

Energy Efficiency of Refrigerating Systems – Information No. 6

The Annual Refrigeration Check: Tips for Energy-Saving Operation of Your Refrigerating System



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1 Checklist for the operator

Site of system

Person responsible

Date

Note

The refrigeration check is no substitute for the statutory requirements for the operation of a refrigerating system, e.g. the Betriebssicherheitsverordnung (Germany), EU F-Gas Regulation, EnEV.

2 The refrigeration check

How to get the highest feasible savings from your refrigerating system with minimal effort!

Even well-run businesses often use too much energy for their refrigerating systems.

It is worth doing something about this.

After all, saving energy means reducing operating costs. Seize the opportunity!

The refrigeration check helps you to optimize your refrigerating system with minimal effort.

The refrigeration check shows you selected measures for optimizing the refrigerating system that have proved themselves in practice and pay off. In the checklist, the stars represent the energy-saving potential – how many kWh a measure can save (**** high saving potential, * low saving potential). This assessment is intended to help you implement appropriate measures.

Consult refrigeration specialists and seek their advice

Many measures can be taken by a technically experienced person from your company. Make sure to consult your specialist refrigeration company, too. They should implement the measures that you cannot take yourself, e.g. handling refrigerants.

Conduct the refrigeration check once a year. It covers the following fields:

1. Reducing the refrigeration demand

- Cold room check
- Refrigerated cabinet check (e.g. display cabinets, chest-type freezers, cabinets)
- Air conditioning check

2. Efficient refrigeration

- Component check

3. Discharging waste heat efficiently

- Waste heat check

How to use the refrigeration check

- The next time you contact your specialist refrigeration company (e.g. for maintenance), discuss these checklists.
- Determine a day on which you will conduct the annual refrigeration check.
- Go through the refrigeration checklists point by point. You can tick off the points that have been checked and record any need for action found.

3 Reducing the refrigeration demand

3.1 Cold room check

Cold room no.:

What you need to check	Potential	Checked	Need for action/measures	To be completed by	Comments
<p>1. Check doors/gates</p> <p>Check whether the doors close tightly. If rubber seals are damaged or magnetic strips incomplete or ripped off, have them replaced.</p>	***	<ul style="list-style-type: none"> In-house Specialist refrigeration company 	<ul style="list-style-type: none"> Replace rubber seals Replace magnetic strips Readjust doors/gates 		
<p>2. Check lights</p> <p>Do staff consistently turn out the lights? If not, instruct them to do so.</p> <p>Check whether it is possible to retrofit a movement sensor or LED lighting. Note that it must still be possible for the refrigeration technician to turn on the light permanently using a switch (safety).</p>	***	<ul style="list-style-type: none"> In-house Specialist refrigeration company 	<ul style="list-style-type: none"> Instruct staff Retrofit contact switch/movement sensor Retrofit LED lighting 		
<p>3. Clean cooler</p> <p>Check how polluted the cooler is and clean if necessary.</p> <p>> Guideline with Measures for Optimizing Refrigerating Systems</p>	***	<ul style="list-style-type: none"> In-house Specialist refrigeration company or specialist company 	<ul style="list-style-type: none"> Clean 		
<p>4. Check cooler frosting/icing</p> <p>Check whether there is too much frost/ice on the cooler plate fins.</p>	****	<ul style="list-style-type: none"> Specialist refrigeration company 	<ul style="list-style-type: none"> Conduct forced defrost Adapt defrost cycle 		
<p>5. Check target, actual and evaporation temperature</p>	****	<ul style="list-style-type: none"> Specialist refrigeration company 	<ul style="list-style-type: none"> In case of deviations, determine causes e.g. lack of refrigerant, incorrect function of expansion valve 		

Optimizing refrigeration in production processes

Even apparently proven processes can hold potential for optimization, e.g. if a change in the process means that only air at -6°C is now needed instead of -9°C originally. That is why it pays off to check the processes regularly and optimize the refrigeration. Energy brought into the cold room unnecessarily, such as unnecessary defrosting and other heat sources, also need to be discharged as refrigeration. As the operator, you pay for this twice.

- Check whether individual cold rooms are still needed.
Switch off unused rooms with $>0^{\circ}\text{C}$ temperature and increase the temperature of freezer rooms to -5°C .
- Set the temperature as high as possible and as low as necessary.
Every $^{\circ}\text{C}$ of excessively low temperature increases energy consumption by up to 5%.
- Check the temperature differences on the heat exchangers.
- Check whether the cooler is able to suck in and blow out the air freely.

3.2 Refrigerated cabinet check (e.g. display cabinets, chest-type freezers, cabinets)

Refrigerated cabinet no.:

What you need to check	Potential	Checked	Need for action/measures	To be completed by	Comments
1. Check doors Check whether the doors close tightly. If rubber seals are damaged or magnetic strips incomplete or ripped off, have them replaced.	**	<ul style="list-style-type: none"> In-house Specialist refrigeration company 	<ul style="list-style-type: none"> Replace rubber seals Replace magnetic strips 		
2. Check outlets of ventilation system Check whether the outlets in the ventilation system are set correctly: they need to be set so that they do not blow feed air directly into the refrigerated cabinet.	****	<ul style="list-style-type: none"> In-house Specialist refrigeration company 	<ul style="list-style-type: none"> Realign ventilation outlets Have air flows analyzed using smoke test Have position and air volume flow checked 		
3. Check plug-in type refrigerated cabinets Ensure that the plug-in type refrigerated cabinets (e.g. integral promotional chest freezers) are set up in such a way that no warm exhaust air from other devices is sucked in.	***	<ul style="list-style-type: none"> In-house Specialist refrigeration company 	<ul style="list-style-type: none"> Rotate or reposition cabinets 		
4. Clean condenser Check how polluted the condenser is and clean if necessary. > Guideline with Measures for Optimizing Refrigerating Systems	****	<ul style="list-style-type: none"> In-house Specialist refrigeration company 	<ul style="list-style-type: none"> Clean condenser 		
5. Clean evaporator (cooler) Check how polluted the cooler is and clean if necessary. > Guideline with Measures for Optimizing Refrigerating Systems	***	<ul style="list-style-type: none"> In-house Specialist refrigeration company 	<ul style="list-style-type: none"> Clean evaporator 		

Do the refrigerated cabinets have roller covers or doors? Do all chest type frozen food storage cabinet have lids?

The refrigerated cabinets and chest type frozen food storage cabinet should always be closed overnight and over the weekend. This minimizes refrigeration loss and noticeably reduces energy consumption. Check whether the refrigerated cabinets have night roller covers or doors. Chest type freezers without lids should be retrofitted with them.

3.3 Air conditioning check

What you need to check	Potential	Checked	Need for action/measures	To be completed by	Comments
<p>1. Check set values for cold water temperature</p> <p>Set the refrigeration curve on the air conditioning control to orient itself on different outside temperatures.</p>	****	<ul style="list-style-type: none"> Specialist refrigeration company 	<ul style="list-style-type: none"> Reset refrigeration curve Retrofit a set value specification that depends on the outside temperature, if applicable 		
<p>2. Check operating times</p> <p>Check whether the operating times of the refrigerating system and the usage times of the building are coordinated (day, night, weekend, public holiday and vacation operation)</p>	****	<ul style="list-style-type: none"> In-house Specialist refrigeration company 	<ul style="list-style-type: none"> Adjust operating times 		
<p>3. Check the air conditioning release value</p> <p>Check the outside temperature value at which the refrigerating system is released and set it as high as possible. > Guideline with Measures for Optimizing Refrigerating Systems</p>	****	<ul style="list-style-type: none"> In-house Specialist refrigeration company 	<ul style="list-style-type: none"> Adjust release value 		
<p>4. Avoid simultaneous heating and refrigeration</p> <p>Use a lock to ensure that heating and cooling do not happen simultaneously. > Guideline with Measures for Optimizing Refrigerating Systems</p>	***	<ul style="list-style-type: none"> In-house Specialist refrigeration company 	<ul style="list-style-type: none"> Set block if possible Retrofit block 		
<p>5. Select maximum cold water inlet temperature</p> <p>Ensure that the temperature of the cold water in the refrigeration machine is tailored exactly to the temperature required by the releasing system (cooling ceiling, refrigeration panels, component activation...). Avoid remixing the cold water subsequently (e.g. from 6°C to 8°C).</p>	****	<ul style="list-style-type: none"> In-house Specialist refrigeration company 	<ul style="list-style-type: none"> Adjust cold water inlet temperature 		
<p>6. Check the free cooling</p>	***	<ul style="list-style-type: none"> In-house Specialist refrigeration company 	<ul style="list-style-type: none"> Check switching point Adjust control Check function Check operating points 		

4 Efficient refrigeration

Component check

What you need to check	Potential	Checked	Need for action/measures	To be completed by	Comments
<p>1. Check compressor performance Check the power demand. In doing so, record the pressures on the suction and discharge sides of the compressor and compare them with the manufacturer's information.</p>	**	<ul style="list-style-type: none"> In-house Specialist refrigeration company 	<ul style="list-style-type: none"> In case of deviation from manufacturer's information, look for causes Check auxiliary units Check measuring units Repair or, if applicable, replace compressor 		
<p>2. Check oil heating for non-operating periods Check whether the oil heating for nonoperating periods is switched off during the operating periods of the compressor.</p>	**	<ul style="list-style-type: none"> In-house Specialist refrigeration company 	<ul style="list-style-type: none"> Commission specialist refrigeration company 		
<p>3. Clean condenser Check how polluted the condenser is and clean completely if necessary. > Guideline with Measures for Optimizing Refrigerating Systems</p>	****	<ul style="list-style-type: none"> In-house Specialist refrigeration company 	<ul style="list-style-type: none"> Clean condenser 		
<p>4. Optimize condenser control Check whether the condensation temperature can be controlled below the minimum permissible condensation temperature, depending on the outside temperature. > Guideline with Measures for Optimizing Refrigerating Systems</p>	***	<ul style="list-style-type: none"> In-house Specialist refrigeration company 	<ul style="list-style-type: none"> Have speed control set Decrease condenser performance by reducing fan power Retrofit suitable condenser control if applicable 		
<p>5. Check superheating at expansion valve Measure the superheating at the evaporator outlet. > Guideline with Measures for Optimizing Refrigerating Systems</p>	***	<ul style="list-style-type: none"> In-house Specialist refrigeration company 	<ul style="list-style-type: none"> Have expansion valve set by specialist refrigeration company 		
<p>6. Optimize defrost process Optimize the defrost process so that the refrigerating system defrosts on demand or not too frequently. Check the defrost threshold temperature to make sure it is not set too high. > Guideline with Measures for Optimizing Refrigerating Systems</p>	***	<ul style="list-style-type: none"> In-house Specialist refrigeration company 	<ul style="list-style-type: none"> Have defrosting set by specialist refrigeration company 		

5 Discharging waste heat efficiently

Waste heat check

What you need to check	Potential	Checked	Need for action/measures	To be completed by	Comments
<p>1. Check heat discharge Check how your heat discharge is working and have it modified if necessary. > Guideline with Measures for Optimizing Refrigerating Systems</p>	**(*)	<ul style="list-style-type: none"> In-house Specialist refrigeration company 	<ul style="list-style-type: none"> Check temperatures 		
<p>2. Prevent waste heat short circuit Ensure that every condenser and re cooler sucks in sufficient air for cooling. > Guideline with Measures for Optimizing Refrigerating Systems</p>	****	<ul style="list-style-type: none"> In-house Specialist refrigeration company 	<ul style="list-style-type: none"> Partition with metal sheets Change location 		
<p>3. Check convector pump (recooling pump) The convector pump should only be in operation when heat is to be discharged.</p>	***	<ul style="list-style-type: none"> In-house Specialist refrigeration company 	<ul style="list-style-type: none"> Have release value adjusted by specialist refrigeration company 		
<p>4. Optimize fan interplay Check fan control. Ensure that the fans are controlled in line with the outside temperature. > Guideline with Measures for Optimizing Refrigerating Systems</p>	***	<ul style="list-style-type: none"> In-house Specialist refrigeration company 	<ul style="list-style-type: none"> Adjust control Have control reset by specialist refrigeration company 		
<p>5. Clean heat exchanger in recooling system Clean the plate fin heat exchanger of the recooling system. > Guideline with Measures for Optimizing Refrigerating Systems</p>	****	<ul style="list-style-type: none"> In-house Specialist refrigeration company 	<ul style="list-style-type: none"> Clean re cooler Commission a specialized company for cleaning 		

Aim for minimum temperature differences in the heat exchangers

Evaporator, condenser, re cooler: The lower the temperature difference at the heat exchangers, the more efficiently the system runs. If this increases the mass flows (air quantity, refrigerant, heat exchanger...) through the heat exchanger, this leads to additional energy consumption in the auxiliary units (pumps, fans...). Larger heat exchangers can reduce this disadvantage, but take up more space and involve higher investment costs. Check the temperature differences of the heat exchangers regularly. Orient yourself towards the standard temperature differences described for the most common types of heat exchanger in the Guideline with Measures for Optimizing Refrigerating Systems as a guide.

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- has been compiled with the kind permission of the Swiss Federal Office of Energy (SFOE). VDMA's Energy Efficiency of Refrigerating Systems working group thanks the Schweizerischer Verein für Kältetechnik (Swiss Association for Refrigeration Technology, SVK) for the opportunity to use the documents from its "Campaign for efficient refrigeration".
- is based on the form and content of the SVK document "Der jährliche Kälte-Check, In 5 Schritten zur optimierten Kälteanlage".
- provides recommendations for refrigerating system operators and refrigeration experts on energy-saving operation of their refrigerating system.
- sensitizes planners, installers and operators of refrigerating systems to the topic of energy efficiency and helps to enhance their skills.
- has been compiled in cooperation with the refrigeration industry (VDMA, Forschungsrat Kältetechnik e. V., cold store operators (VDKL)) and approved monitoring bodies (TÜV SÜD Industrie Service GmbH).

In cooperation



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Layout

DesignStudio

Production

h. reuffurth gmbh, Mühlheim am Main

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