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Ships and marine technology — Hopper dredger supervisory and control systems

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Foreword

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This document was prepared by Technical Committee ISO/TC 8, *Ships and marine technology.*

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

This document describes the supervisory and control system for a number of components, functions and systems that can, but do not have to, be installed on board of a hopper dredger. It does not prescribe that all described components, functions and systems need to be installed.

Ships and marine technology — Hopper dredger supervisory and control systems

1 Scope

This document specifies the components and structure, general requirements, and functional requirements of trailing suction hopper dredger supervisory and control systems.

It is applicable only to the installed components, functions or systems. It covers design, manufacture and modification.

2 Normative references

The following referenced documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 8384, *Ships and marine technology — Dredgers — Vocabulary*

3 Terms, definitions and abbreviated terms

3.1 Terms and definitions

For the purpose of this document, the terms and definitions given in ISO 8384 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1.1
hopper dredger supervisory and control system
HD-SCS
system used for supervising and controlling the dredging operations of a hopper dredger

3.1.2
suction tube position monitor
STPM
system used for supervising and controlling the suction tube operation, displaying the movement and position of the suction tube

3.1.3
depth of draghead
distance from the water surface to the lower edge of the draghead

3.1.4
draught and soil loading system
DSLS
system used to display and record the draught and soil load

3.1.5
light ship weight
displacement of the hopper dredger, while the hopper is empty and the bottom doors are closed

Note 1 to entry: It represents the weight of the ship before each dredging.

3.1.6
light mixture overboard
LMO
controller used to discharge the mixture overboard directly when its concentration is too low

3.1.7
suction tube winch controller
STWC
controller used to move the suction tube to the specified position or to hold the position automatically

3.2 Abbreviated terms

DSLS	Draught and soil loading system
HD-SCS	Hopper dredger supervisory and control system
HMI	Human machine interface
LMO	Light mixture overboard
PLC	Programmable logic controller
SCADA	Supervisory control and data acquisition
STPM	Suction tube position monitor
STWC	Suction tube winch controller

4 Components and structure

4.1 Components

A hopper dredger is a self-propelled dredger with its own integrated hopper hold.

An HD-SCS, according to this document, is a basic system for supervising and controlling the dredging operations performed by a hopper dredger utilising sensors, networks, computers, and technologies concerning measurement, communication and automation.

An HD-SCS is an integrated SCADA system that can consist of the following subsystems, based on their functions.

a) STPM/STWC: STPM/STWC monitor excavation process. It should involve the monitoring and control of the suction tube, gantry, draghead, winch, swell compensator and other equipment. The STPM/STWC includes the suction tube vertical/horizontal angle, visor angle, swell compensator position, and valve/gantry state sensors.

b) DSLS: DSLS monitor loading process. It should involve the monitoring and control of overflows, light mixture overboard valve, loading valve and other equipment. The DSLS includes the dredger draught, hopper level, trim/heel, mixture density, mixture flow, overflow position, and valve state sensors.

c) Unloading system: unloading system monitor bottom dumping, rainbow/shore discharging process. It should involve the monitoring and control of the bottom door, split-system pre-dumping

door, hopper emptying valve, bow coupling and winch and other equipment. The unloading system includes the bottom door position, pre-dumping door position, and hopper emptying valve state.

d) Dredge pump system: the dredge pump system should involve the monitoring and control of the dredge pump, including pump vacuum and pressure, pump speed, and pump power.

e) Jet water system: the jet water system should involve the monitoring and control of the jet pump, hopper jet water valve, and draghead jet water valve. The jet water system includes the jet water pressure, jet water flow, jet pump speed, jet pump power, hopper jet water valve state, and draghead jet water valve state sensors.

f) Dredge valve system: dredge valve system construction of mixture channel for dredging operation. It should involve the monitoring and control of the dredge valve.

4.2 Structure

The HD-SCS should adopt a multi-layer network structure, including equipment layer, process monitoring layer, and information management layer, as follows:

a) equipment layer: field instrumentation/sensors;

b) process monitoring layer: PLC, signals collecting and processing units, communication network;

c) information management layer: central monitoring and control station.

5 General requirements

5.1 Operating position and control mode

5.1.1 Operating position

The HD-SCS should have local and remote operating positions.

5.1.2 Control mode

The HD-SCS should have the following control modes:

a) manual: manual operation by handle/button/knob and in graphical user interface;

b) emergency: direct operation through hardwire, only for dredging equipment that affects the safety of the ship.

5.2 External communication

The HD-SCS should have communication with a tide-system.

5.3 Diagnostic

When the equipment start and stop control, operation position transfer, or control mode shift operation fails, the HD-SCS can provide diagnostic information to accommodate a safe dredging.