NEFI TECHNOLOGY TALK

Drying Processes in Industry

October 12, 2023 10:00 - 12:00, online

FLAGSHIP REGION ENERGY

FTI initiative Flagship Region Energy:

The Climate and Energy Fund of the Austrian government will invest up to 120 million Euros in 3 flagship regions. Focus areas of “Flagship Region Energy” are:

- Model solutions with up to 100% renewable energy
- Strengthening Austria as a leading market for innovative energy technologies
- Largest value for the population

Further Information:

- Folder Flagship Region Energy
- vorzeigeregion-energie.at
- nefi.at

Three Flagship Regions:

Green Energy Lab: Flexibilisation and digitalisation of electricity and heat networks

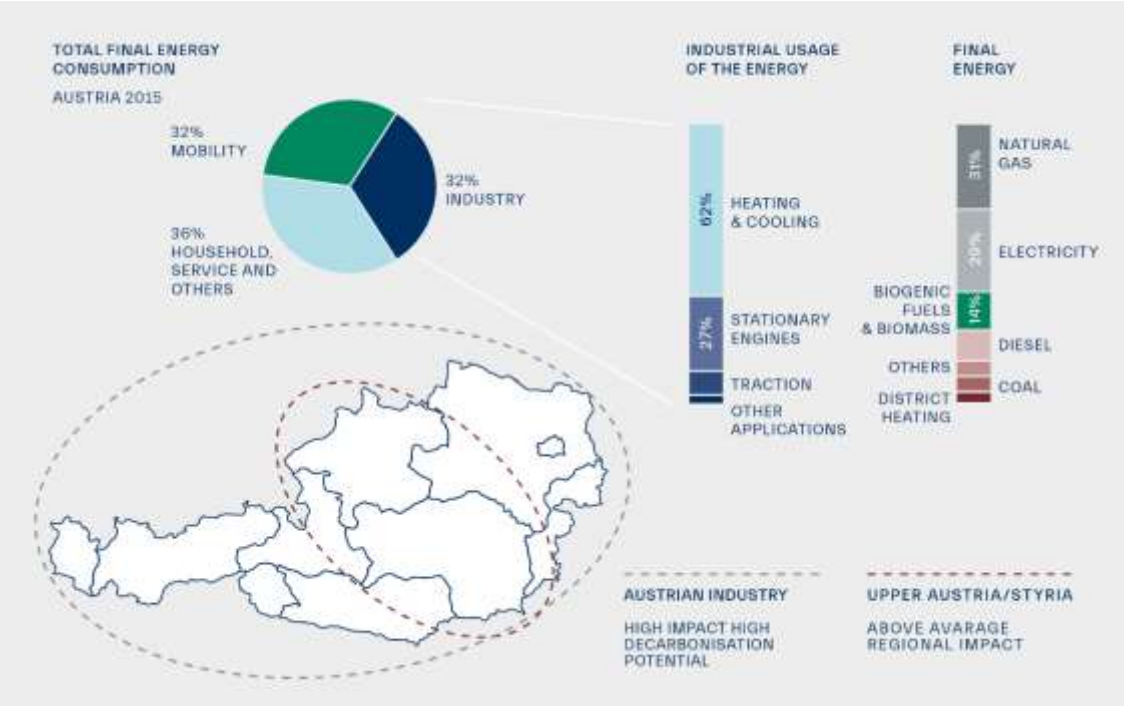
NEFI – New Energy for Industry: Decarbonisation of the Austrian Industry

WIVA P&G: Green Hydrogen for energy supply, industry & mobility

NEFI – BACKGROUND & GOALS

NEW ENERGY FOR INDUSTRY

Industry accounts for 32% of Austria's final energy demand



Decarbonisation of industrial energy systems

100 % renewable energy supply at selected locations

Added value "Made in Austria"

through export and technology development

Securing the industry location

contribution to the economic location Austria by user involvement

Energy efficiency in industrial drying processes

Michael Lauermann, AIT Austrian Institute of Technology GmbH

ENERGY EFFICIENCY IN INDUSTRIAL DRYING PROCESSES

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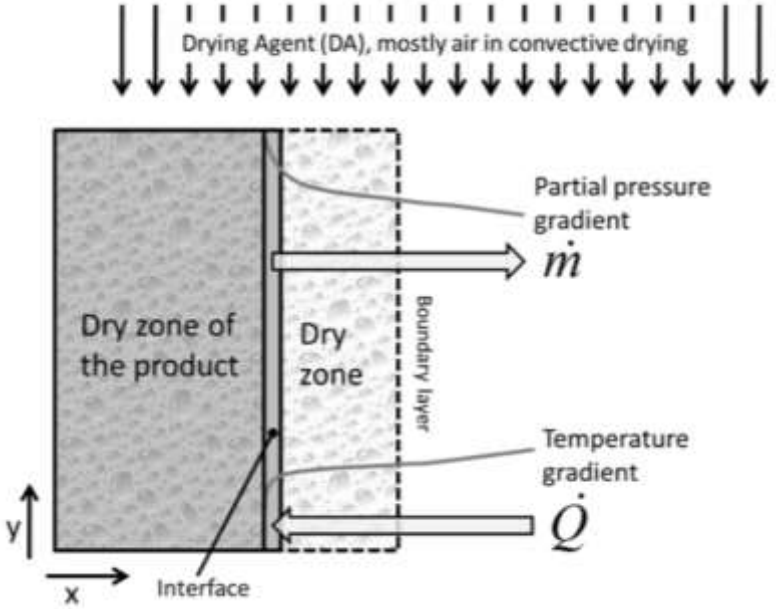
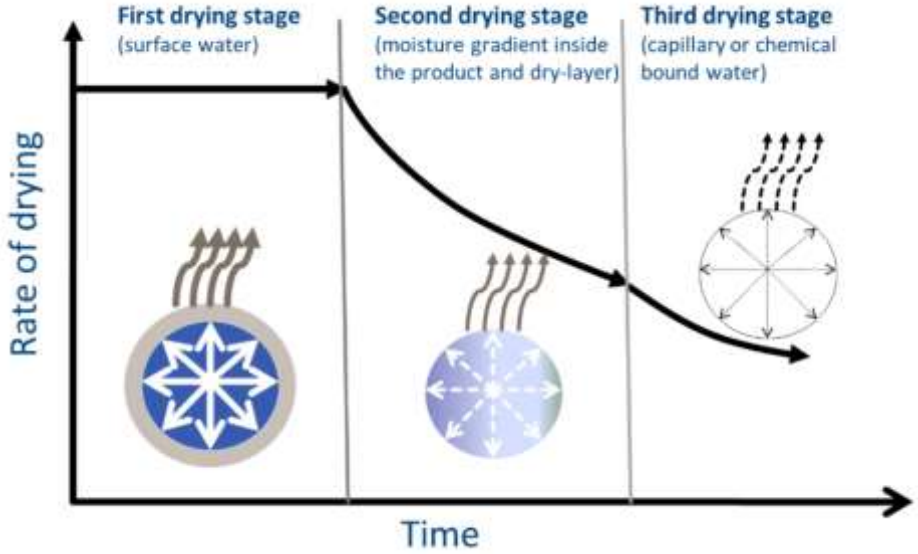
DRYING





Deliverables – Dry-F (dryficiency.eu) → D1.2 Specification of performance indicators and validation requirements

ENERGY EFFICIENCY IN INDUSTRIAL DRYING PROCESSES

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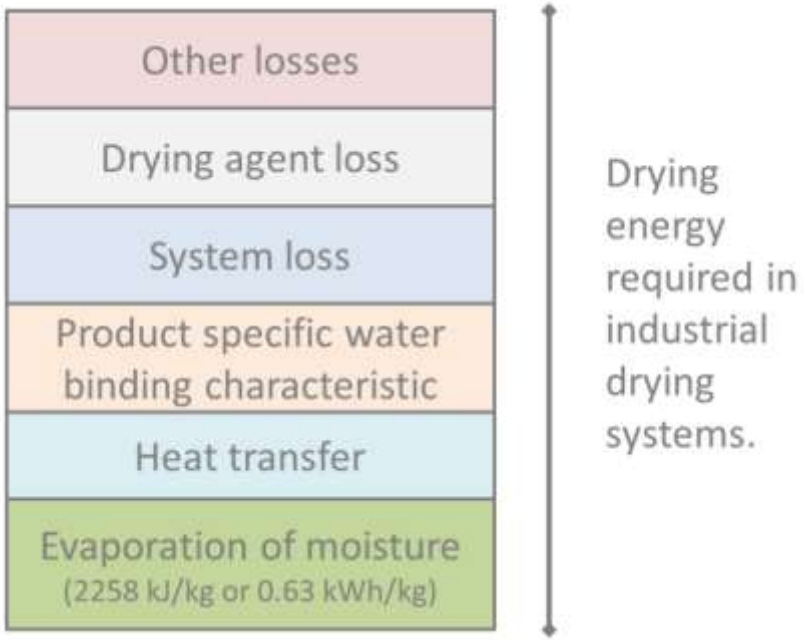
LOSSES



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ENERGY EFFICIENCY IN INDUSTRIAL DRYING PROCESSES

ENERGY EFFICIENCY FOR DRYERS

Rotary dryer

Fluid bed dryer

Spray dryer

Conveyor dryer

- **EXPECTED ENERGY EFFICIENCY VARIES FROM 40 - 80%**
- **ACTUAL EFFICIENCY RANGES FROM 20 - 40%**
  - Improper operation (too high temperature or velocity)
  - Improper application (use of existing dryers for other products)
  - Improper design; Conservative design of old dryers (life time is 30-40 years instead of 15-20 years)
  - Some dryers are built in-house with little knowledge
  - No insulation
  - No control

Mujumdar, Handbook of industrial drying

ENERGY EFFICIENCY IN INDUSTRIAL DRYING PROCESSES

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METHODS TO IMPROVE ENERGY SAVINGS

Methods	Potential
Use of heat exchangers	M
Model-based control	M-L
Optimized operation	H-M
Multi-stage drying	M-L
Superheated steam drying with utilization of condensation	H
Use of heat pumps	H

ENERGY EFFICIENCY IN INDUSTRIAL DRYING PROCESSES

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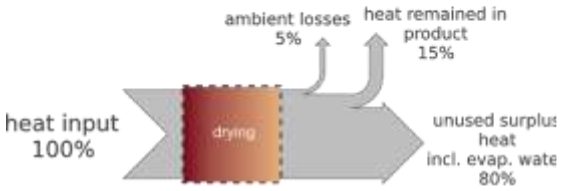
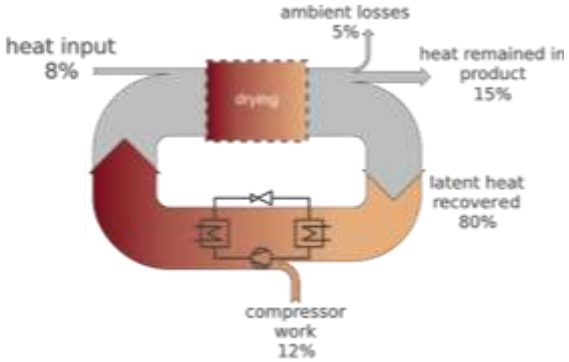
HEAT PUMP DRYING

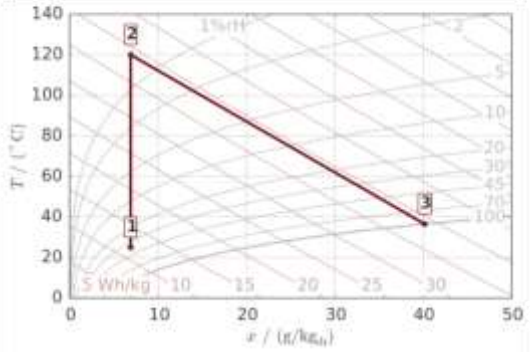
- **Higher efficiency**: Recovery and use of the energy of the water vapor through condensation as it exits the air from the drying system, thus increasing efficiency.
- **Better controllability**: Air flow, temperature and humidity can be precisely controlled with compression heat pumps in drying systems.
- **Product quality**: Lower drying temperatures result in higher product quality. In addition, flavor preservation can be improved by using an inert atmosphere in recirculating air operation.

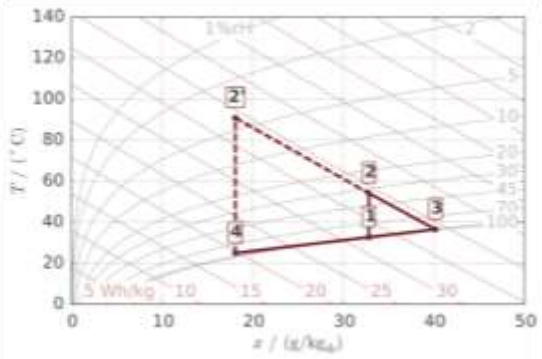
ENERGY EFFICIENCY IN INDUSTRIAL DRYING PROCESSES

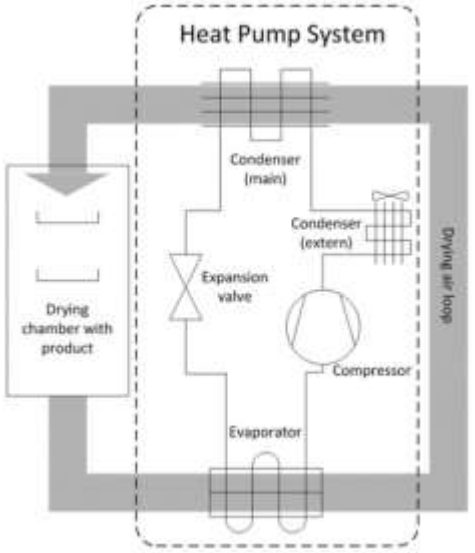
CONVENTIONAL VS. HEAT PUMP











Deliverables – Dry-F (dryficiency.eu) → D1.2
Specification of performance indicators and validation requirements

ENERGY EFFICIENCY IN INDUSTRIAL DRYING PROCESSES

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SUMMARY

- **Methods** to improve energy savings in industrial dryers
- By integrating **heat pumps**, energy savings of up to 80% can be achieved in the drying process.
- Heat pumps in industrial dryers → **deviating operating conditions** are a challenge.

IEA HPT Annex 59
Heat Pumps for Drying

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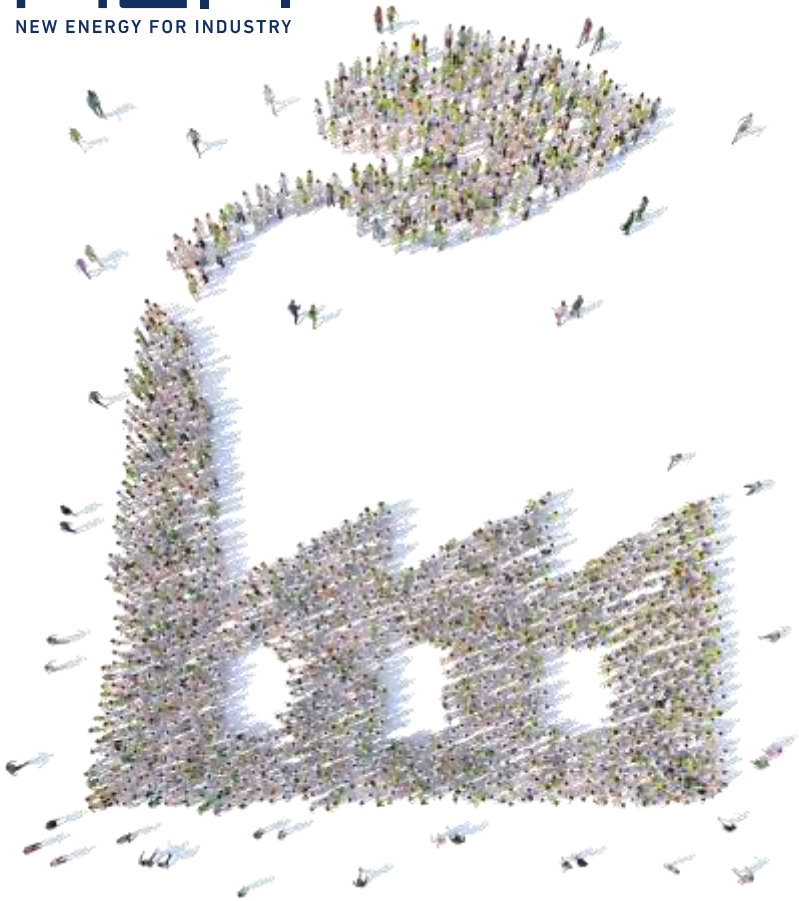

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NEFI is an Energy Model Region funded by the Austrian Climate and Energy Fund