Individual comfort systems
Process Control on a Workplace Level

ICEBO Montréal 11 October 2013

Jacob Verhaart, MSc.
Wim Zeiler
Gert Boxem

Where innovation starts

TU/e Technische Universiteit Eindhoven
University of Technology

Proceedings of the 13th International Conference for Enhanced Building Operations, Montreal, Quebec, October 8-11, 2013
Problem definition

Problems:

• Building sector:
  – 40% of the primary energy use in the world
  – 24% of CO₂ emissions in the world

• Comfort levels of higher than 90% hardly ever reached

Goals:

• Reduce energy use
• Increase Individual comfort level
State of the art comfort technology

Building Technology & Installation Technology

Potential: 20 - 30% reduction

Actual: 0 - 10% reduction

user behavior

Users are the key!

/ built environment
Individual comfort

No matter if you prefer

Warm or Cold

A dream of providing optimal thermal comfort for everybody
Individual differences

One person is cold, while the other is warm

Individual conditioning on top of base-level comfort
Thermal comfort research

Thermal comfort

Weather influence!

Weather influence!
Adaptive vs. Individual comfort

Factors:
- Metabolism
- Clothing
- Gender
- Age
- BMI
- Personal preference

/ built environment
Individual Comfort System

Challenges:

- Mitigation
- Control
- Detection
- Building Integration
Thermal comfort (warm side)

![Diagram showing Thermal comfort (warm side)]
Warm discomfort, detection

Aspects of the onset of sweating:

• Thermal Neutral Zone / Thermal Comfort Zone
• Increase in sweat gland activity
• Skin wettedness, depending on:
  • Air velocity at the exposed skin
  • Relative Humidity

To be studied:

• Order of mechanism
• Detectability of sweat under different circumstances
Building Integration

Multi-Agent System
Distributed control system with
1. Base-level comfort provided by room level agent
2. Workplace level comfort control agent
3. Local intervention and comfort monitoring at WL