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Industrial thermoprocessing equipment - Part 8: Particular safety requirements for quenching equipment

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Industrielle Thermoprozeßanlagen - Teil 8: Besondere Sicherheitsanforderungen an Abschreckanlagen

Equipements thermiques industriels - Partie 8: Prescriptions particulieres de sécurité pour les équipements de trempe

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Equipements thermiques industriels - Partie 8: Prescriptions particulières de sécurité pour les équipements de trempe

Industrielle Thermoprozeßanlagen - Teil 8: Besondere Sicherheitsanforderungen an Abschreckanlagen

This European Standard was approved by CEN on 22 November 1999.

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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 Central Secretariat has the same status as the official versions.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
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FOREWORD

This European Standard has been prepared by Technical Committee CEN/TC 186 "Industrial thermoprocessing - Safety", 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of an identical text or by endorsement, at the latest by March 2001, and conflicting national standards shall be withdrawn at the latest by March 2001.

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For relationship with EU Directive(s), see informative Annex ZA, which is an integral part of this standard.

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, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

The working group that drafted this Part of EN 746 comprised experts from the following countries: France, Germany, Italy, Sweden and United Kingdom.

This standard forms one part of a series safety standards covering Industrial Thermoprocessing Equipment.

The full list of parts of EN 746 is given below:

EN 746 Industrial Thermoprocessing Equipment

- Part 1: Common Safety Requirements for Industrial Thermoprocessing Equipment
- Part 2: Safety Requirements for Combustion and Fuel Handling Systems
- Part 3: Safety Requirements for the Generation and Use of Atmosphere gases
- Part 4: Particular Safety Requirements for Hot Dip Galvanising Thermoprocessing Equipment
- Part 5: Particular Safety Requirements for Salt Bath Thermoprocessing Equipment
- Part 6: Particular Safety Requirements for Material Melting, Remelting and Liquid Phase Maintaining Thermoprocessing Equipment
- Part 7: Particular Safety Requirements for Vacuum Thermoprocessing Equipment.
- Part 8: Particular Safety Requirements for Quenching Equipment

An assessment of the foreseeable risks arising from the use of the equipment was carried out when this standard was prepared.

The annexes A and ZA are informative.

0 INTRODUCTION

The EN 746-1 General Safety Requirements contains the common safety provisions and devices for all types of industrial thermoprocessing equipment. This part of the standard details in addition those extra safety requirements which need special attention against quenching equipment.

This European Standard is a type C standard as defined in EN 292:1991.

The extent to which hazards are covered is indicated in the scope of this standard.

1 SCOPE

This part of EN 746 gives the specific hazards and safety requirements that shall be provided by the manufacturer for Quenching Equipment, whether it is used as an independent unit or an integrated part of a plant.

This part of EN 746 does not cover specific hazards and safety requirements for Salt Bath bath equipment used as a quenching means (see EN 746-5:2000).

This part of EN 746 does not cover the handling, storage, transport, disposal, transfer or regeneration of the quenching media and processed material outside the limits of the equipment.

This part of EN 746 standard applies not only to the normal operation of the equipment but also to the safety of personnel and property when foreseeable faults occur in them.

Examples of quenching equipment are shown in Fig. 1 and Fig. 2.

NOTE: There are many variations in the design of quenching equipment. Only two examples of the various types are given in this text.

2 NORMATIVE REFERENCES

This European Standard incorporates by dated or undated references, 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.

EN 166	Personal eye-protection - Specifications

EN 292-1:1991	Safety of machinery - Basic concepts, general principles for design - Part 1: Basic terminology, methodology
EN 292-2:1991	Safety of machinery - Basic concepts, general principles for design - Part 2: Technical principles and specifications
EN 345	Specification for safety footwear for professional use
EN 346	Specification for protective footwear for professional use
EN 469	Protective clothing for firefighters - Requirements and test methods for protective clothing for firefighting
EN 531	Protective clothing for industrial workers exposed to heat (excluding fire fighters' and welders' clothing)
EN 614-1	Safety of machinery - Ergonomic design principles - Part 1: Terminology and general principles
EN 746-1:1997	Industrial Thermoprocessing Equipment - Part 1: Common Safety Requirements for Industrial Thermoprocessing Equipment
EN 746-2:1997	Industrial Thermoprocessing Equipment - Part 2: Safety Requirements for Combustion and Fuel Handling Systems
EN 746-3:1997	Industrial Thermoprocessing Equipment - Part 3: Safety Requirements for the Generation and Use of Atmosphere Gases
EN 746-5:2000	Industrial Thermoprocessing Equipment - Part 5: Particular Safety Requirements for Salt Bath Thermoprocessing Equipment
EN 746-8:2000	Industrial Thermoprocessing Equipment - Part 8: Particular Safety Requirements for Quenching Equipment
prEN 1005-2:1998	Safety of machinery - Human physical performance Part 2: Manual handling of machinery and component parts of machinery
prEN 1005-3:1998	Safety of machinery - Human physical performance - Part 3: Recommended force limits for machinery operation
EN 1070	Safety of machinery - Terminology

EN 60204-1:1997	Safety of machinery - Electrical equipment of machines - Part 1: General requirements (IEC 60204-1:1997)
EN 61310-1	Safety of machinery - Indication, marking and actuation - Part 1: Requirements for visual, auditory and tactile signals (IEC 61310-1:1995)

3 DEFINITIONS

For the purposes of this standard the definitions given in EN 1070 apply.

Additional definitions specifically needed for this standard are added below:

3.1 Enclosed Chamber

A chamber used for quenching with a gas or gases at low atmospheric or positive pressures.

3.2 Quenching Media

The fluid used as the coolant to extract heat from the components being processed, such as oils, water/oil emulsions, salt solutions, molten lead, polymers, steam (water vapour) and fluidised beds.

3.3 Flood Quench

A quenching process where a liquid quenchant is pumped or flows by gravity over the surface of the part to be treated.

3.4 Open Quench

Components enter the quench medium in contact with the atmosphere contained in a fully open tank.

3.5 Press Quench

A quenching process carried out in specially designed machines in which the hot component is located between dies under pressure and held in position while the quenchant flows over it.

3.6 Small Tank

A container of less than 1000 l capacity and with a surface area (open or covered) of less than 1 m^2.

3.7 Medium Tank

A container of between 1000 l and 3000 l capacity and with a surface area (open or covered) of not more than 2 m^2.

3.8 Large Tank

A container of more than 3000 l capacity and a surface area (open or covered) of more than 2 m^2.

3.9 Closed Tank

A container in which the quenchant surface is covered or totally blanketed by a gas or gases that exclude air or where the empty space is evacuated.

4 LIST OF HAZARDS

An assessment of the foreseeable risks arising from the use of the industrial thermoprocessing equipment has been carried out when this standard was elaborated.

The clause has been condensed into a table (see table 1). It summarises those areas which require consideration by the manufacturer. For ease of reference the table indicates the need for safety features or instructions in columns. The table shall only be used in conjunction with clauses 5 and 7 where further detail is given.

Table 1 shows the Hazard, Hazardous Situation, Preventative Measures and the Verification Means (as pointed out in clause 6) identified for the equipment type described in this part to this standard.

Table 1:
List of Hazards, Hazardous Situations and Preventative Measures

1 Item	2 Hazard	3 Hazardous situations	4 Preventative measures	5 References	6 Verification means*)
1	**MECHANICAL**				
1.1	**Crushing, Shearing, Entanglement**	Mechanical handling system: - lifts - overhead hoists - quench elevators - continuous quenching	see EN 746-1	EN 746-1:1997 Table 1; 2.2 Table 1; 2.3 Table 1; 2.4 EN 746-8:2000 5.8.1 5.8.2 5.8.3	1 and 2
2	**EQUIPMENT USING QUENCHING OIL**				
2.1	**Thermal**	Ejection of hot material causing burns/scalds Water ingress - foaming Vacuum degassing Corrosion of bath, pipes, overflows	1 Design to minimise ejection 2 Maintenance instructions 3 Pumping facilities 4 Indicate max. permissible water content in oil 5 Provision of instructions to check water content in the oil	EN 746-1:1997 5.11	1 and 2 1 1 and 2 1 1
2.2	**Fire and explosion**	Ignition of batch contents inside or outside batch Oil/water explosion(s)	1 Use a quenching medium, whose flash point is above the maximum working temperature of the tank (Temperature after quenching of the part) 2 Design the tank so that the immersion of a part does not lead to the maximum authorized temperature being exceeded. The manufacturer shall indicate to the user the maximum load characteristic (e.g. weight, volume) 3 Avoid use of direct aqueous cooling 4 Prevent foaming	 5.5 5.5.2	1 and 2 1 and 2 1 and 2 1

(continued

*) see Note to clause 6 for explanation of numbers

Table 1: (continued)

1 Item	2 Hazard	3 Hazardous situations	4 Preventative measures	5 References	6 Verification means*)
			5. rovide low level/high level detector/alarm, circulation monitor/alarm, temperature monitor/alarm (all interlocked to heaters and feed system)		1 and 2
			6. Provide covers/snuffer plates		1
			7. 7 Protection or correct position of heaters/coolers, filters and pumps		1
			8 Provide adequately sized/colour coded valves	5.11.3 e)	1
			9 Oil pressure in the cooling system shall be higher than the water pressure in the cooler		1 and 2
			10 Instructions to user to carry out checks on flash point where necessary		1
2.3	**Failure of energy supply**	The equipment feed system stops before full immersion	Provide emergency supply (electrical, hydraulic, pneumatic etc.)		1 and 2
2.4	**Faulty or missing safety device**	Failure of temp. controller Failure of level controls	1 Level control and temperature controller should give an indicating alarm in the event of controller failure (e.g. gives a safe condition)	5.10.2	1 and 2
			2 Provide instructions to carry out regular checks on controllers		1 and 2
2.5	**Failure in :** – **the ventilation equipment**	Failure of fan, bearing, motor etc.	Provide an alarm device.	5.4	1 and 2

(continued

*) see Note to clause 6 for explanation of numbers

Table 1: (continued)

1 Item	2 Hazard	3 Hazardous situations	4 Preventative measures	5 References	6 Verification means*)
	– **the handling system (e.g. overhead hoist)**	Energy failure during handling	Provide emergency system to release in case of failure.	5.8 5.8.1 5.8.2	1 and 2
2.6	**Materials and Substances**				
2.6.1	Harmful substances	Fumes from spill of quenching medium Contact with quenching medium	1 Design to include exhaust ventilation and adequate bath size 2 Provide instructions for choice of fluid, personal protective equipment, use of equipment	5.12.2 7.2.2	1 and 2 1
2.6.2	Fires leading to heat injuries or generating toxic fumes	Build-up of oil in duct work Oil in chute of continuous system may ignite particularly during idling periods	1 Design to prevent build-up and use non-combustible ductwork 2 Design to provide fixed fire protection for oil systems 3 Design to provide local working sprays/curtains/ chutes to extend 150 mm min. below oil level in tank, baffle plates in larger tanks 4 Provide instructions for fire prevention training	5.4 5.4.1 b) 5.12 5.12 5.12.4.1 5.8.3 a) 5.12 7.3	1 and 2 1 and 2 1 and 2 1
3	**EQUIPMENT USING WATER/OIL EMULSIONS, SALT-SOLUTIONS AND POLYMERS**				
3.1	**Failure of energy supply**	Separation of emulsion and consequent ignition of the oil floating on the surface	1 Provide instructions on choice of emulsion formulations and the proper use of agitation/circulation systems 2 Design so that large tanks are fitted with detection alarm systems and the agitation/ circulation systems		1 and 2 1 and 2

(continued

Table 1: (concluded)

*) see Note to clause 6 for explanation of numbers