



Topic of report

The modern design of the sea-river vessel for Russian Inland water ways



Introduction

The main aims of our presentation are:

- To compare two latest modern design ships RSD49 vs RSD59
- Both vessels are being utilized by the same cargo and the same routes
 1. RSD49 based on classic “Armada” tanker curve of hull
 2. RSD59 based on RST27 tanker curve of hull
- Both designs are so called Volga-Don Max class ship. In spite of having seemed equivalency of the vessels the RSD59 rather outranged the “sister” in respect of her commercial characteristics

RSD49 project

RSD49 dry-cargo vessel
“Pola Sevastiana”.
12 vessels were built in
2012-2017. 2 are in order

Operators:

United Volga (Former NWSC) –	7
ANRUS	2+2
KMTF	2
Pola	1





Delivered on to the market 14 units within 2018-2019

In construction 11 units with delivery within 2020

It's signed a LOI for another 20 units

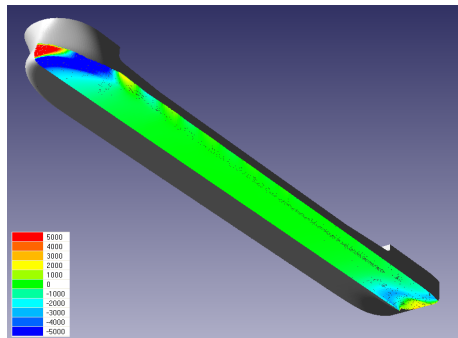


Why do the Volgo-Don Max class ?

- ❑ 62% of total number new self-propelled cargo vessels river- and sea-river going sized at Volgo-Don Channel restriction
- ❑ These vessel are pretend to replace former Soviet Union series such as Volgo-Neft and Volgo-Don. Its are universal
- ❑ Maximum DWCC 4700-5500 tons on 3.6 m FW in river conditions and maximum about DWCC 7000-8000 on maximum real draft in the sea 4,7 m SSW
- ❑ Volgo-Don channel restrictions are cross combined with restrictions of all FSU water ways

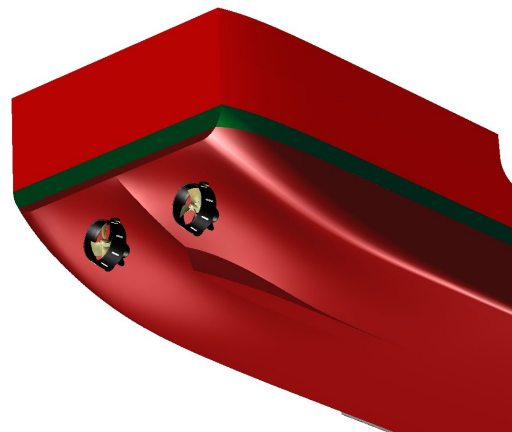
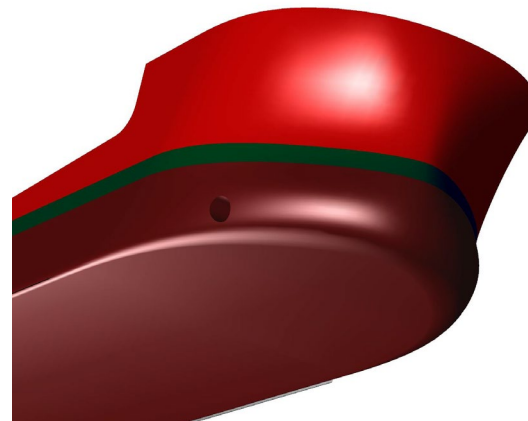
- ✓ Nowadays it's noted a mass building so-called "over disposable" hull such as RST27, RST54, RST27M, RST12C oil and chemical tankers. Since 2012 54 units had been delivered.
- ✓ Such frequency and numbers are common for the time of SU shipbuilding. It's not worth to compare RUSSIAN shipyards which is not an issue that presentation
- ✓ In 2012 and 2013 Britain RINA included RST27 in the list of the best vessels
- ✓ In 2014 RST54 ships were included into list of significant vessels as well
- ✓ In 2016 RSD49
- ✓ In 2017 RST27M
- ✓ In 2018 RSD59





(2) Computer flowed dynamic model test and then again to (1)

(3) and just then simulations of sea trials in pool



(1) The main estimation of crushing surge wave by designing a bulb and designing semi-tunnels to support propeller enough water stream

RSD59 Deadweight Scale

Осадка	Дедвейт $\gamma = 1.000$ т/м ³	Дедвейт $\gamma = 1.015$ т/м ³	Дедвейт $\gamma = 1.025$ т/м ³
3.24	4486.3	4593.6	4665.1
3.25	4509.4	4617.1	4688.9
3.26	4532.6	4640.6	4712.6
3.27	4555.8	4664.1	4736.4
3.28	4579.0	4687.7	4760.1
3.29	4602.1	4711.2	4783.9
3.30	4625.3	4734.7	4807.6
3.31	4648.5	4758.2	4831.4
3.32	4671.7	4781.7	4855.1
3.33	4694.8	4805.3	4878.9
3.34	4718.0	4828.8	4902.6
3.35	4741.2	4852.3	4926.4
3.36	4764.4	4875.8	4950.2
3.37	4787.6	4899.4	4973.9
3.38	4810.7	4922.9	4997.7
3.39	4833.9	4946.4	5021.4
3.40	4857.1	4969.9	5045.2

Осадка	Дедвейт $\gamma = 1.000$ т/м ³	Дедвейт $\gamma = 1.015$ т/м ³	Дедвейт $\gamma = 1.025$ т/м ³
3.41	4880.3	4993.5	5068.9
3.42	4903.5	5017.0	5092.7
3.43	4926.6	5040.5	5116.5
3.44	4949.8	5064.1	5140.2
3.45	4973.0	5087.6	5164.0
3.46	4996.2	5111.1	5187.8
3.47	5019.4	5134.7	5211.5
3.48	5042.5	5158.2	5235.3
3.49	5065.7	5181.7	5259.0
3.50	5088.9	5205.3	5282.8
3.51	5112.1	5228.8	5306.6
3.52	5135.3	5252.3	5330.3
3.53	5158.5	5275.8	5354.1
3.54	5181.7	5299.4	5377.9
3.55	5204.8	5322.9	5401.6
3.56	5228.0	5346.5	5425.4
3.57	5251.2	5370.0	5449.2

Осадка	Дедвейт $\gamma = 1.000$ т/м ³	Дедвейт $\gamma = 1.015$ т/м ³	Дедвейт $\gamma = 1.025$ т/м ³
3.58	5274.4	5393.5	5472.9
3.59	5297.6	5417.1	5496.7
3.60	5320.8	5440.6	5520.5
3.61	5343.9	5464.1	5544.2
3.62	5367.1	5487.6	5568.0
3.63	5390.3	5511.2	5591.7
3.64	5413.5	5534.7	5615.5
3.65	5436.7	5558.2	5639.2
3.66	5459.8	5581.7	5663.0
3.67	5483.0	5605.3	5686.8
3.68	5506.2	5628.8	5710.5
3.69	5529.4	5652.3	5734.3
3.70	5552.5	5675.8	5758.0
3.71	5575.7	5699.4	5781.8
3.72	5598.9	5722.9	5805.5
3.73	5622.1	5746.4	5829.3
3.74	5645.3	5769.9	5853.1

RSD59 Deadweight Scale

Осадка	Дедвейт $\gamma = 1.000$ т/м ³	Дедвейт $\gamma = 1.015$ т/м ³	Дедвейт $\gamma = 1.025$ т/м ³
3.75	5668.4	5793.5	5876.8
3.76	5691.6	5817.0	5900.6
3.77	5714.8	5840.5	5924.3
3.78	5738.0	5864.0	5948.1
3.79	5761.1	5887.6	5971.8
3.80	5784.3	5911.1	5995.6
3.81	5807.5	5934.6	6019.4
3.82	5830.7	5958.1	6043.1
3.83	5853.9	5981.7	6066.9
3.84	5877.0	6005.2	6090.6
3.85	5900.2	6028.7	6114.4
3.86	5923.4	6052.2	6138.1
3.87	5946.5	6075.7	6161.9
3.88	5969.7	6099.3	6185.6
3.89	5992.9	6122.8	6209.4
3.90	6016.0	6146.3	6233.1
3.91	6039.2	6169.8	6256.8

Осадка	Дедвейт $\gamma = 1.000$ т/м ³	Дедвейт $\gamma = 1.015$ т/м ³	Дедвейт $\gamma = 1.025$ т/м ³
3.92	6062.4	6193.3	6280.6
3.93	6085.5	6216.8	6304.3
3.94	6108.7	6240.3	6328.1
3.95	6131.8	6263.8	6351.8
3.96	6155.0	6287.3	6375.6
3.97	6178.2	6310.8	6399.3
3.98	6201.3	6334.3	6423.0
3.99	6224.5	6357.9	6446.8
4.00	6247.6	6381.4	6470.5
4.01	6270.8	6404.9	6494.2
4.02	6294.0	6428.4	6518.0
4.03	6317.1	6451.9	6541.7
4.04	6340.3	6475.4	6565.4
4.05	6363.4	6498.9	6589.2
4.06	6386.6	6522.4	6612.9
4.07	6409.7	6545.9	6636.7
4.08	6432.9	6569.4	6660.4

Осадка	Дедвейт $\gamma = 1.000$ т/м ³	Дедвейт $\gamma = 1.015$ т/м ³	Дедвейт $\gamma = 1.025$ т/м ³
4.09	6456.0	6592.9	6684.1
4.10	6479.2	6616.4	6707.9
4.11	6502.4	6639.9	6731.6
4.12	6525.5	6663.4	6755.3
4.13	6548.7	6686.9	6779.1
4.14	6571.8	6710.4	6802.8
4.15	6595.0	6733.9	6826.5
4.16	6618.1	6757.4	6850.2
4.17	6641.3	6780.9	6874.0
4.18	6664.4	6804.4	6897.7
4.19	6687.6	6827.9	6921.4
4.20	6710.7	6851.4	6945.2
4.21	6733.9	6874.9	6968.9
4.22	6757.0	6898.4	6992.6
4.23	6780.2	6921.9	7016.3
4.24	6803.3	6945.4	7040.1
4.25	6826.4	6968.8	7063.8

RSD59 Deadweight Scale

Осадка	Дедвейт $\gamma = 1.000$ т/м ³	Дедвейт $\gamma = 1.015$ т/м ³	Дедвейт $\gamma = 1.025$ т/м ³
4.26	6849.6	6992.3	7087.5
4.27	6872.7	7015.8	7111.2
4.28	6895.8	7039.3	7134.9
4.29	6919.0	7062.8	7158.6
4.30	6942.1	7086.2	7182.3
4.31	6965.3	7109.7	7206.1
4.32	6988.4	7133.2	7229.8
4.33	7011.5	7156.7	7253.5
4.34	7034.7	7180.2	7277.2
4.35	7057.8	7203.7	7300.9
4.36	7080.9	7227.1	7324.6
4.37	7104.1	7250.6	7348.3
4.38	7127.2	7274.1	7372.0
4.39	7150.3	7297.6	7395.8
4.40	7173.5	7321.1	7419.5
4.41	7196.6	7344.5	7443.2
4.42	7219.7	7368.0	7466.9

Осадка	Дедвейт $\gamma = 1.000$ т/м ³	Дедвейт $\gamma = 1.015$ т/м ³	Дедвейт $\gamma = 1.025$ т/м ³
4.43	7242.9	7391.5	7490.6
4.44	7266.0	7415.0	7514.3
4.45	7289.1	7438.5	7538.0
4.46	7312.3	7462.0	7561.7
4.47	7335.4	7485.4	7585.5
4.48	7358.5	7508.9	7609.1
4.49	7381.7	7532.4	7632.9
4.50	7404.8	7555.9	7656.6
4.51	7427.9	7579.3	7680.3
4.52	7451.0	7602.8	7704.0
4.53	7474.2	7626.3	7727.7
4.54	7497.3	7649.8	7751.4
4.55	7520.4	7673.2	7775.1
4.56	7543.6	7696.8	7798.9
4.57	7566.7	7720.2	7822.5
4.58	7589.8	7743.7	7846.2
4.59	7613.0	7767.2	7870.0

Осадка	Дедвейт $\gamma = 1.000$ т/м ³	Дедвейт $\gamma = 1.015$ т/м ³	Дедвейт $\gamma = 1.025$ т/м ³
4.60	7636.1	7790.6	7893.7
4.61	7659.2	7814.1	7917.4
4.62	7682.4	7837.6	7941.1
4.63	7705.5	7861.1	7964.8
4.64	7728.6	7884.5	7988.5
4.65	7751.7	7908.0	8012.2
4.66	7774.9	7931.5	8036.0
4.67	7798.0	7955.0	8059.6
4.68	7821.1	7978.4	8083.3
4.69	7844.3	8002.0	8107.1
4.70	7867.4	8025.4	8130.8
4.71	7890.5	8048.9	8154.4
4.72	7913.7	8072.4	8178.2
4.73	7936.8	8095.9	8201.9
4.74	7959.9	8119.3	8225.6
4.75	7983.0	8142.8	8249.3
4.76	8006.2	8166.3	8273.0

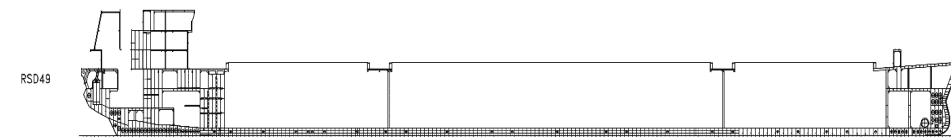
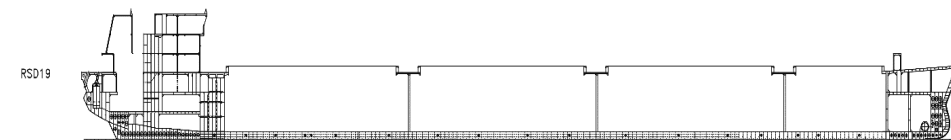
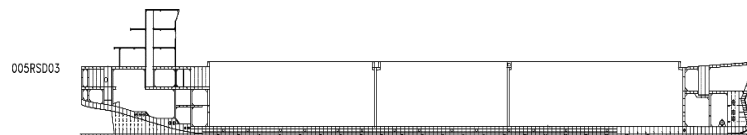
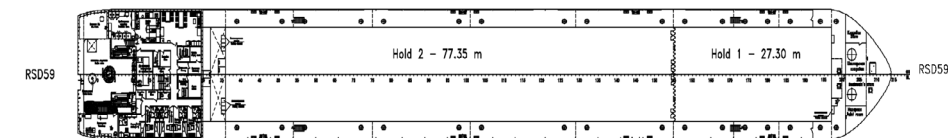
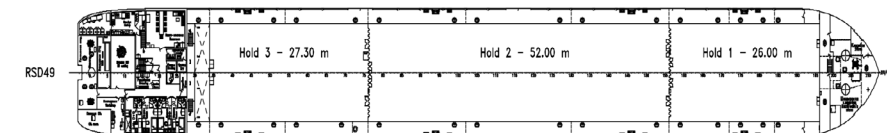
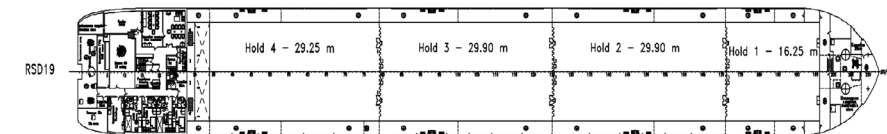
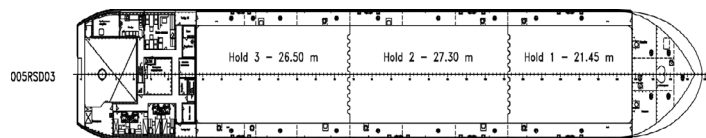
Advantage of RSD59 ship

- Length of the hold is 77 m
- Height of the holds is 9 m
- Grain capacity = bale capacity

NOTE

The successor to the RSD49 project vessels became the new dry bulk cargo ship which was designed with “over disposable” hull forms and with two cargo holds. One of them made a record among “Volgo-Don Max” vessels length of 77 m

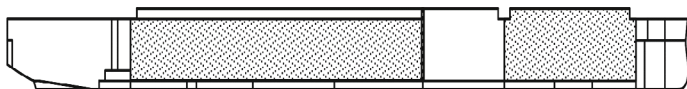




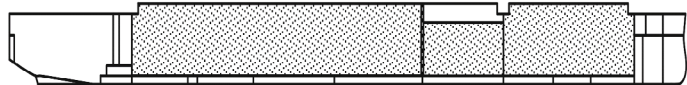
Other smart features

Scheme of arrangement of non-cohesive cargo in dependent on stowage factor

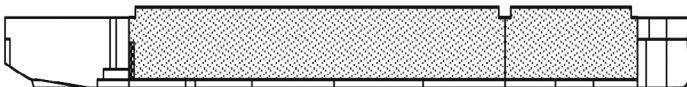
1.25 - 1.49 m³/t



1.50 - 1.59 m³/t



1.60 - 1.80 m³/t



The hatch covers of lift-away type and travelling gantry crane

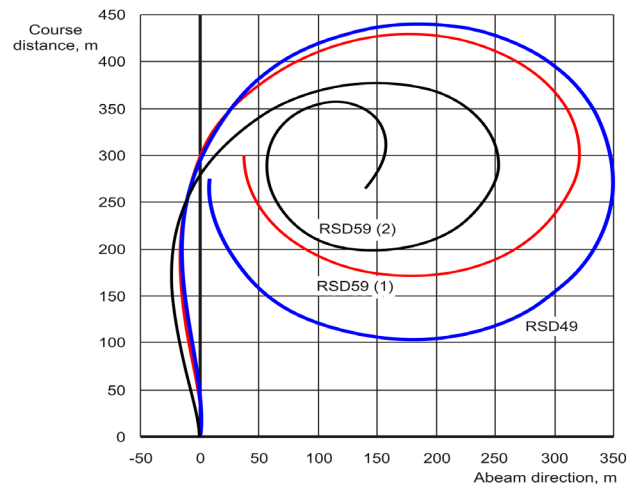


Other smart features

Full turned rudder propellers



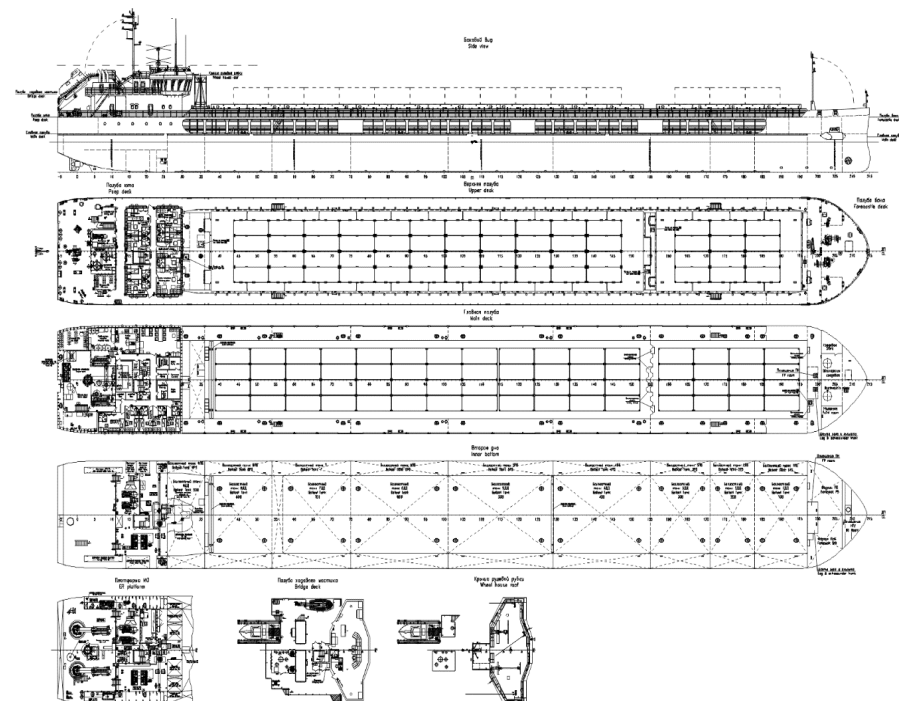
Comparison of turning of different propulsen systems



Results of turning motion of RSD59 vessel with 2 rudder propellers in comparison with RSD49 vessel with 2 screws. RSD59 (1) means 35° rotation of both rudder propellers; RSD59 (2) means 45° and 90° rotation of rudder propellers

GA plan and architectural-structural type RSD59

GA plan



- Single decker
- Two full turned rudder propellers
- Two holds
- Forecastle and poop
- Superstructure and engine room in aft
- Bolbous bow and transom aft
- Semi-tunnels and skeg
- Lift-away hatch covers of the holds
- Bow thruster

Main dimensions of popular sea-river dry-cargo ships

Characteristic	RSD49 “Neva-Leader”	RSD59 “Pola Fiva”	006RSD05 “Heidar Aliyev”	00101 “Rusich”	19610 “Volga”
Vessel’s class notation (Russian Maritime Register of Shipping)	KM ★ Ice2 R2 AUT1-C	KM ★ Ice2 R2 AUT1-ICS CONT (deck. cargo holds Nos.1.2) DG (bulk. pack)	KM ★ LU1 1 II A1	KM ★ LU2 1 I A1	KM ★ L3 1 I A2
Length overall, m	139.95	141.00	139.63	128.20	140.00
Breadth overall, m	16.70	16.98	16.70	16.74	16.56
Depth, m	6.00	6.00	6.00	6.10	6.70
Gross register tonnage, GT	5686	6143	5687	4960	4991
Net register tonnage, NT	3321	3317	3240	2140	1781
Holds capacity, m ³	10921	11292	11408	8090	6864
Number of holds	3	2	4	3	4
Container capacity (hold / deck), TEU	289 / 219	248 / 192	274 / 204	267 / 180	144 / 92
ME power, kW	2 x 1200	2 x 1200	2x1120	2x1140	2x970
Speed at sea draught, kn	11.5	10.5	11.8 (85%)	11.0 (90%)	10.0 (100%)
Rudder and propeller complex	2 screws + 2 rudders	2 rudder propellers	2 rudder propellers	2 screws + 2 rudders	2 screws + 1 rudder
Endurance, days	20	20	15	20	20
Crew / number of places	10 / 12	11 / 15	12 / 14	10 / 12	18
Draught (in sea / in river), m	4.70 / 3.60	4.706 / 3.60	4.60 / 3.60	4.20 / 3.60	4.677 / 3.60
Specified SF of cargo, m ³ /t	1.64	1.40	1.71	1.63	1.18
Block coefficient	0.90	0.932	0.88	0.85	0.85
Deadweight-displacement ratio	0.721	0.753	0.727	0.687	0.696
Energy consumption per transport productivity unit, Ne / (DWT x V), kW / t x kn	0.0292	0.0280	0.0232	0.0359	0.0313
Deadweight at sea draught, t	7147	8144	6970	5190	6207
Deadweight at river draught, t	4507	5320	4580	3855	3825

Analyse of RSD59 characteristics

The designed vessel is rather better than RSD49, “Armada”, energy efficiency is much better

Significant increase of deadweight and displacement

14 “over disposable multi-proposed “Volgo-Dom Max class vessels looks absolutely unique in the world

They are the best modern ship on domestic market in technical and economical mean

Conclusions

The advantages of RSD59vsRSD49:

- River DWT increasing is about 800 mts
- Sea DWT increasing is about 1000 mts
- Length of the hold is 77,35 meters
- Holds' Hight is 9 meters
- Maneuverability is rather better



Thanks for attendance

Albert Vygovskii