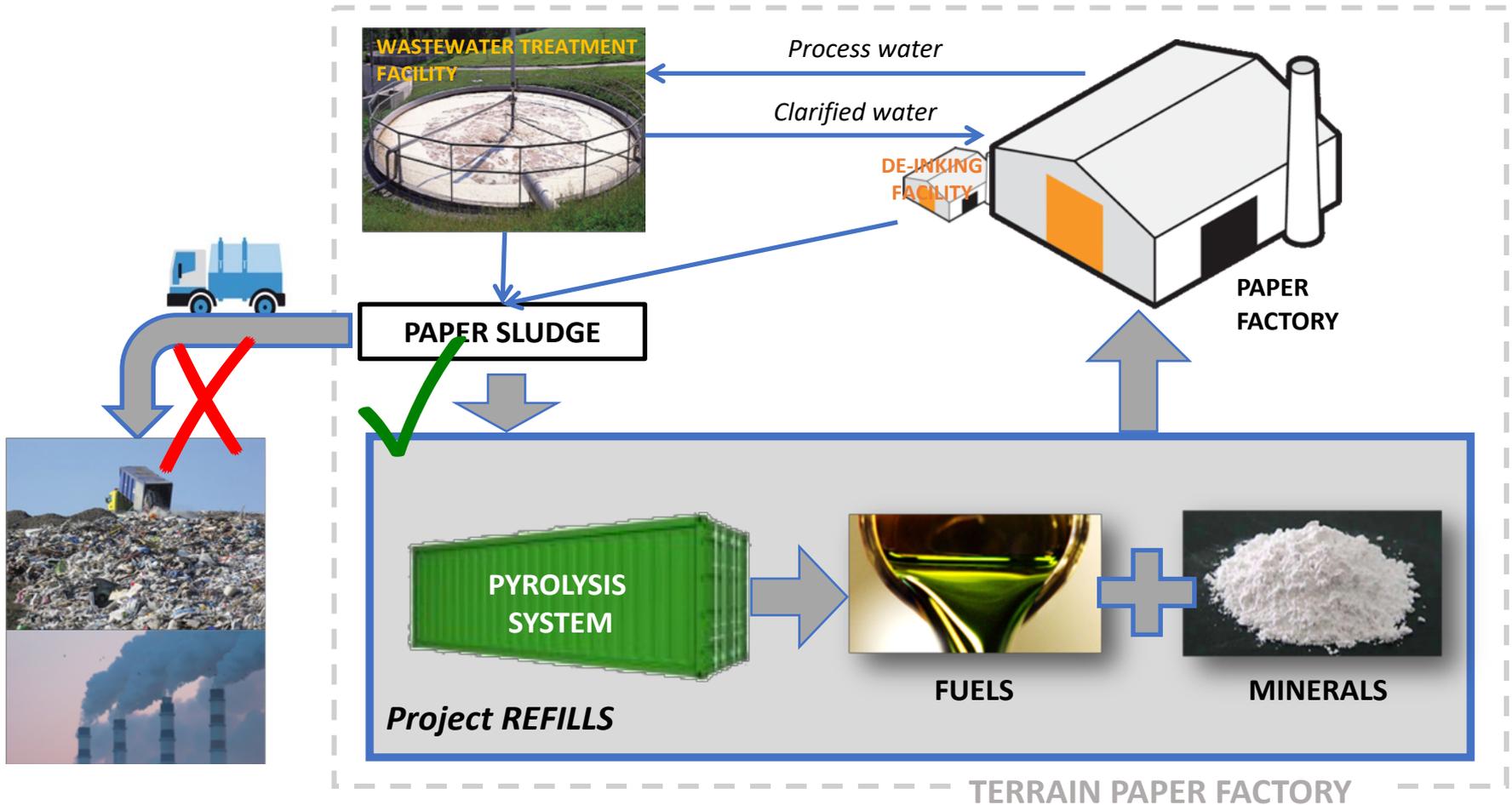


# Goedkopere pyrolyse olie middels het **REFILLS** proces

# PAPER SLUDGE & PROJECT REFILLS



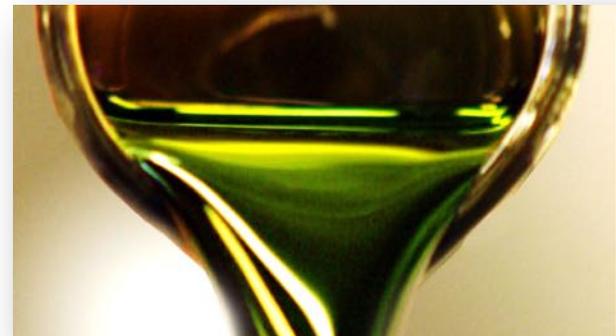
TERRAIN PAPER FACTORY

# KEY PROCESS BENEFITS

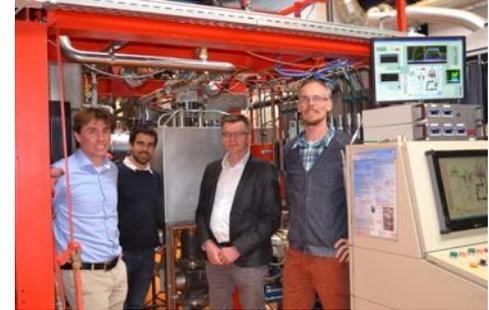
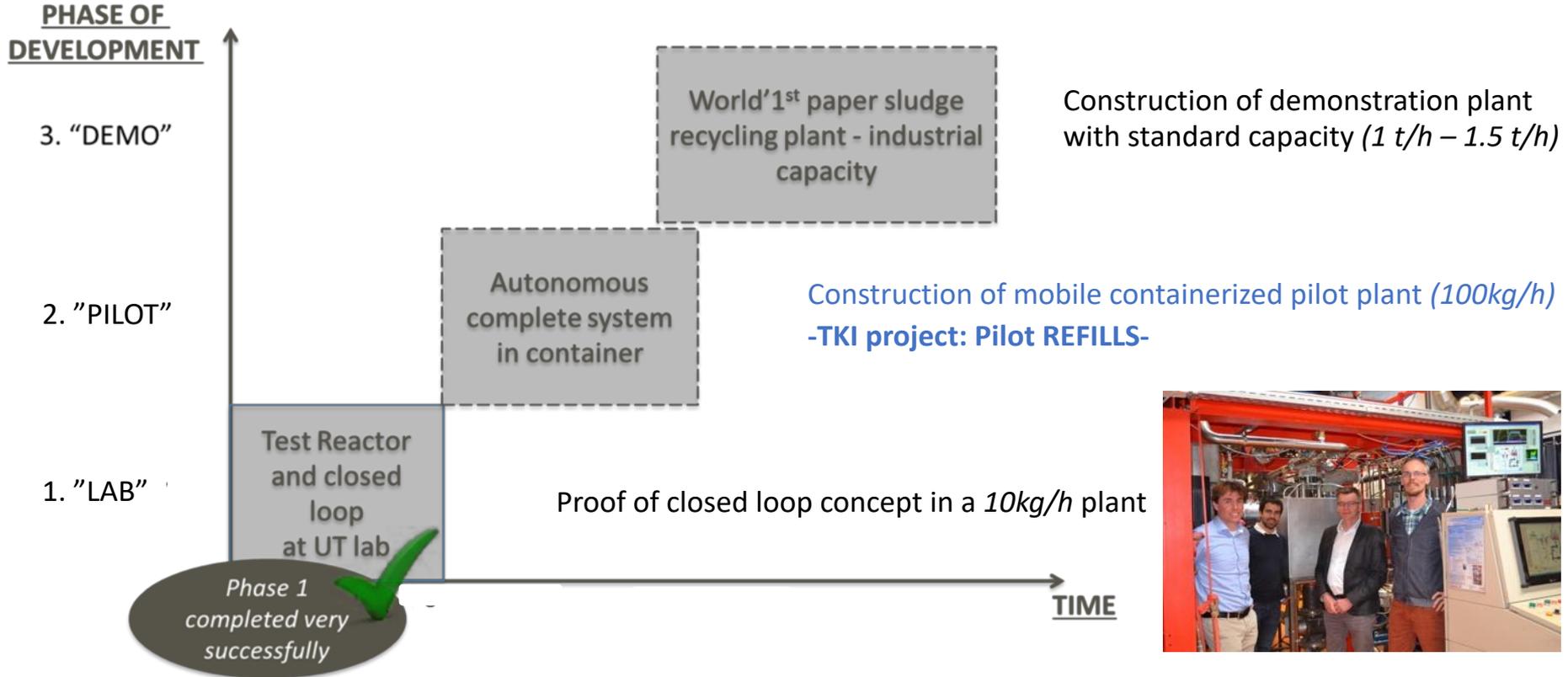
## Objective project REFILLS:

To develop standard containerized solution for the treatment and recycling of paper sludge in order to:

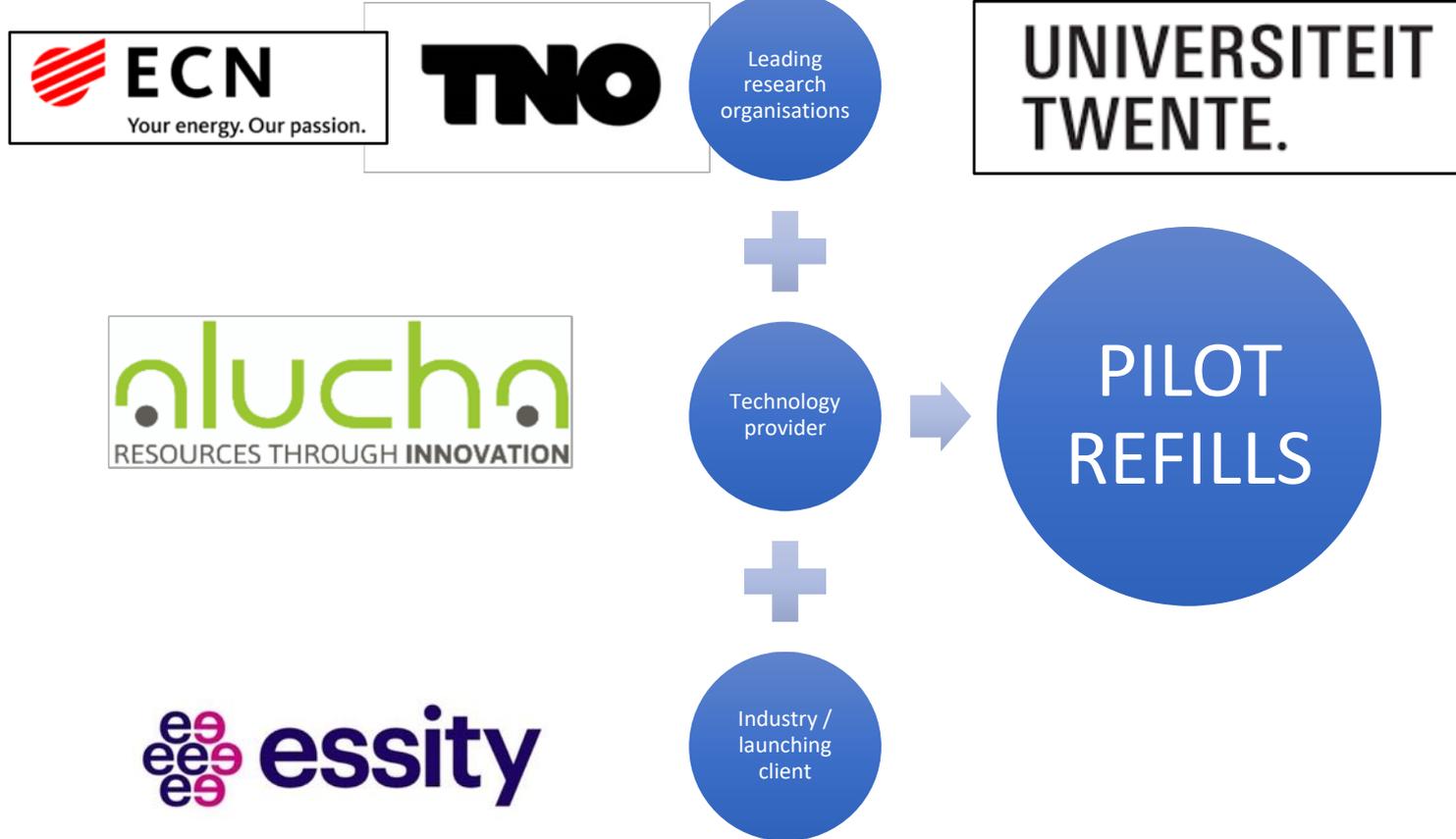
- ✓ Avoid wasting biomass (sludge)
- ✓ Recover energy products (pyrolysis oil)
- ✓ Recover minerals/fillers
- ✓ Save on CO<sub>2</sub> emissions



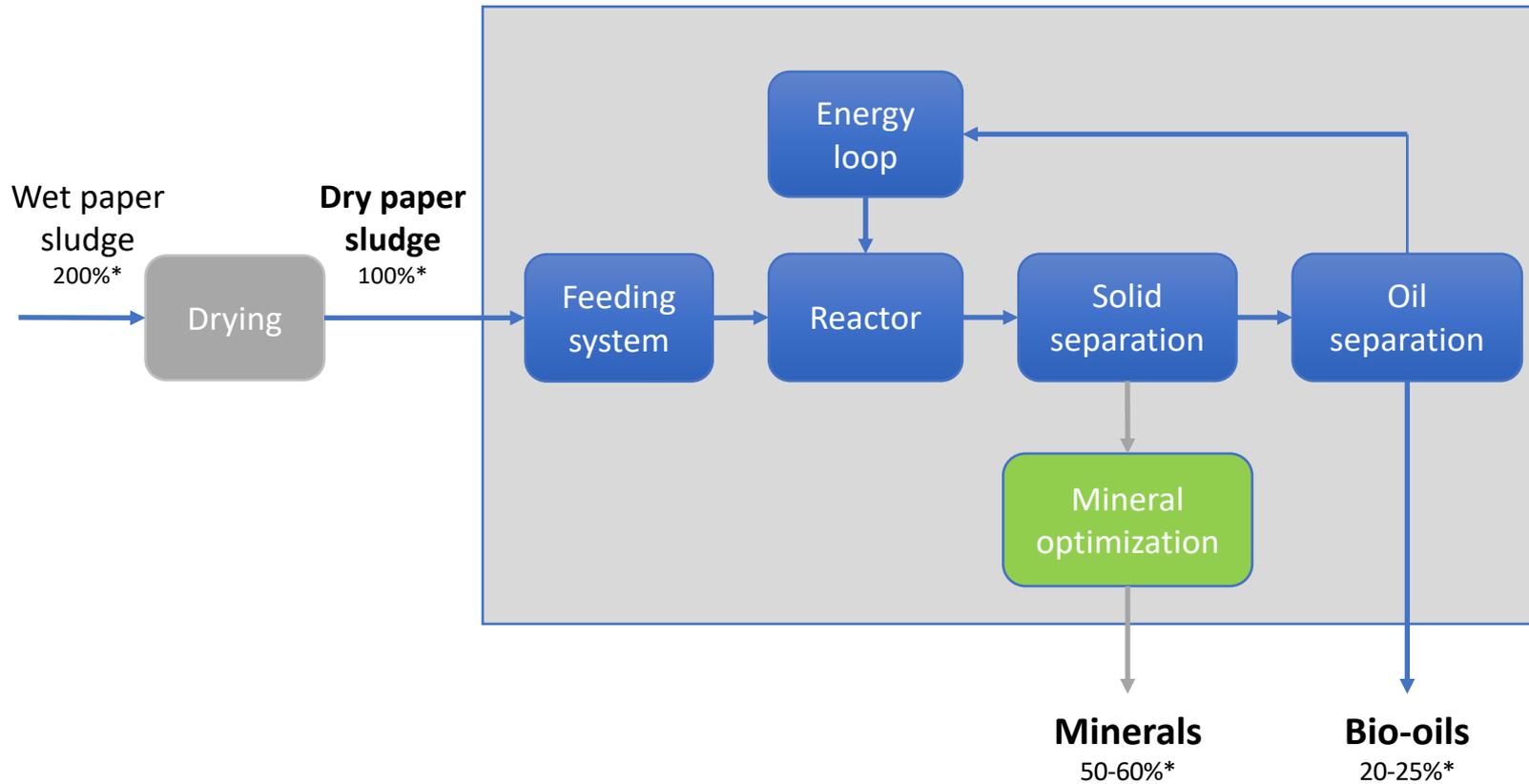
# DEVELOPMENT TIMELINE



# PROJECT PARTNERS



# MAIN PROCESS STEPS



\* Typical values for papersludge

# PROJECT PLANNING

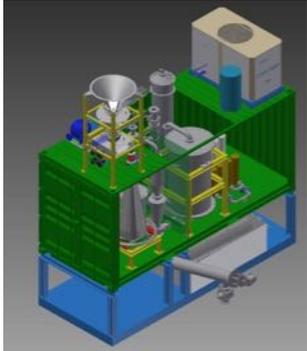
*Sep 2016*

*Dec 2018*



# 100KG/H PILOT PLANT

## Engineering & Construction



## Commissioning



# 100KG/H PILOT PLANT

Engineering & Construction



Commissioning

# TESTS

## First Operational Tests (2017)

	Date pyrolysis run	Hours production	Total mass PS treated (kgs)	Average feed rate (kg/h)
2.1	May 23	1	40.4	40.4
2.2	May 30	1.6	76.5	49.4
2.3	June 27	2.6	175	67.3
2.4	July 12	6.7	500	74.6
2.5	July 27	1.7	121	69.8
	<b>TOTALS</b>	<b>13.6</b>	<b>912.9</b>	



# TESTS

## Duration Tests



**SYSTEM SUCCESSFULLY RUN DURING 2X FULL WEEK!**

# FURTHER TESTS

## Mineral Optimisation Tests

(BFB)



## Oil cleaning Tests



## Emission Tests



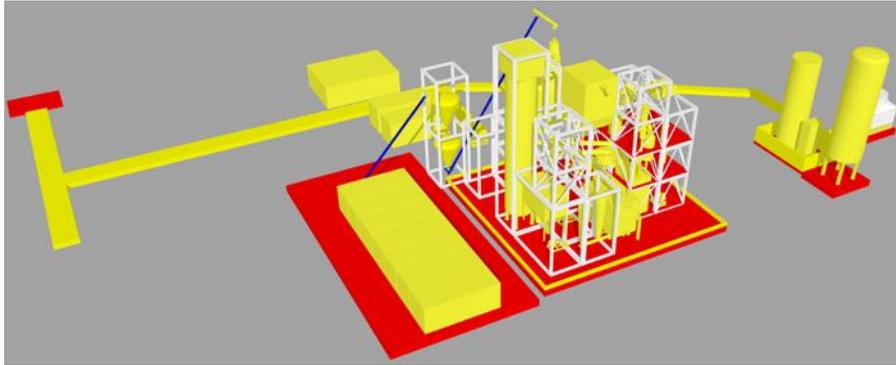
# MAIN ACHIEVEMENTS

- ✓ Not only novel reactor but complete process proven at 100kg/h scale: sludge recycles into oil & minerals!!
- ✓ Pyrolysis oil produced, minerals recovered
- ✓ In total, over 7 tons of paper sludge recycled, more than 10 test runs done, including 2 runs of 72h production
- ✓ System stable and reproducible results
- ✓ Throughput confirmed
- ✓ Mass and energy balances confirmed
- ✓ Majority of equipment confirmed
- ✓ Patent obtained on reactor



# CURRENT ACTIVITIES

## Basic engineering DEMO



## Techno economic evaluation

- Obtaining indicative equipment quotations
- Estimating operational costs
- Identifying mineral applications & potential prices/values

# OPEN CHALLENGES

- Oil quality: how to reduce mineral content in pyrolysis oils?
- Mineral quality: what is the highest value application for 'our' minerals?  
what mineral optimisation needed to get there?
- Heat integration: DEMO system needs heat integration.  
How to design & test this?

**THANKS FOR  
YOUR ATTENTION**



*MET DANK AAN*

