International Cooperation for Know-How Transfer

IEA IETS ANNEX 15 INDUSTRIAL EXCESS HEAT RECOVERY

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IEA-IETS Annex 15-2 Industrial Excess Heat Recovery

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Participating Countries
Denmark, Germany, Norway, Austria, Portugal, Sweden, (Canada, France, Italy)

Phase 2 started 10/2016-09/2018; Subtasks

Subtask 1: In-depth evaluation and inventory of excess heat levels
Subtask 2: Methodology on how to perform an inventory in practice
Subtask 3: Possible policy instruments and the influence on future use of excess heat
Subtask 4: Technology Development
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National partners - Project Team:


- Technische Universität Wien, Institut für Energietechnik und Thermodynamik, Markus Haider, www.iet.tuwien.ac.at

- AEE - Institut für Nachhaltige Technologien, Christoph Brunner, Jürgen Fluch, Wolfgang Glatzl, Anna Grubbauer, Petra Königshofer, www.aee-intec.at

Subcontractor:

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Situation:

**Climate goals**
- Progress in energy-related technologies is of great importance for the achievement of collective goals of energy security, environmental protection and economic and social development.

**Visibility and Know-How Transfer**
- Participation allows access to valuable know-how as well as increased visibility in an international environment. At the international level, the industrial location of Europe is strengthened through close cooperation and the transfer of knowledge.

**Goals and Methods**
- Integrate Austrian research institutions into the international network.
- Information exchange.
- Initiation of international projects.
- Development of new cooperations / partnerships in industry / research.
- Offer and expand existing know-how.
**Annex Time-Line**

- **10/2016** Project start
- **4/2017** International Annex Meeting Lisbon
- **12/2017** Mid-Term report
- **1/2018** International Annex Meeting Vienna
- **?/2018** National Stakeholder Workshop
- **12/2018** National Project ends
- **09/2018** End of Annex 15 Phase 2 (International)

**Stakeholder Workshop:**

Target groups: industry, technical bureaus, process automation, public decision makers, funding agencies, consulting agencies, etc.

Date: TBA
How to perform an inventory?

How to derive potentials for excess heat usage?

Impact of Policy-Instruments on Excess Heat and its usage?

Technologies for excess heat usage

IEA-IETS Annex 15-2 Industrial Excess Heat Recovery
How to perform an inventory?

Development of a standardized evaluation template for industrial excess heat

- Based on available excess heat potential studies
  - Checklist for energy audits (based on IEE projects EINSTEIN and GREENFOODS, linked to EN16247)
  - Excess heat cadaster Graz and Styria methodology
  - Method developed on statistical data (project IntegrCiTy)
  - Comparison with international studies (mainly Germany and Sweden) with different approaches as basis for potential standardized template

Standardized Template
How to derive potentials for excess heat usage?

**SOCO - Storage Optimization Concept**

**SolarSOCO – Integration of system supply**

- System design based on processes and time depending load profiles
- Identification, simulation and design of HEN + storages
- Integration of renewable energies

*SOCO – Storage Optimisation Concepts in Industries, Commerce and District Heating Businesses
Jürgen Fluch*, Christoph Brunner, Bettina Muster-Slawitsch; CHEMICAL ENGINEERING TRANSACTIONS; (2012)
*Based on Tool SOCO – Model and Measures Identified; Juergen Fluch, Christoph Brunner, Bettina Muster-Slawitsch, Christoph Moser, Hermann Schranzhofer, Richard Heimrath; CHEMICAL ENGINEERING TRANSACTIONS; (2013)

**Process Integration Framework**

- Multi-Period Heat Integration
- Cost-optimal design of heat exchangers
- Cost-optimal design of heat storages and heat-pumps
- Retrofitting, DH integration

National contributions to the Annex

How to derive potentials for excess heat usage?

Example: Dairy Factory (AEE INTEC)
Comparison of AIT PI Framework (Mathematical Programming) & (Solar)SOCO

- 37 Process streams
- Changing operating states
- Stream data for 3 weeks
- Storage integration
- Heat exchanger network synthesis
How to derive potentials for excess heat usage?

ANNEX 15/2 WORKSHOPS ON PINCH-METHODOLOGY
27. SEPTEMBER 2017 & 25. JANUARY 2018 - AIT

Program:
• Advanced pinch methods for analysis of industrial process energy systems.
• Applications for identifying opportunities for
  • internal heat recovery;
  • excess heat usage;
  • heat pumping;
  • thermal energy storage
National contributions to the Annex

Impact of Policy-Instruments on Excess Heat and its usage?

Target: Development of tailor-made policy instruments for the optimised enforcement of excess heat recovery in industry

- Identification of currently applied policy instruments concerning the enforcement of excess heat recovery in industries based on previous projects from AEE INTEC and ENERGIEINSTITUT
- **Internal recovery** and **External usage**
- Analysis is conducted for the EU and IEA IETS Annex 15 member states; Austria in more detail
- Result: listing identified policy instruments by category, including (when applicable) relevant design details

Assessment matrix

- Definition of dimensions/criteria for the assessment of policy instruments enforcing excess heat recovery
- Evaluation of the individual and combined application of policy instruments based on microeconomic theory
- Application of the assessment matrix to identified policy instruments
- Input of achieved results in the survey conducted (AEE INTEC)
National contributions to the Annex

**Technologies for excess heat usage**

**Thermal Energy Storages**

**Hybrid Energy Storage**

30% more stored energy in the hybrid storage compared to Ruth’s steam accumulator


**Latent Heat Energy Storages**

PCM: HDPE (Tmelt ~ 135°C)


**Seasonal Sorption Storage**

Summer – desorption
Winter – adsorption
High energy density, only losses while charging/discharging
National contributions to the Annex

Technologies for excess heat usage

**Active Fluidization Technology**
Fluidization of Fine Particle Powders
Self stabilizing Nozzle-Distributor Floor
Modular Design

**Latent Heat Energy Storages**

**Passive Regenerators**
Heating power: P = 15 kWth
Max. temperature: Tmax = 300 °C
Max. volume flow: Vmax = 100 m³/h


*M. Koller, H. Walter, M. Hameter: "Transient Numerical Simulation of the Melting and Solidification Behavior of NaNO3 Using a Wire Matrix for Enhancing the Heat Transfer"; ENERGIES, 9 (2016).*

THANK YOU

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