

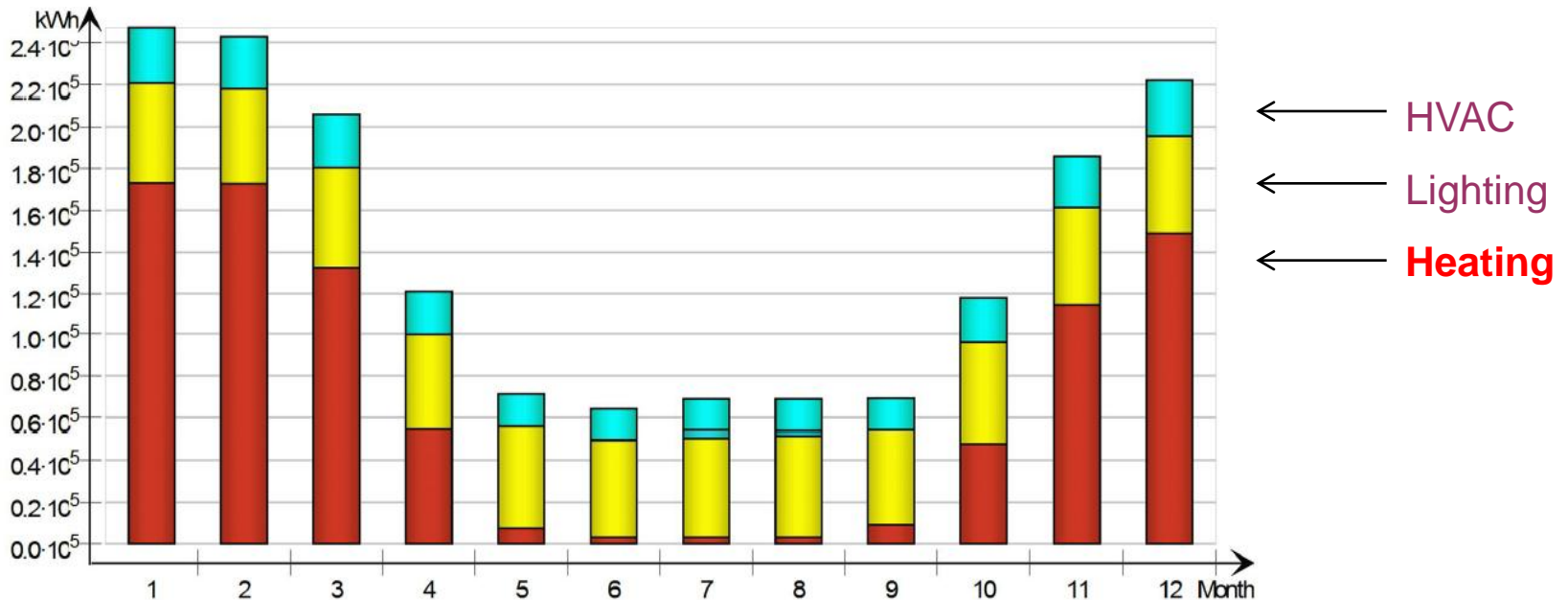
Meeting energy efficiency requirements – Nordic approach

Pasi Turpeenniemi

26.10.2012

Energy consumption in industrial buildings

Delivered energy per month:*



*Typical 'DIY' store located in South-Finland:

- Floor area: 9000m²
- Volume: 76 000m³
- District heating/air heating
- U-values etc. as per building regs

How to improve energy efficiency?

Envelope

- U-values?
 - Walls
 - Roof
 - Floor
 - Windows
 - Doors
- Air tightness?
 - Components
 - The whole envelope



HVAC

Lighting

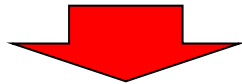
Other



How to improve energy efficiency – U- values?

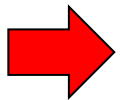
Improving U-values from existing levels:

- Walls: $0.17 \rightarrow 0.12\text{W/m}^2\text{K}$
- Roof: $0.09 \rightarrow 0.08\text{W/m}^2\text{K}$
- Floor: $0.16 \rightarrow 0.12\text{W/m}^2\text{K}$
- Windows: $1.0 \rightarrow 0.5\text{W/m}^2\text{K}$
- Doors: $1.0 \rightarrow 0.7\text{W/m}^2\text{K}$

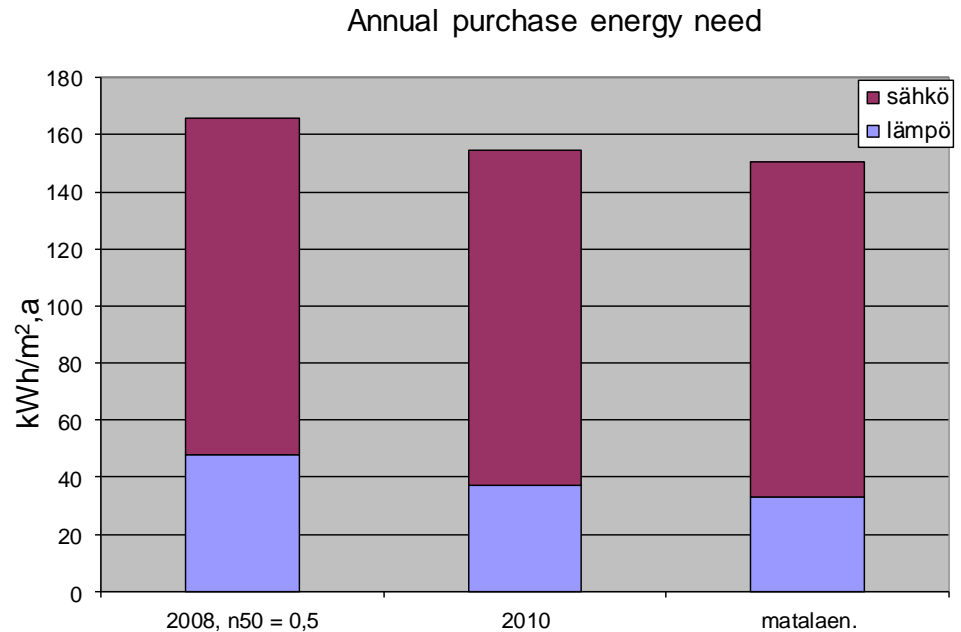


Annual savings in heating bills:

2% (~2k€)

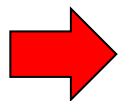
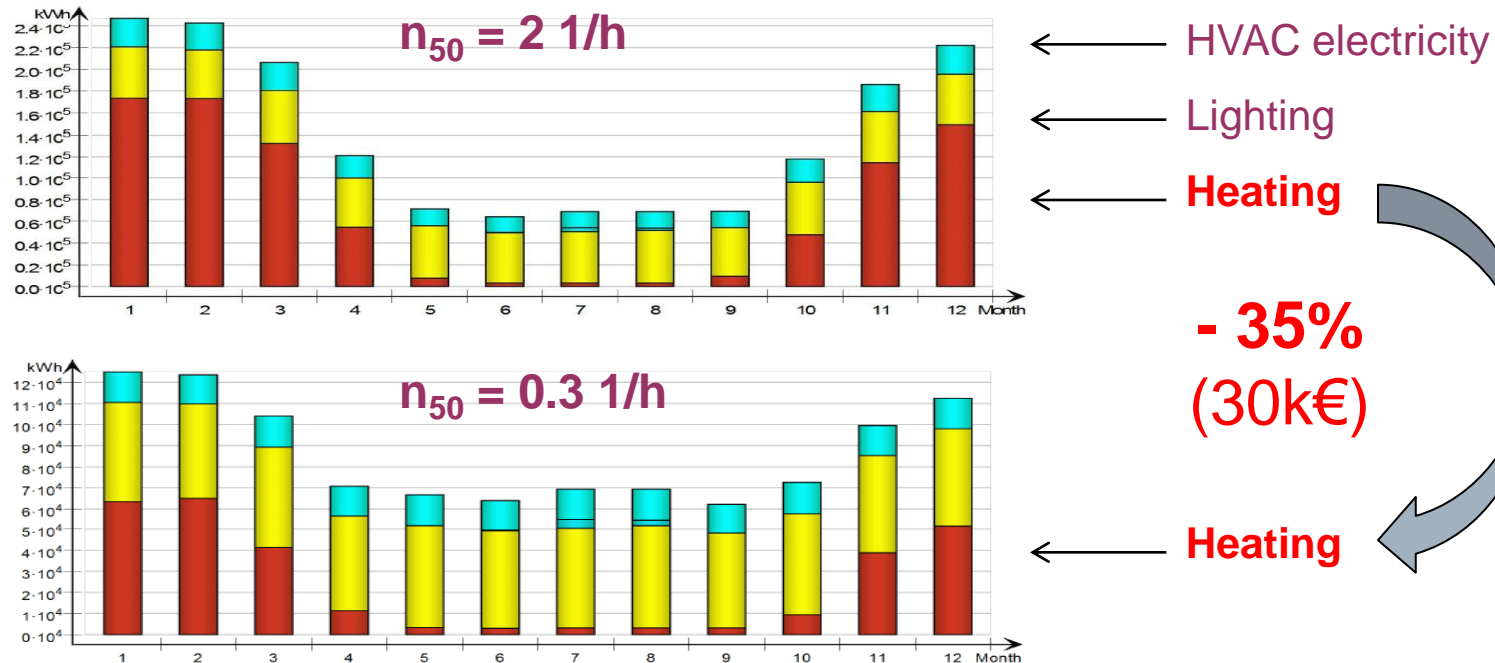


Further u-value improvements have only minimal effect on heating energy consumption and the payback time becomes often too long.



How to improve energy efficiency – Air tightness?

Improving air tightness from traditional levels :



Air tightness has significant effect on heating energy consumption!

Example of an air tight envelope concept

Ruukki® energy panel system:

- Ruukki energy panels
- Complementary products
- Construction details
- Services
- Certified installation
- Air tightness guarantee



Panels

SPA E, F & S ENERGY

- SPA150E, F & S ENERGY
- SPA200E, F & S ENERGY
- SPA230E, F & S ENERGY

SPA E LIFE ENERGY (sustainable version)

- SPA150E LIFE ENERGY
- SPA200E LIFE ENERGY
- SPA230E LIFE ENERGY

Ruukki energy coating

- Lower surface temperature
- 25% lower panel deflection
- Lower cooling energy need



Complementary products

Ruukki energy accessories:

- Expanding gaskets
- Elastic foams
- Butyl tapes



Ruukki energy windows

- Better U-value ($0.9\text{W}/\text{m}^2\text{K}$)
- Better air tightness
- Special features available (thermal reflection etc.)



Ruukki liberta solar

- Sustainable and renewable energy production
- Fully integrated system attached to panel
- Architecturally attractive



Construction details & Certified installation

Air tight interfaces

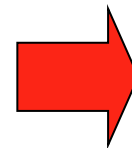
- Special details developed based on pressure testings & thermo camera
- Based on Ruukki's know how
- Tested solutions

Including roof details

- Solutions for various roof structures
- Includes e.g. sealing of penetrations and sealing solutions between panel walls and various roof structures
- Developed together with roofing specialists

Certified installation

- Installation only by certified installation companies
- Installation companies trained & certified by Ruukki
- Wide installation network



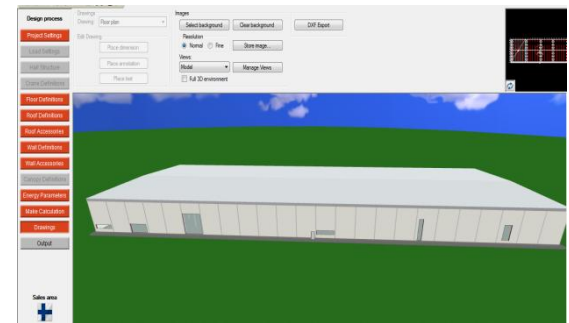
High quality installation ensures air tightness!



Services

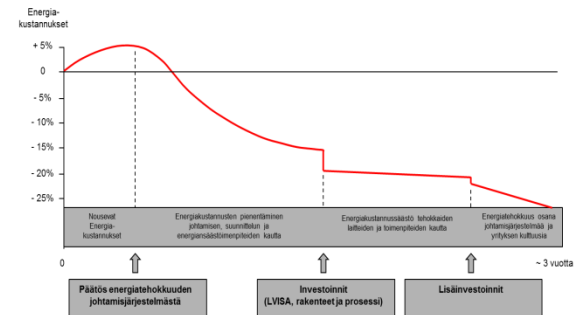
Ruukki energy simulation

- Individual simulation for customers
- Individual saving potentials
- Envelope optimization and its effect on energy efficiency
- Ruukki's own simulation software



Ruukki energy management

- Monitoring and managing energy usage
- Ensuring energy efficient building use
- Includes a 'Stress test start package'
- Option for continuous follow-up
- Service offered by external partner



Air tightness guarantee

Pressure testing included

- Pressure testing for air tightness included in price
- Done in accordance with standard EN 13829
- Done by certified company
- Organized by Ruukki

Money back guarantee

- Money back if air tightness is not achieved!

Certified system

- Independent verification
- Covers the whole Ruukki energy panel solution



Customer benefits

Savings in building life cycle

- Cost optimized envelope structure (construction phase)
- Up to 35% savings in heating bills (use phase)

Lower CO₂ emissions from heating

- Up to 35% lower emissions
- Life time emission cut by thousands of tons

Higher LEED and BREEAM credits

- Extra BREEAM credits from better air tightness
- Extra LEED credits from high recycled material content (LIFE)

Complete and reliable solution

- Complete envelope package with full service
- Backed with pressure testing & VTT certificate



Air tightness level

Building air tightness with Ruukki energy panels:

- $n_{50}=0.3$ 1/h
- $q_{50}=1.0$ m³/h, m² (depending on building geometry)

Air tightness

$q_{50} \leq 1.0$ m³/h, m²

$n_{50} \leq 0.3$ 1/h

Envelope:

- Panel area ≥ 1000 m²
- Openings $\leq 10\%$ of the total wall area



Savings – Reference building

Saving calculations are based on a reference building:

Typical store

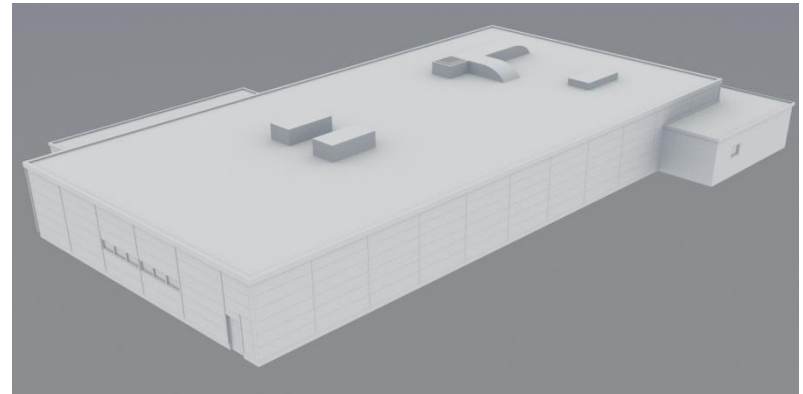
- Floor area: 8 400m²
- Envelope area (wall, roof, floor): 20 000m²
- Window area: 10% of external wall area
- Building volume: 67 000m³
- Heat recovery ratio (ventilation): 0.55

U-values for envelope:

- wall 0.17; roof 0.09; floor 0.16;
windows & doors 1.0 W/m²K

Heating system:

- Air heating, district heating



Energy prices:

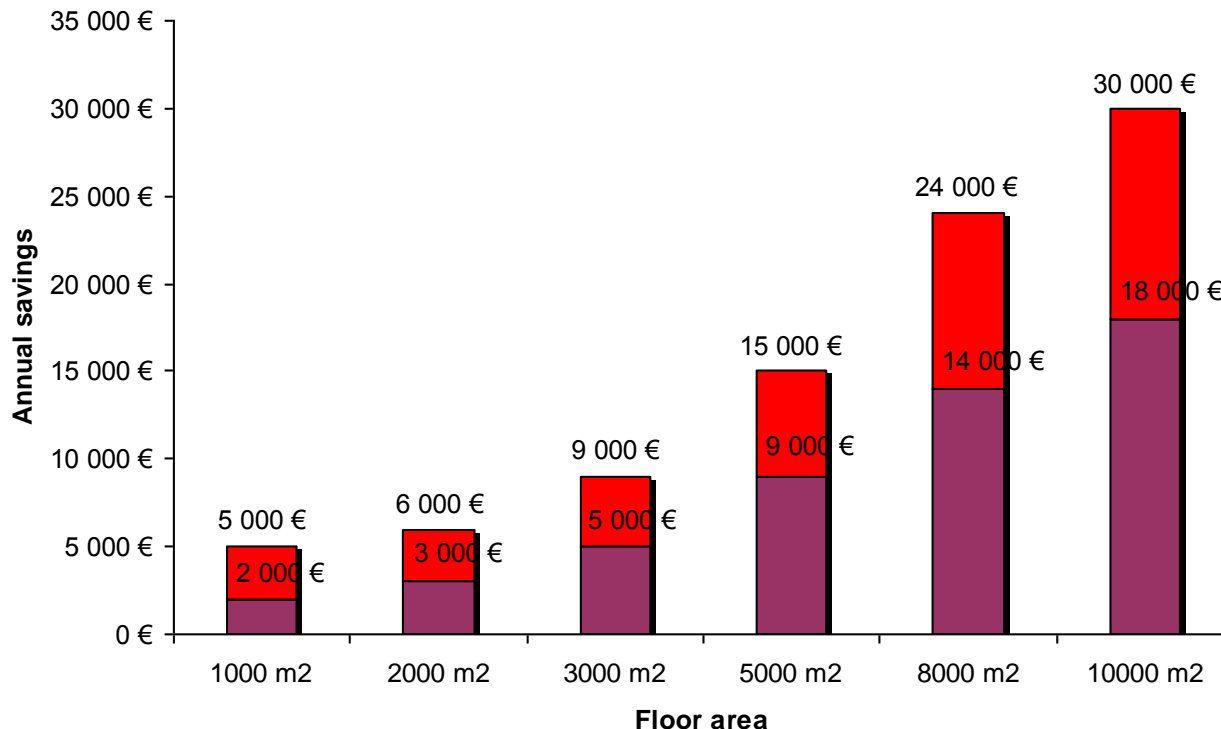
- District heating: 0.05 EUR/kWh;
Electricity: 0.10 EUR/kWh

Nominal emissions,

- 0.218 & 0.185kg/kWh (heating & electricity)

Savings (EUR)

Annual savings in heating bills (EUR):

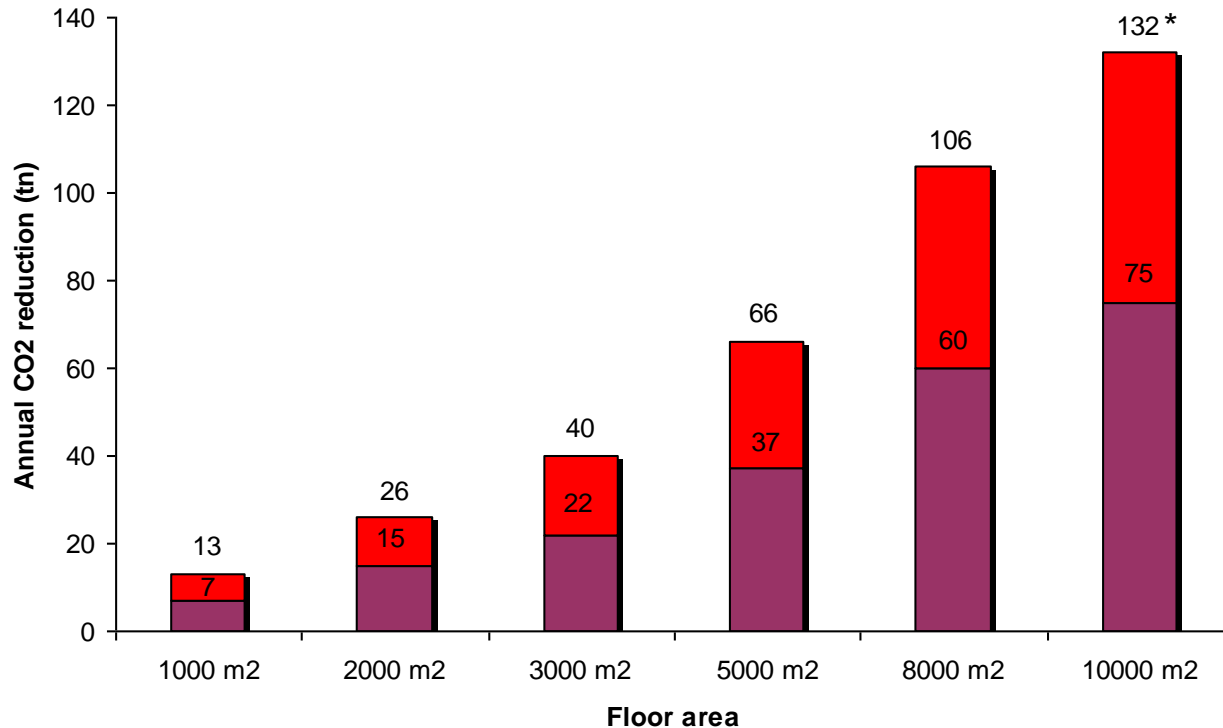


Savings compared to
Finnish building regs
2010: $n_{50}=2$ 1/h
(reference value)

Savings compared to
Finnish building regs
2012: $q_{50}=4$ m³/h, m²
(minimum requirement)

Savings (CO₂)

Annual CO₂ emission reductions (tn):



Savings compared to Finnish building regs 2010: $n_{50}=2$ 1/h (reference value)

Savings compared to Finnish building regs 2012: $q_{50}=4$ m³/h, m² (minimum requirement)

*) Equals emissions of BMW 520dA when driven 27 times around the world (123g/km)



RUUKKI

LIVING. WORKING. MOVING.