INTERNATIONAL, EUROPEAN AND NATIONAL STANDARDS FOR THE PROTECTION OF THE ENVIRONMENT AND THEIR IMPACT ON THE EUROPEAN CERAMIC INDUSTRY

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INTRODUCTION

In the early nineties experts for the protection of the environment started to discuss the question of what could be done to protect the global environment in a better way. The background for doing this were e.g. the increase of the global population, the growing holes in the ozone layer over the South and North Pole, the greenhouse effect etc.

The International Standards Oganisation and their national member organisations all over the world started the work by producing the ISO 14 000 series documents.This work is nowadays partly finished, but there are a lot of problems to be solved during the coming years e.g. Life cycle inventory analysis, Life cycle impact assessment and Life cycle interpretation. There is a risk that only ecologists and representatives from heavy polluting industries will formulate these standards and limit values, which will influence the world markets in the future.

The aim of this article is to show what is going on in this field of standardisation and that it seems to be important that the European Ceramic Industries realize this development and try to find intelligent answers for these new questions.

An example is given by the Environmental Requirements formulated by the European Ceramic Tile Manufacturers' Federation.

A proposal is given concerning what has to be changed in technologies.

EUROPEAN AND INTERNATIONAL STANDARDS FOR THE PROTECTION OF THE ENVIRONMENT

The interrelationship of the ISO 14 000 series of Standards is given in Figure 1. The titles of these standards as known are cited in Table 1.

All of us will know the standard ISO 14 001 Environmental management systems-Specification with guidance for use. The ISO 14 040 series is partly finished and will influence shortly the way of producing, transporting and using ceramic products. Politicians are saying nowadays that their governments will not use the results from LCA´s for selecting products but there are statements from consumer protection agencies saying the contrary. It seems to be clear that in some years LCA´s will influence and change markets and economies for a long time.

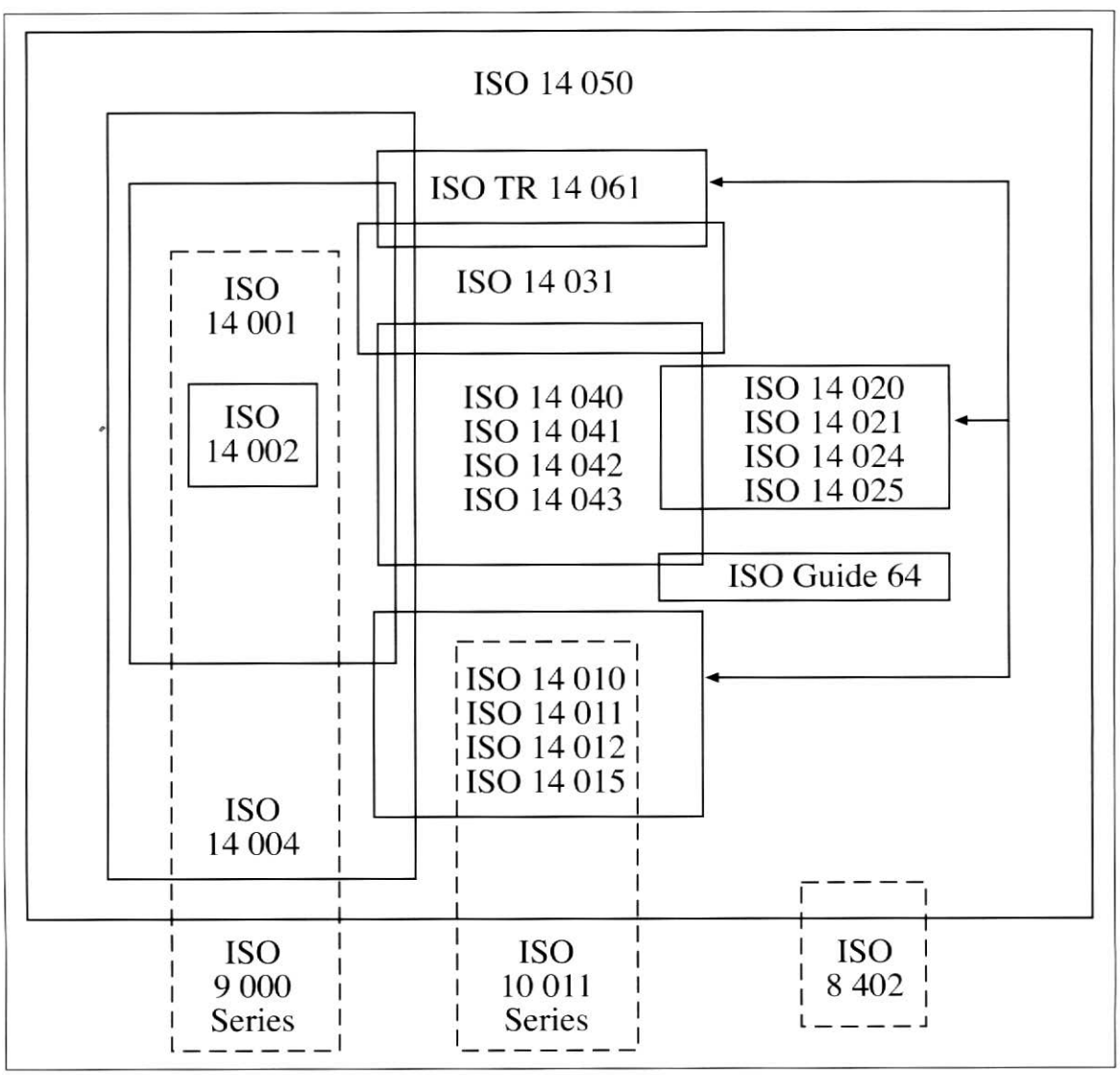

Figure 1. *Interrelationship of ISO 14 000 series documents.*

In Table 2 some details are listed of what sort of data are required to describe and calculate a unit process.

EN ISO	14 001	Environmental management systems – Specification with guidance for use
ISO	14 004	Environmental management systems – General guidelines on principles, systems and supporting techniques
EN ISO	14 010	Guidelines for environmental auditing – General principles
EN ISO	14 011	Guidelines for environmental auditing – Audit procedures-Auditing of environmental management systems
EN ISO	14 012	Guideline for environmental auditing – Qualification criteria for environmental auditors
ISO/DIS	14 020	Environmental labels and declaration – Basic principles
ISO/DIS	14 024	Environmental labels and declaration – Environmental labelling Type I-Guiding principles and procedures
EN ISO	4 040	Environmental management – Life cycle assessment-Principles and framework
EN ISO	14 040-1	Environmental management – Life cycle assessment-Principal and framework, Explanations
EN ISO	14 041	Environmental management – Life cycle assessment-Goal and scope definition and inventory analysis
ISO/CD	14 042	Environmental management – Life cycle assessment-Life cycle impact assessment
ISO/CD	14 043	Environmental management – Life cycle assessment-Life cycle Interpretation
ISO/DIS	14 050	Environmental management – Vocabulary
ISO		International Standard Organisation, Geneva, Switzerland
DIS		Draft International Standard
CD		Committee Draft
EN		Europäische Norm/European Standard

Table 1. *International and European Standards for the protection of the Environment.*

ISO/DIS 1041 1997(E)

Example of Data Sheet for Unit Process		
Performer:	Date of Completion:	
Unit Process Identification:	Reporting Location:	
Time Period: Year	Starting Month	Ending Month
Description of Unit Process: (attach additional sheet if required)		

Material Inputs	Units	Quantity	Description of sampling procedures	Origin

Water Consumption	Units	Quantity

e.g. surface water drinking water...

Energy Inputs	Units	Quantity	Description of sampling procedures	Origin

e.g. Heavy Fuel Oil. Medium Fuel Oil. Light Fuel Oil. Kerosene. Gasoline, Natural Gas. Propane. Coal, Biomass Grid Electricity.

Material Outputs (including products)	Units	Quantity	Description of sampling procedures	Origin

The data in this data collection sheet refers to all unallocated inputs and outputs during the specified time period.

Table 2. *Example of a Data Sheet for a Unit Process according to informative annex A of ISO/DIS 14 041*

ISO/DIS 1041 1997(E)

Life Cycle inventory Analysis Data Collection Sheet Unit Process Identification: Reporting Location:			
Emissions to Air	Units	Quantity	Description of sampling procedures (Attach sheets if necessary)

e.g. Cl_2, CO, CO_2. Dust/Particulate, F_2, H_2S, H_2SO, Hcl. HF, Hg, Hidrocarbons*, N_2O, NH_3, NOx. Organics*. Other Metals*, Pb, SOx,... (*Please list compounds included in data category).

Emissions to Water	Units	Quantity	Description of Sampling Procedures (Attach sheets if necessary)

e.g. BOD, COD, Acids as H^-, Cl^-, CN^-, Detergent/oils, Dissolved organics*, F^-, Fe ions, Hg, Hidrocarbons*, Na^-, NH_4+, NO_3 Organo-Chlonne*, Other Metals*, Other N*, Phenols, Phosphate, SO_4, Suspended solids,...
* Please list compounds included in data category.

Emissions to Land	Units	Quantity	Description of Sampling Procedures (Attach sheets if necessary)

e.g. Mineral Waste, Mixed Industrial, Municipal SW, Toxic Wastes*,... (*Please list compounds included in data category).

Other Releases	Units	Quantity	Description of Sampling Procedures (Attach sheets if necessary)

e.g. Noise Radiation, Vibration, Odour, Waste Heat,...

Describe any unique calculations, data collection, sampling, or variation from description of unit process functions. (Attach additional sheets).

Table 2. *Example of a Data Sheet for a Unit Process according to informative annex A of ISO/DIS 14 041*

THE ENVIRONMENT OF THE WORLD

All production -and consumption- processes must be seen in their relationship to each other and to the environment as a whole. When we started to solve our pollution problems, we were looking only to small parts of the ecosphere like the rivers for the waste water, the air for the emission of dust and fluorine, the land for the disposal of waste and so on. In figure 2 the ecosphere of all we are doing in the environment is illustrated.

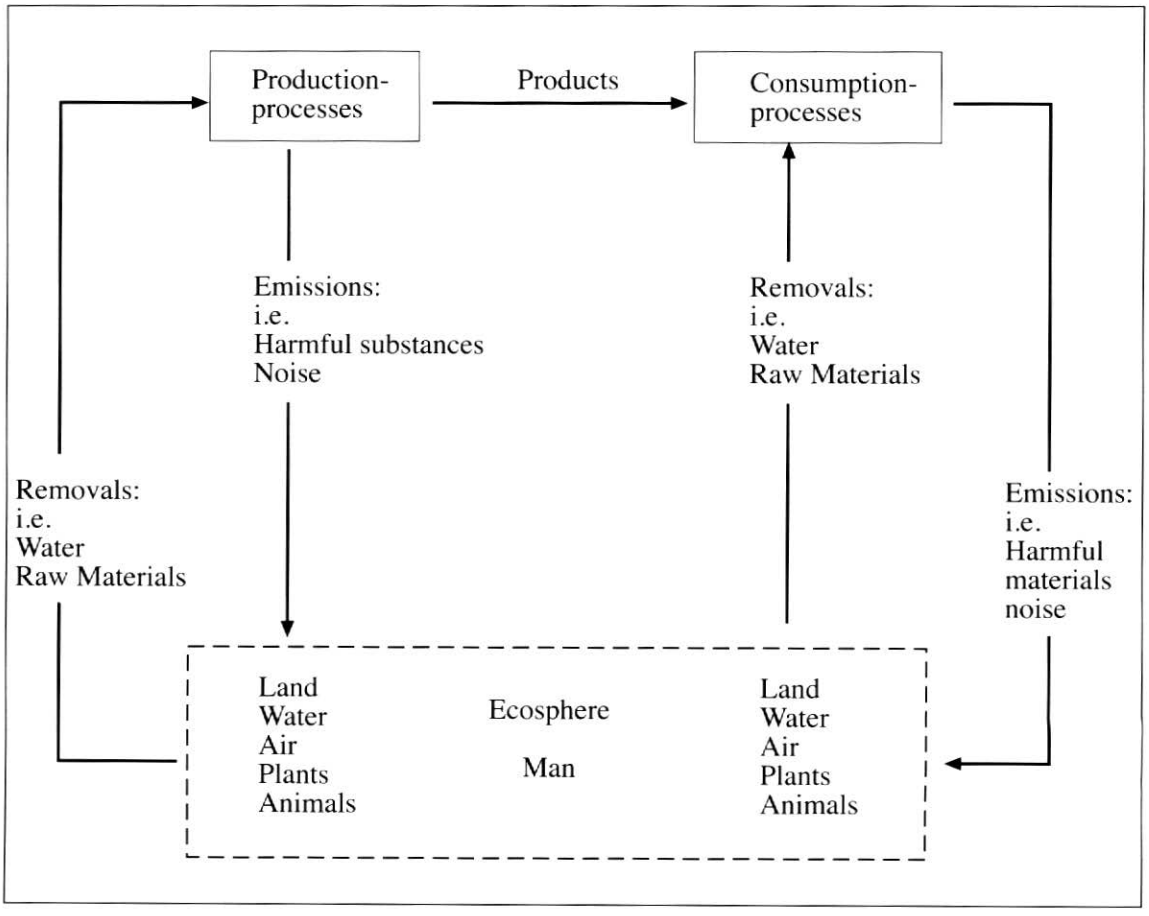

Figure 2. *The environmental system of our world.*

RECOMMENDATION OF THE EUROPEAN CERAMIC TILE MANUFACTURERS FEDERATION FOR ENVIRONMENTAL REQUIREMENTS

Starting in 1994 a group of experts from France, Germany, Great Britain, Greece, Italy, the Netherlands and Spain tried to produce recommendations for the sustainable production of ceramic tiles.

The main purpose of the work was to help around 80 % of the European tile industry to reduce pollution with the aid of voluntary agreements instead of only 15 - 20 % by using e.g. the Ecolabel directive of the European Union which was published in March 1992.

The work was started by looking for appropriate standards to measure the

emissions into the air ,into the water, the specific consumption values for energy and water and the recycling rates. It was agreed within the group to use a collection of British, French, German and - where available - European standards. Details of these standards like the nationality and their specifications are given in the table of the recommendations. Under the references of this paper the full titles are listed.

The basis for the specific energy consumption is the total primary energy consumption related to the production of tiles in GJ divided by the total production in t, which is ready to be sold over a period of 1 year.

The basis for the specific water consumption is the total fresh water consumption in l year divided by the total production in m^2, which is ready to be sold also over a period of 1 year.

The basis for the recycling rates for water is the percentage of waste water which is cleaned and used again to produce ceramic tiles, and for ceramic waste the percentage of ceramic waste which is re-used in the own production or by third parties. The basis for these calculations is a period of 1 year.

Details for the recommendation are given in table 3. These minimum requirements are in some cases less severe than the legal requirements in some member countries of the European Union. In a lot of member countries the majority of the recommended requirements is more stringent than the legal ones and in some cases there are no legal requirements at all.

The European Ceramic Tiles Manufacturers' Federation (CET) recognises the importance of environmental care and underlines its efforts, to encourage and stimulate among the enterprises members of its national associations the adoption of technologies and processes, which improve their environmental performance.

To this end CET recommends to the European ceramic tile manufacturing companies, to meet at least the following environmental requirements, which are to be met **by the year 2000**, and to be revised subsequently.

	Requirements to be met by the year 2000	*Corresponding test methods*
1. Emissions into the air:		
Dust (Grunding, shaping, etc.)	≤ 100 mg/m³	
Sprav dryng	≤ 75 mg/m³	BS3405
Glazing	≤ 20 mg/m³	
Kilns	≤ 25 mg/m³	
Fluorine from kilns	≤ 10 mg HF/m³	VDI guidance 2286
2. Emissions into open waters:		
pH	5.5 - 9.5	NF T 90-008
Suspended solids	≤ 100 mg/l	pr EN 870
COD	≤ 150 mg/l	BS 6068 section 2.31

Table 3. CET recommendation on enviromental requirements.

	Requirements to be met by the year 2000	*Corresponding test methods*
Boron	≤ 5 mg/l	
Lead	≤ 0.5 mg/l	DIN 38406 part 22
Cadmiun	≤ 0.1 mg/l	
Zinc	≤ 5 mg/l	

3. Specific Energy consumption:

≤ 12 GI/t. Total primary energy consumption [(oil, gas, current) related to the production of tiles] divided by the total production which is ready to be sold over a period of 1 year.

4. Specific Water consumption:

≤ 30 l fresh (not recycled) water/m² over a period of 1 year.

5. Recycling rates:

Water ≥ 50% over a period of 1 year.

Ceramic waste: ≥ 50% of weight (dust, sludges <fired and unfired>, broken tiles: including the recycling of tile waste in other building components), over a period of 1 year.

(In some member states legal requirements may be more severe that the requirements mentioned above).

CET also recommends, that companies make use of EMAS as a widely recognised system of environmental management in order to improve their environmental performance.

Table 3. *CET recommendation on enviromental requirements.*

PRODUCTION INTEGRATED TECHNOLOGIES TO REDUCE POLLUTION

The best way to reduce pollution is the use of "clean" or "cleaner" technologies. To change technologies the following guidelines should be followed:

1. Technologies for glazing without water.
2. Unleaded glazes with better properties.
3. The use of so-called sintered lamellar filters to clean the air coming from glazing-cabins. Then the originally lost glaze can be completely recycled as a glaze.
4. To find and install filter technologies for separating waste glazes from the cleansing water of glazing-lines near to the place where they were lost so that the glazes can be completely recycled as glazes
5. To improve technologies to reduce the energy consumption of kilns, dryers, drum mills etc.
6. To find new applications where co-generation can be used.
7. To improve the quality and the properties of the fired materials which are ready to be sold so that they can be made thinner to save raw materials and energy.

REFERENCES

1. BS 3405: 1983 British Standard, Method for Measurement of particulate emission including grit and dust (simplified method).

2. VDI guidance 2585: 1993 Emission Control, Ceramic Industry.

3. NF T 90-008: 1953 Certified French Standard, Water testing, Electrometric pH measurement using a glass electrode.

4. prEN 870: 1992 Draft European Standard, Water quality - Determination of suspended solids- Determination by 0,4 - 0,45 μm pore width filters.

5. BS 6068: Section 2.34: 1988 British Standard, Water quality, Section 2.34, Method for the determination of the chemical oxygen demand.

6. DIN 38 406 Teil 22: 1988 German Standard methods for the examination of water, waste water and sludge; cations (group E); determination of 33 elements by inductively coupled plasma emission spectrometry (ICP - OES) (E 22).