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Introduction to HIT

Metrology for Humidity at High Temperatures and Transient Conditions

Workshop
PTB, Braunschweig, Germany, 16 – 17 November 2017
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HIT

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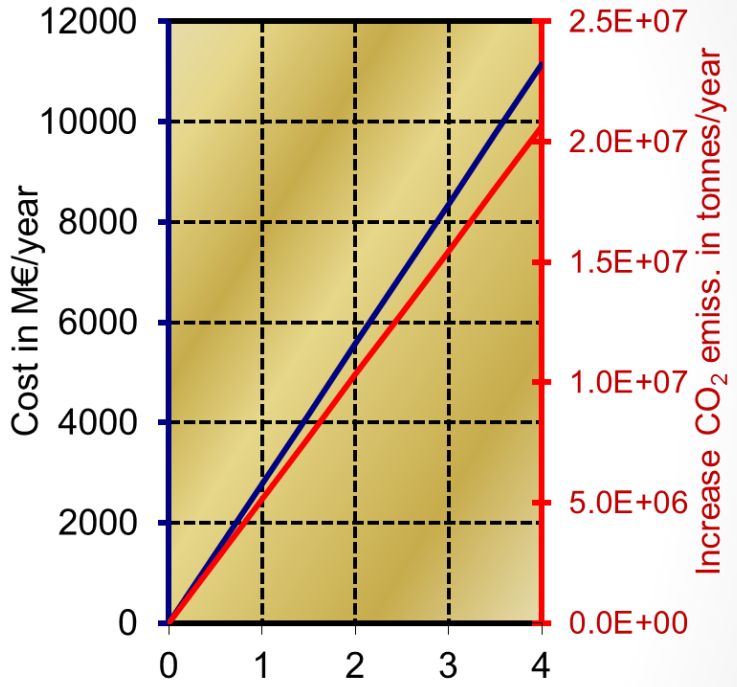
Industrial humidity measurements and climate change

- Heating and vaporising water require significantly more energy than many other liquids
- Drying = vaporising water
- In 2012, the annual energy consumption in Europe was about 2×10^7 GWh
  - It's estimated the 15 % of this consumed in drying processes
- More reliable humidity measurement in drying
  => less over drying
  => reduced energy consumption



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Humidity and product quality (1/2)

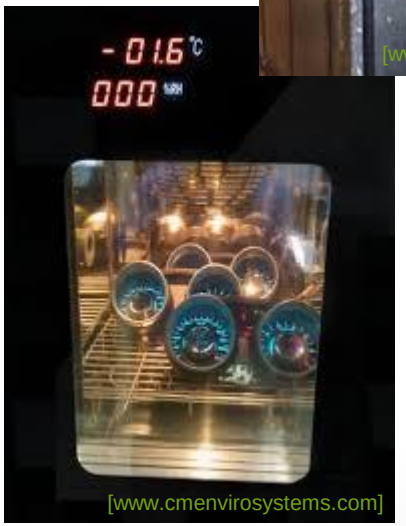
- In many applications humidity is measured for determining the dryness of material flow in a process:
  - Paper mills
  - Wood driers
  - Raw material dryers (plastic)
  - Etc.
- Material properties and final product quality is highly dependent on the dryness
- E.g. in food production, the most important moisture related parameter is water activity:
  - Water activity = equilibrium relative humidity on scale 0 to 1


[www.cds-concrete.com]

Humidity and product quality (2/2)

- Storage conditions are important e.g. in production of pharmaceuticals and various bioproducts
  - Effect on product quality and shelf life

- Environmental tests are are vital for ensuring and improving characteristics of e.g. electronic components and products
  - Operation and safety in various conditions
  - New materials and features



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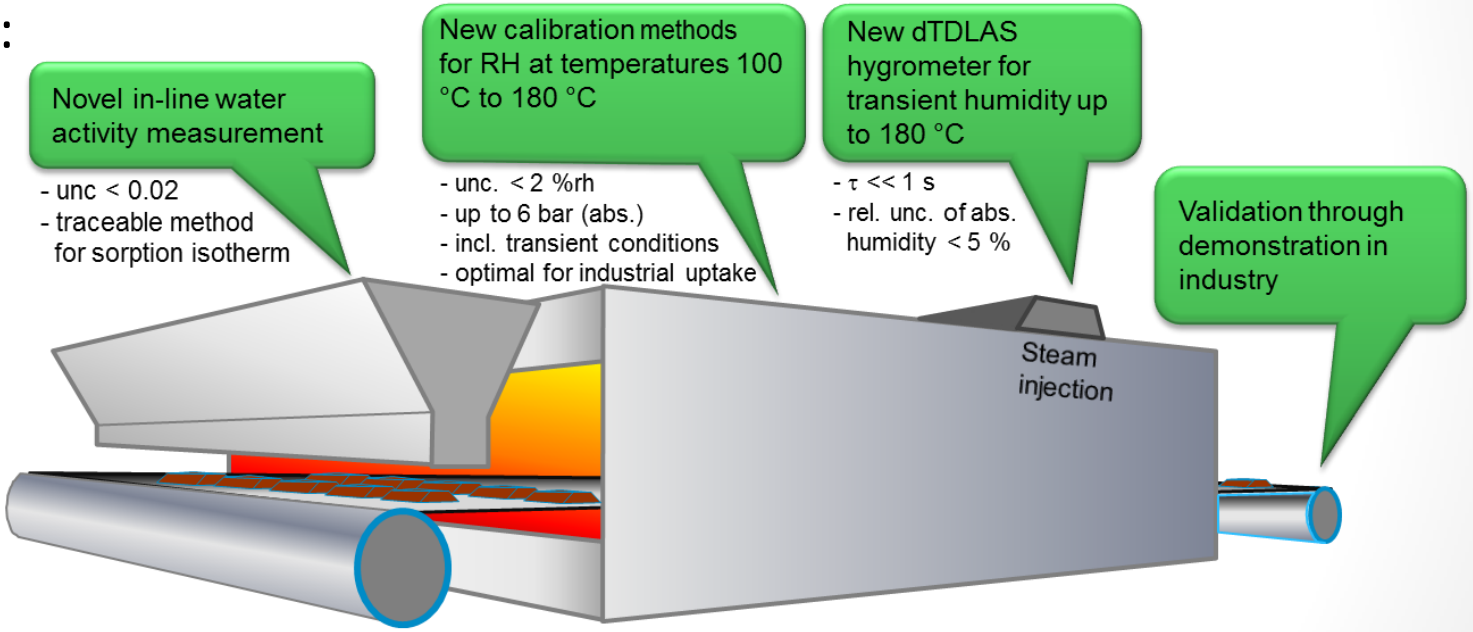
Traceability challenges in humidity measurements

- Relative humidity measurements at high temperatures (> 100 °C)
  - Humidity sensors are only calibrated at lower temperatures: How representative are the calibration results?
  - Humidity realisations (national standards) are limited to lower temperature range
  - How to estimate measurement uncertainty? (e.g. effect of thermal radiation)
- Humidity measurements in non-static conditions:
  - Fast transients in e.g. baking control
  - Humidity ramps in e.g. electronic testing
  - Non-static spatial inhomogeneities in e.g. product storages
- Traceable in-line water activity measurement
  - E.g. in food and feed production

EMPIR 14IND11 HIT

- HIT = Metrology for Humidity at High Temperatures and Transient Conditions
- Objectives:



New measurement approach for microbiological sample storage
- influence of microbiological processe on humidity gradients and transients
- unc. < 2 %rh

New approach for maintenance of equipment
- dynamic humidity measurement
- unc. < 2 %rh
- calibr. time reduced by 50 %
- new field calibrator

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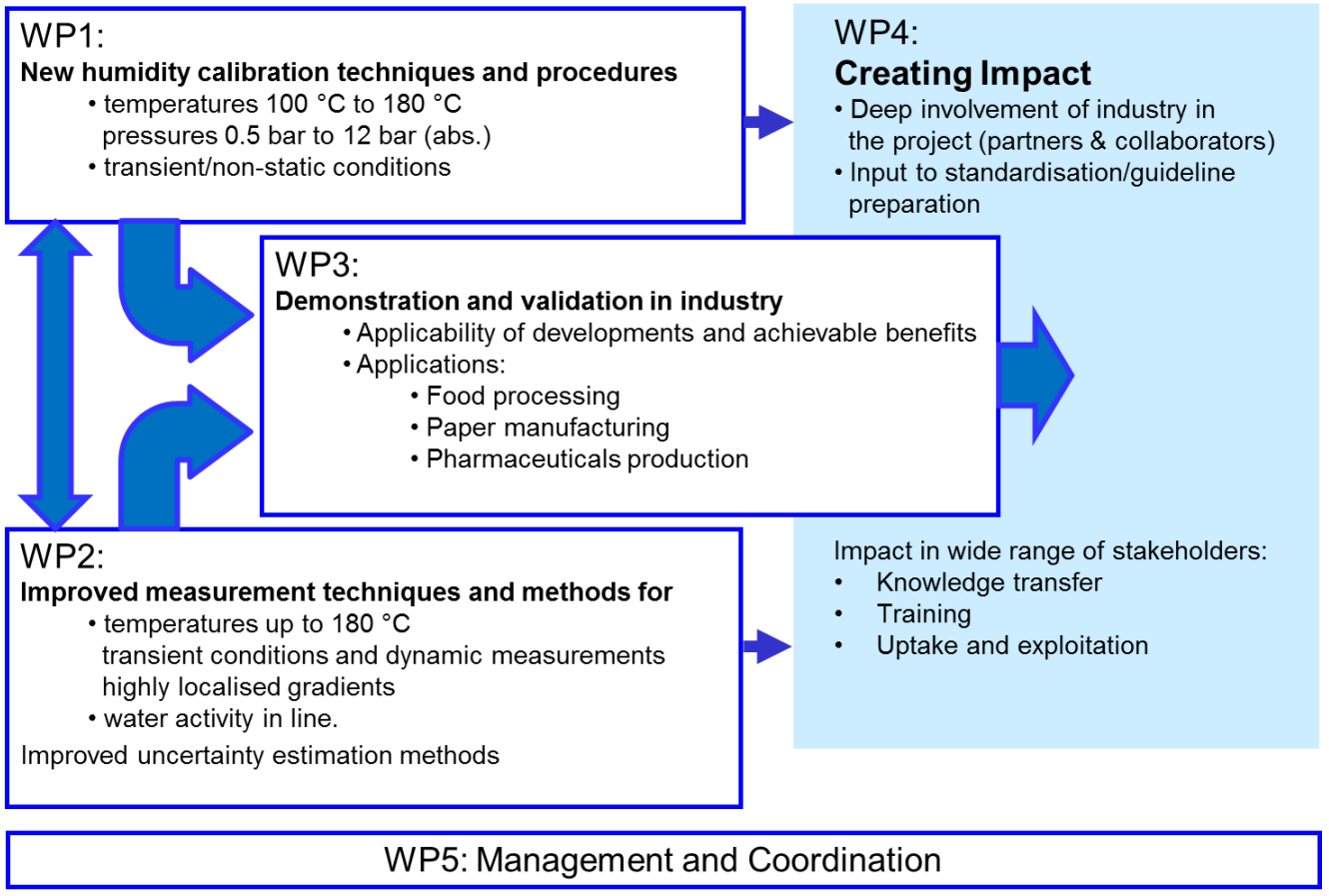
HIT: Implementation



ALL DEVELOPMENTS ARE DEMONSTRATED IN INDUSTRY:

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