SLOVENSKI STANDARD
SIST EN 12255-12:2004

01-maj-2004

Ļistilne naprave za odpadno vodo - 12. del: Krmiljenje in avtomatizacija

Wastewater treatment plants - Part 12: Control and automation

Kläranlagen - Teil 12: Steuerung und Automatisierung

Stations d'épuration - Partie 12: Régulation et automatisation

Ta slovenski standard je istoveten z: **EN 12255-12:2003**

ICS:

13.060.30 Odpadna voda Sewage water

SIST EN 12255-12:2004 **en**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 12255-12

September 2003

ICS 13.060.30

English version

Wastewater treatment plants - Part 12: Control and automation

Stations d'épuration - Partie 12: Régulation et automatisation

Kläranlagen - Teil 12: Steuerung und Automatisierung

This European Standard was approved by CEN on 1 August 2003.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovakia, Spain, Sweden, Switzerland and United Kingdom.

EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

Management Centre: rue de Stassart, 36 B-1050 Brussels

Ref. No. EN 12255-12:2003 E

Contents

page

Foreword 3

1 Scope 4

2 Normative references 4

3 Terms and definitions 4

4 General requirements 5

5 Design requirements and automation concept 6
5.1 Input data for the design of the automation system 6
5.1.1 General 6
5.1.2 Instrumentation and automation systems 6
5.1.3 Plant operating conditions 6
5.2 Automation concept 7

6 Design and implementation 8
6.1 Tendering 8
6.1.1 General 8
6.1.2 Functional tendering 8
6.1.3 Sectional tendering 8
6.2 Basic design 9
6.3 Detail design 9
6.4 Implementation, test and take over 9

7 Specification of automation systems 10
7.1 General 10
7.2 Requirements 10

Bibliography 15

Foreword

This document (EN 12255-12:2003) has been prepared by Technical Committee CEN/TC 165 “Wastewater engineering”, the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by March 2004, and conflicting national standards shall be withdrawn at the latest by March 2004.

It is the twelfth part prepared by the Working Groups CEN/TC 165/WG 42 and 43 relating to the general requirements and processes for treatment plants for over 50 PT. EN 12255 with the generic title “Wastewater treatment plants” consists of the following Parts:

— *Part 1: General construction principles.*

— *Part 3: Preliminary treatment.*

— *Part 4: Primary settlement.*

— *Part 5: Lagooning processes.*

— *Part 6: Activated sludge processes.*

— *Part 7: Biological fixed-film reactors.*

— *Part 8: Sludge treatment and storage.*

— *Part 9: Odour control and ventilation.*

— *Part 10: Safety principles.*

— *Part 11: General data required.*

— *Part 12: Control and automation.*

— *Part 13: Chemical treatment — Treatment of wastewater by precipitation/flocculation.*

— *Part 14: Disinfection.*

— *Part 15: Measurement of the oxygen transfer in clean water in aeration tanks of activated sludge plants.*

— *Part 16: Physical (mechanical) filtration.*

NOTE For requirements on pumping installations at wastewater treatment plants, provided initially as *Part 2: Pumping installations for wastewater treatment plants*, see EN 752-6 *Drain and sewer systems outside buildings — Part 6: Pumping installations*.

EN 12255-1, EN 12255-3 to EN 12255-8 and EN 12255-10 and EN 12255-11 were implemented together as a European package (Resolution BT 152/1998).

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovakia, Spain, Sweden, Switzerland and the United Kingdom.

1 Scope

This European Standard specifies requirements for control and automation systems on wastewater treatment plants for more than 50 PT. If necessary, the control system should also be designed to cover the control of sewer systems in the receiving area of the wastewater treatment plant.

It specifies the necessary information and data which are needed for the design and implementation of such systems as well as the performance requirements with respect to the hard- and software.

Differences in wastewater treatment throughout Europe have led to a variety of systems being developed. This standard gives fundamental information about the systems; this standard has not attempted to specify all available systems.

Detailed information additional to that contained in this standard can be obtained by referring to the bibliography.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

EN 1085:1997, *Waste water treatment — Vocabulary.*

EN 12255-1, *Wastewater treatment plants — Part 1: General construction principles.*

EN 12255-11, *Wastewater treatment plants — Part 11: General data required.*

3 Terms and definitions

For the purposes of this European Standard, terms and definitions given in EN 1085:1997 and the following apply.

3.1
client-server
computer configuration using one or more servers for handling and storage of the PVs (see 3.10) as data base of the process. The servers transmit the necessary data to the clients for their special applications

3.2
delta-event
SCADA functionality (see 3.11), which initialises recording of a PV (see 3.10) only when it has changed its value by a specified increment

3.3
event-controlled
SCADA functionality (see 3.11), that initialises recording of a PV (see 3.10) only if a specified binary input is active

3.4
LAN
Local Area Network

3.5
multi-tasking
the feature that different running programs ('tasks') are handled by the operating system quasi parallel in time so that they do not interfere with one another and each task gets enough CPU-time for sufficient performance as well as interrupts if required

3.6
multi-screen
technique for process visualisation using more than one screen with only one operating console (keyboard / mouse) by means of special graphic boards

3.7
OLE
Object Linking and Embedding

3.8
OPC
OLE (see 3.7) for process control

3.9
PLC
Programmable Logic Controller for process automation and control functions

3.10
PV
Process Variable, i. e. binary input/output e. g. signal/switch, analogue input/output e. g. measurement value/positioning value, counter-values, computed values in the automation system, data implemented into the system by manual input. The PV's form the data basis of the automation system

3.11
SCADA
Supervisory Control And Data Acquisition

3.12
TCP/IP
Transmission Control Protocol/Internet Protocol

3.13
WAN
Wide Area Network

3.14
watch-dog
time-out-signal used for control of the cyclic CPU program

4 General requirements

Control and automation systems are used to support the operators in maintaining process quality and cost efficiency of the wastewater treatment plants. In addition they serve for documentation of the process, especially to monitor and record the effluent quality parameters and as a tool for organising the maintenance of the plant itself.

The control system shall be considered at an early planning stage when evaluating the process design for the overall process. The overall costs, including the investment and operating expenses for the control system with respect to various treatment alternatives should be estimated and checked at this stage. Account shall be taken of the fact, that a sophisticated control system requires skilled and trained personnel for maintenance. Therefore it is mainly dependent on the plant size and process complexity whether a sophisticated control system or simple controls are required.

The design shall take into account the required management information system. In certain cases it can be advantageous to incorporate the control of the sewerage system.

The control and automation concept shall be specially designed for each wastewater treatment plant depending on the treatment processes, manning levels and skills. It should also allow compliance with the requirements for reliability and the operation in special situations, e.g. in case of failure of some components.

Control and automation systems should be configured as a network of several intelligent subsystems which are served and operated by one or more central control stations in a hierarchical client-server-architecture. The design of such networks shall comply with the requirements on data transfer rate, transmission protocols and the functions of the substations. The control and automation system should support the communication via internet, e.g. it should

be possible to implement the web-server functionality to present on-line data as well as archival information in the web compatible formats via the web.

Based on these basic considerations for the design of control and automation systems, in the following clauses requirements on the necessary information with respect to the system design and further more to the hardware and software features of the system are compiled. A fundamental concept is given for simple plants, which can be upgraded to a network system applying to more complex process design.

5 Design requirements and automation concept

5.1 Input data for the design of the automation system

5.1.1 General

In addition to the general specifications and requirements according to prEN 12255-11 the customer shall supply further requirements as basis for the evaluation of the appropriate degree of instrumentation and the selection of the required components of the control and automation system as well as for the design of the control room equipment. The extent of the data needed varies with the requirements on plant operation, on the level of automation as well as on the documents to be produced, i.e. compiling of operational data in lists or balances. These additional requirements refer to the instrumentation and automation systems (see 5.1.2) and the plant operating conditions (see 5.1.3).

5.1.2 Instrumentation and automation systems

The complexity of the plant design relates to the sophistication of instrumentation and automation system. Therefore the following requirements should be specified:

a) The level of instrumentation for process control, e.g.:

   — flow, level, pressure, temperature;

   — for chemical parameters such as pH;

   — conductivity, redox, dissolved oxygen and turbidity;

   — more complex on-line monitors for ammonia, nitrite, nitrate, phosphate;

   — for mixed liquor suspended solids (MLSS).

b) strategies for providing default values in case of malfunction or failure of the transmitters, e. g. in control loops.

c) the control loop design for aeration facilities, nitrification, denitrification and phosphorus removal control as well as recirculation and sludge treatment.

d) advanced control systems as modelling or fuzzy-control for the dosage of precipitant or flocculation agents.

5.1.3 Plant operating conditions

In addition to the basic process design the operational conditions, e. g. the required effluent quality, the power supply, the manning and organisation of the maintenance shall be considered. The necessary data can include:

a) requirements on electrical power supply, emergency power supply and energy management systems including gas engine powered generators;

b) location of control rooms on the plant and information on how to operate the different process units;

c) specification of explosion protected areas within the plant (see EN 12255-10);

d) specifications concerning plant infrastructure e. g. telephone, TV-supervision, fire alarm system;

e) the number of external working places connected to the control room, e. g. in the laboratory on site or external offices and remote notebook computers for service and maintenance personnel;

f) identification code system for units, power consumers and measuring points with the help of tag numbers;

g) system requirements:

- simple recording or complex control system within a network of automation units or computers, requirements on data transmission via standardised interfaces or via internet;

h) operator assistance by expert systems, software tools comprising artificial intelligence or adaptive modelling systems;

i) maintenance and repair protocols eventually connected to stock keeping and spare part ordering systems;

j) diagnostic and predictive functions e. g. for energy management, control of sewer system or flow control and load computing;

k) permanently or periodically manned control rooms;

l) skills and availability of operator and maintenance personnel;

m) training programs for the operator and maintenance personnel by the supplier of the automation system;

n) log-in procedures for different hierarchical degrees of admittance control, e.g.:

- system administration, checking and setting or altering system control parameters, or only system-operating-functions;

o) alarm schedule and regulations concerning the method of information handling in case of malfunction or alarms.

5.2 Automation concept

The automation concept is a written document that shall specify in detail, how the requirements according to 5.1 are to be implemented into the system. The main points to be included are:

a) automation system design parameters:

— a complete description of the treatment process;

— a piping and instrumentation scheme that shall show the interconnections between different process steps and the associated control-loops or sequential-batch-controls as well as the machinery, the instrumentation and the different product flows with, e.g. the associated flow-rates, pressures and temperatures;

— number of signals to be processed, identified and qualified as binary and analogue input-/output process variables, counter values or manual inputs as well as the number of control-loops and step-wise operated processes;

— number of substations, network design and control stations on the different operating levels;

— specification of hierarchical operation strategy on the different levels of automation systems, i.e. local operation and control room;

— specification of the control room equipment, i.e. number of working places, monitors and printers, interfaces to broadcast alarm systems or other data management systems;

— cabling for process variables and several system components.

b) Specifications concerning safety and operation: