



Energioptimering af køle- frysehuse

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Optimering af køle-frysehuse i Europa.

IEE støtte projekt med deltagelse fra seks lande:

- England
- Belgien
- Holland
- Italien
- Bulgarien
- Danmark

Køle- og frysehuse fra 5m³ og op...

Hjemmesiden: www.ice-e.eu



ICE-Es struktur og indhold

- Gratis survey og benchmark-værktøj (dansk)
- E-learning (Engelsk)

The project offers **cost free e-learning modules**. These modules aim to improve knowledge on energy efficiency in cold stores.

The titles of the e-learning modules are:

- Introduction to Refrigeration
- Environmental and legal aspects of carbon reduction
- Service and maintenance to reduce carbon
- Energy improvements through plant design and retrofitting

The e-learning modules can be opened by this url: **[ICE-E e-learning](#)**.

- Modeller (dansk)
 - Simple
 - Kompleks > Pack Calculator II (nu på dansk)
- Informative dokumenter (dansk)
- "Leverancer"
























All the **Deliverables** from the ICE-E project are available to download below:

1. D2.2 - Survey report (zip, 672 kB)
2. D2.4 - Energy labal report + translations (zip, 9.3 MB)
3. D2.5 - Training needs (zip, 229 kB)
4. D2.6 - Financial investment opportunities (zip, 127 kB)
5. D2.7 - Overall audit report + translations (zip, 3.8 MB)
6. D2.8 - Benchmark and audits report + translations (zip, 2.3 MB)
7. D3.1 - Info packs
8. D3.2 - Case studies
9. D5.1 - Non technical barriers report (zip, 1.9 MB)
10. D5.2 - Social marketing campaign (zip, 250 kB)
11. D5.3 - Training marketing package (zip, 2.3 MB)
12. D6.2 - E-learning report (zip, 987 kB)
13. **The videos of the webinars from the end-seminar can be viewed online, for free.**


















Informative dokumenter (på danske)

Info Packs”

-  ICE-E info pack 1 Refrigerant cycles DM
-  ICE-E info pack 2 Operation and choice of compressors DM
-  ICE-E info pack 3 Heat exchangers DM
-  ICE-E info pack 4 Throttling valves DM
-  ICE-E info pack 5 Pipe work and system layout DM
-  ICE-E info pack 6 Pumps DM
-  ICE-E info pack 6 Pumps DM
-  ICE-E info pack 7 Refrigerants DM
-  ICE-E info pack 8 Insulation and structure DM
-  ICE-E info pack 9 Heat reclaim-recovery DM
-  ICE-E info pack 10 Thermal storage DM
-  ICE-E info pack 11 Renewable energy (solar, wind) DM
-  ICE-E info pack 12 Free cooling DM
-  ICE-E info pack 13 Operation of doors and door protection DM
-  ICE-E info pack 14 Inverters DM
-  ICE-E info pack 15 Loading & Unloading a Store DM
-  ICE-E info pack 16 Minimising load DM
-  ICE-E info pack 18 Control systems (defrosts, lighting, fans) DM
-  ICE-E info pack 19 Target and monitoring DM
-  ICE-E info pack 20 Lighting DM
-  ICE-E info pack 21 Maintenance DM

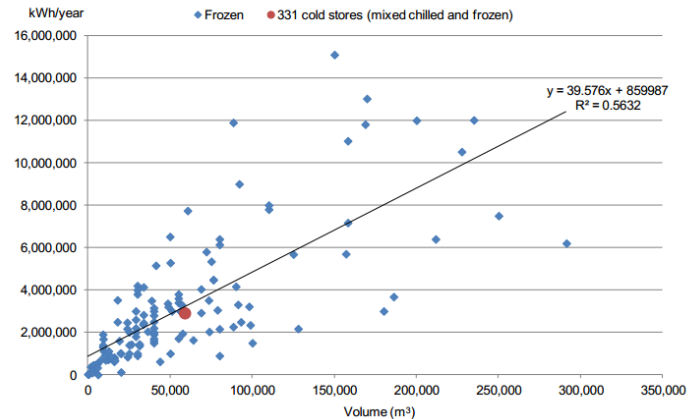
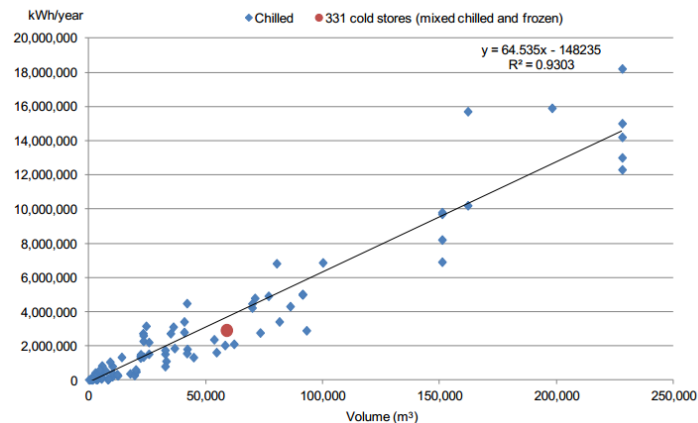
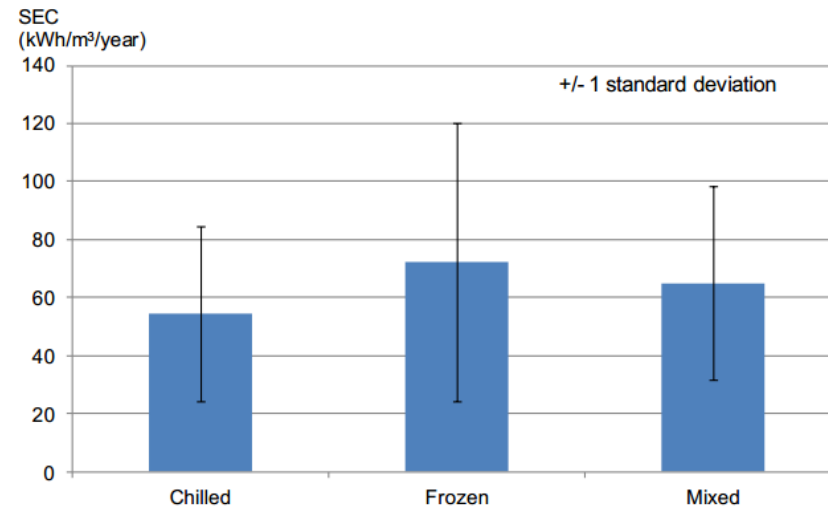
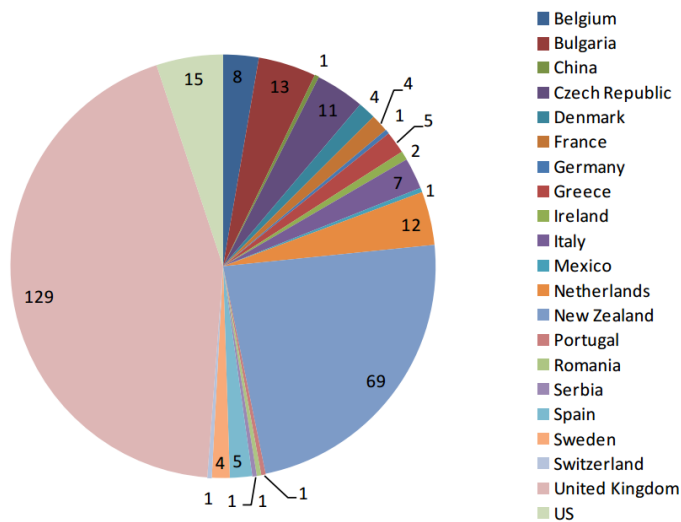
”Case Stories”

-  ICE-E case study 1 Superheat DM
-  ICE-E case study 2 Room setting DM
-  ICE-E case study 3 Defrost control DM
-  ICE-E case study 4 Door protection DM
-  ICE-E case study 5 Refrigerants DM
-  ICE-E case study 6 Heat recovery DM
-  ICE-E case study 7 Insulation DM
-  ICE-E case study 8 Condenser selection DM
-  ICE-E case study 9 Evaporator selection DM
-  ICE-E case study 10 Compressor selection DM
-  ICE-E case study 11 Financial aspects DM
-  ICE-E case study 12 Lighting DM
-  ICE-E case study 13 Secondary cooling DM
-  ICE-E Case Study 14 Recommissioning condensers DM
-  ICE-E case study 15 Loading and operation DM



"Survey" og "Benchmark"

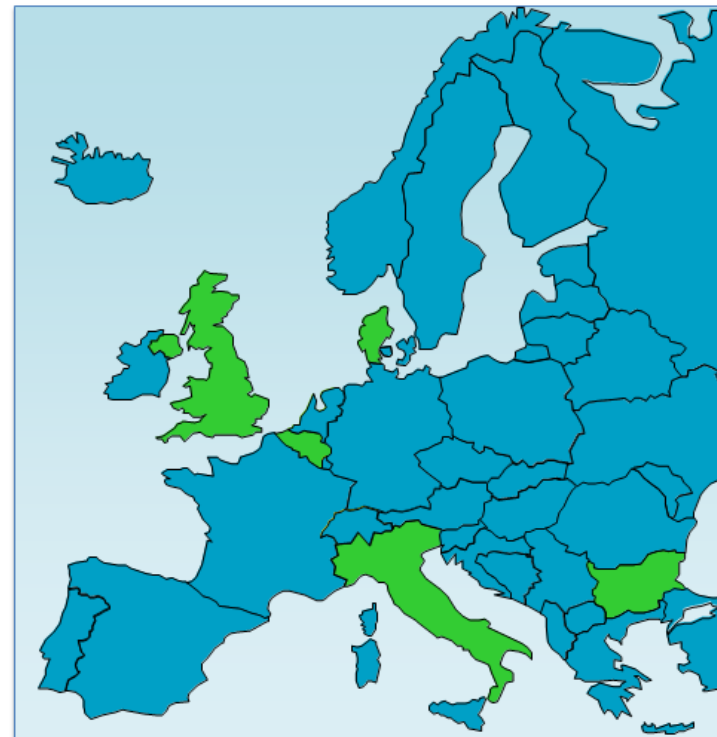
- 329 køle-/frysehus i databasen
- Stor spredning i specifikt energiforbrug





28 detaljerede energigennemgange af køle-/frysehuse

Country	No.
UK	9
Belgium	1
Italy	9
Denmark	5
Bulgaria	4
TOTAL	28





28 detaljerede energigennemgange af køle-/frysehuse

Den eneste grund til, at der er et køleanlæg er fordi kølehuset ikke er ideelt.

Hvad er kommer ind skal ud igen...

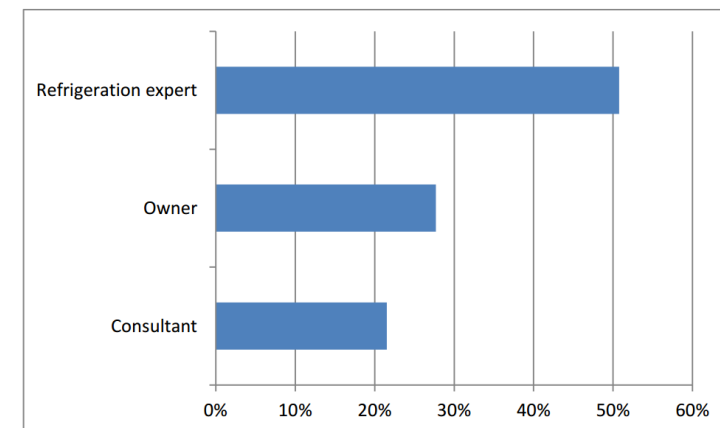
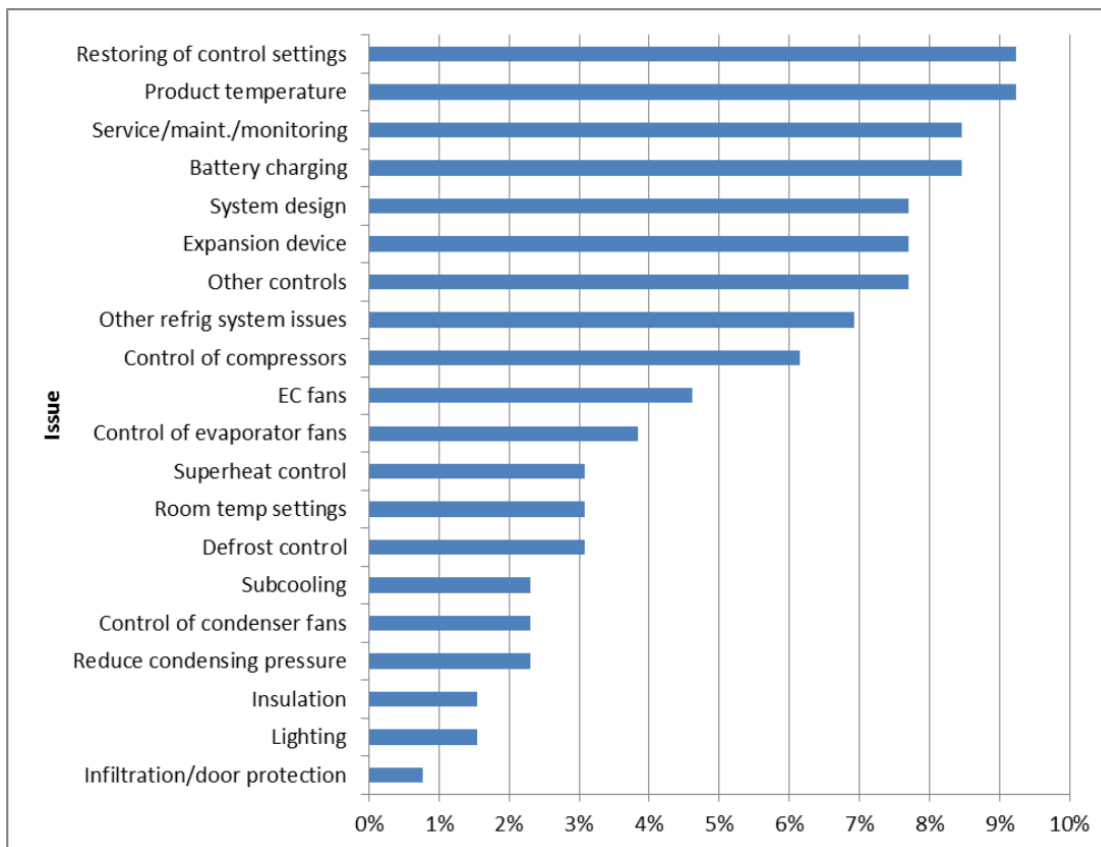
Metoden:

- Minimering af varmebelastningen
- Minimering af elektrisk forbrug i køle-/fryserummet
- Optimere køleanlægget (+ andet)



28 detaljerede energigennemgange af køle-/frysehuse

- 130 forskellige forhold fordelt i 20 emne-grupper





28 detaljerede energigennemgange af køle-/frysehuse

- 0-72% besparelser fundet (typisk 20-35%)



Modeller: Den "simple" og den "komplekse"

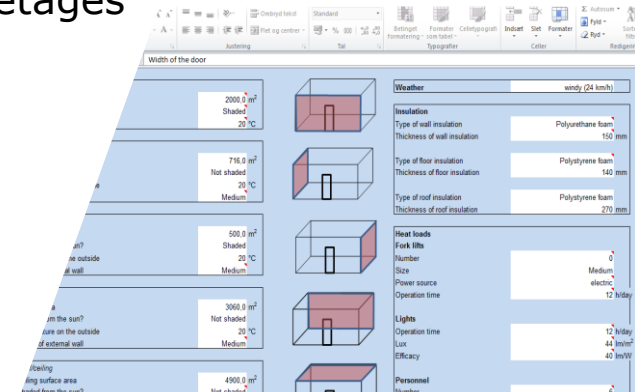
Modellerne er ret ens

Den "simple" model

- Udviklet til at få en idé om betydningen af et muligt tiltag
- Statisk model

Den "komplekse" model

- Anvender vejrdata for området til beregning af tiltags betydning
- Kan eksportere belastningsdata for anvendelse i "Pack Calculator II", hvor detaljeret analyse af køleanlægget kan foretages





Den "simple" model: Input

The screenshot shows the Microsoft Excel interface for the Simple_Model_v2.5_(English) spreadsheet. The spreadsheet is organized into several sections for inputting building parameters:

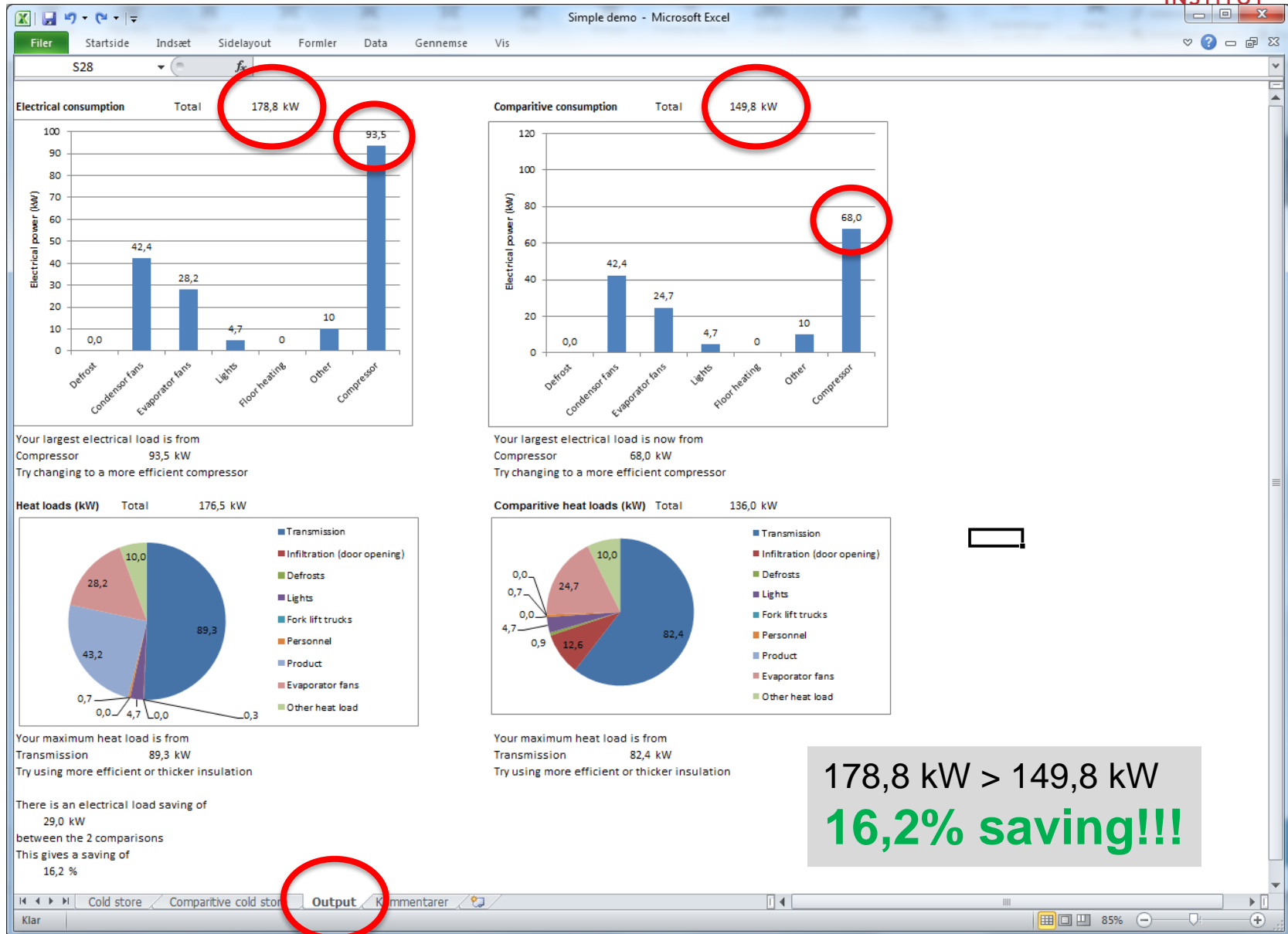
- North wall:** Surface area (1500.0 m²), Shaded from the sun?, Temperature on the outside (20 °C). A dropdown menu for 'Length x Width' is highlighted with a red circle.
- East wall:** Surface area of the wall (800.0 m²), Shaded from the sun?, Temperature on the outside (20 °C), Colour of external wall (Medium).
- West wall:** Surface area, Shaded from the sun?, Temperature on the outside, Colour of external wall.
- South wall:** Surface area, Shaded from the sun?, Temperature on the outside, Colour of external wall.
- Roof/ceiling:** Ceiling surface area, Shaded from the sun?, Temperature above roof insulation, Colour of the roof.
- Floor:** Surface area, Temperature under floor insulation, Floor heating average power.
- Door:** Width of the door, Height of the door.

On the right side, there are sections for:

- Weather:** A dropdown menu.
- Insulation:** Type and Thickness of wall, floor, and roof insulation (mm).
- Heat loads:** Fork lifts (Number, Size, Power source, Operation time in h/day).
- Lights:** Operation time, Lux, and Efficacy (h/day, lm/m², lm/W).
- Personnel:** Number, Average time each person in room, and Are personnel in for short or long time? (h/day).
- Product:** Mass loaded, Temperature when loaded, Total mass in store, Type, and Weight loss (kg/day, °C, kg, kg/day).
- Defrosts:** A section at the bottom right.

The spreadsheet tabs at the bottom include: Instructions, Cold store, Comparative cold store, Output, Versions.

Modeller: Resultater





Den "komplekse" model: Input

demo-complex - Microsoft Excel

File Startside Indsæt Sidelayout Formler Data Gennemse Vis

M43

Colour of external wall Medium

Roof/ceiling
Ceiling surface area 4250,0 m²
Internal or external ceiling? External
Shaded from the sun? Not shaded
Colour of roof Light

Floor
Surface area 4250,0 m²
Is floor temperature controlled? Yes
Temperature under floor insulation 5 °C
Floor heating average power 0 W

Door
Width of the door 1,5 m
Height of the door 2 m
Internal or external door Internal
Temperature outside the door 12 °C
Relative humidity outside the door 60 %
Number of door openings per day 150
Duration of each door opening 20 s
Volume of traffic passing through the door whilst it is open High
Door protection strip curtain
Door seal condition good

Refrigeration
Store temperature -23 °C
What is the refrigerant? R717
Is the condenser internal or external External
Number of compression, expansion stages 1,1
Isentropic efficiency of compressor high (0.7)

Disclaimer
The sole responsibility for the content of this model lies with the authors.
It does not necessarily reflect the opinion of the European Union.
Neither the EACI nor the European Commission are responsible for any use that may be made from the results of this model.

Number 2
Time 10 h/day
Are personnel in for short or long time long

Product
Mass loaded 308000 kg/day
Temperature when loaded -21 °C
Total mass in store 4400000 kg
Type Beef-raw
Weight loss 0 kg/day

Defrosts
Type Gas

Evaporator fans
Number 1
Shaft power of each fan 6500 W
Motors inside refrigerated space? yes
Motor efficiency 100 %

Condenser fans
Number 0
Shaft power of each fan 0 W
Motor efficiency 100 %

Other heat loads
Average power 2 W

Statistics for DNK_Copenhagen.061800_IWEC

Import weather

Calculate

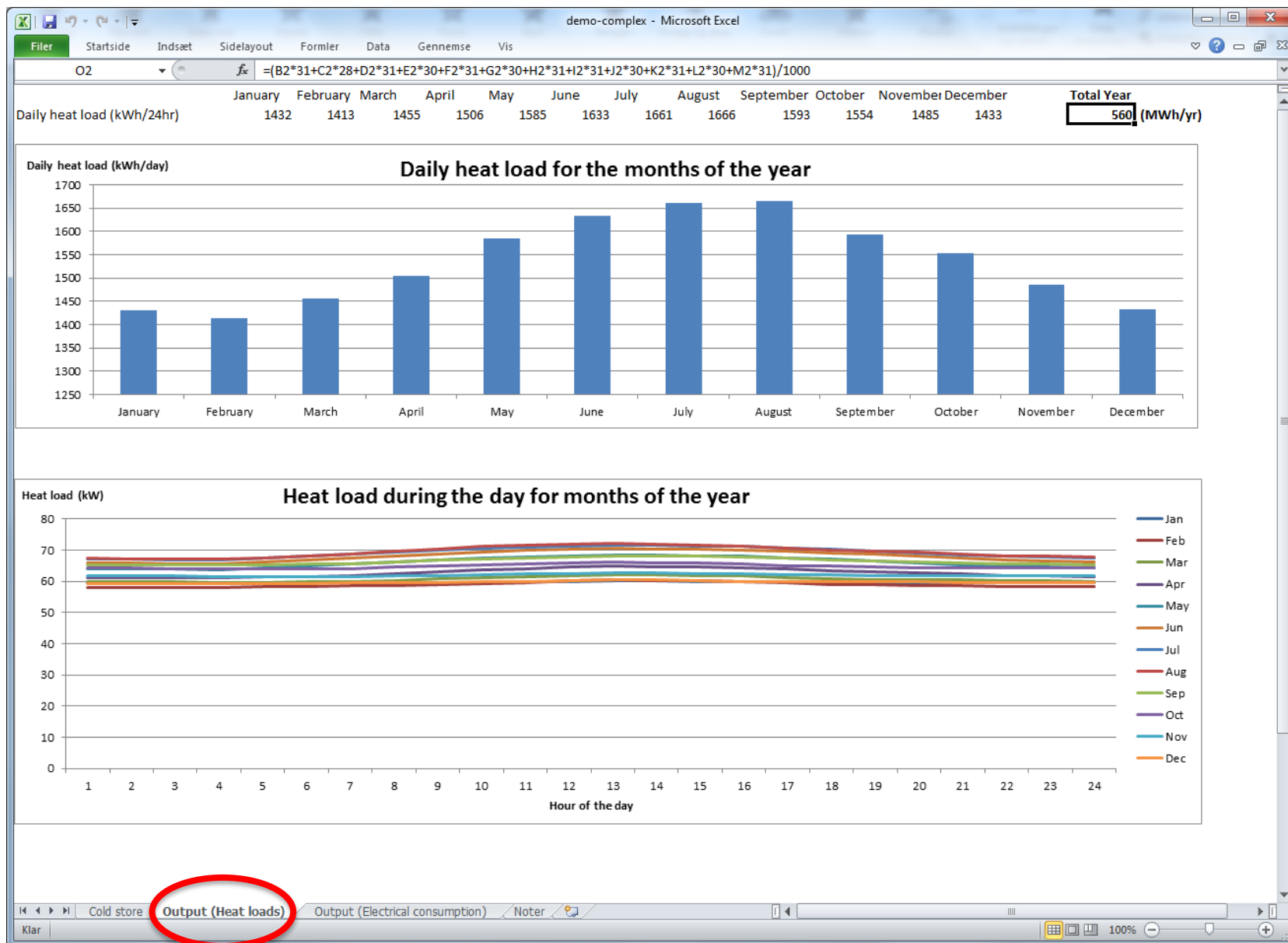
Export

Output (Heat loads) Output (Electrical consumption) Noter

Klar

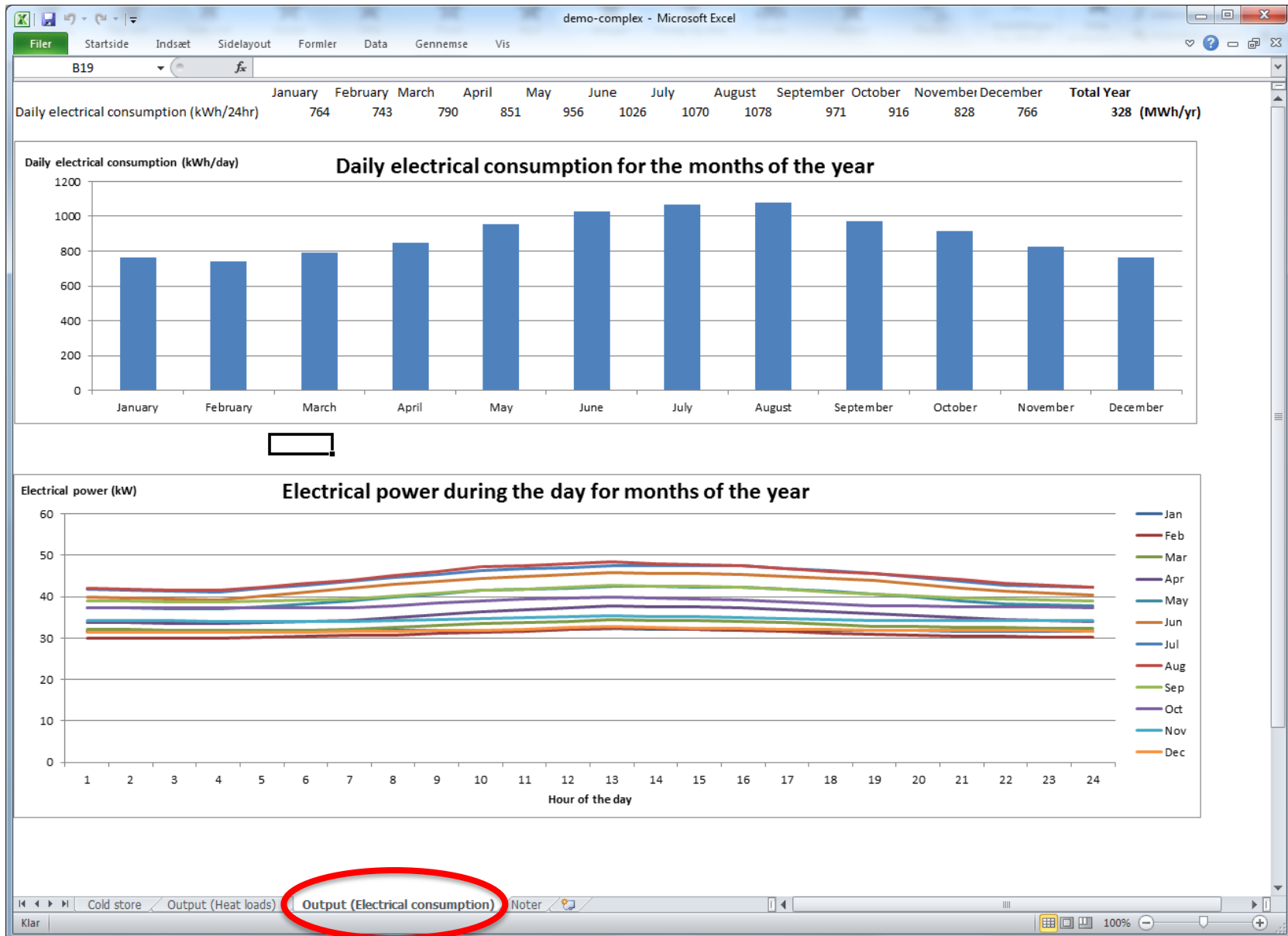


Den "komplekse" model: Output





Den "komplekse" model: Input





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Mange tak

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