Energy Efficiency in the food and drink industry

The road to Benchmarks of Excellence

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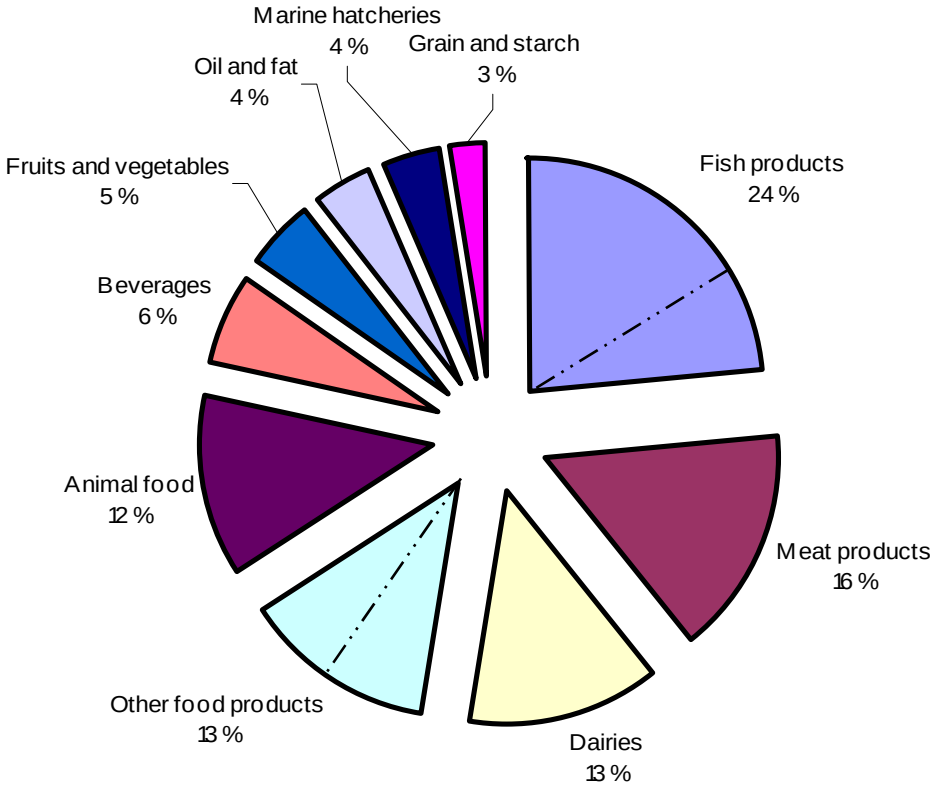
Food and drink sector

- Typical SME sector
  - ✓ 2 200 companies in Norway
  - ✓ 45 % with less than 5 employees
- Important sector
  - ✓ 19 % of total employment in industry
  - ✓ Important sector in terms of value added
- Energy issue
  - ✓ Energy use: 4,7 TWh/year (5,7 % of total in industry)
  - ✓ Energy cost: 0,26 Billion Euro (12,8 % of total in industry)
  - ✓ Energy savings will contribute to better profit and environment

Approach and methodology

- Study worked out in close cooperation with trade organisation
- System boundary is set around the factory fence
- Energy use = Purchased energy + Internal generated energy – Sold energy
- No changes in input (raw material) and output (end products)
- Potential is based on proved available technology
  - ✓ New technology will increase energy saving potential
  - ✓ Implementation will decrease energy saving potential
- Estimation is based on a twelve step “bottom-up” approach

Step 1: Division into sub-sectors

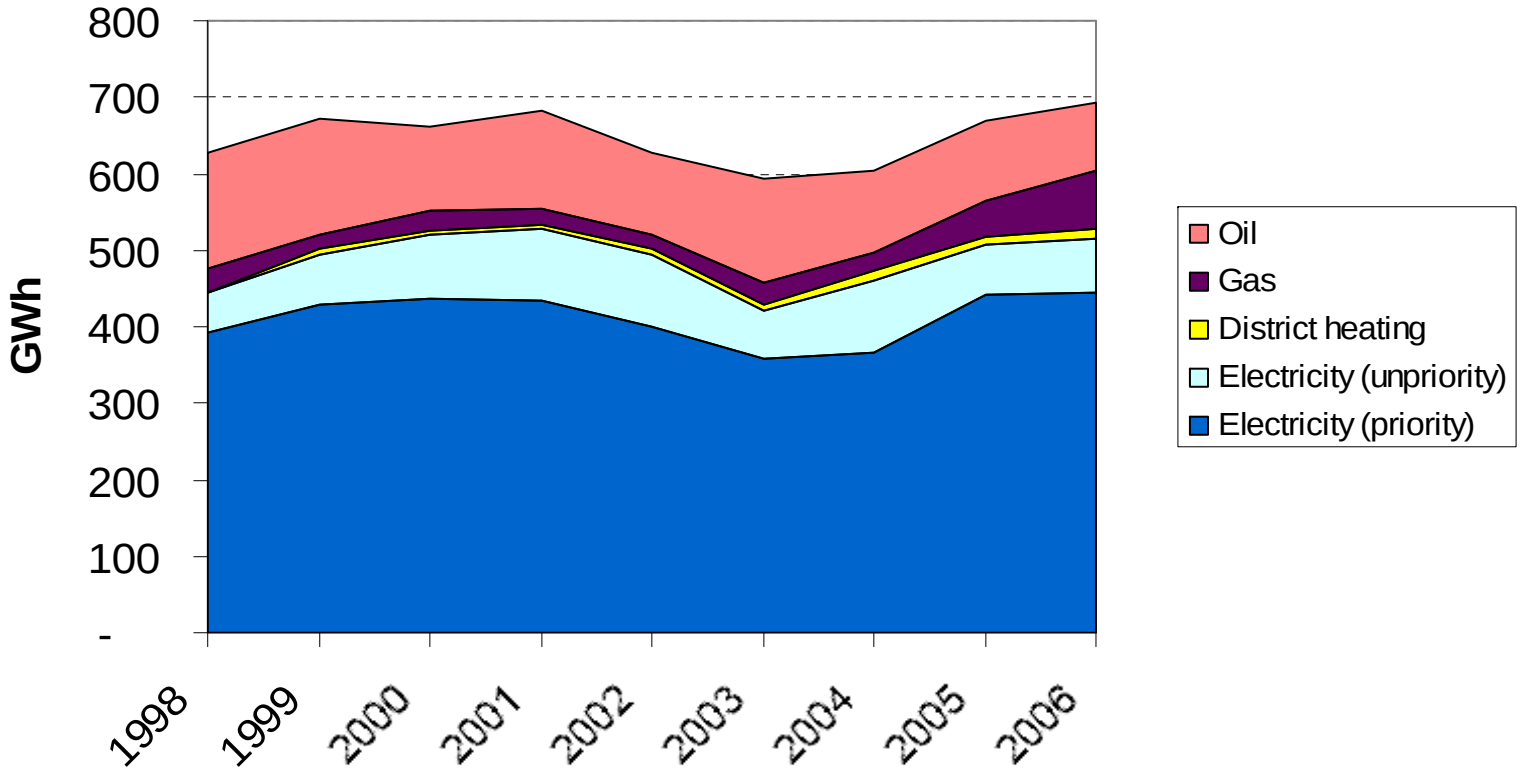


Division based on the official classification system (Standard Industrial Classification)

Source: Energy Statistics Norway 2007

Step 2: Historical energy use

Example: Meat processing industry (SIC 10.1)



- Average energy use for three last years is used as baseline

Source: Energy Statistics Norway 2007

Step 3: Energy accounts

Estimate energy use based on purpose

Sources: Sector-studies, energy audits and specific knowledge

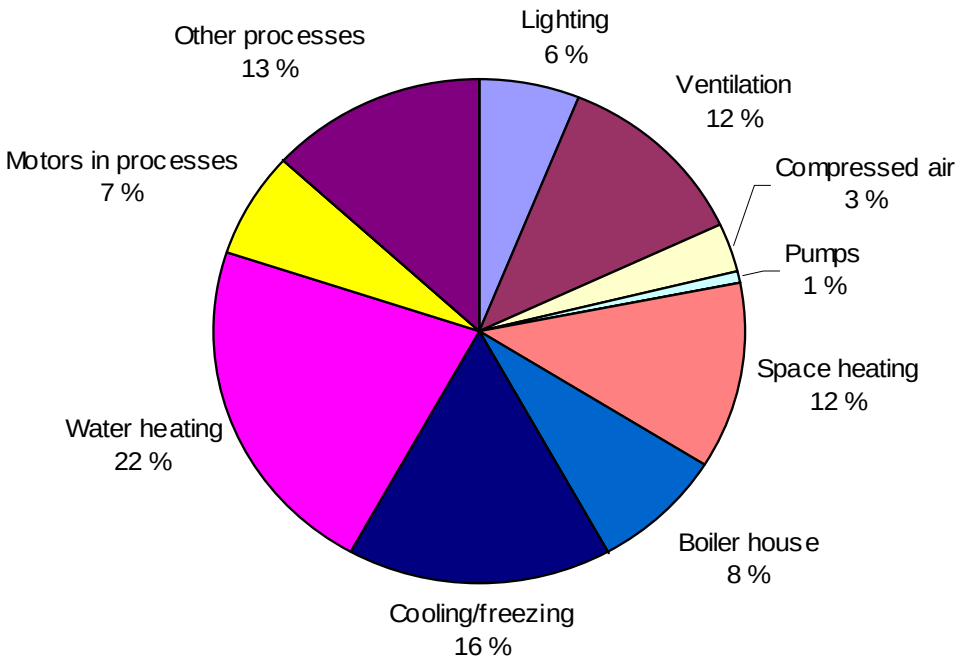


Figure: Estimated energy use based on purpose within the dairy-sector (SIC 10.5).

Step 4 and 5: Measurelists

Lighting:
- ❑ Efficient light source
- ❑ HF-system
- ❑ Efficient lighting fixture
- ❑ Light on demand/control system

Ventilation:
- ❑ Reduce ventilation demand
- ❑ Efficient ventilation solution
- ❑ Ventilation on demand/VAV
- ❑ Heat recovery

Compressed air:
- ❑ Stop air leakage
- ❑ Right operating pressure
- ❑ Optimal air treatment components
- ❑ Compressed air on demand/speed control

Pumps:
- ❑ Speed control of pumps
- ❑ Energy efficient motors
- ❑ Right pump size and operation

Hydraulick:
- ❑ Hydraulick on demand/speed control
- ❑ Booster/accumulator
- ❑ Reduce stand-by pressure

Space heating:
- ❑ Upgrade building construction (insulation etc)
- ❑ Radiant heating
- ❑ Controlling room temperature
- ❑ Utilize waste heat

Boilerhouse:
- ❑ Utilize waste heat
- ❑ Hot water reduction
- ❑ Insulation of pipes, valves and boiler system
- ❑ Recuperate flue gas and condensate
- ❑ Optimal operation of boiler
- ❑ Improvement in steam system
- ❑ New efficient boiler

Energy management:
- ❑ Worked out energy related targets and plans
- ❑ Carried out actions for awareness and training
- ❑ Implemented procedures for optimal operation and maintenance
- ❑ Implemented procedures for energy optimal design and procurement
- ❑ Implemented procedures for monitoring and measurement

Step 6 and 7: Sort and adjust

Step	Input	Process	Output
6	Knowledge about logical priority on measure implementation	Sort measurelist regard preferred order for implementation	Sorted measurelists with potential and investment cost
7	Available energy audits, measurelists from other countries and specific knowledge	Adjust specific potential for measures that have influence on each other	Sorted measurelists with adjusted potential and investment cost

Step 8 and 9: Map implementation rate

- Web-based market survey among 664 companies (30 % response rate)
  - ✓ General information about the company, size employees etc.
  - ✓ Questions about barriers to energy efficiency
  - ✓ Questions about implementation rate of each measure
    - ❑ Completed (0 % remaining potential)
    - ❑ Partly completed (50 % remaining potential)
    - ❑ Not completed (100 % remaining potential)
    - ❑ Not relevant (0 % remaining potential)
- Average sector implementation rate for all measures

Step 10: Energy saving potential

Energy saving potential for each measure (n) within the sub-sector is calculated by:

$$P_n = (E_{el\ ,\ B1} * k_i * p_n) + (E_{term\ ,\ B1} * k_i * p_n)$$

Where

P_n = Total energy saving potential (electric + thermal) for measure n
$E_{el,B1}$ = Electric energy used on energy block 1
$E_{term,B1}$ = Thermal energy used on energy block 1
k_i = adjustment factor on implementation
p_n = energy saving potential linked to measure n, where n is measure in measure list

Step 11 and 12: Work out graphs

Example: Bakeries

Step 11: Sort the measure with estimated saving potential based on increasing specific investment cost. List accumulated energy saving potential

Step 12: Work out graphs

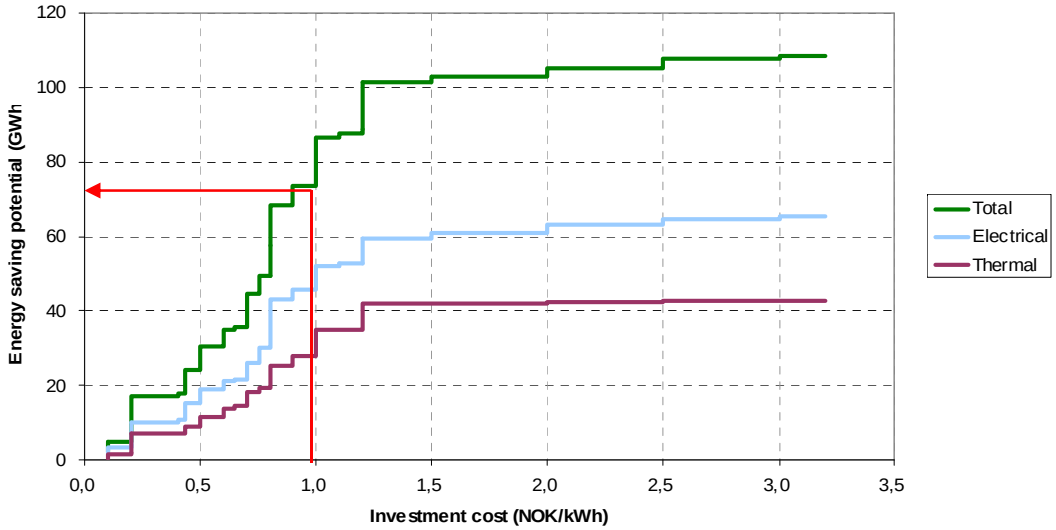
Results from bakery sector:

Energy saving potential: 109 GWh/år (34 %)

- 43 GWh electricity
- 66 GWh thermal energy

50 % av energy saving potential related to general measure list

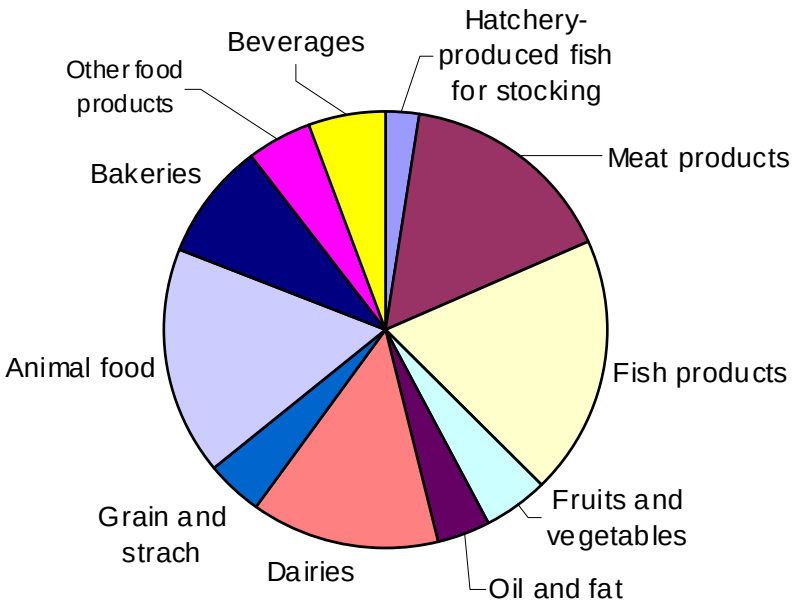
20 % economic profitable energy saving potential (pay-back less than 2 years)



Accumulated energy saving potential corresponding to investment cost for the bakery sector

Summary of study

- Energy saving potential: 1,3 TWh (30%)
  - ✓ 0,63 TWh electricity (28 %)
  - ✓ 0,67 TWh thermal energy (32 %)
- 20 % economic profitable energy saving potential (pay-back less than 2 years)
- Obstracles:
  - ✓ Uncertainty regarding profitability/economic savings
  - ✓ Lack of investment capital/capital needed for other priorities
  - ✓ Lack of competence regarding possibilities
- Obstracles rating higer for small companies
- Companies with energy management are rating obstracles lower and these companies have a higher implementation rate linked to measures



Energy saving potential separated in sub-sectors (% of total potential)

Follow up project

Road to benchmark of excellence

A three year programme have started up with four of the sub-sectors (meat-processing, bakeries, breweries and grain mill and starches) focusing on nettworking, energy management and benchmarking.

Five steps approcach to benchmark of excellence based on the energy management loop:

1. **Identify opportunities**
2. **Set targets**
3. **Energy action plan**
4. **Benchmark and monitor progress**
5. **Review**

Benchmark

New European Standard on Energy Management (EN 16001)

Web-based benchmarking

- National (www.enova.no/industrinettverk)
- International (www.bess-project.info)

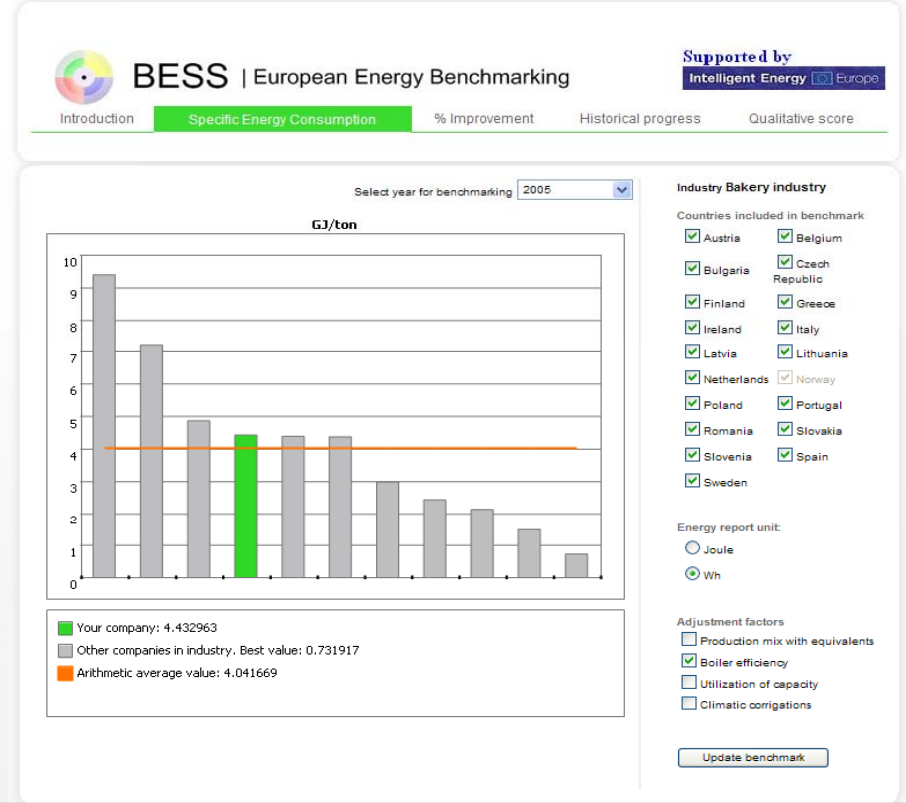


Figure: Example of BESS benchmark results – SEC of a bakery company

Thank you for your attention

Questions?

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