

Manufacturer	Product name	Approval status (type appr.)	Ex. Appr.	AMS (USCG)	USCG Type approval status (amendment)	Technology / Process steps		Options	Capacity on module / skid* (m³/h)	Investment € per m³/h	Power req. on average (kWh / 1000 m³) (SW = sea water, FW = fresh water)	Chemical / Neutralizer used	Weight (kg per m³/h)	Retention time (hrs)	Effluent analysis	Pressure drop (bar)	Lifecycle main component	Website
						solid-liquid separation	Disinfection											
						chemical	physical											
Ahead Ocean Technology	Ahead-BMWS	2015 yes				filtration, UV			200–1,500									aheadocean.en.ec21.com
Alfa Laval	PureBallast 3.2	2015 yes	yes	yes, 2015	May 2019 (Sep 2020)	filtration + UV (basket)	N/A	UV(MP)	32–3,000 (larger by mult.) new 1,500 reactor	N/A	SW = 51 kW (min) FW = 101 kW (min)	N/A		IMO: none USCG: 2,5 hrs	optional	0.3–0.8	3,000 hrs	alfalaval.de/
Aqua Engineering Company Ltd.	AquaStar Mac Gregor	2012 yes		yes, Jun 14		electrolytic system			200–5,000							0–0.2		aquaeng.kr
Azienda Chimica Genovese (ACG)	Ecolcell	no	yes			electrolytic system	NaOCl (from seawater)											acgmarine.com
Bawat	Bawat BWMS Mk2	2015 yes		yes, Feb 15	Mar 2020 (pending)	heat			50–5,000		0,1 kW	none		none	none	none	10 years	bawat.com
Bio-UV Group	Bio-Sea B	2017 yes	yes	yes, 2017	Jun 2018 (Mar 2020)	filtration 20 µm mech.	N/A	UV (MP)	10–2,000	N/A	6–14 kW per UV-reactor	N/A	N/A	IMO: none USCG: FW 0h BW: 19h MW 24h	N/A	< 0.55	UV Lamp: 3,000–5,000 hrs	ballast-water-treatment.com
BOS	BOS Natural Ballast																	bos.com.sg
Cathelco	Evolution	2014 yes, exp. Q1 /18 (Rev. G8)		yes, Nov 14	Jun 2019	20 / 25 µm self cleaning filter	N/A	UV (MP)	55–1,500,		136 kW/ Hr for SW/ FW		dep. on size, Skid mounted A10 (1000m3/hr) = 7KG per m3/ hr	48 hrs	UV transmission UVT	typ. 0.8	reactor >5 y. filter <20 y.	cathelco.com
Coldharbour Marine Limited	Coldharbour Marine GLD BWTS	LR / UK MCA approval Feb 2015		yes, Jun 15		none, no filters		treatment by inert gas	flow rates not relevant with intank treatment	treatment capacity is unlimited		non required. G8 system under IMO guidelines		treatment can take place at any time				coldharbourmarine.com
Cosco Shipbuilding Industry Company	Blue Ocean Shield (BOS)	2011 yes			Nov 2013	filtration+UV	no	UV	100–3,200									en/wecosco.com
De Nora	BalPure	2011 yes	yes	yes, revised Dec 14	Dec 2018 (Dec 2020)	filtration + electrolysis	EC / EA (only 1 % vol) NE		400–8,570		0,05kW	N/A		none	yes	0,5	N/A	balpure.com
Desmi Ocean Guard	RayClean CompactClean	2014 yes	yes	yes, N/A	Apr 2019 (pending)	filtration+UV	no	UV (LP) UV (MP)	30–3,000 35–3,000		45 105–133	no	approx. 4.5 kg >1.7 kg	none	N/A	max. 0.6	UV lamps: 12,000 hrs	desmioceanguard.com
Ecochlor Inc.	Ecochlor BWTS	2011 yes	N/A	yes, Oct 13	Aug 2017 (Sep 2020)	filtration+chemical injection	ClO2	N/A	500–16,200	N/A	typically 5–15 kW per 1,000m3 max. 75 kW	chlorine dioxide as the biocide. No neutralization required	no retention time	ClO2 ensure MADC 0.2 mg / l	none	0.4	N/A	ecochlor.com
Ecospec Marine Technology	Semb-Eco					UV/ LED-UV	no											ecospec.com
Elite Marine Corp	Seascape		yes	yes, Oct 14	Oct 2020	filtration+UV		UV Ultra-sound	80–5,000		10–20 kW per 100 m3					0.4–0.6		bwts.cn

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In the Ballast Water Management System market, complexity reigns supreme. Picking the most effective solution for your vessel or fleet is not clear cut – and not all systems are made equal. We truly believe that a full-flow electro-chlorination proposition is the best all-round approach for ship owners. Research from shipbrokers Clarksons already suggests that 46% of the world's merchant ships have installed electro-chlorination and 25% ultra-violet systems.

Konstantinos Stampedakis
Managing director, Erma First

SPEAKERS' CORNER



Read the complete commentary of Konstantinos Stampedakis in our »Speakers' Corner« at www.hansa-online.de

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							chemical	physical											
Envirocleanse	Envirocleanse	2018 yes		no	Feb 2019	electrolysis + chemical injection	NaOCl		NaOCl: bulk dosing and / or on-board, electro-chlorination generator	<200,000									eco-enviro.com
Envirotech and Consultancy Pte Ltd.	BlueWorld	2011 yes	no			electrode is used				500–5,000		<40 kW							bluseas.com.sg
Erma First	Erma First Fit	2012 yes		yes, Oct 13, rev. Mar 15	Oct 2017 (pending)	filtration + electrolysis				100–3,740		1.8 kW per 100 m3				0.5	5,000–6,000 hrs		ermafist.com
Evac	see Cathelco																		evac.com
Evoqua Water Technologies	SeaCURE	2014 yes	yes	yes, Jul 14, rev. Oct 14	pending	filtration (screen)	EC (only 1 % vol) NE		Cooling Water Treatment (Anti-Fouling)	500–6,000		50 (SW) -75 (only 1 x / in)	3–6 ppm in-situ NE max. 0.005 kg / m3	3.2	24	yes	0.35	ship's lifetime	evoqua.com
Filtration Group GmbH	Ocean Protection System (OPS)	2011 yes	yes	yes, Feb 14		2 x filtration (proprietary)	no	UV (LP)		250 (max. 2,000)	400	75kW (2 x, in / out)	no	7.5	none	no (sample points)	0.7–0.9	8,000 hrs or 1,500 x power on	filtrationgroup.com/mahle
Hamworthy Greenship	see Wärtsilä																		
Hanla IMS	EcoGuardian	2013 yes	yes	yes	Nov 2019 (Feb 2021)	filtration + electrolysis				130–4,000		41 kW (SW) 110 kW (FW)	required				0.1		hanlaims.com
Headway Technology Co. Ltd.	OceanGuard	2012 yes		yes, Sep 13	Nov 2018 (May 2020)	filtration + electrolysis	EA / AO	no		65–5,200		12kW		0.4–1.3	3–5	yes	0.5–0.7	ship's lifetime	headwaytech.com
Hitachi Plant Technologies	ClearBallast	2010 yes				filtration, flocculation				200–2,400+							N / A		hitachi.com
Hwaseung	HS Ballast	no				electrolysis													hsma.co.kr
Hyde Marine, Inc.	Guardian-US	2009 yes	yes	yes, Jun 13, rev. Aug 14	Apr 2020	filtration (disc) (screen)	no	UV (MP)		60–1,000	vaires	60kW (2 x, in / out)	no	4	none	no	0.4–0.8	5,000 hrs	hydmarine.com
Hyundai Heavy Industries JFE Engineering Corp	EcoBallast	2010 yes		yes, Mar 14, rev. Dec 14	Oct 2019	filtration+UV	EC	UV		250–2,160		115kW		1.6–2.6					hhi.co.kr
	HiBallast	2011 yes		yes, Jun 13, rev. Dec 14	Oct 2018 (Apr 2020)	filtration+electrolysis		UV		75–10,000		50kW		1.2–3.4					
JFE Engineering Corp	Ballast Ace	2010 yes		yes, Oct 13, rev. April 14 and Mar 15	Nov 2018 (pending)	filtration + chemical injection	Cl (liquid & granular)	no		500–3,500		3.65kW							jfe-eng.co.jp / en /
Jiangsu Nanji Machinery Company	NiBallast	2013 yes		ye, Nov 13		filtration + micro-membranes + deoxygenation				200–4,000								4 years (membrane)	jsnj.com
Juijiang Precision Measuring Technology Research Institute	OceanDoctor	2014 yes		yes, Mar 14, rev. Dec 14		filtration + photocatalytic	no	UV		50-5,000									iecp.com
Kadalneer Technologies	Varuna	no				filtration, electro-chlorination													sgpbusiness.com
Kalf Engineering	ElysisGuard	no				filtration electro-chlorination													
Knutsen Ballast water AS	KBAL BWMS	no	yes	yes, May 14	Nov 2020	pressure vacuum + ultraviolet	no	UV		400 and 3,000									knutsenoas.com
Korea Top Marine	Marinomate (ex KTM)	yes 2014				cavitation, electrolysis				100–2,000		40–55kW							ktmarine.net
Kurita Water Industries	Kurita BWMS	2014 yes	no		Feb 2021	chemical injection				375–3,750									kurita.co.jp
Kuraray Co. Ltd.	Microfade	2012 yes		yes, Oct 13, rev. Oct 14		filtration													kuraray.co.jp / en
Kwang San Co. Ltd.	EnBallast	no final approval yet		yes, Dec 15		filtration + electrolysis													kwangsan.com
MH Systems			no			deoxygenation													ballastwatersolutions.com
Mitsui Engineering & Shipbuilding Co.	FineBallast MF	2011 yes		yes, Sep 14		filtration		special pipe + ozone											mes.co.jp / english
	FineBallast OZ	2011 yes						special pipe + ozone		<75–300 (three types)		47–91kW (three types)		5.8–10.1t (absolute)					
Miura Co.	HK -(E)C	2014 yes		yes, Nov 14	Oct 2019 (pending)	filtration+UV	no	filtration+UV		160–900									miuraz.co.jp / en
N.E.I. Treatment Systems	Ventury Oxygen System (VOS)	2008 yes	yes	yes, Dec 13		none	no	deox. + cavitation		300–6,800 (max. mult. unlim.)	800 (small) 200 (large)	30kW (only 1 x / in)	N / A	2.5–3.5 nozzle + burner	48	N / A	0	20 years	nei-marine.com
Nippon Yuka Kogyo	Sky-System	2014 yes				chemical													nipponyuka.co.jp
NK Company Ltd.	NK-03 BlueBallast II / Plus	2009 yes		yes, Oct 13	Mar 2020	ozone	chemical injection	O3		200–8,000		75–145kW		3.3–10.5					daishin-technos.co.jp

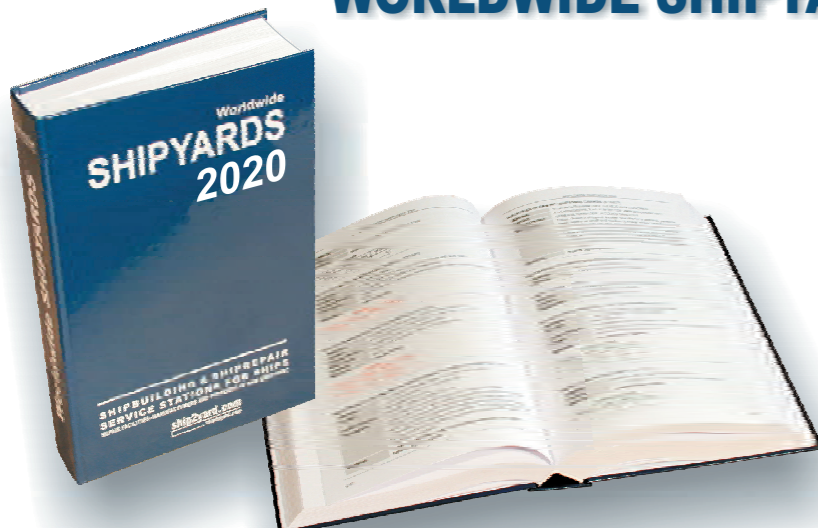
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							chemical	physical											
Norwegian Greentech AS	TRC BWMS	yes DNV	case by case	yes, Aug 13		filter and UV	no			50–1,200	200–1100	92kW	no	3.5–10	NA		1.5		norwegiangt.no
Ocean Clean	Bio Sea	2013 yes		yes, Mar 14	pending	mechanical filtration + UV (MP) disinfection	NC	mechanical filtration + UV (MP) disinfection	skid version, semi-modular-version, modular version	30–2,000		14kW/ 150m3	NC		IMO: 0, USCG: under process		< 0.8 in dirty conditions		ballast-watertreatment.com
OneTank	oneTank				Sep 2020	chemical injection				up to 4,000 m3/ tank									
Optimarin	OBS	2009 yes	yes	yes	Dec 2016 (Dec 2020)	filter + UV	no	filter		100–3,000		15kW in IMO mode	NA		none	NA	0.7	2,5 years (UV lamp)	optimarin.com
Pact Marine	Pact Marine BWTS	2014 yes		yes Apr 15		filtration	no	UV		100–4000		27–432kW (eleven types)	no						pactchina.com
Panasia Co Ltd.	GloEn-Patrol 2.0	2009 yes	yes	yes Oct 13, rev. Feb 15	Dec 2018	filtration+UV	no	UV (LP)		50–6,000	182–338	100kW (2 x)	no	3.6–4.8	none	yes	0.4–0.6	4,000 hrs	worldpanasia.com
Panasonic Environmental Systems & Engineering	ATPS-Bluesys	2016 yes			Oct 2020	electrolysis				150–3,600									panasonic.com
Redox Maritime Technologies	see Sunbo Industries																		redox.no
RWO Veolia	CleanBallast	2010 yes	under development	yes Apr 13, rev. Dec 14	pending	filtration (disc)	advanced electro-chemical	no		150–3,750 (max. mult. 7,000)		14 (SW) – 70 (FW) (2 x, in / out)	only in SW: sodium tiosulfate	< 5	none	optional	> 0.7	electrodes 3,000 hrs filter discs 8,000 hrs	rwo.de
Samkun Century	Ara Plasma	2012 yes		yes Oct 13		filtration	no	UV (MP) plasma											samkunok.com
Samsung Heavy Industries	Purimar 2.0	2011 yes		yes Oct 13, rev. May 14 / Feb 15	Jun 2018 (Jul 2018)	filtration+electrolysis				250–10,000						TRO			shi.samsung.co.kr/ Eng
Scienco / Fast	inTank BWTS				Feb 2019 (Sep 2020)	electrolysis+ chemical injection				up to 200,000									
Semb-Eco	Luv U1				May 2020	filtration+UV				500									ecospec.com
Shanghai Cyeco Environmental Technology Co.	Cyeco BWTS	2012 yes		yes, Jul 14		filtration (screen)	no	UV (MP)		250–2,000									cyecomarine.com
Shanghai Hengyuan Marine Equipment Co.	Shanghai Hengyuan HY	2013 yes		yes, Sep 14		filtration+UV	no	UV		200									sh-hengyuan.com / en

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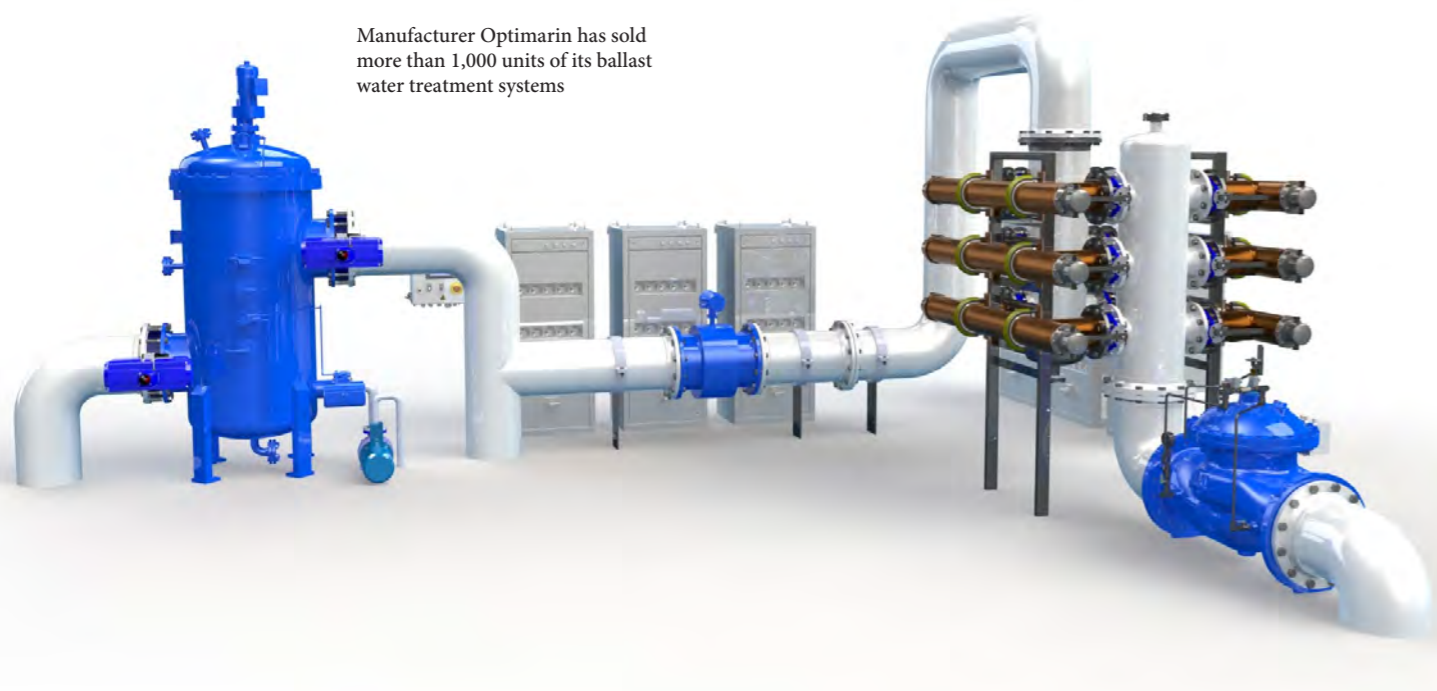
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Shanghai Lees Fuda Electro-mechanical Technology	LeesGreen BWMS	2013 yes				filtration+UV				250–3,000									sh-lees.com
SKF Marine	SKF BlueSonic BWMS				pending	UV		UV		100–1,500									skf.com
STX Heavy Industries Company	Smart Ballast	2013 yes		yes, Jan 14		sterilizer without filter				300–1,000									stxhi.co.kr / Eng
Sumitomo Electric Industries	Ecomarine	2014 yes		yes, Dec 14		filtration	no	UV		100–1,000			no						global-sei.com
Sunbo Industries	BlueZone	2014 yes	no			ozonation				250–6,000									sunboind.en.ec21.com
SunRui Marine Environmental Engineering Company	BalClor	2012 yes		yes, May 13	Jun 2017 (Jun 2020)	filtration (Screen 50 µm)	EC / electrolysis			50–8,500			neutralizing unit to add sodium thiosulfate						sunrui.net
Team Tec AS	Oceansaver BWTS	yes	yes		Dec 2016 (Dec 2020)	filtration+ electro-dialysis				200–7,200		0.026 (2 x 3000m3/ h system)	sodium thiosulfate	15,624 (system weight 2x3000m3/ h)	none	yes	0.3 (clean filters)	2–3 years (filter)	teamtec.no
Techcross	ECS-Hychlor	2008 yes	yes	yes, Oct 13, rev. Jan 16	May 2020	filtration+electrolysis	EC / AO NE	no		300–8,000		34 (SW)	< 6–8 ppm in-situ sodium thiosulfate	2.5 (450m3)	6	TRO	0.3	8,000–10,000 hrs	techcross.com
Trojan Marinex	GEA BallastMaster marineX, Trojan Marinex BWT	2014 yes	yes	yes, Aug 14	pending	filtration (integrated with UV)	no	UV (LP)		150–1,500 depending on model		45kW	no	3–6 (dep. on model)	none	no	<0.1	12,000 hrs	trojanmarinex.com, gea.com
Wärtsilä Water Systems	Aquarius EC	2013 yes	yes	yes, Oct 14	Aug 2018 (Aug 2020)	filtration+electrolysis	EC + NC	no		250–4,000		80kW	sodium bisulfite	(variable)	none	TRO	0.3	ship's lifetime	wartsila.com
	Aquarius UV	2012 yes	yes	yes, Oct 13	May 2019 (Dec 2020)	filtration (screen)	no	UV (MP)				100kW (2 x, in / out)	no	(variable)	none		0.5	3 years or 2,500 hrs	
Wuxi Brightsky Electronic Company	BSKY	2011 yes		yes, Oct 13	pending	filtration	no	UV		80–6,000									bsky.cn / english
YingPeng Marine Equipment Factory	YP-BWMS	2015 yes		yes, Oct 14		filtration	no	UV		300–1,200									zjyingpeng.com
Yixing Pact	Pact Marine BWMS	no				filter		UV		200–4,000									pactchina.com
Zhejiang Yingpeng	YP-BWMS	2015 yes				filtration, UV				300–1,200									en.ypbwms.com

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Manufacturer Optimarin has sold more than 1,000 units of its ballast water treatment systems



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