

From toiletpaper to

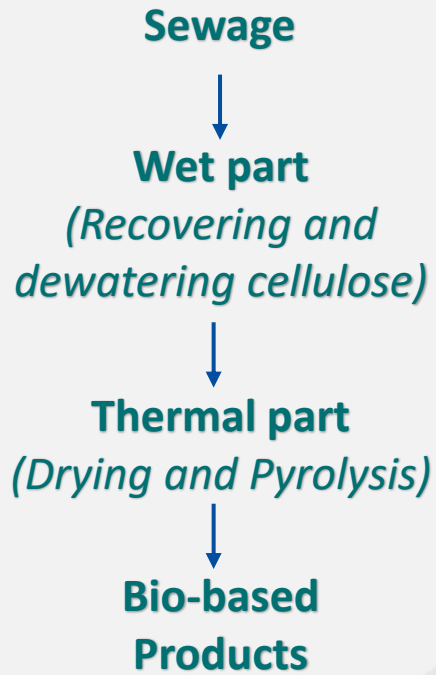


Marit van Veen

CirTec B.V.
Nijverheidsweg 26
1442 LD Purmerend
www.CirTec.nl

CIRTEC

From toiletpaper to



Valuable resources

Interreg EUROPEAN UNION
North-West Europe
WOW!
European Regional Development Fund

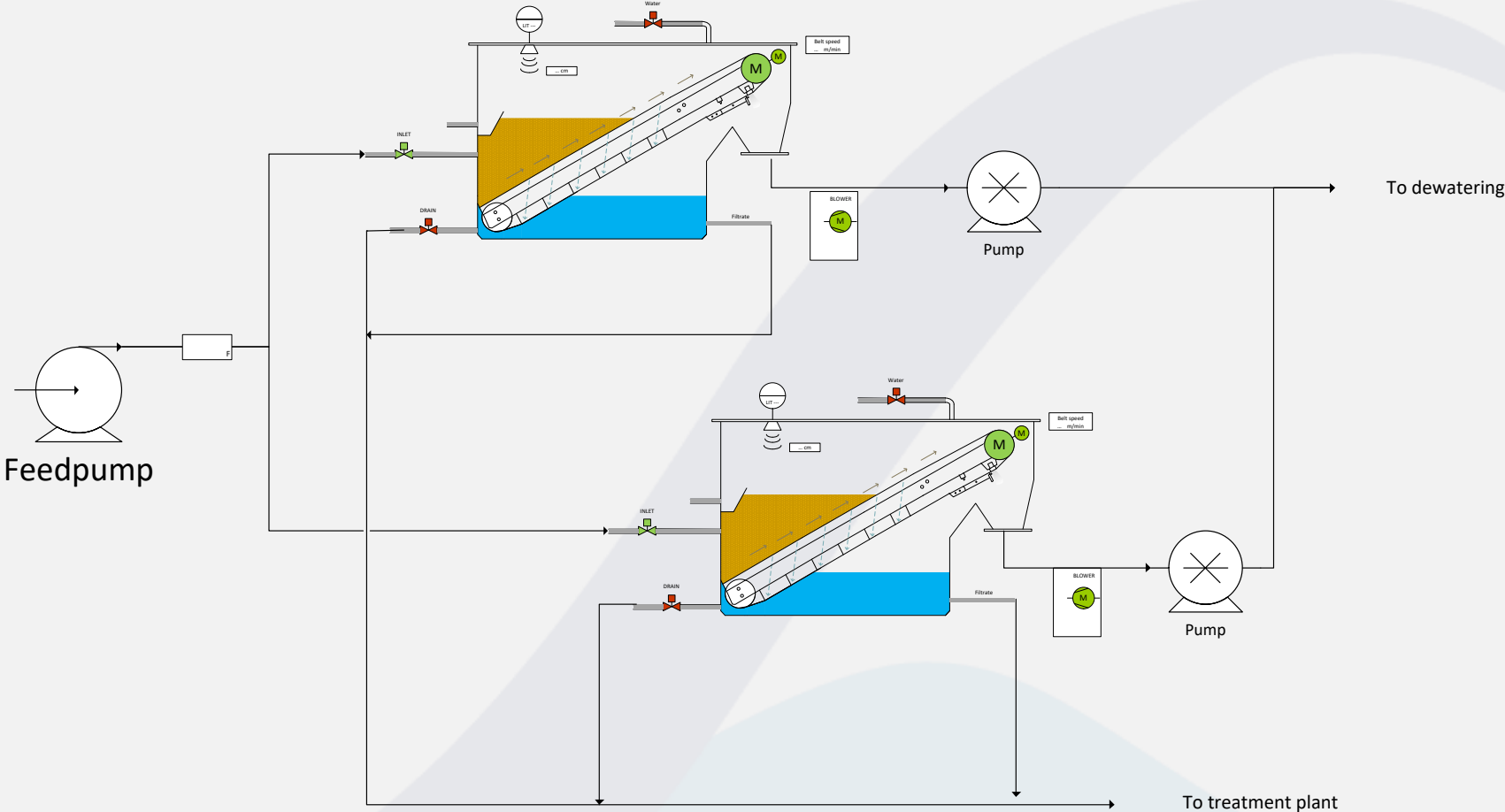


Pilot at sewage treatment plant Ede



Type installation	Activated sludge			
Design capacity	272.000	PE		
Actual load	261.041	PE		
Treated sewage water	14.056.903	m ³ /year		
Average feed	38.512	m ³ /day		
Dry weather feed (50 percentiel)	30.193	m ³ /day		
Maximum capacity	8.000	m ³ /hour		
COD	27.000	kg/day	695	mg/l
BOD	9.066	kg/day	233	mg/l
TKN	2.660	kg/day	58	mg/l
Ptot	362	kg/day	9	mg/l
TSS	11.238	kg/day	288	mg/l

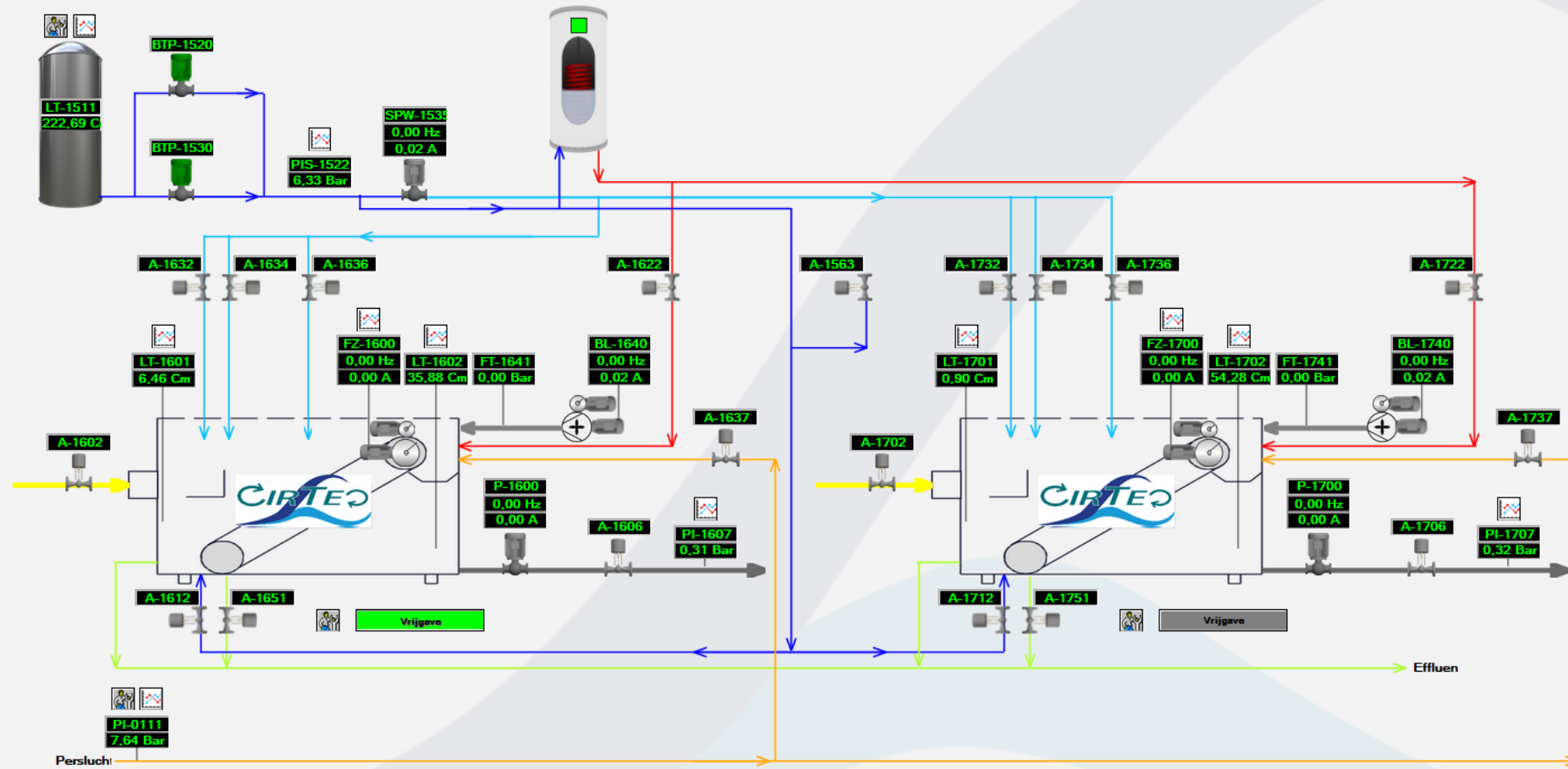
System set-up



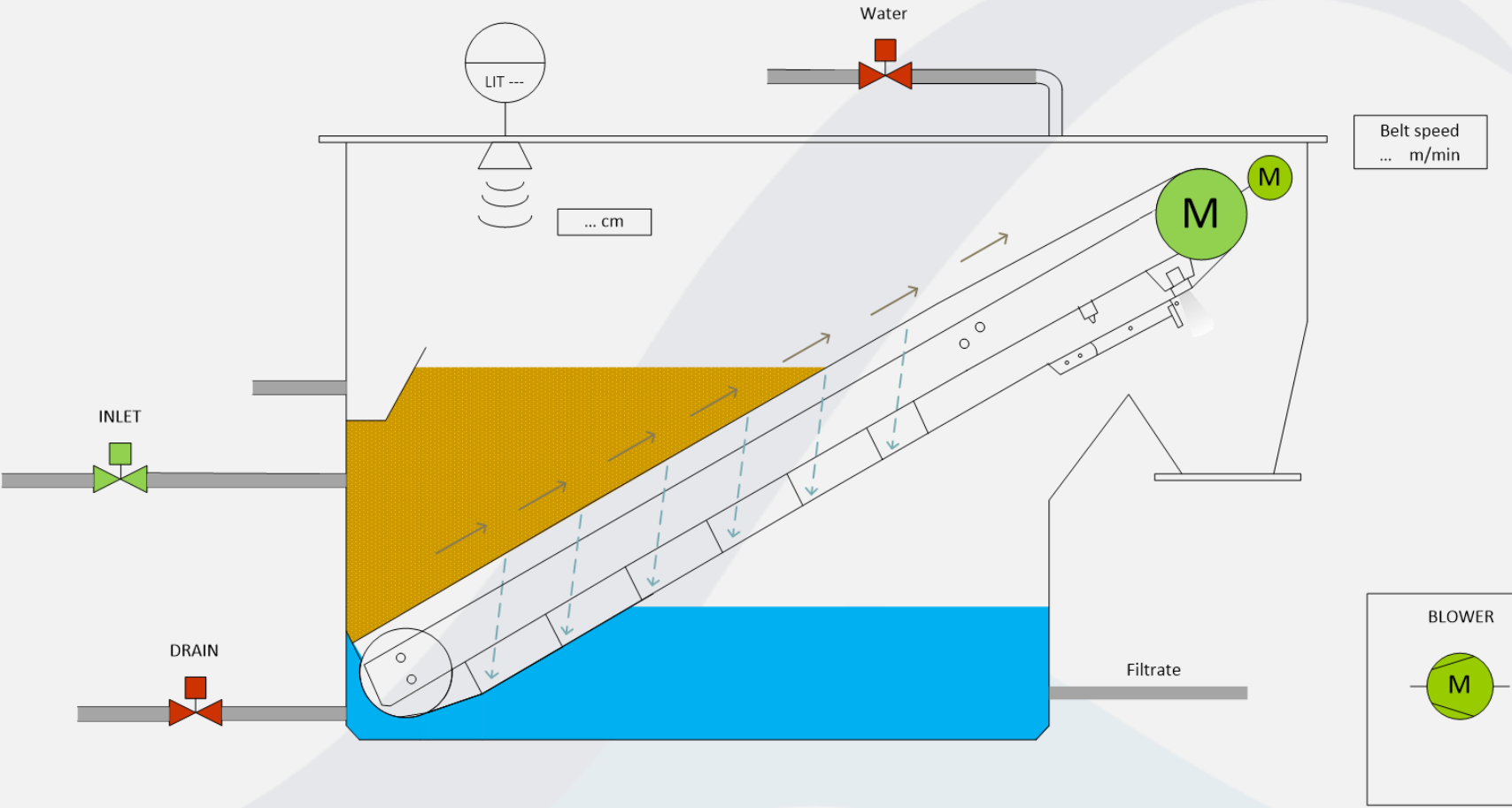
A quick tour



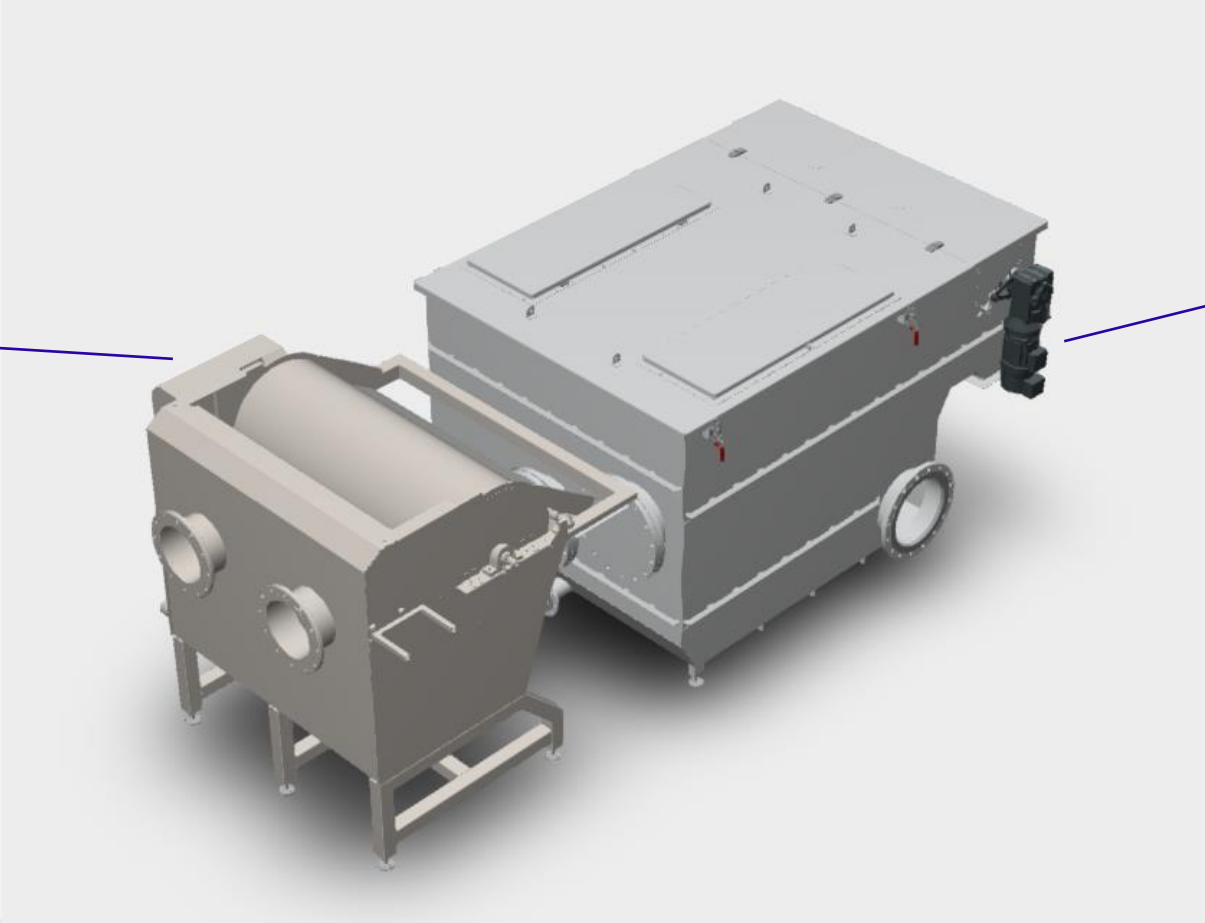
Controls



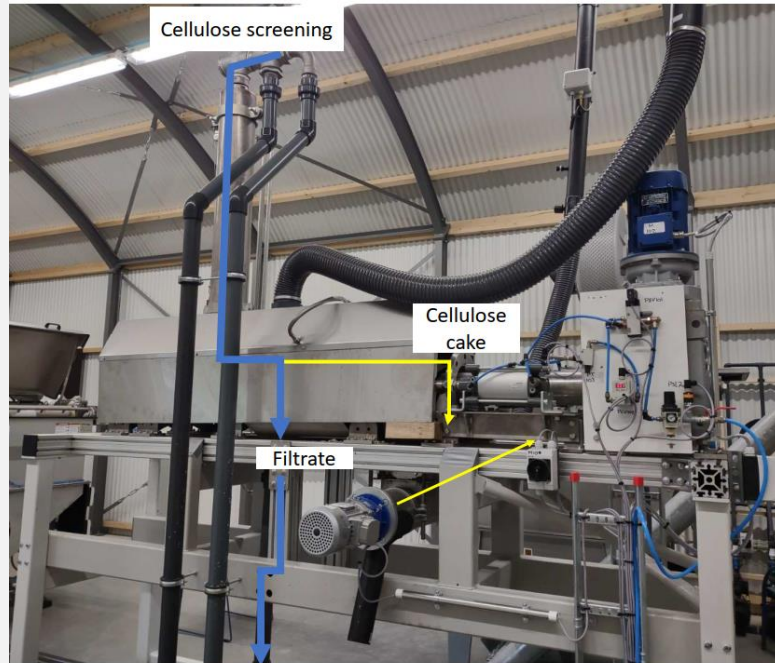
Working principle



In-line separation of cellulose and residue



Dewatering



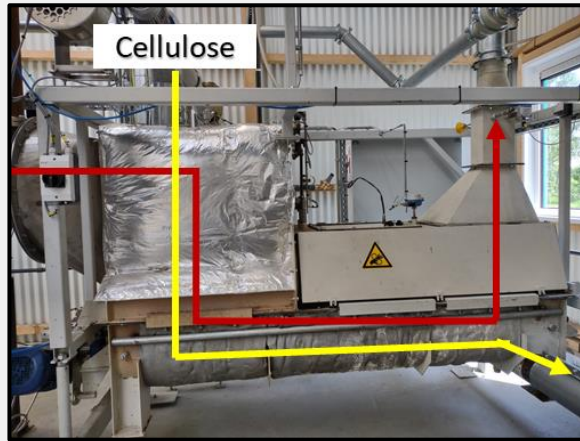
- Mechanically dewatering the Cellulose screenings from the CirTec sieves
- Cake dewatered up to 45...50% DS
- Dewatered cake is stored in a buffer, to separate different sections of the installation
- Filtrate returned to the WWTP



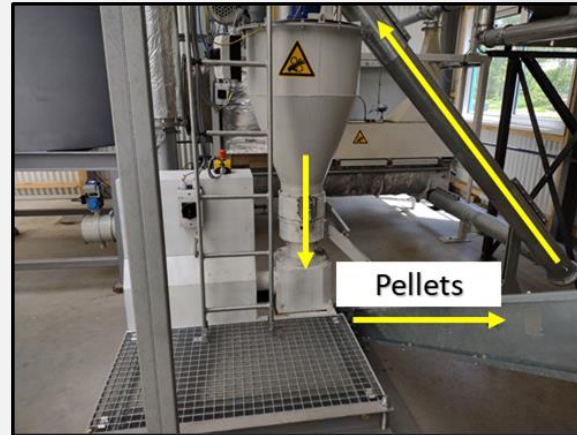
Cake, 45%DS

Drying section

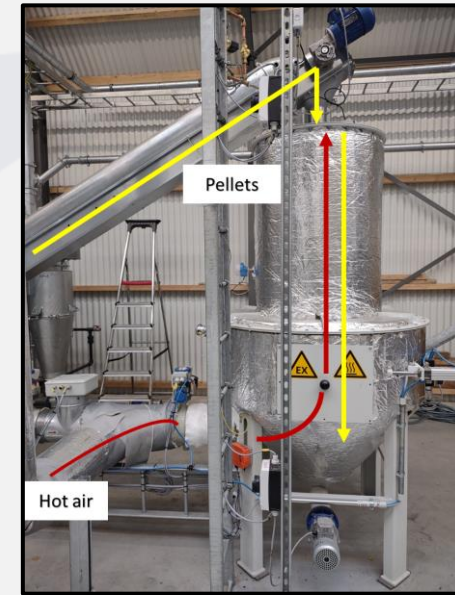
(1) Falling curtain dryer



(3) Pellet press



(4) Deep Dryer



Cake, 45%DS



Fluff, 60...65%DS



Pellets, 90%DS

Pyrolysis

Cracking of organic material at a high temperature and low oxygen content

Temperature gradient 200-900 °C

Flash reactor for very rapid pyrolysis

Advantage:

Degradation toxic components and pathogens; gasses as fuel

Disadvantage:

Ash contains heavy metals

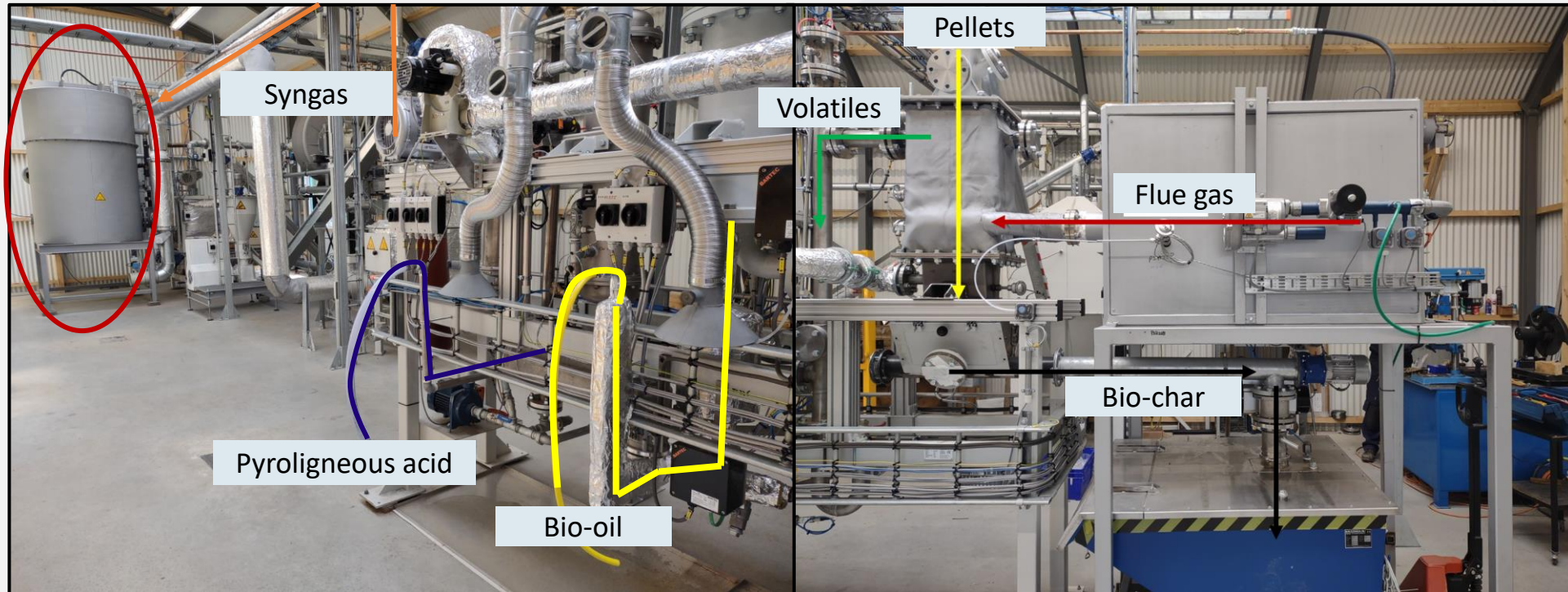
Pyrolysis section

(4) Pyrogas co-combustor

(3) Separation

(1) Reactor

(2) Burner



Pyrolysis Products



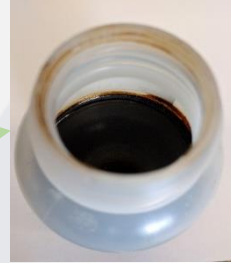
Cellulose Pellets
Feedstock of the
pyrolysis reactor

Pyrolysis



Char

Used as activated carbon,
For adsorption of micro-
pollutants in effluent



Bio-oil

Green fuel used
Externally for steam
generation



(Pyrolignous) Acid (pH ~5)

Enhances denitrification and
biological P-removal in WWTP



Pyrolysis gas

Combusted in the installation,
to supply heat for the dryers

Challenges on the products

Bio-oil

Technical:

- The ash content of the oil is relatively high (lead to dust formation on the heat exchanger reducing the heat transfer)
- Concentration of several species could be to high (for instance chlorine)

Activated carbon

Technical:

- Microstructure (500...2000 m²/gram)
- Activation options: thermal, chemical or biological
- The effect of pyrolyse temperatuur

Legal: Waste status
Fiscal: product status

Challenges on the proces

How circular and environmental positive is the process?

- WWTP, reducing sludge deposition, producing biochar, acid, bio-oil
- Replacing fossile activated carbon (removal pharmacueticals)
- Can the energy consumption of the proces be reduced?

"We cannot solve our problems with the same thinking we used when we created them"

- Albert Einstein -

Towards a cleaner circular future

CIRTEC



CirTec B.V.
Nijverheidsweg 26
1442 LD Purmerend
www.CirTec.nl