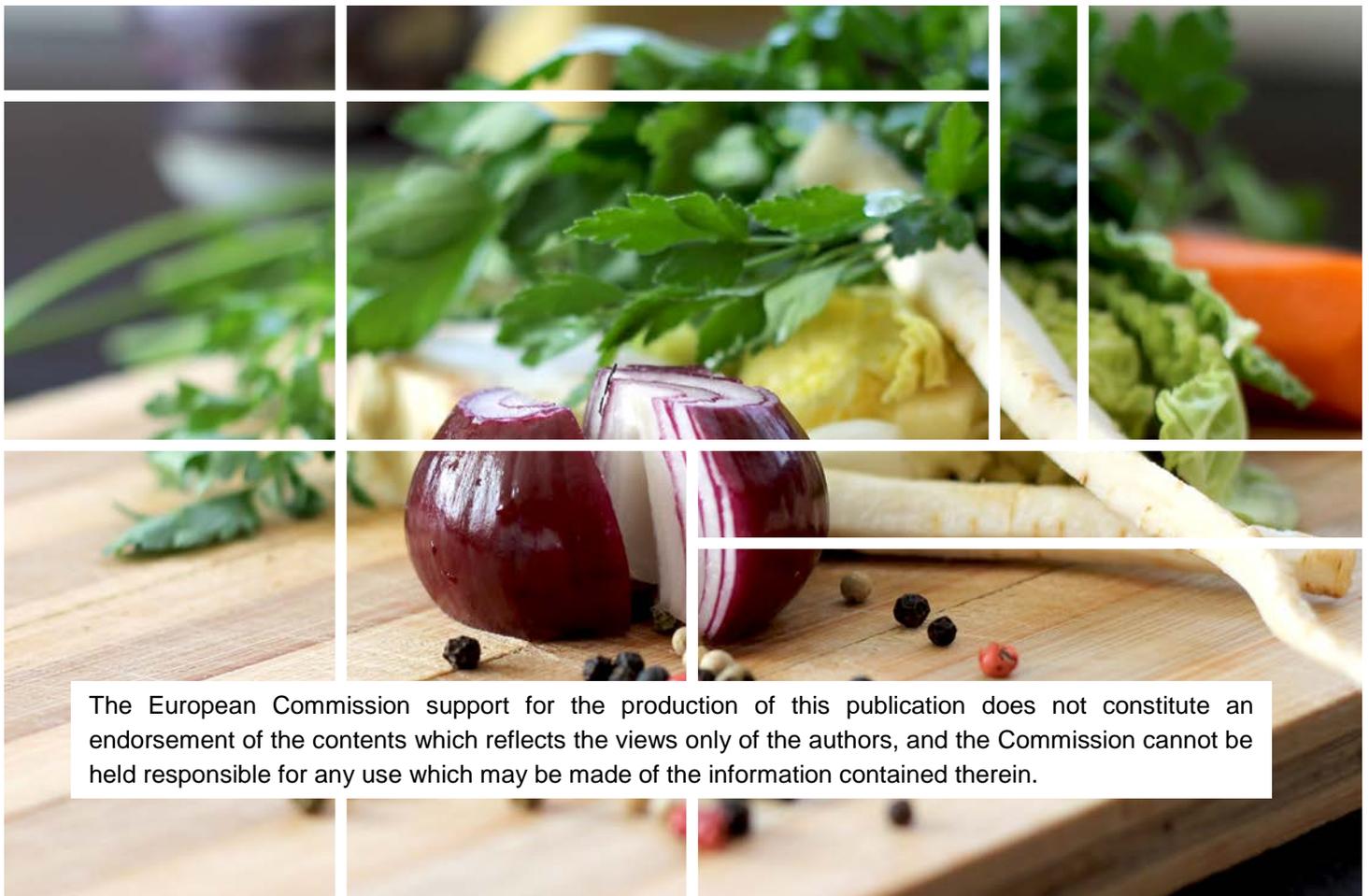




# PROJEKT REKUK

Vocation Training for Chefs and Executive Chefs of Large-Scale Kitchens in Sustainable Food and Kitchen Management

## Module Energy Checklist



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# 1 Check List Module Energy

The following checklist is closely related to the "Guidelines for protecting the climate and reducing costs" [HKI Industrieverband Haus- Heiz- und Küchentechnik e.V., 2016].

Through systematic energy management, the company's energy flows are continuously monitored and improved.

This leads to long-term and sustainable:

- Continuous improvement of energy efficiency
- Reduction of energy costs
- Improvement of profitability
- Security of energy supply
- Sustainable reduction of CO2 emissions
- Awareness of employees
- Increased data transparency

## 1.1 Thermal Kitchen Appliances:

Calcification of equipment deteriorates the heat transmission, prolongs heating times and cooking times, leads to energy loss and affects the equipment life.

- Descale the equipment if necessary.
- Prevent calcification by water pre-treatment.

## 1.2 Cookers:

- Prefer devices which detect an item on their surface and turn off automatically when not in use (available for induction cookers and specially equipped glass ceramic cooking zones).
- For cooking, use water from the hot water reservoir instead of cold water.
- Small amounts of water can also be heated with a water heater instead of the cooker (faster and more energy efficient).
- Ensure that the cookware used has a level floor (uneven floor leads to an energy consumption of up to 30%).
- Use the lid (without cooking the lid consumes about three times as much energy).

### 1.2.1 Induction cookers:

- Prefer induction cookers. (fine regulation of the temperature possible; achieves three times faster the operating temperature as glass ceramic cookers; direct energy transfer into the bottom of the cookware).
- Voraussetzung für eine optimale Funktionsweise ist Kochgeschirr mit einer durchgehenden und ungelochten Stahleinlage, die den gesamten Boden bedeckt.

### 1.2.2 Cookers with glass ceramic cooking zones:

- Ensure that cookware fits completely the cooking surface.

### 1.2.3 Cookers with cast hotplates:

- Switch on the appliance only when cookware already placed on the hotplate.

### 1.2.4 Cookers with gas hobs:

- Direct heat is supplied by the gas flame. This is available instantly at full performance. The food gets hot quickly. The burner control is infinitely variable. It must be considered that combustion products enter the exhaust air. The heat source can be switched off quickly. Compared to the glass ceramic cooking field, the reaction time is significantly faster.
- Ensure that cookware fits completely the cooking surface.

### 1.2.5 Incandescent plate heaters and large cooking zones:

- In the case of large cooking zones and incandescent plate heaters, as a rule, a favorable ratio between the heated surface and cooking surface is not possible, and an energy-intensive standby operation is necessary because of the inertia. Therefore, the energy efficiency is significantly worse than of other cookers.
- Opt for other appliances.
- Opt for independent heating zone settings and temperature control if available.

### 1.2.6 Baking ovens:

- Use the heating phase to defrost or, if possible, dispense with cold food.
- Keep the door closed during the baking process.
- Use residual heat by switching off the appliance before the end of the baking process.
- Provide viewing windows with heat-reflecting coating or double-glazing.

### 1.2.7 Micro-wave appliances:

- Preferably used to regenerate small quantities of cooked food (very efficient).

### 1.2.8 Hot-air dampers:

Thanks to their high-energy efficiency and the different cooking methods, state-of-the-art hot-air dampers have a fundamental advantage to the conventional cooking equipment, such as cookers, hot-air ovens, tippers or boilers in terms of energy consumption. By replacing other individual units, the hot air damper also saves space, which has a positive impact on

investment and operating costs. The energy is mostly used exclusively for food preparation. Thus, air-conditioning systems (extractor hoods, air-conditioning systems) can be dimensioned considerably smaller. The investment and operating costs for room air cooling are much lower.

- Adjust the menu, so a number of dishes can be cooked together, and the appliance can be fully charged.
- Preference is given to the use of appliances with an appropriate cooking process, since they respectively determine the ideal cooking process for the current state and optimise it even during the ongoing process.
- Use the programmability of the hot-air dampers to cook food overnight (the price advantage of the night tariff used for this saves additional energy costs).
- Prevent calcification by water treatment or integrated system cleaning.
- Adjust the device size to the requirements, when purchasing, check whether two smaller devices would be more reasonable, as they are much more flexible.
- Adjusting the cookware to the food saves energy.

### 1.2.9 Multifunctional contact cooking appliances - combination of tipping pan, (pressure) cooking vessel and fryer

- Opt for devices with the most accurate, uniform temperature regulation possible, as they ensure only the required heating.
- Use an insulated lid during the cooking process.
- When purchasing, opt for cooking containers easy to clean.
- Opt for multifunctional cooking appliances equipped with innovative technology and can be operated or programmed automatically, with a more favorable night tariff.

### 1.2.10 Fryers

- When purchasing, opt for fryers which heat the fat by direct heating in the fat basin.
- When purchasing, pay attention to the existence of a cold zone under the heating elements, as it prolongs the life of the fat.
- Cover the pool during operating breaks and lower the temperature (automatically).

### 1.2.11 Cauldrons

- Use double-walled covers.
- Prefer systems with blower burner technology.
- Generate the steam required for the cooking process separately from the pressure vessel.

### 1.2.12 Salamanders (ovens with strong top heat):

- Prefer appliances with plate detection and zone switching.

### 1.2.13 Grills and griddles

- Stainless steel, steel, cast or hard chrome plates (grill plates with anti-radiation coating) are heated over a large area. This results in high energy consumption due to heat radiation and standby.
- Prefer hard chrome plating or stainless steel surfaces.
- Clean regularly.

### 1.2.14 Steamers

- If possible, cook under pressure (the cooking times are thereby shortened with relatively low energy consumption and the energy output to the room is minimised).

### 1.2.15 Bain-Marie

- Avoid open surfaces during operation.
- Cover also non-used surfaces with a flat container.

### 1.2.16 Plate dispenser

- Adjust the temperature to the actual need.
- Ensure that the device is adequately insulated.

### 1.2.17 Food serving trolley

- Fill the food serving trolley with hot and not cold water.
- Determine the warm-up phase required when using hot water by switching on the heat pump daily five minutes later and empirically establish the time at which the trolley must be switched on so that it reaches the desired temperature on time
- Use consequently cover lids (this increases the energy efficiency and improves the ambient air in the kitchen, as less water steam is released).
- Place the food containers evenly on the surface and Speisentransportbehälter eben auf der appliance lid and cover them, too.

## 1.3 Refrigeration Equipment

- When purchasing a new refrigerator, take into account energy consumption, good thermal insulation and a powerful chiller. Consider investment and operating costs together.



- Set the temperature as low as necessary and check it regularly. For cooling temperatures, which are set too low, for 1 ° C, approx. 4-6% extra energy is required.
- Open refrigerators as briefly and rarely as possible.
- Install advising signs, install – if needed – also self-locking doors.
- Defrost regularly and consider the parameters set by the producer.
- Employ refrigerators with glass doors only for self-service refrigerators with drinks for guests, otherwise use refrigerators with insulated full doors.
- Fill frozen chillers only to the stacking mark.
- Freezer chillers are better than freezers in terms of energy consumption.
- If refrigerators, cold rooms and freezers are frequently opened, use transparent doors, strip curtains or air curtain systems.
- Never adjust yourself the ventilation openings (grilles).
- Keep the ventilation openings, cooling ribs and condenser clean. Impurities can prevent the heat dissipation and lead to a failure of the device.
- Use a hand sweeper, then use a vacuum cleaner to remove coarse soiling. Avoid pressurised air.
- Clean the evaporator and the condensers at least twice a year; refrigerate the appliances in greasy and fogged kitchen zones every two to three months.
- Only refrigerated and correctly packaged food should be added to the refrigerator. Thus, frost formation resulting in additional energy consumption is avoided.
- Ensure a good space utilisation, avoid partially-filled refrigerators.
- Outside the interior of refrigerators and freezers and separated in the machine compartment, can achieve up to 20% more utility space. Furthermore, when the doors are opened, the incoming hot air does not impact directly the evaporator surfaces (resulting in lower ice formation, shorter or lower defrosting times and lower power consumption).
- Install a control switch to prevent the evaporator fans from running when the doors are opened, and additional warm air from the kitchens is sucked in by the evaporator.
- Food should be granted according to a certain system. Labelling helps to keep the time when the refrigerators are open.
- Remove unnecessary packaging and empty containers.
- Disconnect unnecessary equipment. After switching off, clean the interior and leave the door open to prevent mould.
- If large quantities of food are taken from a freezer or a freezer compartment, they defrost in the refrigerator or in the refrigerator compartment, thus saving cold energy.
- If possible, open refrigerated counters should be closed with glazed doors or covered with insulating material. Turn off the refrigeration system, clean the interior, and leave the door open to prevent mould.
- Reduce lighting to a minimum, as the heat output increases the cold demand. A door switch that turns on after opening the door (and can be switched off manually at rush times) and LED lights are ideal.
- Refrigerators should be away from thermal equipment or other sources of heat.
- Avoid high dust loads near the equipment.
- Ensure that the supply air is as cool as possible.





- For centrally cooled units, separate condensers are recommended, which can be located on the shady north side of the building, for example. With generous dimensioning, additional cooling of the refrigerant after leaving the condenser is achieved.
- If the units are located in the basement or in an extension, ventilation elements can provide a necessary air supply. Place the ventilation elements in a place which is as cool as possible and low in flow (low room temperature). Ventilation elements are e.g. ventilation slots, slat windows, door slits or electric fans with low power.
- Door seals should be as wide as possible. Grooved PVC magnetic gaskets prevent heat bridges and condensation on the door frames and provide an optimal seal against heat penetration.
- Replace door linings if they are brittle or have cracks.
- If possible, use the waste heat from the cooling units. For example, for preheating hot water use a heat exchanger.
- Since July 2016 there has been a uniform label for industrial refrigerators and freezers, which allows a comparison of the net capacity and the climatic conditions to be able to select the optimum device for the particular application.

## 1.4 Flushing Devices

- Purchase of a new flushing device must take account of the degree of utilization, operational requirements, number, type and turnover frequency of the parts to be washed, type of return of the washing items, planned machine rinsing time and capacity reserve. Also pay attention to energy values, water consumption and standby consumption values and look at investment and operating costs together.
- If the flushing operation is only rare, fresh water appliances are preferred because they do not have standby consumptions and only a rough pre-clearing of the dishes is required (saves water and energy).
- If possible, connect devices to the central hot water supply. Without a hot water connection the appliance requires a higher connection capacity since an electric heating system must heat the cold water from 10 ° C to a purge temperature of 60 ° C.
- Do not excessively lower the room temperature due to the supply air condition (too low a room temperature results in an increased energy consumption.) Too high temperatures lead to an increased ventilation energy expenditure.
- Avoid calcification by water treatment or integrated system cleaning
- Optimize the equipment and take it fully filled.
- Pre-clean with a water temperature of max. 35 ° C. Manual pre-cleaning helps to avoid multiple flushing.
- Select the wash program according to the degree of soiling of the dishes. Choose low-cost dishes.
- Always keep the doors of dishwashers, especially of tank cleaners, closed and open only briefly to avoid loss of energy and not allow the food to be allowed to dry.



- Adjust the detergent dosage optimally, observe the dosage recommendation of the manufacturer. If the water is low, reduce the amount of detergent.
- Reduce the rinse temperatures and reduce the rinse quantity. With a reduction of approx. 5 K, 5-10% energy can be saved. The reduction of the final rinse quantity for tank rinsers also saves energy in addition to water and chemicals.
- Integrated waste water heat recovery. Built-in heat pumps remove the exhaust air and the heat of the room which is used for tank heating.
- At the moment, no distinction is made between energy efficiency classes for industrial washing machines, as is required for domestic dishwashers.

## 1.5 Commercial Hot Drink Appliances

### 1.5.1 Coffee machines:

- Opt for appliances dimensioned according to demand so that neither over- or under-capacities are created.
- Keep in readiness only if necessary.
- Avoid calcification by water treatment.
- Avoid unnecessary heat losses by using devices with energy saving mode or time controlled switching devices.

### 1.5.2 Milk freezer

- Use pre-cooled milk.

### 1.5.3 Cup warmer

- Use residual heat and switch off half an hour before operation.
- Use time-controlled switching devices

## 1.6 Ventilation Systems

- Switch off ventilation systems that are not required at the moment/after operation.
- When the operating times are variable, divide the ventilation and ventilation system into individual zones in order to allow for a reduction in the volume flow as required.
- Adjust the operating times of the ventilation and the ventilation stages to the actual requirements.
- Regularly check and adjust the time programme, clock and operation time.
- If less air is required in the long term, let the fan run more slowly than the air volume throttle.
- Adjust the belt pulley diameter to the fan drive (costs will arise but noise will be reduced and energy will be saved).
- Adjust the required air quantity via the valve speed with a frequency converter or directly with EC fans (higher energy savings than with control via throttle caps possible).

- If possible, use control systems that recognise active sources of emissions in kitchens and adjust the air quantity independently depending on temperature, humidity and other released particles (energy savings above 40% can be achieved compared to a continuous operation with a nominal number).
- Through heat recovery by heat exchanger, 50 to 70% of the heat energy can be recovered. Use for hot water.
- Air at night and use humidifiers.
- Increase the pipe power cross section (reduces the pressure loss, thus the required fan power).
- In larger ventilation devices, replace belt-driven fans with ventilator walls with a modular arrangement of several small EC fans.
- Filters, heat exchangers, ventilation grilles and air ducts should be serviced regularly - at least twice a year or at least the condition should be checked.

## 1.7 Lighting

- Equip spaces and areas, which are frequently frequented only for a short period of time (cooling rooms and storage rooms, employee toilet facilities), with an automatic lighting circuit - the switching off is worthwhile energetically after only one second.
- In areas with daylight, turn off the artificial light in the morning.
- Paint spaces with dark ceilings and walls in a light colour – this improves the effect of artificial light.
- Ensure that the lighting is divided by areas and can be switched individually.
- Clean dirty lamps and lights.
- Place lighting as close as possible to the workplace.
- If the light is too strong, remove or replace the lamps/bulbs.

## 1.8 Leistungsoptimierung

*In the case of a power tariff with power measurement, the annual or monthly peak power has a significant share of the electricity costs. In the billing one speaks here of the power price specified in €/kW.*

*The power supply uses a remotely readable counter to measure 1/4 average values and calculate the consumption in kWh and the highest peak in kW, depending on the tariff. It is thus essential to avoid unnecessary power peaks by simultaneous employing significant consumers, e.g. dishwasher, hot air driers and laundry kitchens. This reduces the peak load and therefore also the electricity costs.*

- Set the operating times for large kitchen appliances, thus preventing the simultaneous switching-on of significant consumers.
- Install intelligent load management system. Nearly every large kitchen equipment manufacturer equips its appliances with an optimisation interface according to DIN 18875 - for the larger part, but this is not possible with all large kitchens, so this should be taken into account when planning.

### **Advantages:**



- Hygiene and food safety are guaranteed.
- No special knowledge is required
- No priority list for the switching sequence of the devices, the system determines as required.
- Induction cookers can be included in newer systems

## 1.9 Energy management

- Energy saving options that are only possible by changing the behaviour without an investment are definitely worthwhile (e.g. switching off equipment and machines during operating breaks).
- Install workgroups with employees from different areas and coordinate energy issues in a wide range of business areas.
- Involve proposals by employees for energy saving to contribute to raising awareness.
- Monitor consumption and influencing parameters, as a basis for energy management
  - Compilation of information on the organisation and technical equipment of the establishment.
  - Analyses of the recorded consumption data with corresponding known energy indicators in order to establish evaluation criteria for consumption.
  - Continuous consumption and monitoring based on the developed assessment criteria.

## 1.10 Measures towards a long-term Reduction of Energy Costs

- For performance-dependent electricity contracts, it is useful to have an analysis of the electrical load profile developed by the energy supplier. In most cases, this is done free of charge or for a small fee. A load analysis allows the identification of short-term electrical power peaks by size and time. It also illustrates the current consumption outside the operating times (basic load). This can also be used to detect electrical loads which could be switched off.
- Compare prices of energy suppliers. Every company has a free choice.
- Consider energy-saving contracting, a contractual agreement for the pre-financing of energy-saving measures between the energy user and the energy provider. The task spectrum of energy contracting covers the planning and construction of energy generation and distribution systems, measurement and control systems, financing and operation of the plants as well as the delivery and billing of final finished products (heat, cold, electricity, compressed air). Advantages for the energy user are the saving of the pre-financing of partly considerable investments, the introduced competence for the efficient use of energy. It is a good possibility if the energy user is missing capital for investments and know-how.
- An automatic load management system or load shedding system ensures that a given consumption is exactly adhered to within a measuring period - as a rule 15 minutes - and is not exceeded in any case and leads to a reduction in load peaks and energy costs but has no effect on actual energy consumption.



## 1.11 Measures towards Improved Energy Use

### 1.11.1 Waste Heat Recovery

- Use waste heat, thus reducing the consumption of primary energy e.g. for freezing, for the pre-heating of air, for heat recovery from thermal exhaust air purification processes, for freezing and for electricity co-generation.

### 1.11.2 Electricity Co-generation

- Simultaneous generation and use of electricity and heat. Thus, the fuel used is more effectively utilised than in single generation processes. This topic complex is to be assessed with the building technology.

## Literatur

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