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1. Scope

As a result of the development of the DGNB - and later the BNB criteria for the certification of laboratory buildings, it became clear that the influence of the technologies used for laboratory processes, i.e. equipment, instruments and facilities, is to be regarded as essential for the sustainability of the socio-technical system of laboratory buildings. The usual disregard of process consumption in other building types leads to an approach that is not holistic in any way for laboratory buildings and is thus of little use for sustainability.

Process-related installations require their consideration in the dimensioning of services and energy supply; thus, significant savings effects, cost-effective solutions, resource-saving equipment and user safety can only be achieved if laboratory equipment and instruments are developed and operated under sustainability criteria to the same extent as the buildings.

Although laboratory buildings represent only a very small part of the national and international building stock, their importance for the development of society is considerable. Furthermore, energy consumption in medium-sized laboratories, for example, is similar to that of small towns.

The fulfilment of sustainability criteria is a socio-political demand that research in particular must meet as a driver for the development of future sustainable solutions, processes and substances. To enable it - research - to do this, the provision of a sustainable working environment is essential.

2. Objectives

EGNATON CERT focuses on the direct working environment of laboratory users. The system boundary is the laboratory room and all devices, instruments or equipment which

- are to be regarded as work equipment,
- have service consumption and
- are technically connected to the building,
- or whose use must be taken into account in planning.

In this sense, it is important to optimise them under the premise of sustainability.

With the EGNATON - CERT - system, tendering bodies have a tool at their disposal which:

- makes it possible to invite tenders for sustainable laboratory equipment,
- understands sustainability within the framework of the BNB/DGNB three-pillar model
- comprehensively describes and weights all award criteria,
- is transparent and neutral, and
- makes comparisons of equipment possible

2.1 Improving lab work

Laboratory buildings are workrooms that:

- generate extremely high energy consumption,
- generate very high operating costs,
- are to be regarded as part of a socio-technical system and
- fundamentally represent a hazardous workplace.

These influencing factors are intrinsically taken into account by sustainable laboratory equipment.

Users must be given the opportunity to work sustainably at the highest level, so to speak, largely without their own intervention, with the help of sustainable technologies. This not only achieves the desired

socio-political goal, but also gives users the performance-enhancing feeling that they are making an important contribution.

2.1.1 Efficiency (economical quality)

Increasing economic quality, efficiency or profitability against the background of an extremely expensive workplace¹ is legitimate and does not affect the demands for free science.

The faster the results of laboratory work are available, the more favourable the consequences for operators and the population. I.e. all planning and development measures that increase sustainability with regard to workplace equipment have positive effects on the economic efficiency of laboratory operation.

2.1.2 Ecological quality

The ecological footprint of a laboratory building - seen as a socio-technical system - is considerable. For researchers, however, it is primarily crucial that the process-related work equipment functions and produces reliable results as quickly as possible. It is therefore the task of the planners and operators to ensure that the working equipment is optimised in terms of efficiency and ecological quality.

2.1.3 Human factors

Since a laboratory is basically a hazardous workplace, the socio-cultural quality of the BNB/DGNB system is replaced at EGNATON by the umbrella term human factors. **I.e. only the safe workplace and analogously the safe equipment can be sustainable.**

This also takes into account the operator's and employer's responsibility to provide safe workplaces.

2.2. Improving the sustainability of laboratory buildings

The laboratory building as a socio-technical system requires a holistic view. Restricting sustainability criteria to the building alone without simultaneously assessing the technical equipment of the devices described in 3. is not only incomplete but of secondary importance if sustainability is to be realised as an honest concern of builders, operators and users.

2.3 Complementing building certification systems

EGNATON CERT sees itself as completing the building certification systems². This naturally makes the adoption of the certification principles and the system structure a prerequisite. It is now possible to complete the assessment result, whereby the weighting of EGNATON CERT in the BNB/DGNB system still has to be carried out.

Below are the assessment levels of EGNATON CERT analogous to BNB/DGNB:

Level	Total degree of fulfillment	Minimal degree of fulfillment
Bronze	min. 35%	-
Silver	> 50%	min. 35%
Gold	> 65%	min. 50%
Platinum	> 80%	min.65%

2.4 Assistance for procurement

In the course of operating a laboratory building, equipment is purchased at the following times or because of the following reasons:

- at the beginning
- Replacement investments due to unusability (also technical progress)

¹ In pharmacology laboratories, the total cost of a laboratory workstation is estimated to be over 250,000€/a.

² With respect to DGNB, Leeds or BREAM

- Additional investments due to capacity expansion
- Change to new fields of research (e.g. due to appointments or change of Chair)

In terms of initial investment, the laboratory equipment under consideration often falls under cost group 300 and thus into the budget of the building owner or the funding agency.

However, it also happens that such equipment is renewed or supplemented during operation, since the average time for new developments is only two years and users need the latest versions. In these cases, the budgets of the operators are strained. Therefore, it makes sense to also procure equipment with a proven sustainability level when investing in ongoing operations.

Basically, for equipment as well as for buildings, taking into account the life cycle, the costs cannot be higher than for a non-certified equipment (or building), otherwise the economic quality would not be taken into account with 22.5% of the total evaluation; in other words, a sustainable building or equipment cannot be more expensive than a non-sustainable one, because it would fail in terms of economic quality. Consequently, the economic efficiency of a piece of laboratory equipment is assessed appropriately and consensually, transparently and uniformly, and solely with the help of the LCC, which thus represents the ultimate aid in procurement, whether as a first-time, replacement or multiple procurement.

EGNATON CERT enables the use of a comprehensive evaluation system for purchasing, which, due to its complexity and its neutral auditing system, could not be set up by a single investor alone.

3. Products in focus

Initially, equipment was considered that has a significant influence on the sustainability of laboratory operation, i.e. equipment with high consumption, including of media planned and provided by the technical building equipment, e.g. electricity, water, steam, gases³. The intention is that manufacturers of this equipment will be induced to subordinate their development to design criteria that promote sustainability, following the individual profiles of the evaluation categories, in order to score more points. With the market penetration of EGNATON CERT, sustainable laboratory operation of new and existing buildings can therefore be expected soon.

3.1 Cleaning and sterilisation equipment

This group of units is characterised by very high consumption of various services and chemicals, i.e. the operating costs are considerable. In many places, the units run in continuous operation. A typical criterion of this group of units is the large amount of waste heat, which requires corresponding planning measures concerning the buildings. Interruptions in operation would mean the immediate shutdown of entire laboratories or parts of them. The performance of the products is systemically important for the safety of the users, the quality and efficiency of the work. The space requirements of these devices play a major role in floor planning, statics, supply and disposal of consumables (logistics); intelligent integration into the workflow must also be taken into account in planning. In terms of safety, they are subject to special requirements.

3.1.1 Laboratory glasswashers

Cleaning machines for laboratory glassware are indispensable and in use in large numbers. Their example illustrates the systemic difficulties. On the one hand, the load spectrum of the machines must be defined in order to obtain a test scenario that is as close to practice as possible, and on the other hand, a certain performance must be demanded. In the case of laboratory glassware washers, a clean wash ware is required, which also presupposes the definition of a standard contamination. This means that the degree of fulfilment of the requirements for the machines plays a major role and makes all the difference.

³ The system could easily be extended to other families of appliances, even in other sectors (e.g. hospitals, commercial kitchens).

3.1.2 Rack washer

Rack washers are cleaning devices used in animal husbandry, e.g. for cleaning cages and large racks. For these and the next group of tunnel washers, the AK KAB (Arbeitskreis Käfigaufbereitung) has already made very far-reaching specifications regarding their performance. EGNATON CERT has identified this functional minimum requirement as an approval prerequisite for a certification procedure.

3.1.3 Tunnel washer

These devices fulfil similar tasks as the rack washers and are also used in animal husbandry. They have high capacities and are in continuous use in many places. In order to avoid downtimes, redundant machines are often available.

This group of equipment clearly shows why EGNATON CERT does not insist on the testing or measurement of consumption by neutral test houses. Laboratory equipment is very bulky and heavy; its transport and installation are complex and expensive. Therefore, the applicants test themselves according to EGNATON specifications. The devices are usually manufactured to order and there is no time and the effort would be too high and unsustainable for shipment to test houses. A plausibility check by the auditor ensures that the information is consistent.

3.1.3 Autoclaves

The use and size of autoclaves are diverse. Therefore, the determination of the goods to be sterilised was also accompanied by repetitive discussions.

This group of devices requires a comparatively large number of servicesa for operation; as a result, measurements in the load spectrum are very complex.

3.1.4 Freezer

The large number of freezers (e.g. in biological laboratories) suggests great potential for energy savings. In molecular biology laboratories, freezers can account for up to 5% of total energy consumption. These devices are also significant when it comes to their sustainable operation by users (freezer management).

3.1.5 Lab Furniture

Laboratory furniture is at the end of EGNATON CERT's work list because no energy or media are consumed during operation. In this respect, laboratory facilities are comparable to building materials. However, they must also be taken into account when considering the LCA⁴ of the entire building.

3.1.6 Fume Cupboards

Fume cupboards are, on the one hand, an important part of safety installations and, on the other hand, are to be regarded as the final device of laboratory ventilation. If their total air consumption is below the air requirement of the room, a separate room extract air must be provided. If it is higher, as for example in a seminar room with many fume cupboards, the lowest possible air consumption for the energy consumption of the building plays a major role with the help of design optimisation of the fume cupboard.

Approximately 40 % of the building's energy consumption is attributed to laboratory ventilation. This means an enormous cost-saving potential, the decisive influence on laboratory user safety, but also their well-being.

EGNATON CERT requires as a prerequisite for approval conformity with DIN EN 14175 or the performance of the tests described therein - and further tests, e.g. the service life of the sashes or the break-out behaviour under thermal loads.

With the help of the test set-up described in DIN EN, the extent of break-outs is measured, for example. The sash gets the highest score in this prioritised profile if less than 0.05 ppm is measured. Such a result

⁴ In all appliance families, applicants receive points when submitting EPDs

can only be achieved with a higher air volume – in conjunction with flow-technological measures - , as a result of which fewer points are awarded in the corresponding fact sheet, but this does not have the same negative effect; i.e. the resulting safety plus is weighted higher.

3.4 Laboratory logistics

Laboratory relocations are very often underestimated and neglected, although the impact on sustainability is considerable and must therefore be attributed to the laboratory. EGNATON has therefore decided to subject laboratory moves or their providers to a sustainability assessment. The use of vehicles, their optimisation, the use of qualified personnel trained in handling hazardous materials, packaging materials and transport containers requires planning effort and experience. Laboratory relocation is a complex service provided by specialised companies and is subject to the same regulations for handling hazardous substances as laboratory operations.

Sustainability criteria are implemented systemically by EGNATON CERT, even though products are not involved.

4. System

The basic structure of EGNATON CERT corresponds to DGNB/BNB and is shown below. The sub-items do not correspond to the profiles and are only intended to pass on the contents of the categories:

1. economic quality (22.5%)

- a. LCC: Invest. Consumption costs, maintenance costs, personnel costs
- b. Spare parts availability and guaranteed spare parts delivery time

2. ecological quality (22.5%)

- a. Energy consumption: electricity, steam, heat, gas, media
- b. Extract air volume
- c. Cooling water quantity and temperature level
- d. Quantity of detergents and chemicals consumed
- e. Other service consumption
- f. Space consumption/utilised volume and power
- g. Heat recovery efficiency
- h. Heat load to space
- i. Ecological material use, EPD submission
- j. Recyclability
- k. Take-back and recycling

3. human factors (22.5%)

- a. Perception of safety facilities
- b. Operability, handling, haptics
- c. Height adjustability and operating height
- d. Suitability for disabled persons
- e. User guidance
- f. Operating instructions

g. Stress factors - noise, heat, etc.

h. Surface temperature (radiant heat)

4. technical quality (16.25%)

a. Performance - minimum requirements

b. Maintenance accessibility

c. Installation quality

d. Cleanability, disinfectability, freedom from dead space

e. Modularity

f. Up date capability

g. Diagnostics, monitoring, interfaces

h. Service infrastructure

5. process quality (16.25%)

a. ISO 9001 certification

b. ISO 14001 certification

c. Own R & D

d. Training on sustainability and sustainability reporting

e. Social standards

4.1 Special features

An important distinguishing feature between BNBB/DGNB and EGNATON CERT are the objects considered. This results in features that do not make sense in the other system.

The main difference is, on the one hand, the individual building at a known location and, on the other hand, devices in large numbers at many unknown locations. This means that local parameters such as energy prices, personnel costs, climate conditions, etc. must be standardised in order to enable transparent evaluations of equipment from different manufacturers.

In DGNB/BNB, the sustainable planning process (of the building) plays an important role with 16.25 %. EGNATON considers the manufacturing process under the category of process quality. Features such as the fulfilment of social standards are also included here.

The EGNATON CERT certificate is valid for a period of 5 years.

4.1.1 Typ test

The EGNATON CERT test is the type test of a specific version of a device family and requires the consensual cooperation of the market participants, i.e. manufacturers, users and planners, when compiling the device family-dependent profiles. This avoids that:

- Unique selling propositions are not included in the profiles,
- requirements of individual groups of market participants are not taken into account,
- the evaluation of the profiles is not accepted by market participants, and
- some features are not taken into account.

In contrast to norms or standards, EGNATON CERT evaluates the execution and overall performance of the device and the manufacturer, i.e. the degree of fulfilment is decisive for the final score. This requires agreement in the EGNATON working groups on what is necessary and desirable.

4.1.2 Load spectrum

The load spectrum is the reference scenario of use to which every measurement and statement refers.

Defining the load spectrum or the load changes is difficult, especially for laboratory equipment that is used in a working environment that could not be more different. Research is inherently innovative, so the work equipment is also subject to continuously changing requirements. Furthermore, laboratory equipment is constantly being developed further.

The load spectrum of a laboratory device is completely non-uniform, but should be as close to reality as possible in the context of supplying reliable consumption data in order to be recognised by all market participants in the first place.

In all unit families, the load spectrum was carefully created by the corresponding experts. Usage data, such as daily or annual working hours, are the same for all unit families.

In some cases, load spectra, e.g. for rack and tunnel washers, are already available in other certifications or standards and could be adopted.

4.1.3 Location

With the exception of individual certifications, the location of the device is unknown at the time of the audit. Should the end customer require an adapted certificate for his individual appliance, an assessment can be made with the known local data.

The country in which the installation site is located plays a certain role, insofar as the certificate is only valid for the countries to be named by the applicant. For these, the manufacturer must specify maintenance structures and guarantee times within which a spare part can be delivered to the installation site.

4.1.4 Minimum requirements

For laboratory equipment, EGNATON CERT applies minimum requirements, such as function, fulfilment of safety standards or conformity to standards, if relevant standards and codes are available. The performance of the required tests is also mandatory. In the course of the certification procedure, the applicant must therefore first check whether it meets the minimum requirements, otherwise an application would be obsolete. The minimum requirements are formulated for all device families in the fact sheet 4a.

The results of the tests - always related to the load spectrum - are evaluated in the different fact sheets.

4.1.5 General requirements for the LCC

The evaluation of life cycle costs is an essential character of the system. This means that in tenders for EGNATON CERT certified equipment, the economic efficiency of the product is calculated and weighted according to valid standards of an LCC calculation with the BNB/DGNB method. Thus EGNATON CERT meets the widespread demand to use not only the price but also the life cycle costs as a characteristic of economic efficiency when evaluating offers⁵.

The reference value in LCC is the service life. Its reliable determination is critical and almost impossible. Therefore, a fiscal useful life, i.e. the depreciation period, is calculated depending on the equipment.

For reasons of equal treatment, the prices for resources and the load spectrum are kept constant and determined by EGNATON alone regardless of the installation site. The LCC is calculated by EGNATON auditors. The data are protected.

⁵ § 97 GWB, §2 und §43 Abs. 4 UVgO, §59 VGV (German laws)

If a customer needs the LCC with his own local data (also possibly the lifetime), he can request this for a fee. However, the individual LCC data has no influence on the points awarded for certification.

4.1.6 Safety standards

The change of the category socio-cultural quality in the BNB/DGNB system to the category human factors is intended to express the special importance of user safety. Laboratory equipment must be particularly safe. Therefore, special importance is attached to this circumstance when awarding points. For all equipment families, the applicant must submit a risk assessment or make it available for inspection by the auditors.

4.2 Characters

Basically, an attempt was made to create profiles with quantitative measurement parameters.

The auditor's test is primarily a plausibility test that ensures the consistency of the information (e.g. also 2nd law of thermodynamics or similar).

A maximum of 30 credit points is awarded for each profile.

The English version always applies.

Example:

Character no. 2b, category 2 Ecological quality, equipment family Autoclaves

Autoclaves	Version:2020/2 01_28_2020	Character serial number: 2b	Page 1/1
Category: 2 Ecological Quality		Character: Consumables - Water	
Rating qualitative			
Rating quantitative X			
<p>Objective: It is the goal to reduce water consumption</p> <p>Water consumables used by lab autoclaves: WDC/Water Demineralized Cold, Water Nonpotable Cold/WNC</p>			

Method: Measuring with calibrated measuring units or calculation by manufacturer. Plausibility check by third party test house. In house test by third party test house if not plausible.

Rating:

WDC < x l = 7 credit points

WDC < x l = 5 credit points

WDC < x l = 3 credit points

WNC < x l = 7 credit points

WNC < x l = 5 credit points

WNC < x l = 3 credit points

Assessment:

15% of the category is equivalent 3,38% of the total assessment

Rating

In the rating, the possible credit points corresponding to the water consumption are mentioned. In this example case, the final allocation of points is only determined after the so-called pilot phase, when the measured values from at least two tests are available.

Assessment

The weight of the assessment from this profile is 5.63 % of the total assessment.

The example clearly shows that manufacturers can aim for desired certification levels in the development of new appliances with the help of targets, e.g. with a certain target consumption of "Water non potable".

5. Administrative requirements

In developing the characters, EGNATON followed the recommendations of the Competence Centre for Sustainable Procurement and had the conformity of the procedure with §34 VGV determined by a lawyer.

The working steps for the preparation of the certification criteria take place as indicated in the following table:

Step	responsibility	Tool	Aim
1st Step	General work group, TV	Meetings	General structure
Decision	Technical committee (TC)	Meetings	Definition, devices, specification
Invitation	Management, chairman,	Web Site, personally, hints	Groupformation
Equipment family, characters	Management, chairman	Meetings	Strategy, motivation
1st Meeting	Management	Election of chairman	Content
2nd Meeting	Management, chairman	Distribution of tasks, talks	Content
Pilotphase	Management, applicant, group	Measurements, tests	Contracts, results
Certification	Management, auditors	characters	certificate
Up Date	Management, group	Meetings	Up date of systema

5.1 Application

Any manufacturer of laboratory equipment for which an EGNATON evaluation system is available is allowed to apply for a certificate. Manufacturers of laboratory equipment for which there is not yet an EGNATON evaluation system may submit a request for the development of evaluation criteria. EGNATON will then decide on this, provided that a representative working group of experts and other manufacturers can be found for this purpose.

The application for certification of a device triggers the conclusion of a certification contract.

The applicant receives the documents from EGNATON and carries out the measurements. EGNATON reserves the right to send a representative to the test runs entitled to apply for certification.

The applicant completes the necessary declarations of conformity and a questionnaire. The applicant provides the necessary documents for the individual characters (e.g. proof and organisation of the warehousing management), certificates (e.g. for the environmental management system) as well as declarations of conformity and fills out the questionnaire. The questionnaire also contains the requirements from the individual characters, which the applicant also enters and which are checked by the auditor. The questionnaire is part of the EGNATON CERT certification document.

6. Release

For obvious reasons, the applicants have particular economic interests in participating in the certification process. They expect better sales opportunities for certified equipment and consideration of certificates in public and private tenders according to European procurement procedures.

There is therefore an expectation among EGNATON members and beyond to motivate planners, architects, public and private builders and investors to use EGNATON CERT in the context of sustainable procurement and to put certified equipment out to tender.

Public tenders and procurement must follow the regulations from § 97 GWB, §2 and §43 para. 4 UVgO, §59 VGV and accordingly recognise life cycle calculations as evaluation criteria. In this respect:

- a standardised recording of consumption costs and cost types
- and a standardised calculation for the calculation of the LCC,
- as well as a recognised structure of sustainability assessment,

such as those used by EGNATON CERT as a basis, are without alternative.

Furthermore, it is possible to retrieve limit values from EGNATON CERT or unassessed measurement results from manufacturers and use them for planning purposes.

In this respect, the characteristic consumption data described by EGNATON CERT, as well as their measurement methods, represent an alternative requirement that must be fulfilled by manufacturers in principle if at least two suppliers cannot present a complete EGNATON CERT certificate. This at least enables a realistic comparison of devices from different manufacturers and , furthermore , allows to determine the CO₂ consumption during the life span.

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