

ISO 23314-2:2021-11 (E)

Ships and marine technology - Ballast water management systems (BWMS) - Part 2: Risk assessment and risk reduction of BWMS using electrolytic methods

Contents		Page
Foreword		v
Introduction		vi
1	Scope	1
2	Normative references	1
3	Terms and definitions	1
4	Strategy for risk assessment and risk reduction	3
5	Risk assessment process	4
5.1	General	4
5.2	Information for risk assessment	4
5.3	Determination of the limits	5
5.3.1	General	5
5.3.2	Use limits	5
5.3.3	Space limits	5
5.3.4	Time limits	6
5.3.5	Environmental limits	6
5.4	Hazard identification	7
5.4.1	General	7
5.4.2	Human interaction with the equipment over the entire life cycle of a BWMS using the electrolytic method	7
5.4.3	Possible states of BWMS using the electrolytic method	8
5.4.4	Unintended behaviour of the operator or reasonably foreseeable misuse	9
5.5	Risk estimation	9
5.5.1	General	9
5.5.2	Elements of risk	9
5.5.3	Aspects to be considered during risk estimation	10
5.6	Risk evaluation	11
6	Risk reduction	12
6.1	General	12
6.2	Inherently safe design	12
6.2.1	General	12
6.2.2	Considerations during the initial design	12
6.2.3	Choice of appropriate technology	13
6.2.4	Applying inherently safe design measures to control systems	13
6.3	Safeguarding and/or complementary protective measures	14
6.3.1	General	14
6.3.2	Safeguarding measures	14
6.3.3	Complementary protective measures	14
6.4	Information for use	16
6.4.1	General	16
6.4.2	Installation guide	16
6.4.3	Commissioning procedure	16
6.4.4	Operation, maintenance and safety manual (OMSM)	17
6.4.5	Maintenance scheme	17
6.4.6	Calibration manual	17

6.4.7	Warning indication	18
6.4.8	Training plan and documentation	18
7	Documentation of risk assessment	18
Annex A (informative)	Example of a risk estimation matrix table in accordance with ISO/ TR 14121-2	19
Annex B (informative)	Example of a risk assessment and risk reduction worksheet -- Filtration unit	20
Annex C (informative)	Example of a risk assessment and risk reduction worksheet -- Electrolysis unit	22
Annex D (informative)	Example of a risk assessment and risk reduction worksheet - Neutralization unit	26
Annex E (informative)	Example of a training plan for BWMS using the electrolytic method	27
Bibliography	28