



Waste biorefinery technologies for accelerating sustainable energy processes

# Commissioning of a 1 barrel per day Fischer-Tropsch slurry bubble column reactor

## STSM report

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WIRE Workshop Cottbus, October 5<sup>th</sup>, 2023

# Chemical conversion of renewable energies<sup>[1]</sup>



**Investigate synthesis and upgrading of renewable liquid energy carriers !**

## Hydroprocessing

- Upgrading renewable intermediates
- Production of ASTM conform kerosene
- Future proof refinery design



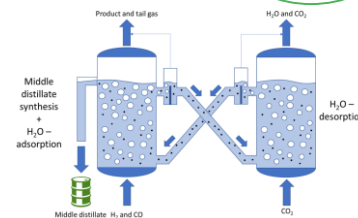
## Fischer-Tropsch synthesis

- CO and CO<sub>2</sub> feeds
- Three-phase system
- Reaction kinetics
- Reactor & process modelling



## Sorption enhanced synthesis

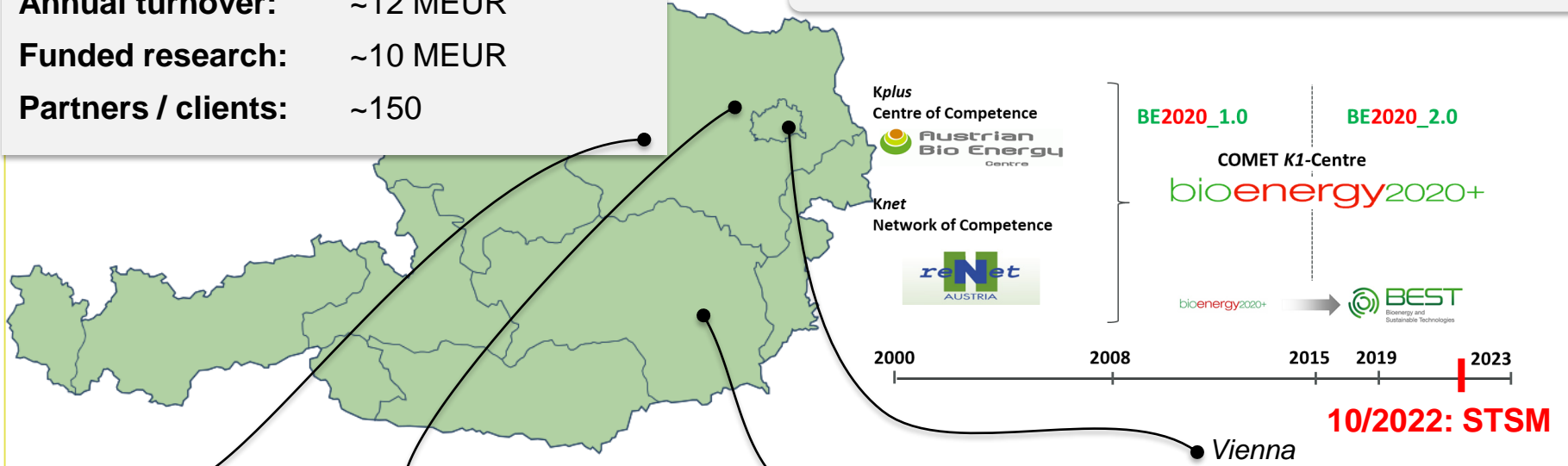
- In-situ water removal
- Cold model of looped bubble columns
- Sorbent characterization and circulation



# BEST in a nutshell [2]

**Human resources:** ~100 employees  
**Annual turnover:** ~12 MEUR  
**Funded research:** ~10 MEUR  
**Partners / clients:** ~150

**Bridging the gap between fundamental research and industrial deployment!**



Wieselburg, Lower Austria



Tulln, Lower Austria



Graz, HQ, Styria



# Syngas Platform Vienna [2]

FT lab scale



Fuel storage



Gas cleaning & FT pilot scale



APR plant



Lab



Gasifier



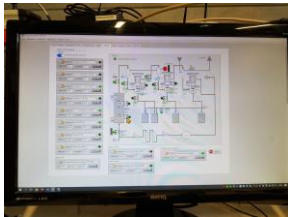


# Working plan of STSM

**Duration:** 03/10/2022 to 27/10/2022  
**Budget:** 1750 €

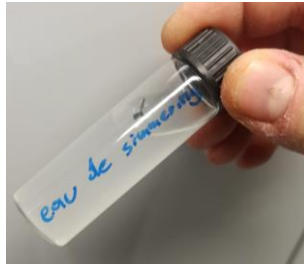
## Week 1

Hot  
commissioning  
of FT-SBCP



## Week 2

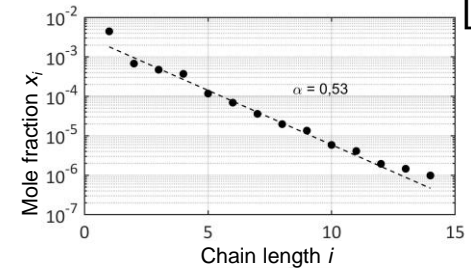
1<sup>st</sup> major experimental campaign  
with varying operating conditions  
and real-time sampling



## Week 3

## Week 4

Assessment of  
analytical  
results



[3]

# Working plan of STSM

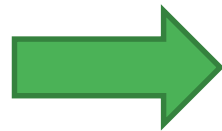
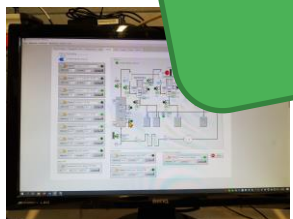
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Week 1

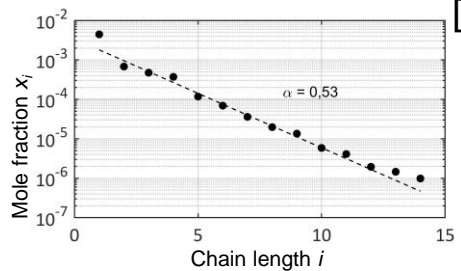
Week 2

4

Of course this is not what happened...



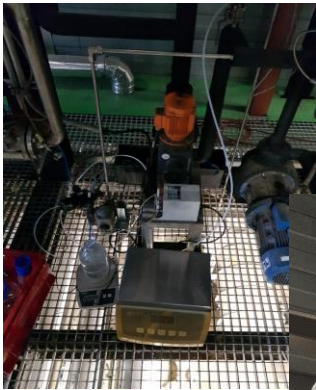
... of analytical results



[3]

## Week 1

Installment of  $\text{H}_2\text{SO}_4$  dosing for gas scrubber



## Week 2

Ensuring process safety to TÜV standards



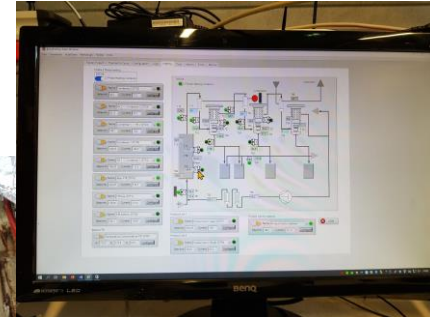
## Week 3

Reactor cleaning and catalyst preparation

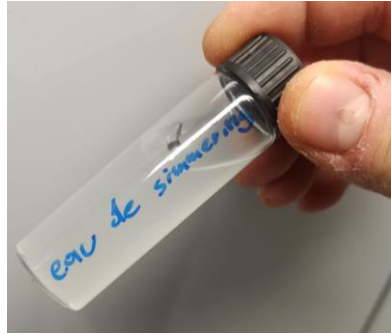


## Week 4

Start-up of FT process chain



# Main achievements



- ✓ Hot commissioning of 1 barrel per day FT-SBCR



[4]

- ✓ Exchange of contact information and experience with partners and staff (Covid conform!)

TRL 1-4



TRL 4-5



[4]

TRL 5-6



- ✓ Suitability of lab-scale and pilot-scale reactors for innovative FT variations confirmed



COMET  
**Green Fuel and Chemicals**  
Online, 20<sup>th</sup> of September 2023  
Gerald Weber

Working Group Gas Cleaning and Synthesis:  
Stefan Arlt, Matthias Binder, Anna Egger, Katharina Fürsatz,  
Stephan Hochgerner, Theresa Köffler, Luzia Wilhelm,  
Benjamin Lang



[5]

- ✓ Discussion of joint projects  
→ Started in early 2023



# Stay in contact!

W I R E



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# Thanks to...

- ... **BEST** for taking me in
- ... **KIT** for sending me
- ... **Prof. Rauch and Gerald Weber**  
for supervision
- ... **WIRE** for funding
- ... **BTU** for hosting
- ... **you** for listening!

- [1] Karlsruhe Institute of Technology: Homepage EBI CKE, <https://ceb.ebi.kit.edu/1522.php>, accessed 28/09/2023
- [2] Gerald Weber. „Syngas platform in Vienna“, 2023
- [3] Valentin Honold. „Fundamental investigation and kinetics in three-phase CO<sub>2</sub>-Fischer-Tropsch synthesis, 2023
- [4] Gerald Weber. Photograph of Plant commissioning, 2022
- [5] Gerald Weber. „Green Fuel and Chemicals – Working group Gas cleaning and synthesis“, 2023