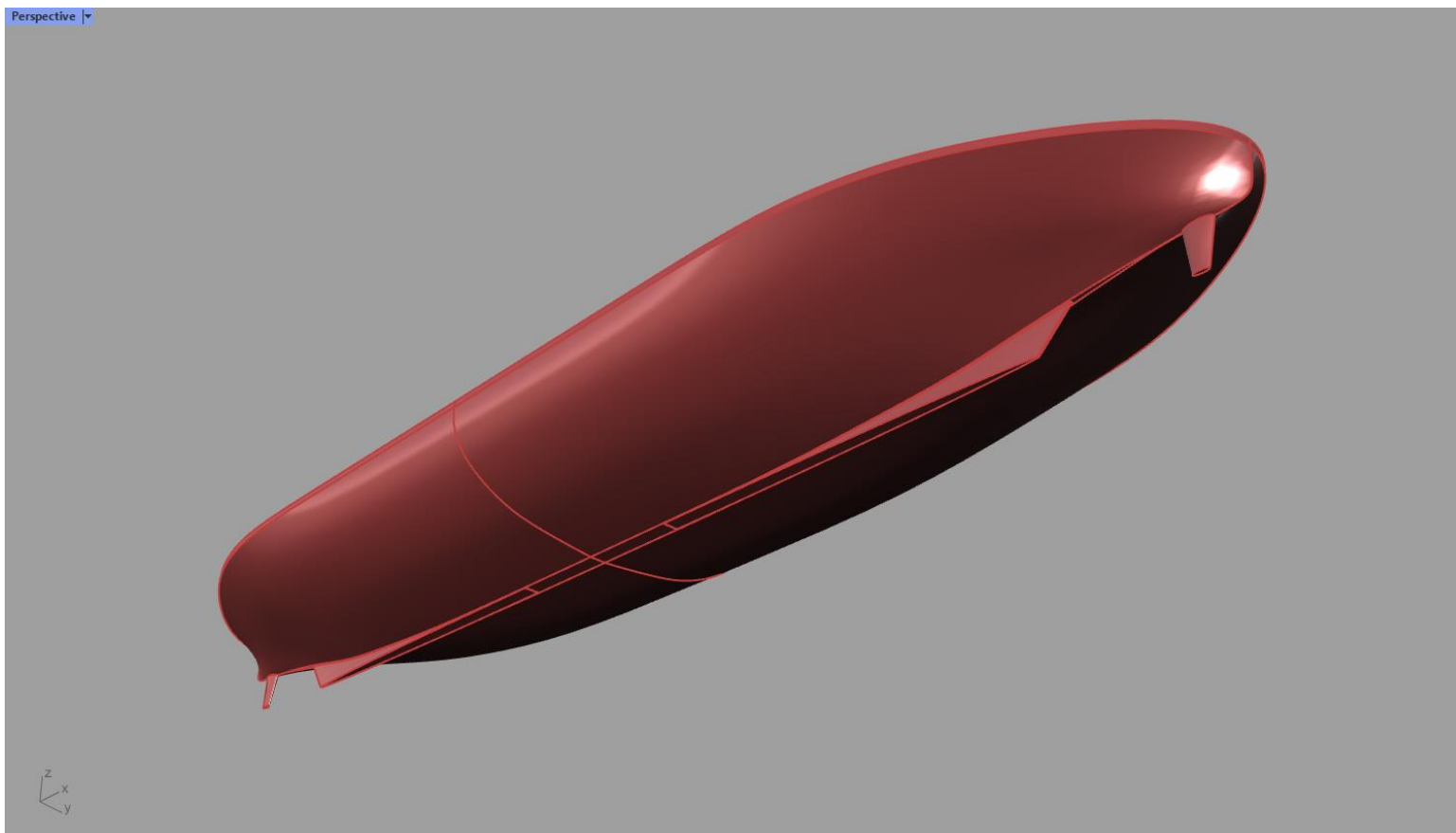
Enkeltender – Stål



Dobbeltender – Stål



Dobbeltender – Aluminium



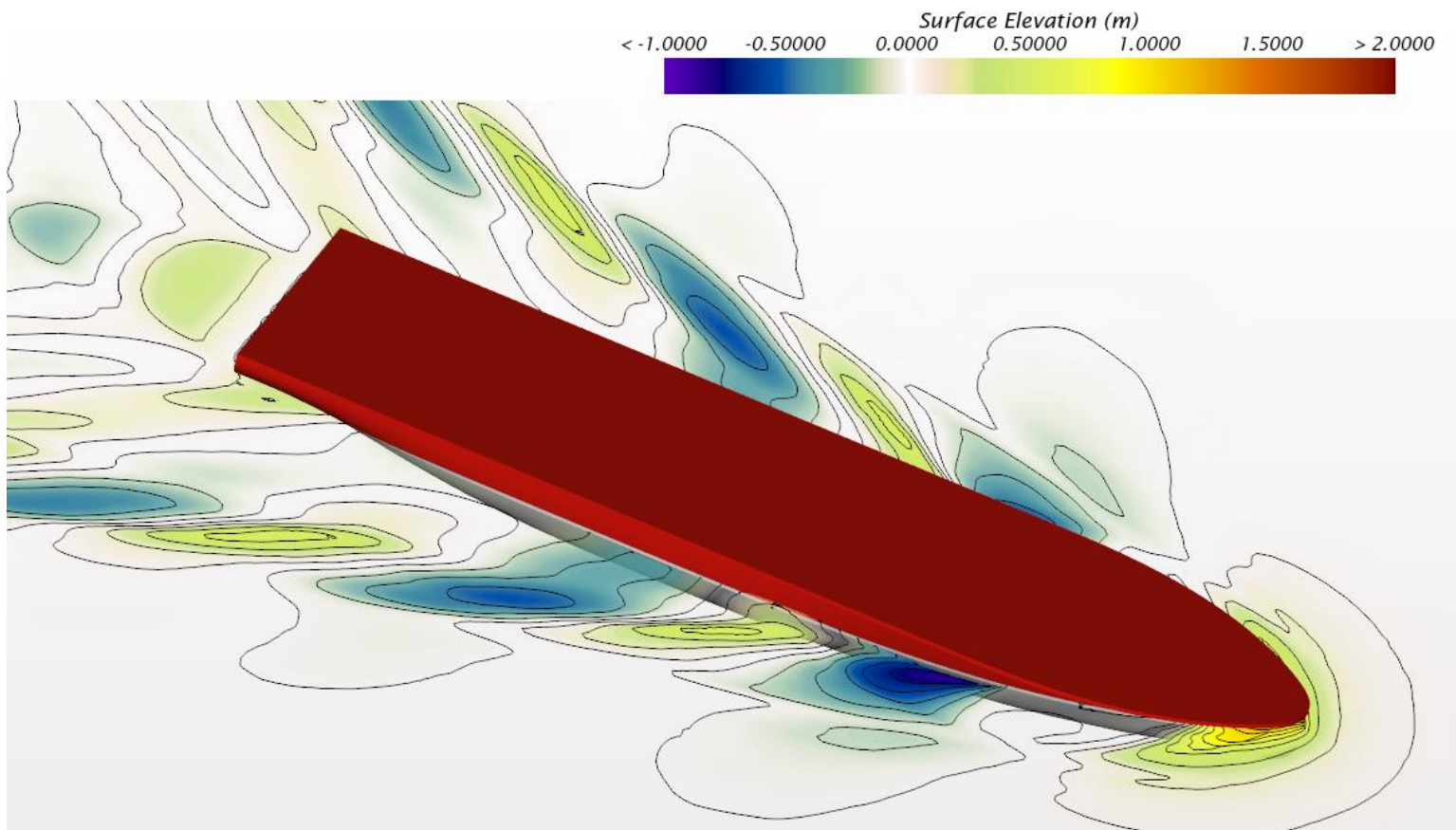
2.2 CFD / Modstandsberregning



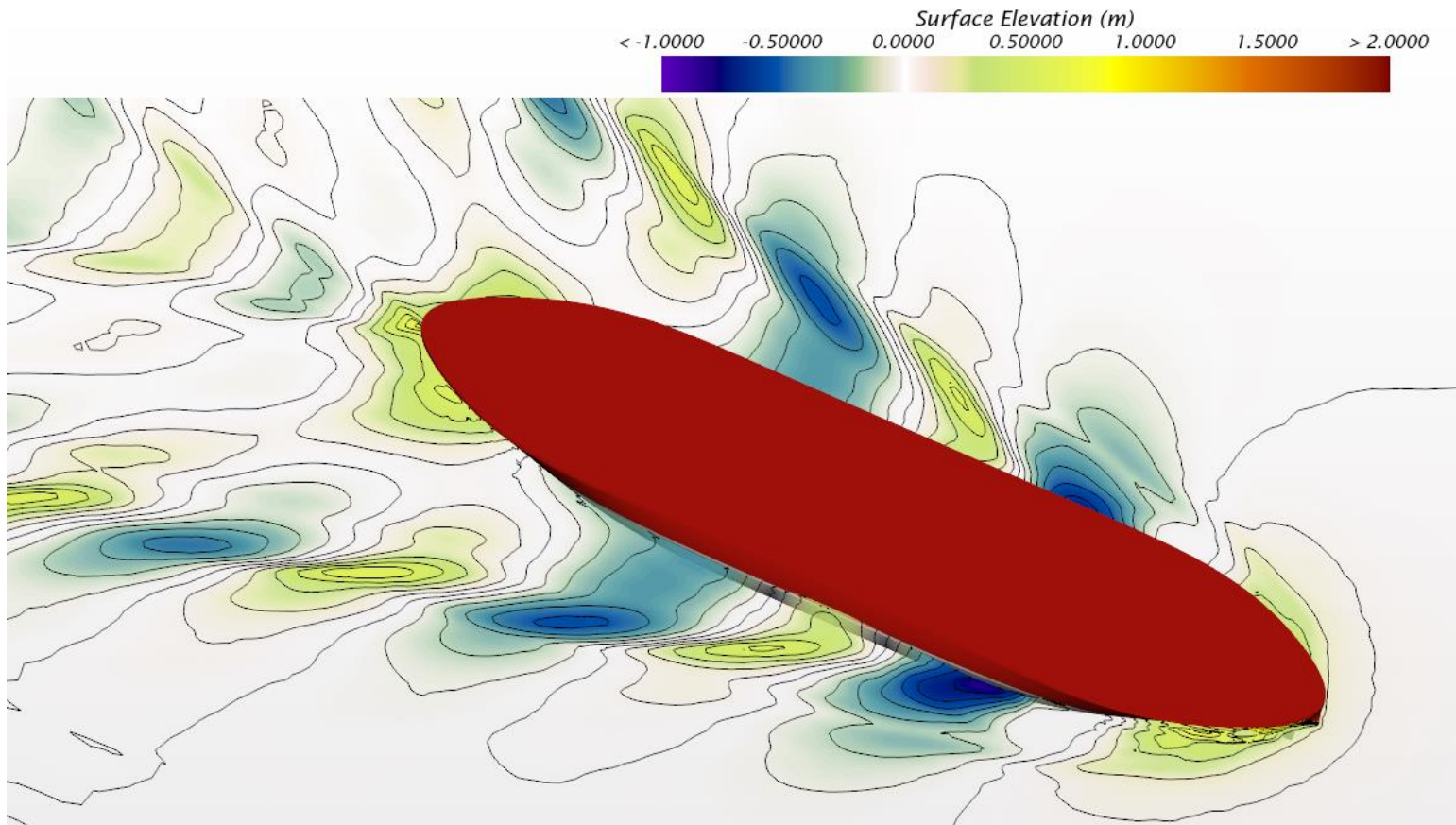
CFD



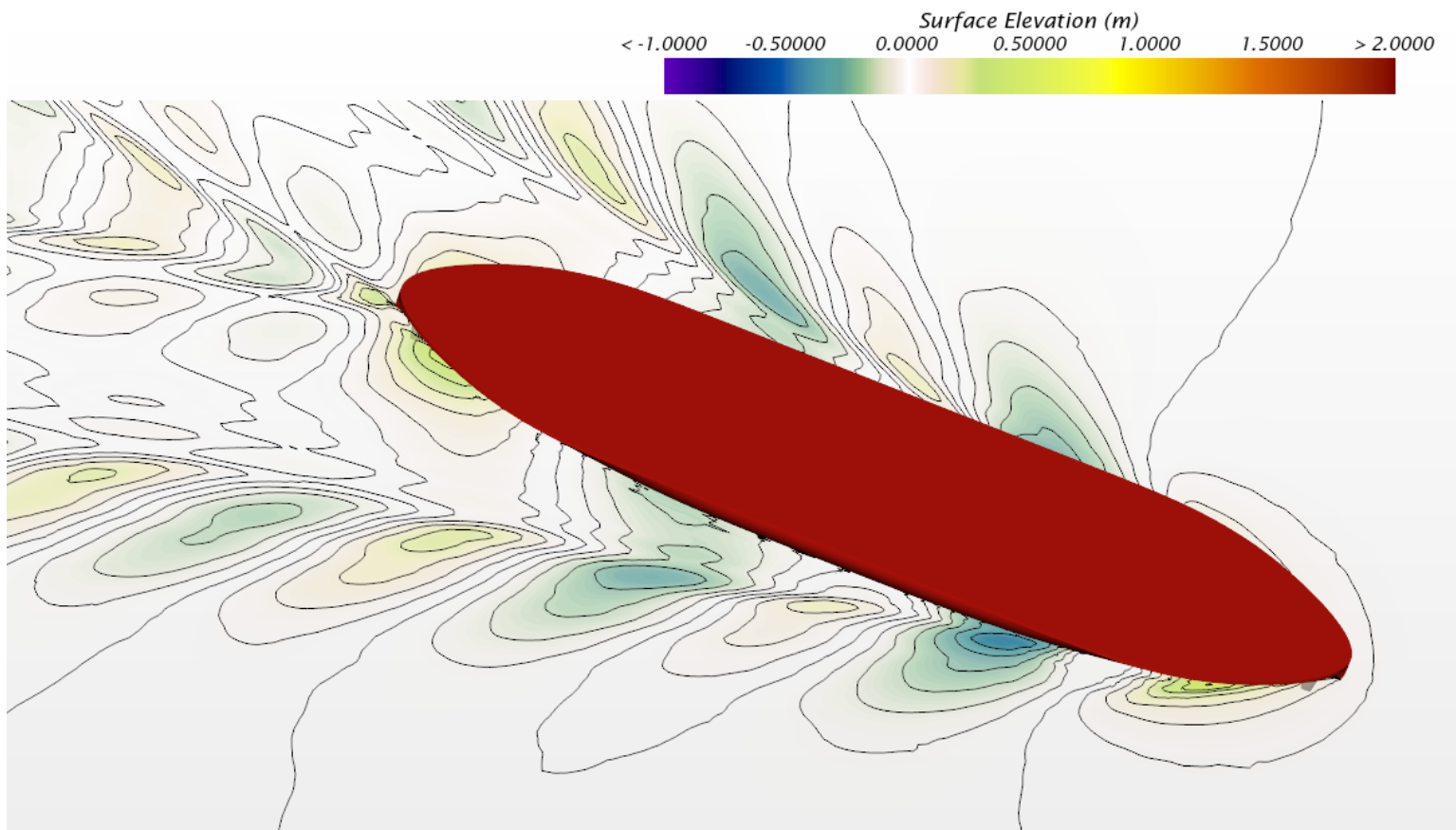
Enkeltender – Stål – 12 knob



Dobbeltender – Stål – 12 knob



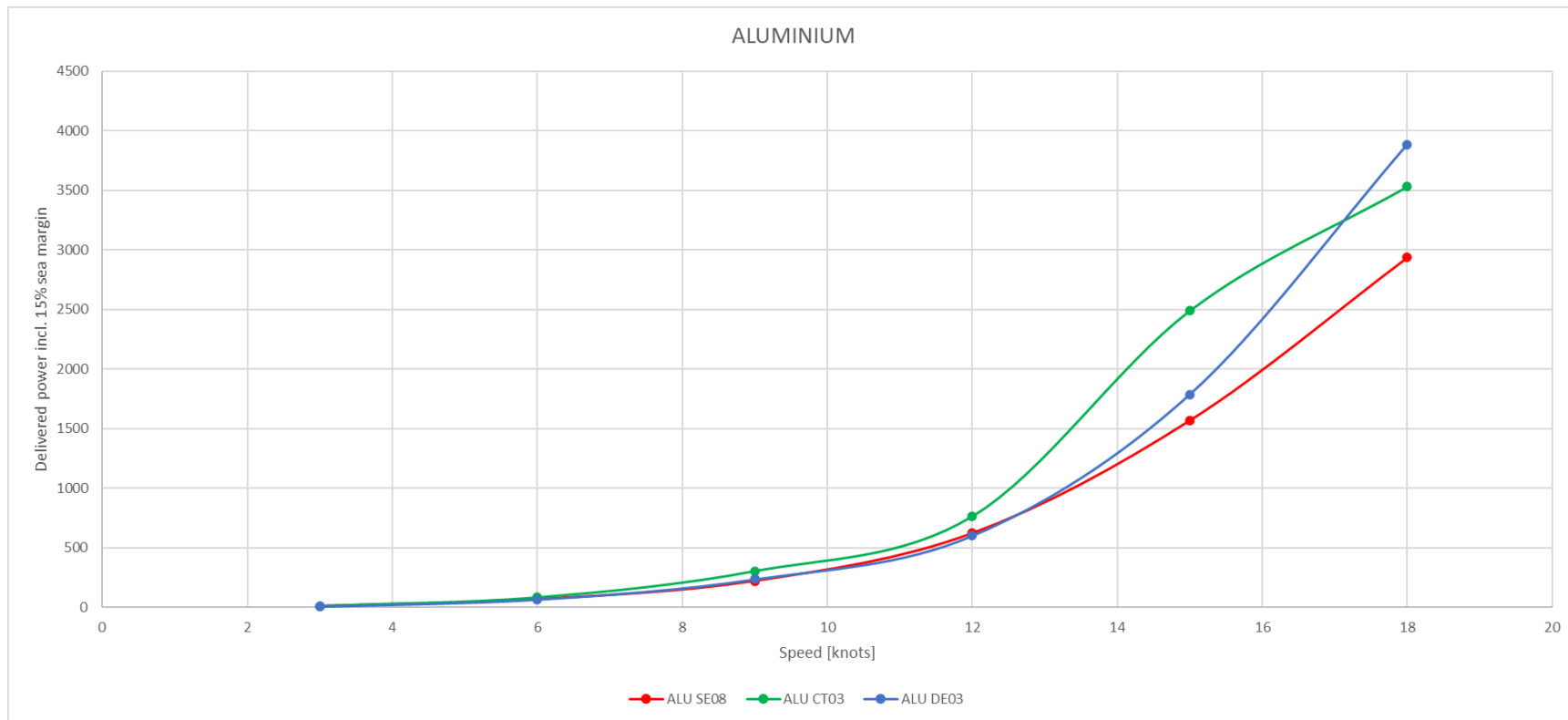
Dobbeltender – Aluminium – 12 knob



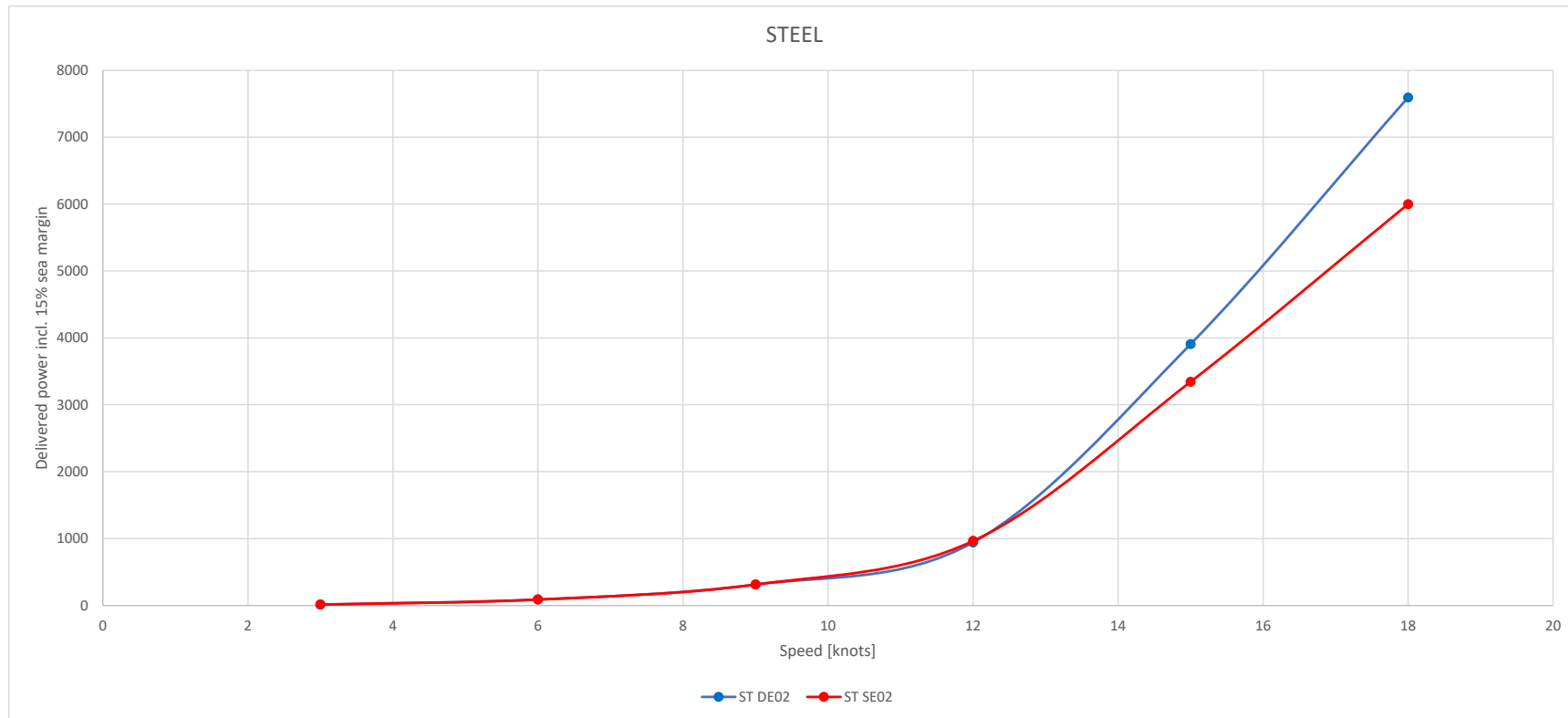
Modstand / Fart-Effekt



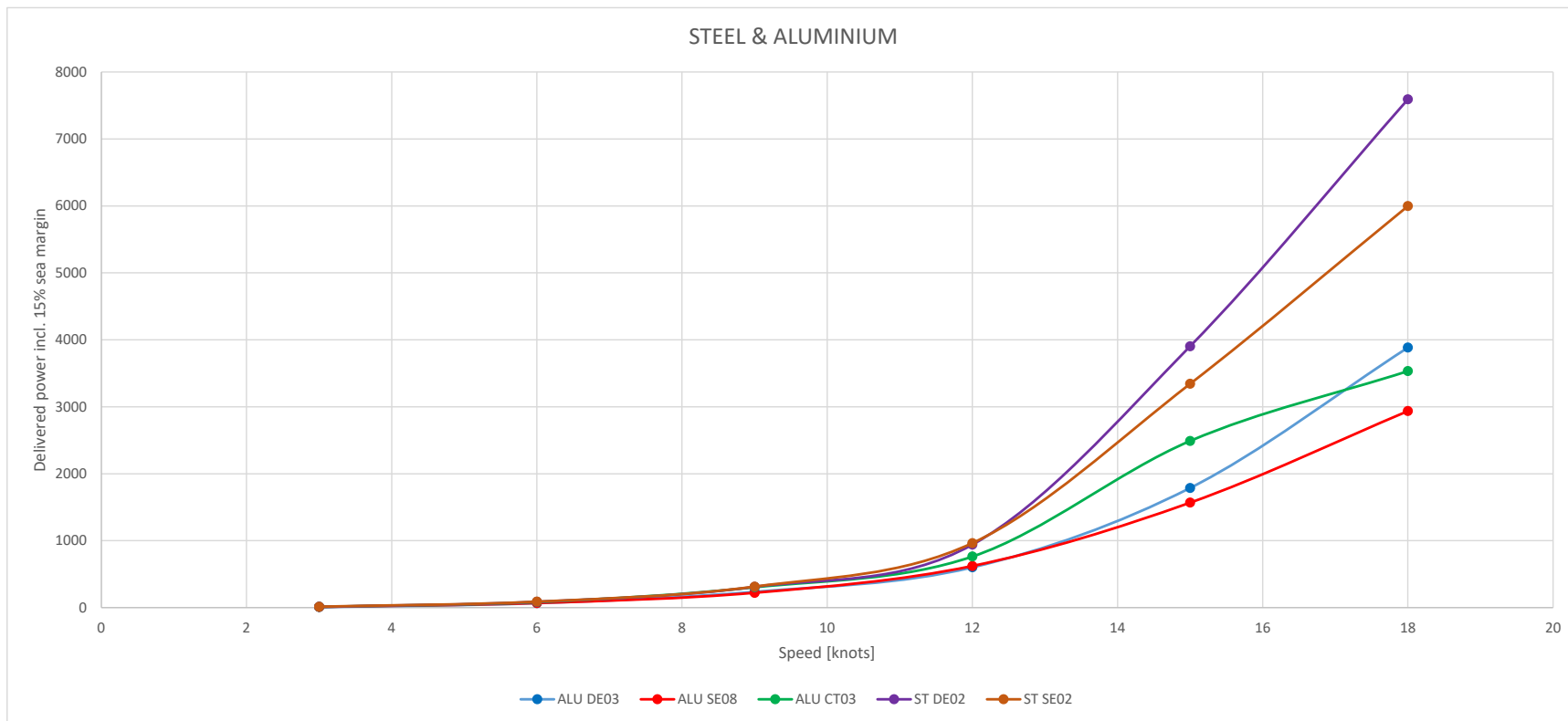
Fart og Effekt - Aluminium



Fart og Effekt - Stål



Fart og Effekt - Samlet



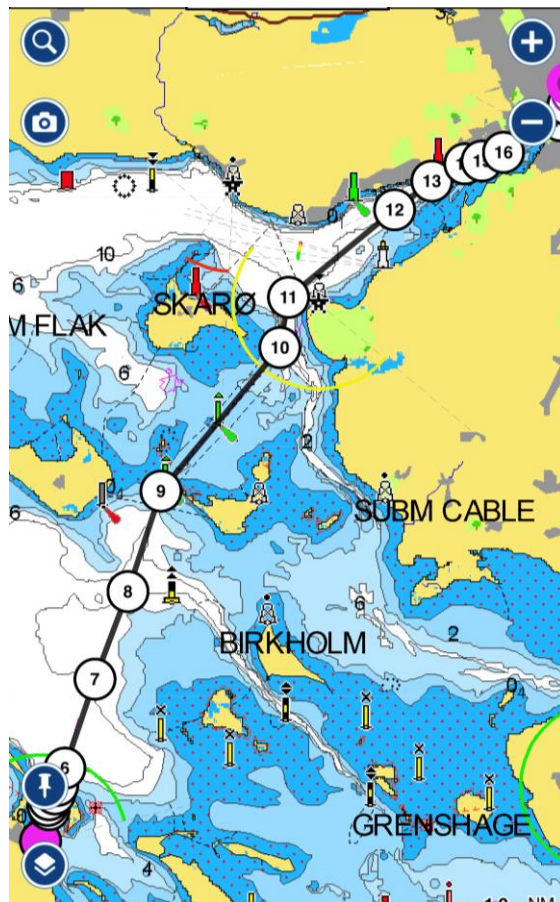
2.3 Ruteanalyse



Rute opmåling



Ruteopmåling



Section	Distance [nm]	Depth [m]
Exit Landing	0.00	4.00
-acc	0.10	4.00
-acc	0.10	4.00
-acc	0.10	4.00
Inderodden	0.10	4.00
-acc	0.08	6.75
-acc	0.08	9.50
-acc	0.08	12.25
Møllegab	0.08	15.00
Dejrø Midtfarvand	1.60	12.00
Egholm flak	1.20	8.00
Mod Højestene	1.20	10.00
Ved Højestene	0.05	10.00
-acc	0.05	8.75
-acc	0.05	7.50
-acc	0.05	6.25
Højestene løbet	2.50	5.00
-acc	0.05	6.25
-acc	0.05	7.50
-acc	0.05	8.75
Fra Højestene	0.05	10.00
Til Holmtunge	3.40	10.00
Pladerne	0.45	8.00
-acc	0.45	7.25
-acc	0.45	6.50
-acc	0.45	5.75
Svendborg	0.05	5.00
-acc	0.05	5.00
-acc	0.05	5.00
-acc	0.05	5.00
Enter Landing	0.00	5.00
Total	13.00	



Energi-beregninger



Energiberegning – Enkeltender – Stål – 75 min

Shallow water calculation on crossing: Ærøskøbing - Svendborg (SE - STEEL)

Section	Distance [nm]	Depth [m]	Speed [kn]	Time [min]	Time _{accum} [min]	Speed _{deep} [kn]	Propulsion [kW]	Hotel [kW]	Energy _{prop} [kWh]	Energy _{Hotel} [kWh]	ΔE _{kin} [kWh]	P _{kin,mean} [kW]	P _{total} [kW]	Energy _{Total} [kWh]
Exit Landing	0.00	4.00	0.00	0.50	0.50	0.00	0	250	0.0	2.1	0.0	0	250	2.1
-acc	0.10	4.00	2.48	2.42	2.92	3.09	15	250	0.6	10.1	0.8	21	285	11.5
-acc	0.10	4.00	4.96	1.21	4.13	6.19	100	250	2.1	5.0	2.5	124	474	9.6
-acc	0.10	4.00	7.21	0.83	4.96	9.28	335	250	4.8	3.5	3.7	268	854	12.0
Inderodden	0.10	4.00	8.58	0.70	5.66	12.38	1180	250	14.3	2.9	2.9	253	1683	20.2
-acc	0.08	6.75	11.02	0.41	6.07	12.38	1180	250	8.4	1.7	0.0	0	1430	10.1
-acc	0.08	9.50	12.21	0.37	6.44	12.38	1180	250	7.5	1.5	0.0	0	1430	9.1
-acc	0.08	12.25	12.28	0.37	6.80	12.38	1180	250	7.5	1.5	0.0	0	1430	9.0
Møllegab	0.08	15.00	12.32	0.37	7.17	12.38	1180	250	7.5	1.5	0.0	0	1430	9.0
Dejrø Midtfarvand	1.60	12.00	12.28	7.82	14.99	12.38	1180	250	160.2	32.6	0.0	0	1430	192.7
Egholm flak	1.20	8.00	11.47	6.28	21.26	12.38	1180	250	128.5	26.2	0.0	0	1430	154.7
Mod Højestene	1.20	10.00	12.23	5.89	27.15	12.38	1180	250	120.6	24.5	0.0	0	1430	145.1
Ved Højestene	0.05	10.00	12.23	0.25	27.40	12.38	1180	250	5.0	1.0	0.0	0	1430	6.0
-acc	0.05	8.75	12.00	0.25	27.65	12.19	1069	250	4.6	1.0	0.0	0	1319	5.7
-acc	0.05	7.50	11.04	0.27	27.92	12.01	968	250	4.6	1.1	0.0	0	1218	5.7
-acc	0.05	6.25	10.38	0.29	28.21	11.82	878	250	4.4	1.2	0.0	0	1128	5.6
Højestene løbet	2.50	5.00	9.42	15.92	44.13	11.64	797	250	220.3	66.4	0.0	0	1047	286.7
-acc	0.05	6.25	10.38	0.29	44.42	11.81	873	250	4.4	1.2	2.6	535	1658	8.2
-acc	0.05	7.50	11.02	0.27	44.70	11.99	957	250	4.5	1.1	1.9	413	1620	7.5
-acc	0.05	8.75	11.97	0.25	44.95	12.16	1051	250	4.6	1.0	3.0	709	2009	8.6
Fra Højestene	0.05	10.00	12.18	0.25	45.19	12.33	1153	250	4.9	1.0	0.7	173	1575	6.7
Til Holmtunge	3.40	10.00	12.18	16.74	61.94	12.33	1153	250	335.1	69.8	0.0	0	1403	404.9
Pladerne	0.45	8.00	11.44	2.36	64.30	12.33	1153	250	47.2	9.8	0.0	0	1403	57.1
-acc	0.45	7.25	11.20	2.41	66.71	12.33	1151	250	48.2	10.0	0.0	0	1401	58.2
-acc	0.45	6.50	10.85	2.49	69.20	12.33	1150	250	49.7	10.4	0.0	0	1400	60.0
-acc	0.45	5.75	10.39	2.60	71.80	12.33	1148	250	51.8	10.8	0.0	0	1398	62.7
Svendborg	0.05	5.00	9.75	0.31	72.10	12.32	1147	250	6.1	1.3	0.0	0	1397	7.4
-acc	0.05	5.00	8.53	0.35	72.45	9.24	332	250	2.0	1.5	0.0	0	582	3.5
-acc	0.05	5.00	5.91	0.51	72.96	6.16	98	250	0.9	2.1	0.0	0	348	3.0
-acc	0.05	5.00	2.89	1.04	74.00	3.08	14	250	0.3	4.3	0.0	0	264	4.6
Enter Landing	0.00	5.00	0.00	1.00	75.00	0.00	0	250	0.0	4.2	0.0	0	250	4.2
Total	13.00				75.00									1591.4



Energiberegning – Enkeltender – Stål – 75 min

Shallow water calculation on crossing: Svendborg - Ærøskøbing (SE - STEEL)

Section	Distance [nm]	Depth [m]	Speed [kn]	Time [min]	Time _{accum} [min]	Speed _{deep} [kn]	Propulsion [kW]	Hotel [kW]	Energy _{prop} [kWh]	Energy _{Hotel} [kWh]	ΔE_{kin} [kWh]	P _{kin,mean} [kW]	P _{total} [kW]	Energy _{Total} [kWh]
Exit Landing+180	0.00	5.00	0.00	2.00	2.00	0.00	314	250	10.9	8.3	0.0	0	564	19.2
-acc	0.05	5.00	3.01	1.00	3.00	3.21	15	250	0.3	4.2	1.2	74	339	5.7
-acc	0.05	5.00	6.15	0.49	3.49	6.41	114	250	1.0	2.0	3.9	482	845	6.9
-acc	0.05	5.00	8.16	0.37	3.85	9.62	363	250	2.3	1.5	3.9	637	1250	7.8
Svendborg	0.05	5.00	9.97	0.30	4.15	12.83	1487	250	7.8	1.3	4.5	889	2626	13.5
-acc	0.05	5.75	10.65	0.28	4.44	12.83	1487	250	7.3	1.2	0.0	0	1737	8.4
-acc	0.05	6.50	11.16	0.27	4.70	12.83	1487	250	6.9	1.1	0.0	0	1737	8.1
-acc	0.05	7.25	11.54	0.26	4.96	12.83	1487	250	6.7	1.1	0.0	0	1737	7.8
Til Pladerne	0.05	8.00	11.81	0.25	5.22	12.83	1487	250	6.6	1.1	0.0	0	1737	7.6
Pladerne	1.60	8.00	11.81	8.13	13.34	12.83	1487	250	209.7	33.9	0.0	0	1737	243.6
Mod Højestene	3.40	10.00	12.66	16.11	29.45	12.83	1487	250	415.8	67.1	0.0	0	1737	482.9
Ved Højestene	0.05	10.00	12.66	0.24	29.69	12.83	1487	250	6.1	1.0	0.0	0	1737	7.1
-acc	0.05	8.75	12.38	0.24	29.93	12.58	1314	250	5.5	1.0	0.0	0	1564	6.5
-acc	0.05	7.50	11.29	0.27	30.20	12.34	1156	250	5.3	1.1	0.0	0	1406	6.4
-acc	0.05	6.25	10.56	0.28	30.48	12.09	1013	250	5.0	1.2	0.0	0	1263	6.2
Højestene løbet	2.50	5.00	9.53	15.75	46.23	11.85	889	250	242.9	65.6	0.0	0	1139	308.5
-acc	0.05	6.25	10.61	0.28	46.51	12.17	1056	250	5.2	1.2	3.0	630	1936	9.3
-acc	0.05	7.50	11.40	0.26	46.78	12.49	1254	250	5.7	1.1	2.4	540	2044	9.2
-acc	0.05	8.75	12.02	0.25	47.03	12.82	1477	250	6.4	1.0	2.0	476	2204	9.4
Fra Højestene	0.05	10.00	12.96	0.23	47.26	13.14	1722	250	6.9	1.0	3.2	820	2792	11.1
Mod Egholm flak	1.20	10.00	12.96	5.56	52.82	13.14	1722	250	166.2	23.2	0.0	0	1972	189.3
Egholm flak	1.20	8.00	12.04	5.98	58.80	13.14	1722	250	178.8	24.9	0.0	0	1972	203.7
Dejrø Midtfarvand	1.60	12.00	13.02	7.38	66.17	13.14	1722	250	220.5	30.7	0.0	0	1972	251.2
Møllegab	0.08	15.00	13.07	0.34	66.52	13.14	1722	250	10.3	1.4	0.0	0	1972	11.7
-acc	0.08	12.25	13.02	0.35	66.86	13.14	1720	250	10.3	1.4	0.0	0	1970	11.8
-acc	0.08	9.50	12.93	0.35	67.21	13.14	1718	250	10.4	1.5	0.0	0	1968	11.8
-acc	0.08	6.75	11.50	0.39	67.60	13.13	1716	250	11.7	1.6	0.0	0	1966	13.3
Inderodden	0.10	4.00	8.79	0.68	68.28	13.13	1714	250	20.3	2.8	0.0	0	1964	23.2
-acc	0.10	4.00	7.53	0.80	69.08	9.85	385	250	5.3	3.3	0.0	0	635	8.6
-acc	0.10	4.00	5.26	1.14	70.22	6.57	124	250	2.4	4.8	0.0	0	374	7.2
-acc	0.10	4.00	2.63	2.28	72.50	3.28	16	250	0.6	9.5	0.0	0	266	10.1
Enter Landing+180	0.00	4.00	0.00	2.50	75.00	0.00	314	250	13.6	10.4	0.0	0	564	24.0
Total	13.00			75.00										1951.3



Energiberegning – Dobbeltender – Stål – 75 min

Shallow water calculation on crossing: Ærøskøbing - Svendborg (DE - STEEL)

Section	Distance [nm]	Depth [m]	Speed [kn]	Time [min]	Time _{accum} [min]	Speed _{deep} [kn]	Propulsion [kW]	Hotel [kW]	Energy _{prop} [kWh]	Energy _{Hotel} [kWh]	ΔE _{kin} [kWh]	P _{kin,mean} [kW]	P _{total} [kW]	Energy _{Total} [kWh]
Exit Landing	0.00	4.00	0.00	0.50	0.50	0.00	0	250	0.0	2.1	0.0	0	250	2.1
-acc	0.10	4.00	2.42	2.48	2.98	3.01	12	250	0.5	10.3	0.8	19	281	11.6
-acc	0.10	4.00	4.84	1.24	4.22	6.03	89	250	1.9	5.2	2.3	113	452	9.4
-acc	0.10	4.00	7.07	0.85	5.07	9.04	313	250	4.6	3.5	3.5	250	814	11.7
Inderodden	0.10	4.00	8.49	0.71	5.77	12.05	971	250	11.9	2.9	3.0	251	1473	17.8
-acc	0.08	6.75	10.80	0.42	6.19	12.05	971	250	7.0	1.7	0.0	0	1221	8.8
-acc	0.08	9.50	11.92	0.38	6.57	12.05	971	250	6.4	1.6	0.0	0	1221	7.9
-acc	0.08	12.25	11.98	0.38	6.94	12.05	971	250	6.3	1.6	0.0	0	1221	7.9
Møllegab	0.08	15.00	12.01	0.37	7.32	12.05	971	250	6.3	1.6	0.0	0	1221	7.9
Dejrø Midtfarvand	1.60	12.00	11.97	8.02	15.34	12.05	971	250	135.2	33.4	0.0	0	1221	168.7
Egholm flak	1.20	8.00	11.87	6.07	21.41	12.05	971	250	102.3	25.3	0.0	0	1221	127.6
Mod Højestene	1.20	10.00	11.93	6.03	27.44	12.05	971	250	101.8	25.1	0.0	0	1221	126.9
Ved Højestene	0.05	10.00	11.93	0.25	27.69	12.05	971	250	4.2	1.0	0.0	0	1221	5.3
-acc	0.05	8.75	11.79	0.25	27.94	11.95	909	250	4.0	1.1	0.0	0	1159	5.1
-acc	0.05	7.50	10.91	0.27	28.22	11.84	852	250	4.1	1.1	0.0	0	1102	5.2
-acc	0.05	6.25	10.34	0.29	28.51	11.74	798	250	4.0	1.2	0.0	0	1048	5.2
Højestene løbet	2.50	5.00	9.43	15.91	44.42	11.63	749	250	206.8	66.3	0.0	0	999	273.1
-acc	0.05	6.25	10.40	0.29	44.71	11.84	850	250	4.3	1.2	2.6	537	1637	8.0
-acc	0.05	7.50	11.07	0.27	44.98	12.04	967	250	4.5	1.1	1.9	423	1639	7.6
-acc	0.05	8.75	12.09	0.25	45.23	12.25	1100	250	4.7	1.0	3.2	764	2114	8.9
Fra Højestene	0.05	10.00	12.33	0.24	45.47	12.45	1249	250	5.3	1.0	0.8	191	1690	7.1
Til Holmtunge	3.40	10.00	12.33	16.54	62.02	12.45	1249	250	358.9	68.9	0.0	0	1499	427.8
Pladerne	0.45	8.00	11.54	2.34	64.36	12.45	1249	250	50.8	9.8	0.0	0	1499	60.5
-acc	0.45	7.25	11.29	2.39	66.75	12.45	1247	250	51.8	10.0	0.0	0	1497	61.8
-acc	0.45	6.50	10.94	2.47	69.22	12.45	1246	250	53.4	10.3	0.0	0	1496	63.7
-acc	0.45	5.75	10.46	2.58	71.80	12.45	1244	250	55.7	10.8	0.0	0	1494	66.5
Svendborg	0.05	5.00	9.82	0.31	72.10	12.44	1242	250	6.6	1.3	0.0	0	1492	7.9
-acc	0.05	5.00	8.44	0.36	72.46	9.33	326	250	2.0	1.5	0.0	0	576	3.5
-acc	0.05	5.00	6.01	0.50	72.96	6.22	102	250	0.9	2.1	0.0	0	352	3.0
-acc	0.05	5.00	2.88	1.04	74.00	3.11	12	250	0.2	4.3	0.0	0	262	4.6
Enter Landing	0.00	5.00	0.00	1.00	75.00	0.00	0	250	0.0	4.2	0.0	0	250	4.2
Total	13.00				75.00									1537.1



Energiberegning – Dobbeltender – Stål – 75 min

Shallow water calculation on crossing: Svendborg - Ærøskøbing (DE - STEEL)

Section	Distance [nm]	Depth [m]	Speed [kn]	Time [min]	Time _{accum} [min]	Speed _{deep} [kn]	Propulsion [kW]	Hotel [kW]	Energy _{prop} [kWh]	Energy _{Hotel} [kWh]	ΔE_{kin} [kWh]	P _{kin,mean} [kW]	P _{total} [kW]	Energy _{Total} [kWh]
Exit Landing	0.00	5.00	0.00	0.50	0.50	0.00	311	250	2.7	2.1	0.0	0	561	4.8
-acc	0.05	5.00	2.82	1.07	1.57	3.04	12	250	0.2	4.4	1.1	60	322	5.7
-acc	0.05	5.00	5.87	0.51	2.08	6.07	92	250	0.8	2.1	3.5	414	756	6.5
-acc	0.05	5.00	8.33	0.36	2.44	9.11	316	250	2.0	1.5	4.7	777	1344	8.1
Svendborg	0.05	5.00	9.68	0.31	2.75	12.14	1029	250	5.5	1.3	3.2	627	1906	10.1
-acc	0.05	5.75	10.34	0.29	3.04	12.22	1081	250	5.4	1.2	1.8	362	1693	8.4
-acc	0.05	6.50	10.84	0.28	3.31	12.30	1135	250	5.5	1.2	1.4	310	1695	8.0
-acc	0.05	7.25	11.23	0.27	3.58	12.38	1191	250	5.5	1.1	1.2	259	1700	7.8
Til Pladerne	0.05	8.00	11.54	0.26	3.84	12.45	1249	250	5.6	1.1	0.9	212	1711	7.6
Pladerne	1.60	8.00	11.54	8.32	12.16	12.45	1249	250	180.5	34.7	0.0	0	1499	215.2
Mod Højestene	3.40	10.00	12.33	16.54	28.71	12.45	1249	250	358.9	68.9	0.0	0	1499	427.8
Ved Højestene	0.05	10.00	12.33	0.24	28.95	12.45	1249	250	5.3	1.0	0.0	0	1499	6.3
-acc	0.05	8.75	12.10	0.25	29.20	12.26	1105	250	4.8	1.0	0.0	0	1355	5.8
-acc	0.05	7.50	11.08	0.27	29.47	12.06	976	250	4.6	1.1	0.0	0	1226	5.7
-acc	0.05	6.25	10.42	0.29	29.76	11.86	862	250	4.3	1.2	0.0	0	1112	5.5
Højestene løbet	2.50	5.00	9.44	15.89	45.64	11.66	762	250	210.3	66.2	0.0	0	1012	276.5
-acc	0.05	6.25	10.35	0.29	45.93	11.76	809	250	4.1	1.2	2.4	496	1556	7.7
-acc	0.05	7.50	10.93	0.27	46.21	11.86	860	250	4.1	1.1	1.6	356	1466	6.9
-acc	0.05	8.75	11.80	0.25	46.46	11.95	914	250	4.0	1.1	2.6	625	1789	7.7
Fra Højestene	0.05	10.00	11.93	0.25	46.71	12.05	971	250	4.2	1.0	0.4	101	1322	5.7
Mod Egholm flak	1.20	10.00	11.93	6.03	52.75	12.05	971	250	101.8	25.1	0.0	0	1221	126.9
Egholm flak	1.20	8.00	11.87	6.07	58.81	12.05	971	250	102.3	25.3	0.0	0	1221	127.6
Dejrø Midtfarvand	1.60	12.00	11.97	8.02	66.83	12.05	971	250	135.2	33.4	0.0	0	1221	168.7
Møllegab	0.08	15.00	12.01	0.37	67.21	12.05	971	250	6.3	1.6	0.0	0	1221	7.9
-acc	0.08	12.25	11.79	0.38	67.59	11.86	864	250	5.7	1.6	0.0	0	1114	7.3
-acc	0.08	9.50	11.54	0.39	67.98	11.68	770	250	5.2	1.6	0.0	0	1020	6.8
-acc	0.08	6.75	10.40	0.43	68.41	11.49	689	250	5.2	1.8	0.0	0	939	7.0
Inderodden	0.10	4.00	8.23	0.73	69.14	11.31	619	250	7.8	3.0	0.0	0	869	10.9
-acc	0.10	4.00	6.70	0.90	70.04	8.48	280	250	4.4	3.7	0.0	0	530	8.1
-acc	0.10	4.00	4.54	1.32	71.36	5.65	68	250	1.6	5.5	0.0	0	318	7.1
-acc	0.10	4.00	2.27	2.64	74.00	2.83	11	250	0.5	11.0	0.0	0	261	11.5
Enter Landing	0.00	4.00	0.00	1.00	75.00	0.00	311	250	5.4	4.2	0.0	0	561	9.6
Total	13.00				75.00									1537.1



Energiberegning – Dobbeltender – Aluminium – 75 min

Shallow water calculation on crossing: Ærøskøbing - Svendborg (DE - ALU)

Section	Distance [nm]	Depth [m]	Speed [kn]	Time [min]	Time _{accum} [min]	Speed _{deep} [kn]	Propulsion [kW]	Hotel [kW]	Energy _{prop} [kWh]	Energy _{Hotel} [kWh]	ΔE_{kin} [kWh]	P _{kin,mean} [kW]	P _{total} [kW]	Energy _{Total} [kWh]
Exit Landing	0.00	4.00	0.00	0.50	0.50	0.00	0	250	0.0	2.1	0.0	0	250	2.1
-acc	0.10	4.00	2.55	2.35	2.85	3.01	9	250	0.4	9.8	0.5	13	273	10.7
-acc	0.10	4.00	5.10	1.18	4.03	6.01	68	250	1.4	4.9	1.6	81	399	7.9
-acc	0.10	4.00	7.45	0.80	4.83	9.02	238	250	3.3	3.4	2.4	179	667	9.1
Inderodden	0.10	4.00	8.96	0.67	5.50	12.03	609	250	7.1	2.8	2.0	180	1039	11.9
-acc	0.08	6.75	11.02	0.41	5.91	12.03	609	250	4.3	1.7	0.0	0	859	6.0
-acc	0.08	9.50	11.83	0.38	6.29	12.03	609	250	4.0	1.6	0.0	0	859	5.6
-acc	0.08	12.25	11.91	0.38	6.67	12.03	609	250	4.0	1.6	0.0	0	859	5.6
Møllegab	0.08	15.00	11.96	0.38	7.05	12.03	609	250	4.0	1.6	0.0	0	859	5.5
Dejrø Midtfarvand	1.60	12.00	11.91	8.06	15.11	12.03	609	250	85.3	33.6	0.0	0	859	118.9
Egholm flak	1.20	8.00	11.75	6.13	21.23	12.03	609	250	64.8	25.5	0.0	0	859	90.3
Mod Højestene	1.20	10.00	11.85	6.08	27.31	12.03	609	250	64.3	25.3	0.0	0	859	89.6
Ved Højestene	0.05	10.00	11.85	0.25	27.56	12.03	609	250	2.7	1.1	0.0	0	859	3.7
-acc	0.05	8.75	11.67	0.26	27.82	11.90	581	250	2.6	1.1	0.0	0	831	3.7
-acc	0.05	7.50	11.07	0.27	28.09	11.78	554	250	2.6	1.1	0.0	0	804	3.7
-acc	0.05	6.25	10.56	0.28	28.38	11.65	529	250	2.6	1.2	0.0	0	779	3.8
Højestene løbet	2.50	5.00	9.75	15.39	43.76	11.53	505	250	134.8	64.1	0.0	0	755	199.0
-acc	0.05	6.25	10.56	0.28	44.05	11.66	530	250	2.6	1.2	1.3	283	1064	5.1
-acc	0.05	7.50	11.08	0.27	44.32	11.80	557	250	2.6	1.1	0.9	202	1010	4.7
-acc	0.05	8.75	11.70	0.26	44.58	11.93	587	250	2.6	1.1	1.1	265	1101	4.8
Fra Højestene	0.05	10.00	11.88	0.25	44.83	12.06	618	250	2.7	1.1	0.4	85	953	4.1
Til Holmtunge	3.40	10.00	11.88	17.17	61.99	12.06	618	250	184.0	71.5	0.0	0	868	255.6
Pladerne	0.45	8.00	11.42	2.36	64.36	12.06	618	250	25.4	9.9	0.0	0	868	35.2
-acc	0.45	7.25	11.22	2.41	66.77	12.06	617	250	25.8	10.0	0.0	0	867	35.8
-acc	0.45	6.50	10.94	2.47	69.23	12.06	616	250	26.4	10.3	0.0	0	866	36.7
-acc	0.45	5.75	10.57	2.55	71.79	12.06	616	250	27.3	10.6	0.0	0	866	37.9
Svendborg	0.05	5.00	10.03	0.30	72.09	12.05	615	250	3.2	1.2	0.0	0	865	4.4
-acc	0.05	5.00	8.52	0.35	72.44	9.04	240	250	1.5	1.5	0.0	0	490	2.9
-acc	0.05	5.00	5.80	0.52	72.96	6.03	69	250	0.6	2.2	0.0	0	319	2.8
-acc	0.05	5.00	2.87	1.04	74.00	3.01	9	250	0.2	4.4	0.0	0	259	4.5
Enter Landing	0.00	5.00	0.00	1.00	75.00	0.00	0	250	0.0	4.2	0.0	0	250	4.2
Total	13.00				75.00									1015.8



Energiberegning – Dobbeltender – Aluminium – 75 min

Shallow water calculation on crossing: Svendborg - Ærøskøbing (DE - ALU)

Section	Distance [nm]	Depth [m]	Speed [kn]	Time [min]	Time _{accum} [min]	Speed _{deep} [kn]	Propulsion [kW]	Hotel [kW]	Energy _{prop} [kWh]	Energy _{Hotel} [kWh]	ΔE_{kin} [kWh]	P _{kin,mean} [kW]	P _{total} [kW]	Energy _{Total} [kWh]
Exit Landing	0.00	5.00	0.00	0.50	0.50	0.00	237	250	2.1	2.1	0.0	0	487	4.1
-acc	0.05	5.00	2.78	1.08	1.58	2.92	9	250	0.2	4.5	0.6	35	293	5.3
-acc	0.05	5.00	5.61	0.53	2.11	5.83	61	250	0.6	2.2	1.9	216	528	4.7
-acc	0.05	5.00	8.28	0.36	2.48	8.75	221	250	1.4	1.5	3.0	497	968	5.9
Svendborg	0.05	5.00	9.82	0.31	2.78	11.67	532	250	2.8	1.3	2.3	445	1227	6.4
-acc	0.05	5.75	10.39	0.29	3.07	11.77	552	250	2.8	1.2	0.9	194	995	4.9
-acc	0.05	6.50	10.81	0.28	3.35	11.87	572	250	2.8	1.2	0.7	153	975	4.6
-acc	0.05	7.25	11.14	0.27	3.62	11.97	594	250	2.8	1.1	0.6	134	978	4.5
Til Pladerne	0.05	8.00	11.42	0.26	3.88	12.06	618	250	2.8	1.1	0.5	114	981	4.4
Pladerne	1.60	8.00	11.42	8.41	12.29	12.06	618	250	90.1	35.0	0.0	0	868	125.2
Mod Højestene	3.40	10.00	11.88	17.17	29.45	12.06	618	250	184.0	71.5	0.0	0	868	255.6
Ved Højestene	0.05	10.00	11.88	0.25	29.71	12.06	618	250	2.7	1.1	0.0	0	868	3.8
-acc	0.05	8.75	11.67	0.26	29.96	11.90	580	250	2.6	1.1	0.0	0	830	3.7
-acc	0.05	7.50	11.04	0.27	30.23	11.74	546	250	2.6	1.1	0.0	0	796	3.7
-acc	0.05	6.25	10.50	0.29	30.52	11.57	514	250	2.5	1.2	0.0	0	764	3.7
Højestene løbet	2.50	5.00	9.68	15.49	46.01	11.41	484	250	130.2	64.5	0.0	0	734	194.8
-acc	0.05	6.25	10.50	0.29	46.30	11.57	512	250	2.5	1.2	1.3	279	1041	5.1
-acc	0.05	7.50	11.02	0.27	46.57	11.72	542	250	2.6	1.1	0.9	203	995	4.6
-acc	0.05	8.75	11.64	0.26	46.83	11.87	574	250	2.6	1.1	1.1	264	1089	4.8
Fra Højestene	0.05	10.00	11.85	0.25	47.08	12.03	609	250	2.7	1.1	0.4	94	953	4.1
Mod Egholm flak	1.20	10.00	11.85	6.08	53.16	12.03	609	250	64.3	25.3	0.0	0	859	89.6
Egholm flak	1.20	8.00	11.75	6.13	59.28	12.03	609	250	64.8	25.5	0.0	0	859	90.3
Dejrø Midtfarvand	1.60	12.00	11.91	8.06	67.35	12.03	609	250	85.3	33.6	0.0	0	859	118.9
Møllegab	0.08	15.00	11.96	0.38	67.72	12.03	609	250	4.0	1.6	0.0	0	859	5.5
-acc	0.08	12.25	11.85	0.38	68.10	11.97	595	250	3.9	1.6	0.0	0	845	5.5
-acc	0.08	9.50	11.70	0.38	68.49	11.90	580	250	3.9	1.6	0.0	0	830	5.5
-acc	0.08	6.75	10.88	0.41	68.90	11.84	566	250	4.1	1.7	0.0	0	816	5.8
Inderodden	0.10	4.00	8.87	0.68	69.58	11.77	553	250	6.5	2.8	0.0	0	803	9.3
-acc	0.10	4.00	7.32	0.82	70.39	8.83	226	250	3.2	3.4	0.0	0	476	6.6
-acc	0.10	4.00	4.99	1.20	71.60	5.89	63	250	1.3	5.0	0.0	0	313	6.3
-acc	0.10	4.00	2.50	2.40	74.00	2.94	9	250	0.4	10.0	0.0	0	259	10.4
Enter Landing	0.00	4.00	0.00	1.00	75.00	0.00	237	250	4.1	4.2	0.0	0	487	8.3
Total	13.00				75.00									1015.8



2.3 Valg af model



Vægt-overslag, opsummering af metode

To skrogmodeller er interessante:

- 1) Aluminiums dobbeltender med laveste energiforbrug i forhold til øvrige.
- 2) Stål dobbeltender såfremt aluminiums 'light-craft koncept' ikke kan realiseres

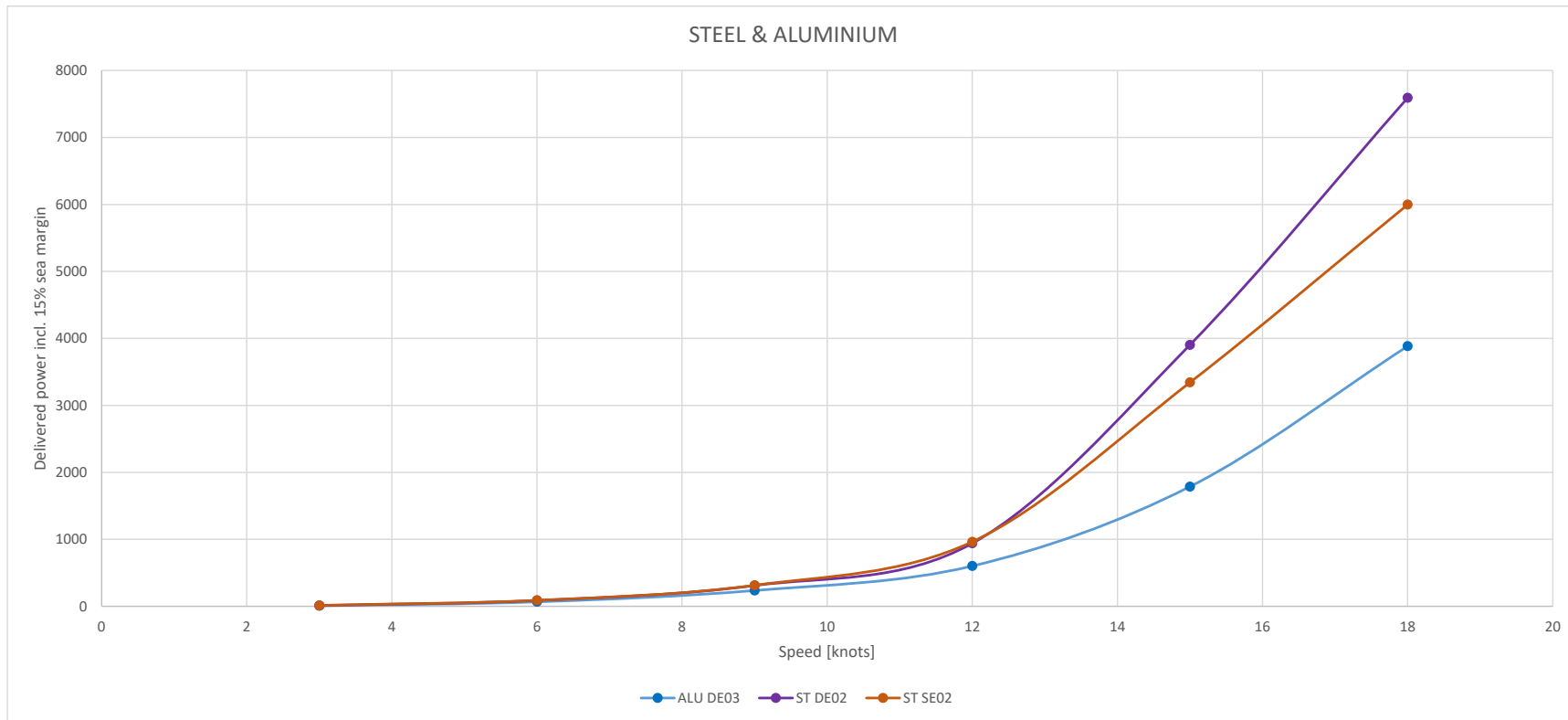
På de efterfølgende slides er en sammenligning mellem stål enkeltender på 70 m som reference og de to dobbeltendere på 70 m, i henholdsvis stål og aluminium.

Alle 3 modeller har **samme dødvægt** i personbils konditionen med 67/65 biler, og i maksimal last konditionen med 8 lastbiler og henholdsvis 36 og 33 biler.

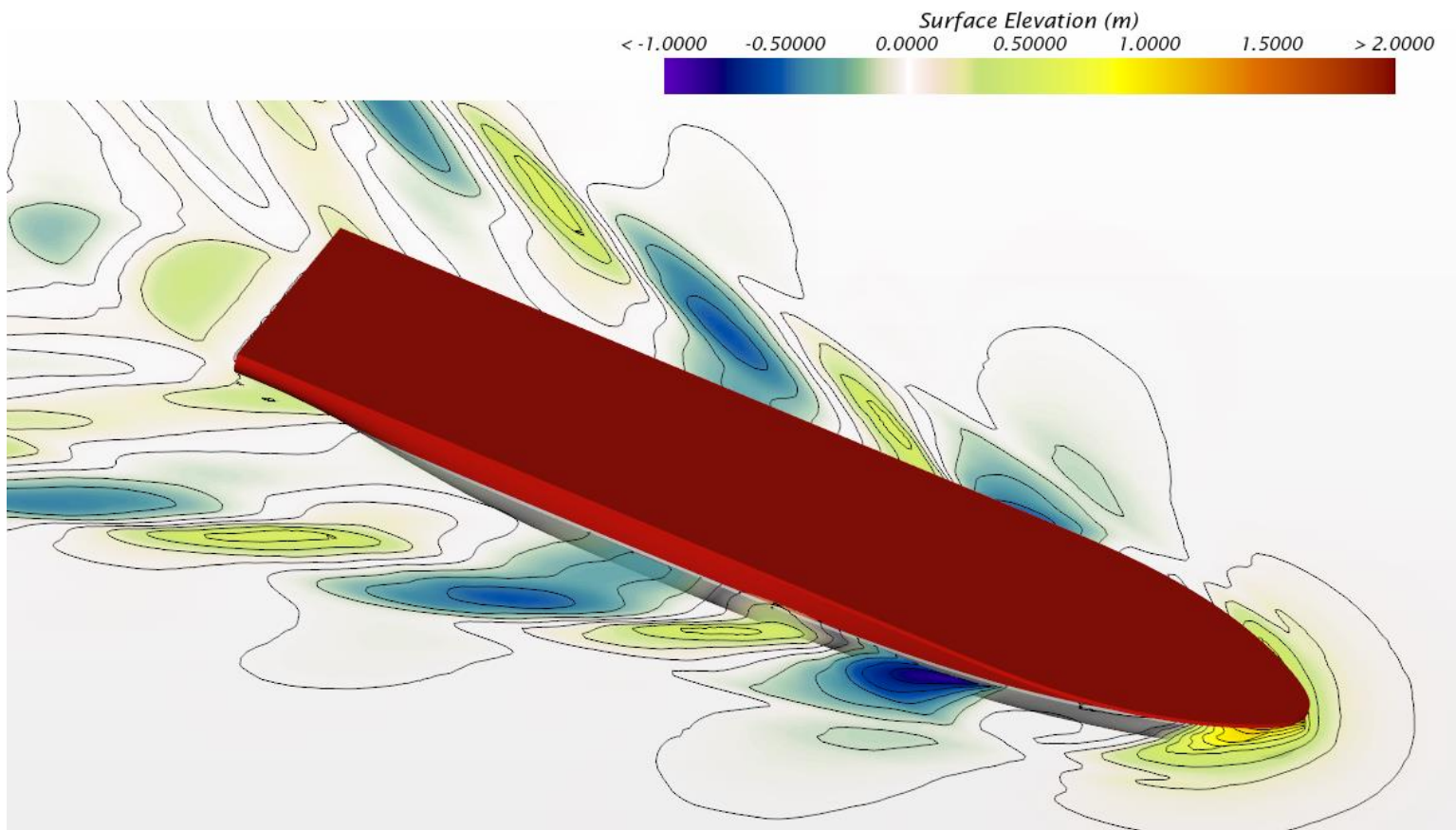
Energiforbrug dobbeltender med 65 personbiler er multipliceret med en faktor 67/65



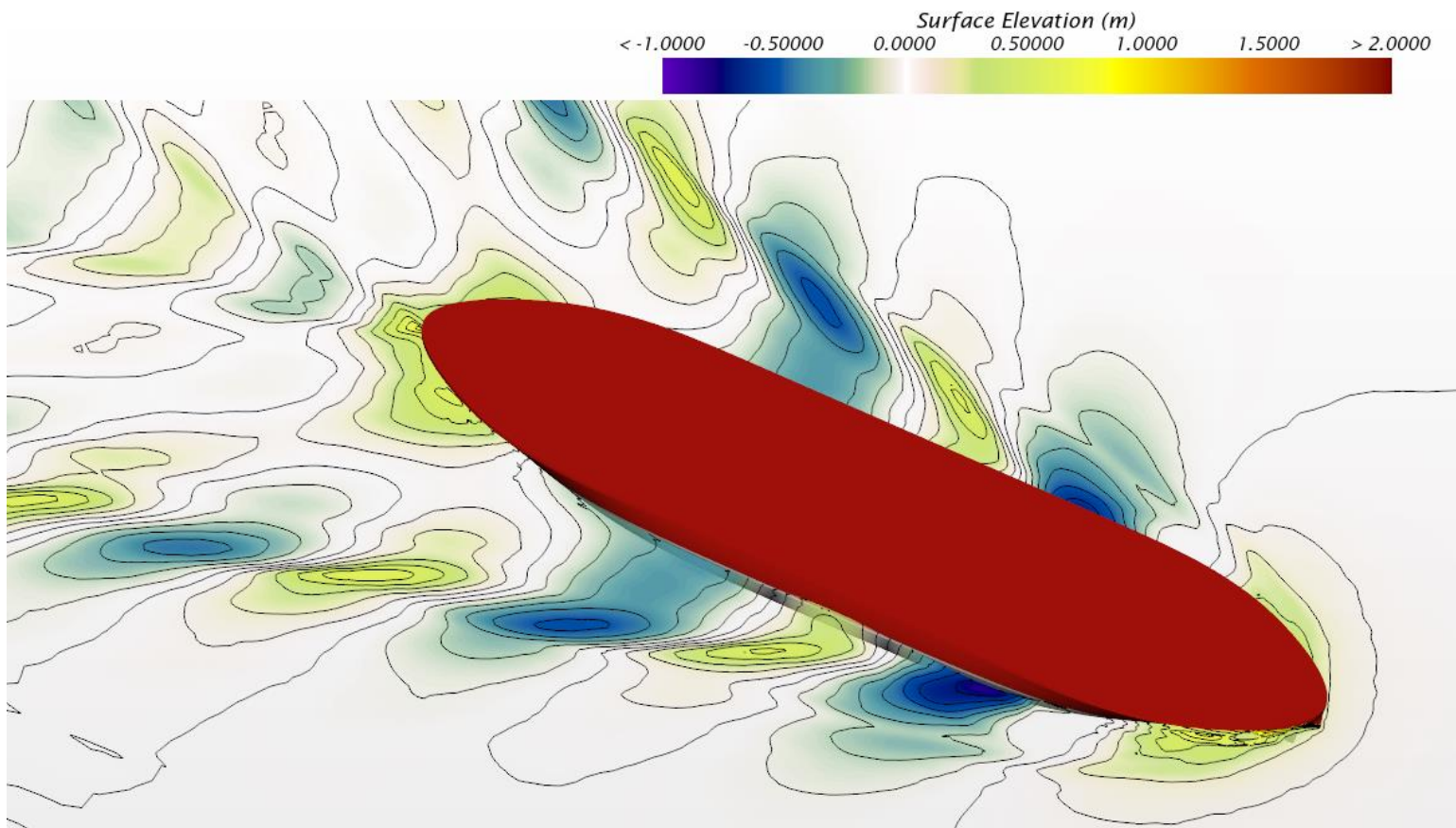
Fart og Effekt



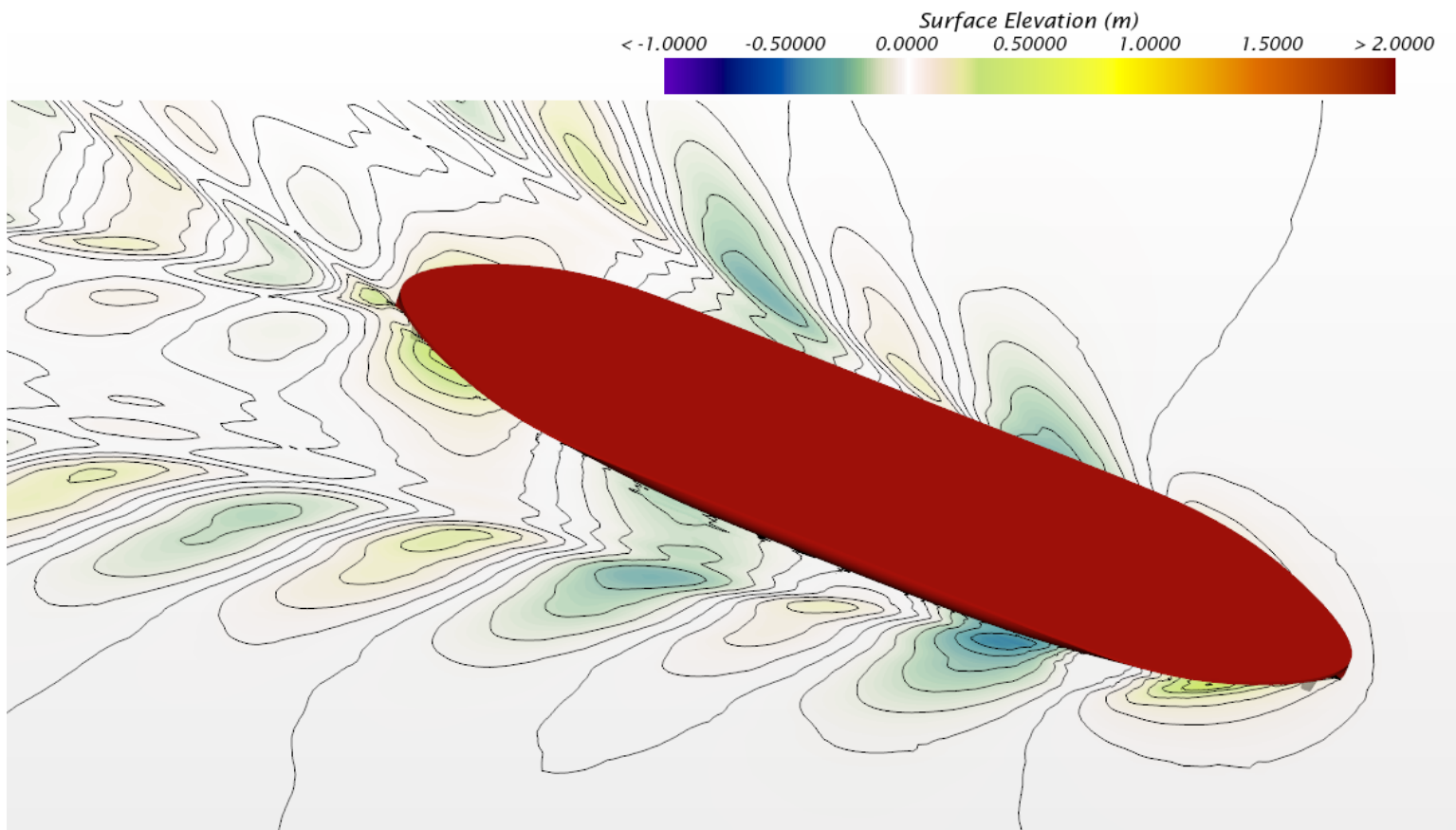
Enkeltender – Stål – 12 knob



Dobbeltender – Stål – 12 knob



Dobbeltender – Aluminium – 12 knob



Ærøskøbing-Svendborg - Energiforbrug kWh - Dobbelttur

Type	Materiale	Dybgang	75 min
Enkeltender	Stål	2,399	3543
Dobbeltender	Stål	2,381	3169
Dobbeltender	Aluminium	2,347	2094

Ærøskøbing-Svendborg - Enkeltender - Stål 75 minutter - Index 100

Type	Materiale	Dybgang	75 min
Enkeltender	Stål	2,399	100
Dobbeltender	Stål	2,381	89
Dobbeltender	Aluminium	2,347	59