Cambi THP & SolidStream

Maarten Kanters
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FROM WASTE TO WORTH USING ADVANCED ANAEROBIC DIGESTION

THE CAMBI SOLUTION TURNS PROBLEMS INTO PRODUCTS: FROM WASTE TO WORTH

Who is Cambi

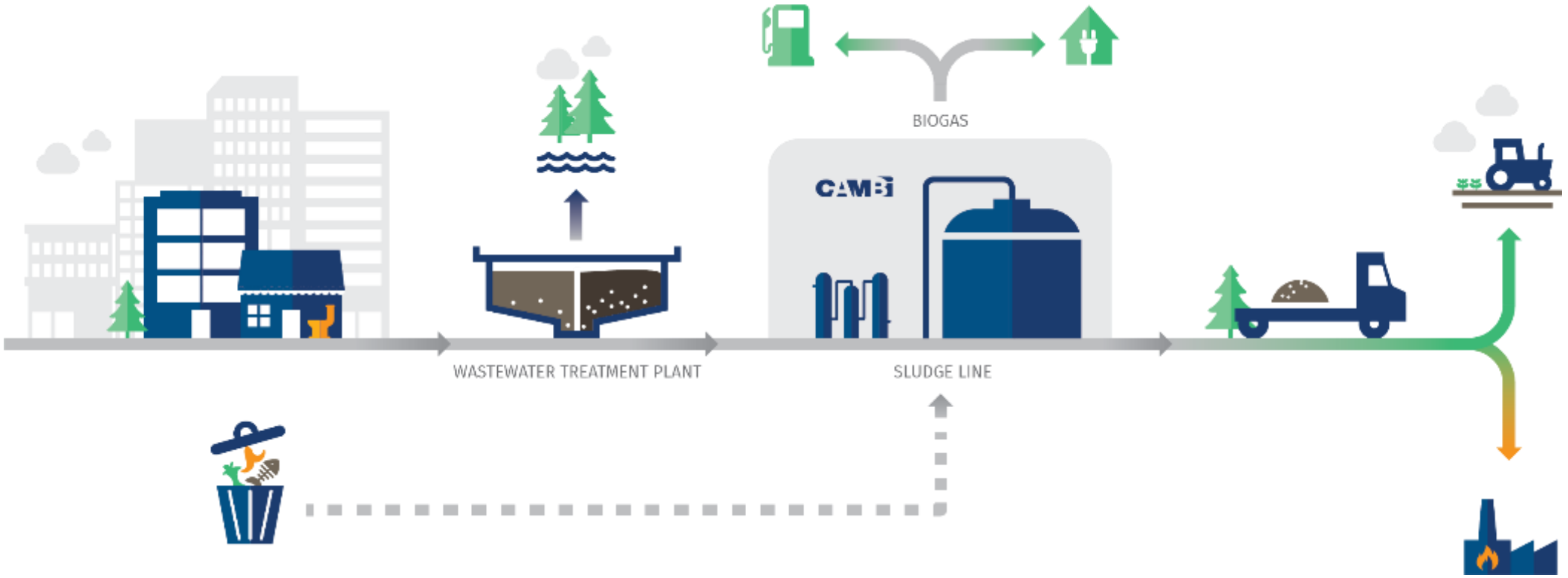
6
Offices

28
Nationalities

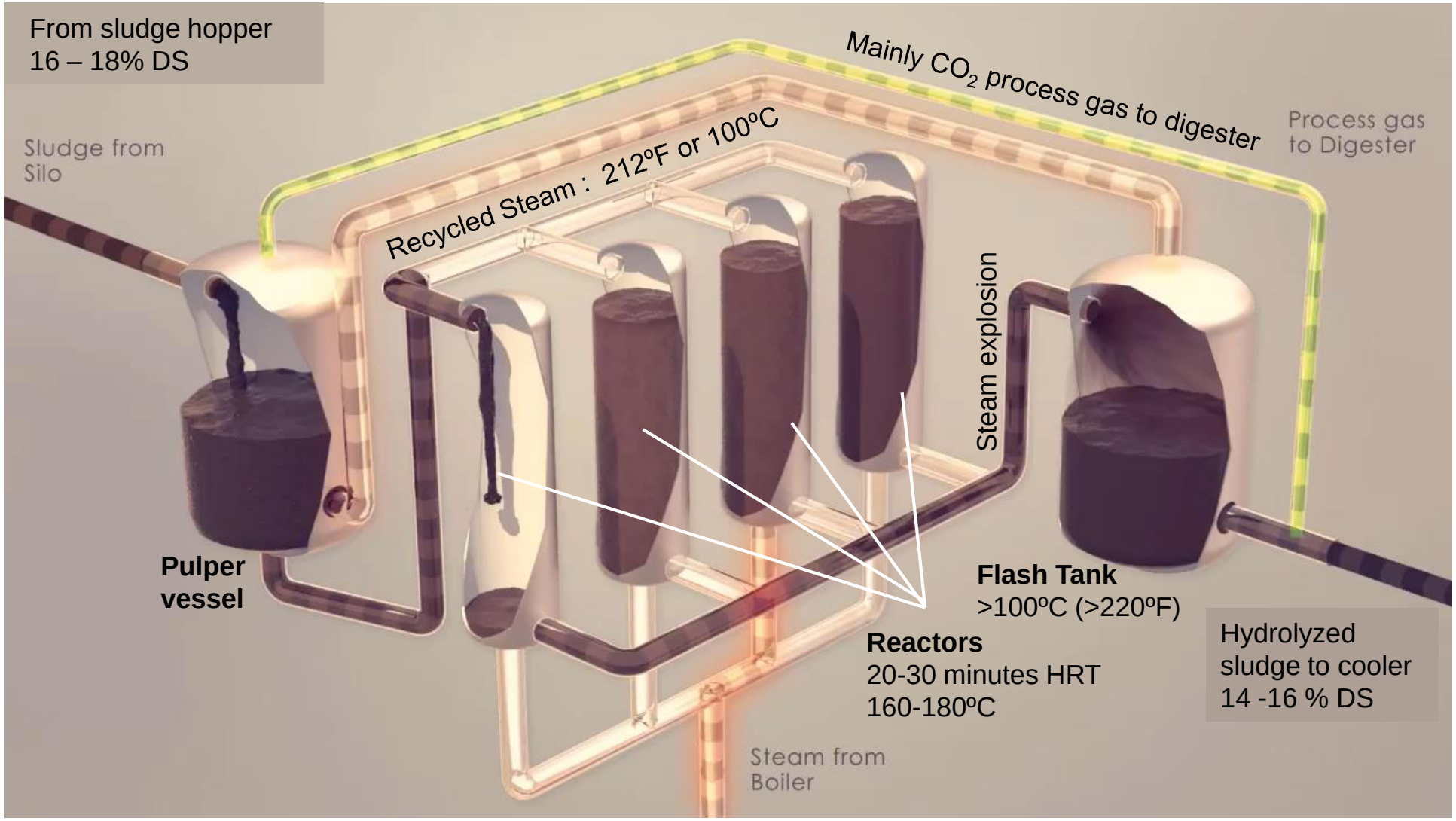
21
Languages spoken

18
Disciplines

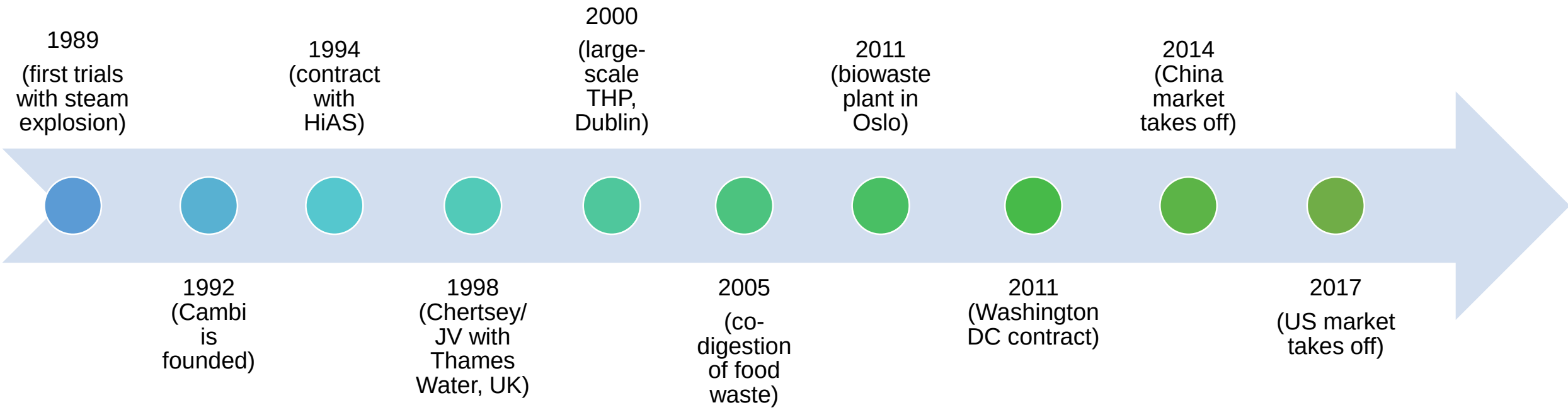
Cambi delivers solids management solutions



THP: sterilisation, followed by steam explosion…



Cambi has more than 25 years experience with THP

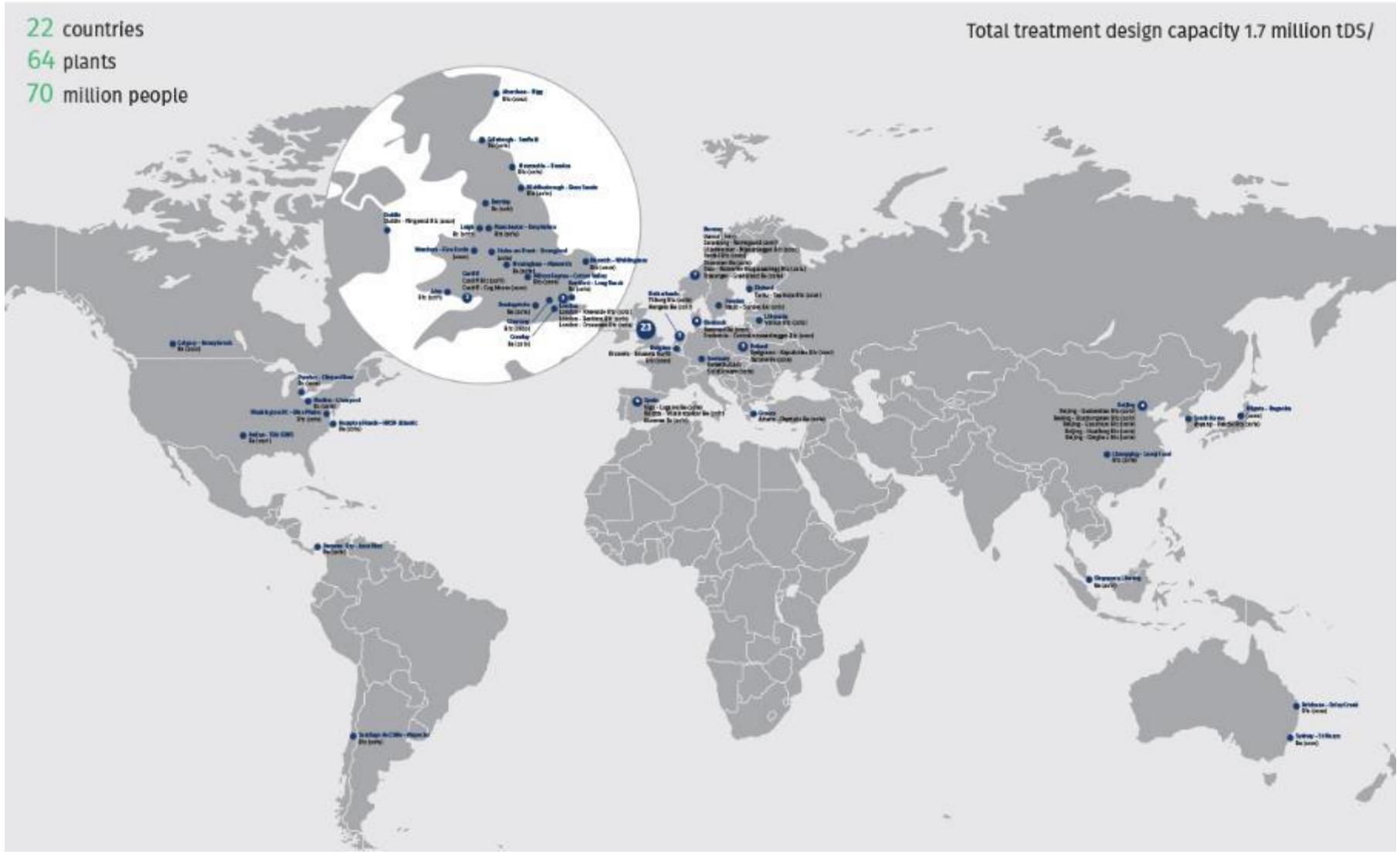


Cambi today

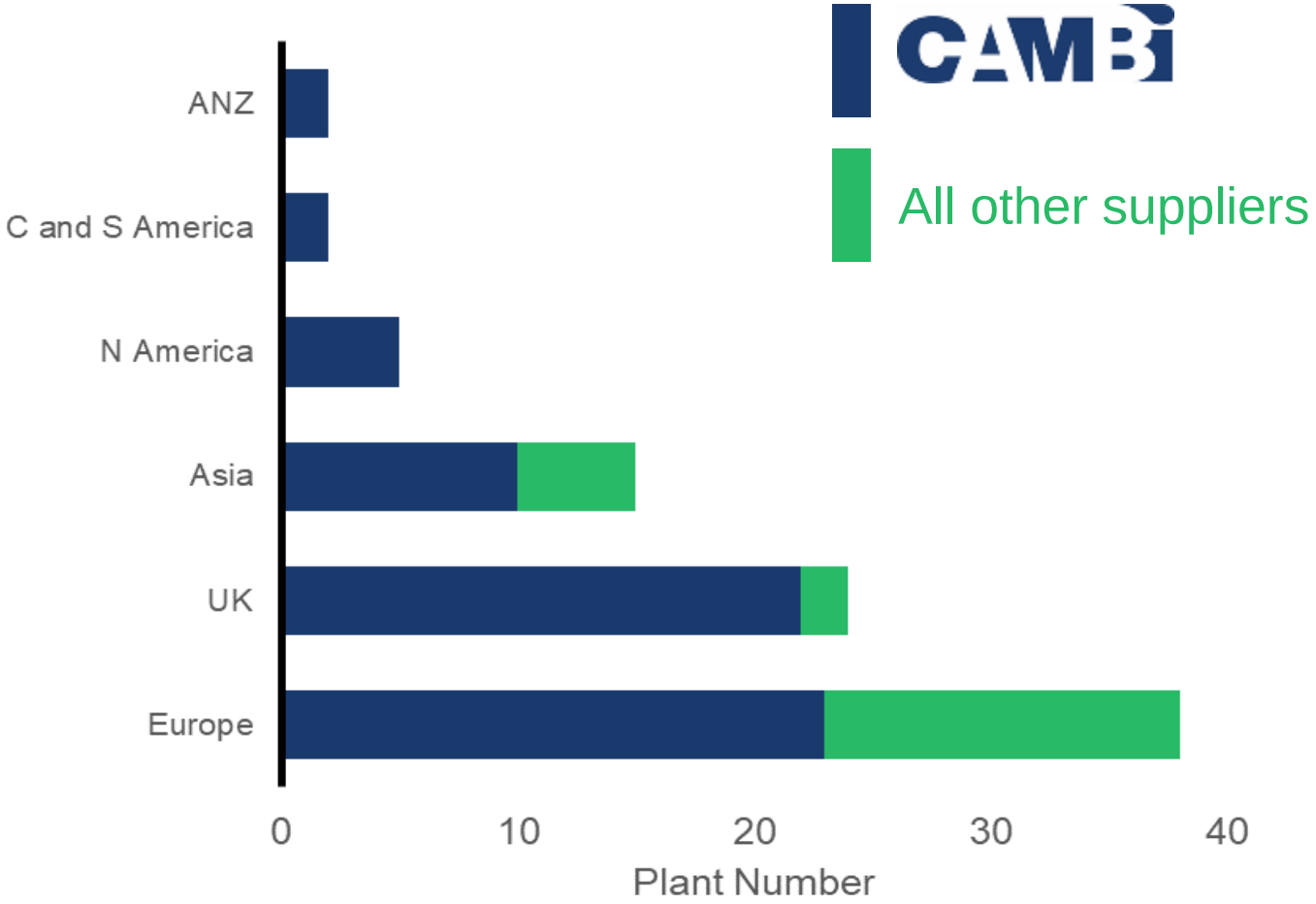
64 Plants, of which	50 Running	396 Years of plant operational experience	70M People served	6310 Tonnes dry solids/day
22 Countries	5 Continents	1/2 Repeat customers	1/3 of UK's sludge production can be treated by installed capacity of Cambi thermal hydrolysis	
11- 410 Range of plant size tonnes DS/day	364 Reactors in 105 Trains			

CAMBI -recycling energy

References

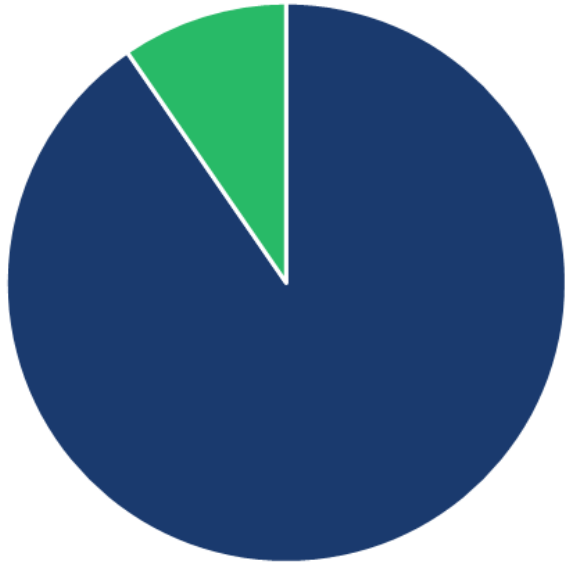

22 countries
64 plants
70 million people
Total treatment design capacity 1.7 million tDS/

Thermal Hydrolysis Globally



Between 80 and 90 facilities

Market Share by installed capacity



Over 2 million tonnes dry solids processed annually

Cambi Solutions

CAMBI THP before digestion (Conventional)

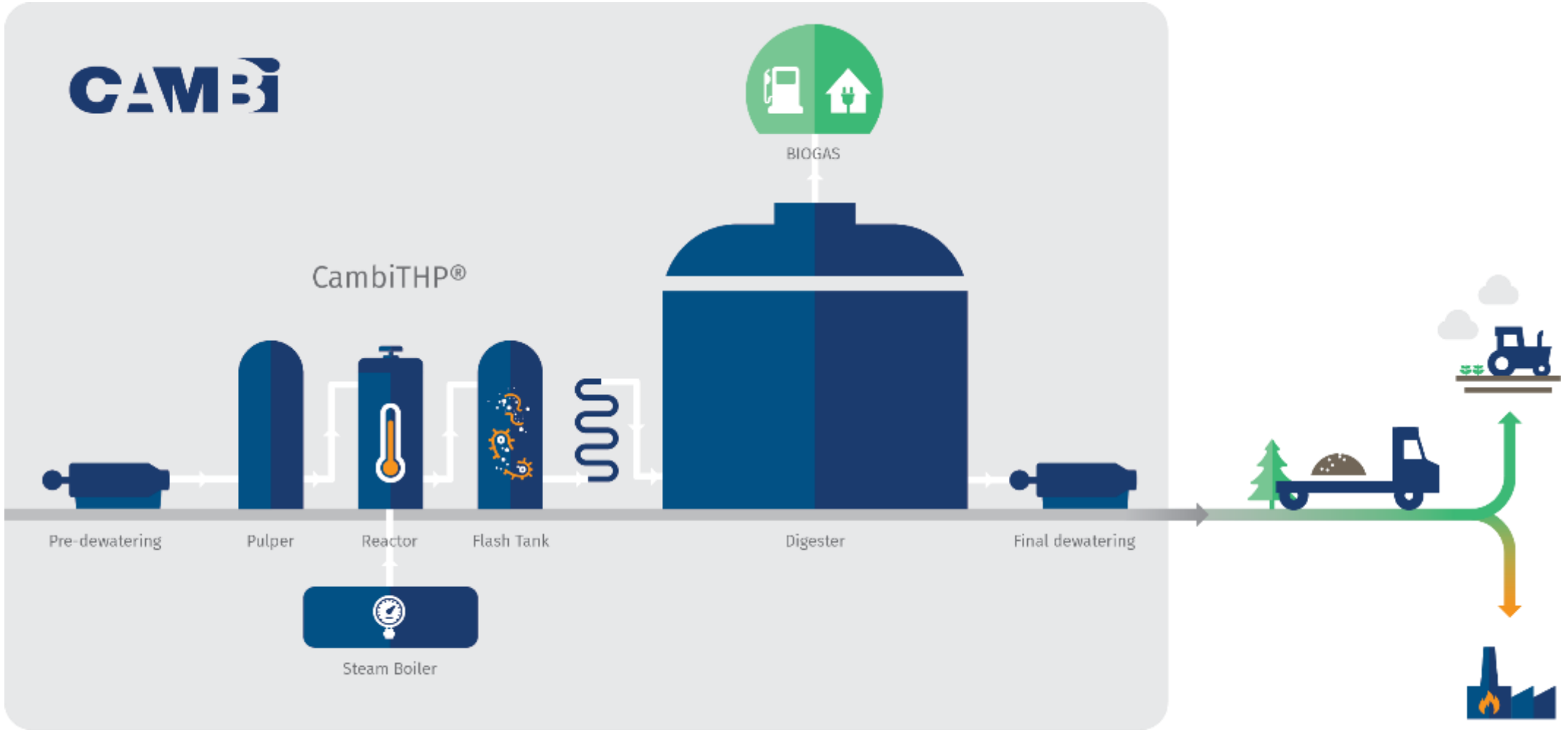
CAMBI THP after digestion (SolidStream)

Sludge Line

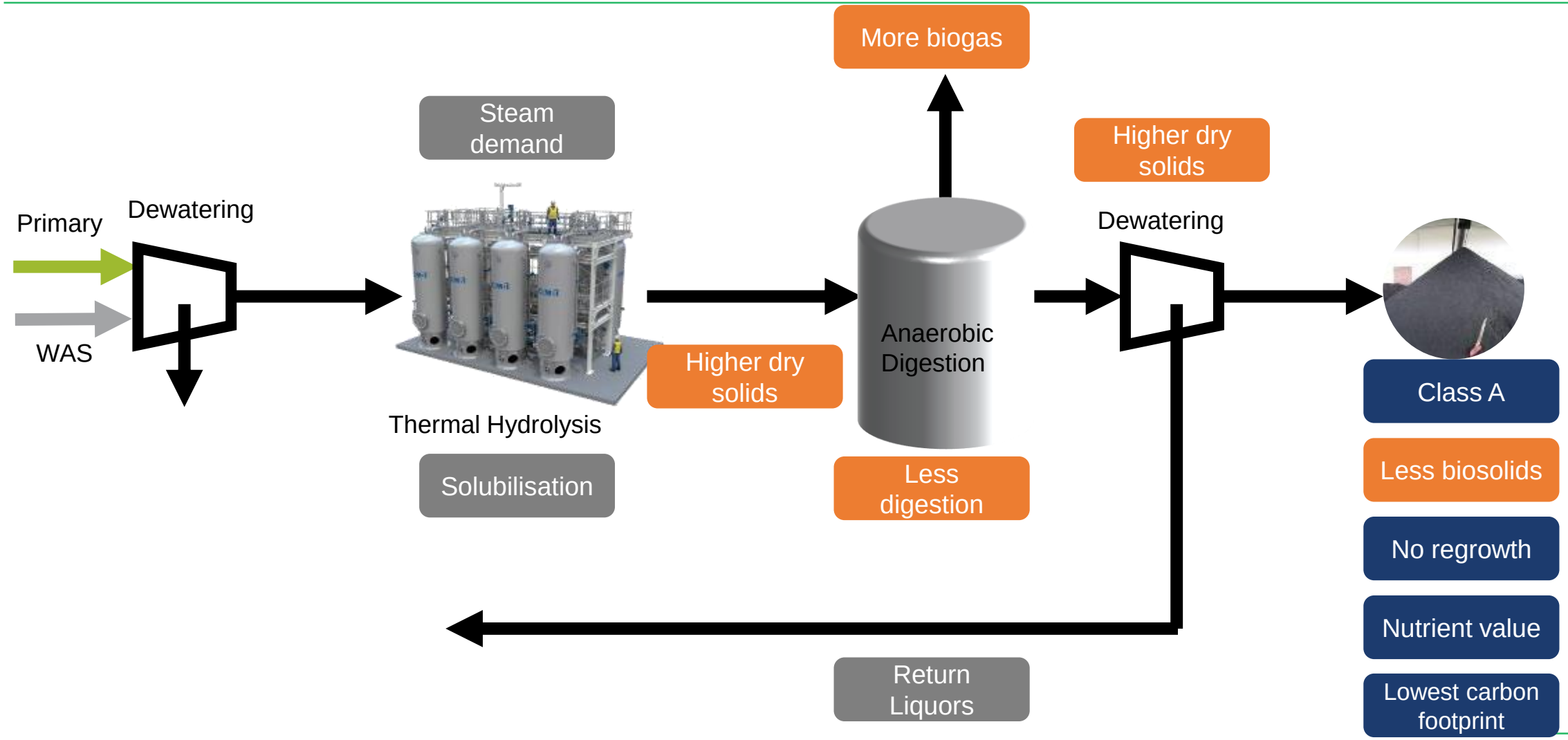
Services

Cambi THP before digestion

Cambi Pre-AD THP



Influence of Pre-AD THP on overall process



Example : Tilburg and Hengelo

Key drivers Tilburg:

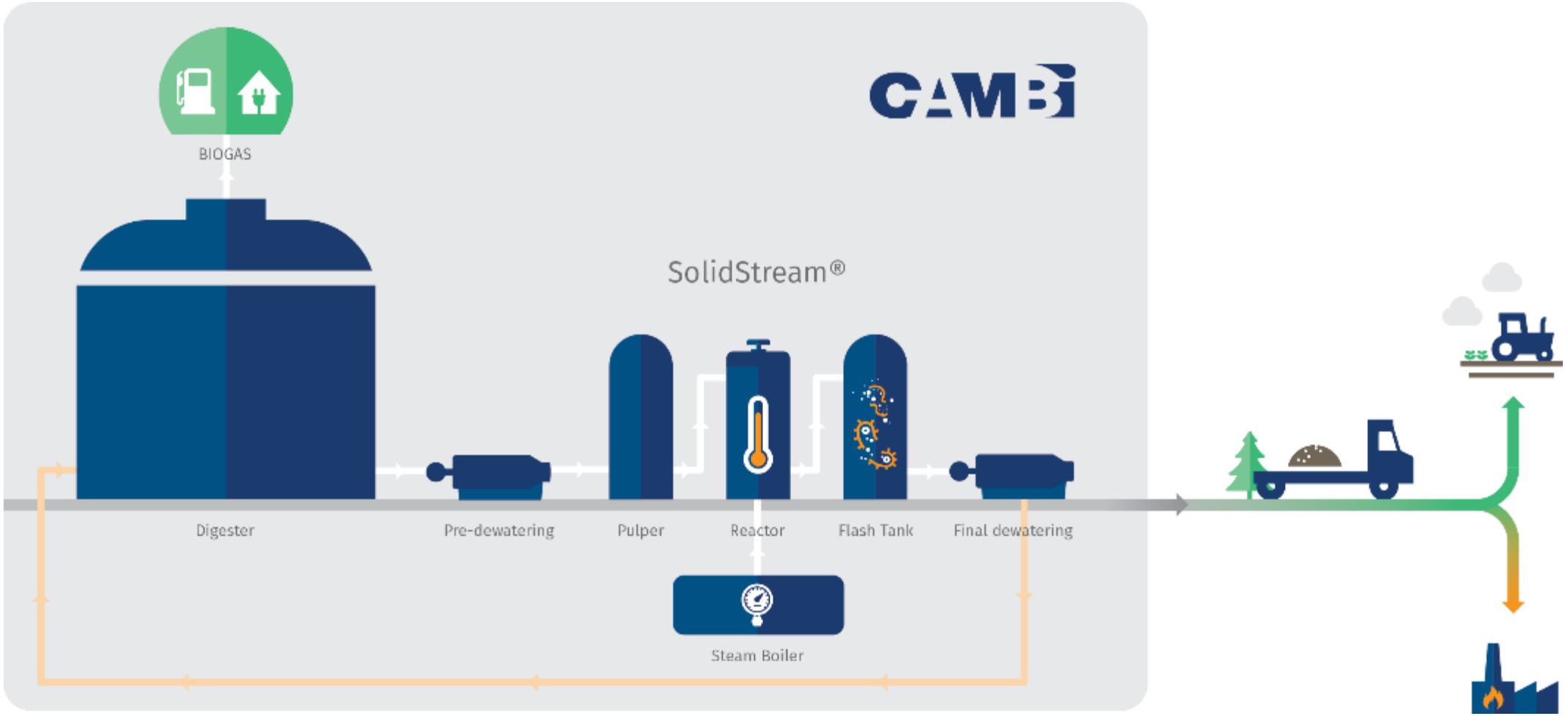
- ❑ Centralised sludge treatment for Tilburg, Eindhoven & smaller WWTP's
- ❑ Improved dewatering and reduced cake volumes to SNB
- ❑ Increase in energy production and delivery of biogas to Atero

Key drivers Hengelo:

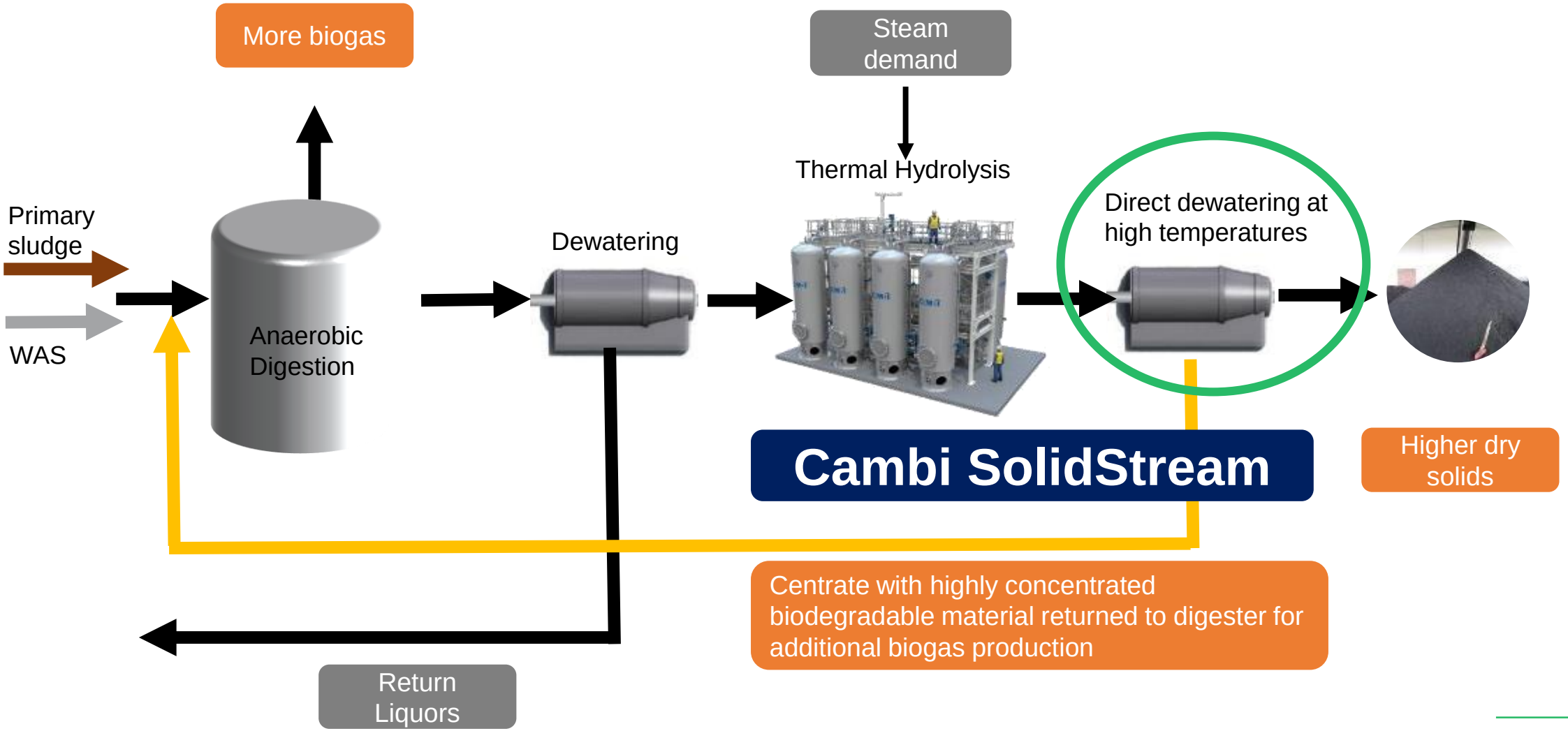
- ❑ Centralised sludge treatment for Hengelo, Enschede and other WWTP's
- ❑ Avoid rehabilitation of Enschede digesters
- ❑ Increased energy generation
- ❑ Reduced cake volumes to SNB for incineration

Cambi SolidStream

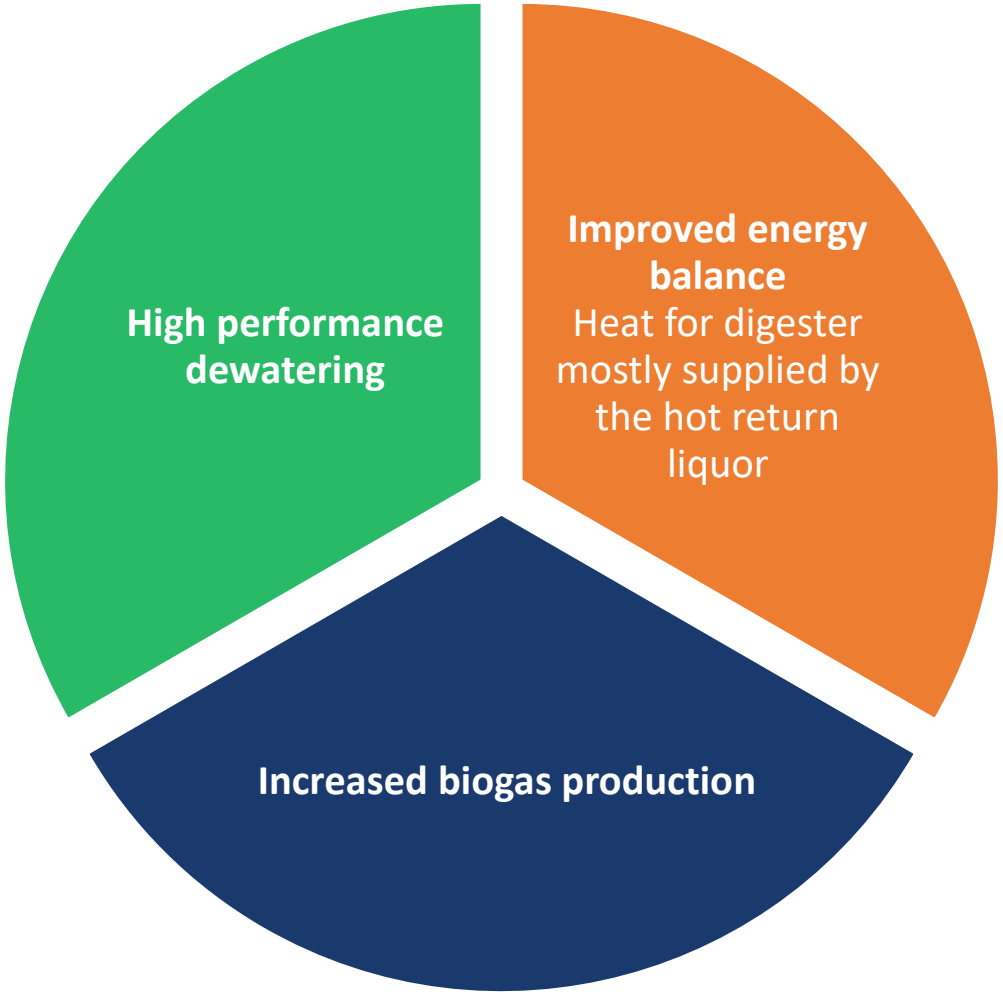
Cambi SolidStream
Thermal hydrolysis **after anaerobic digestion**



Cambi SolidStream
Thermal hydrolysis **after anaerobic digestion**



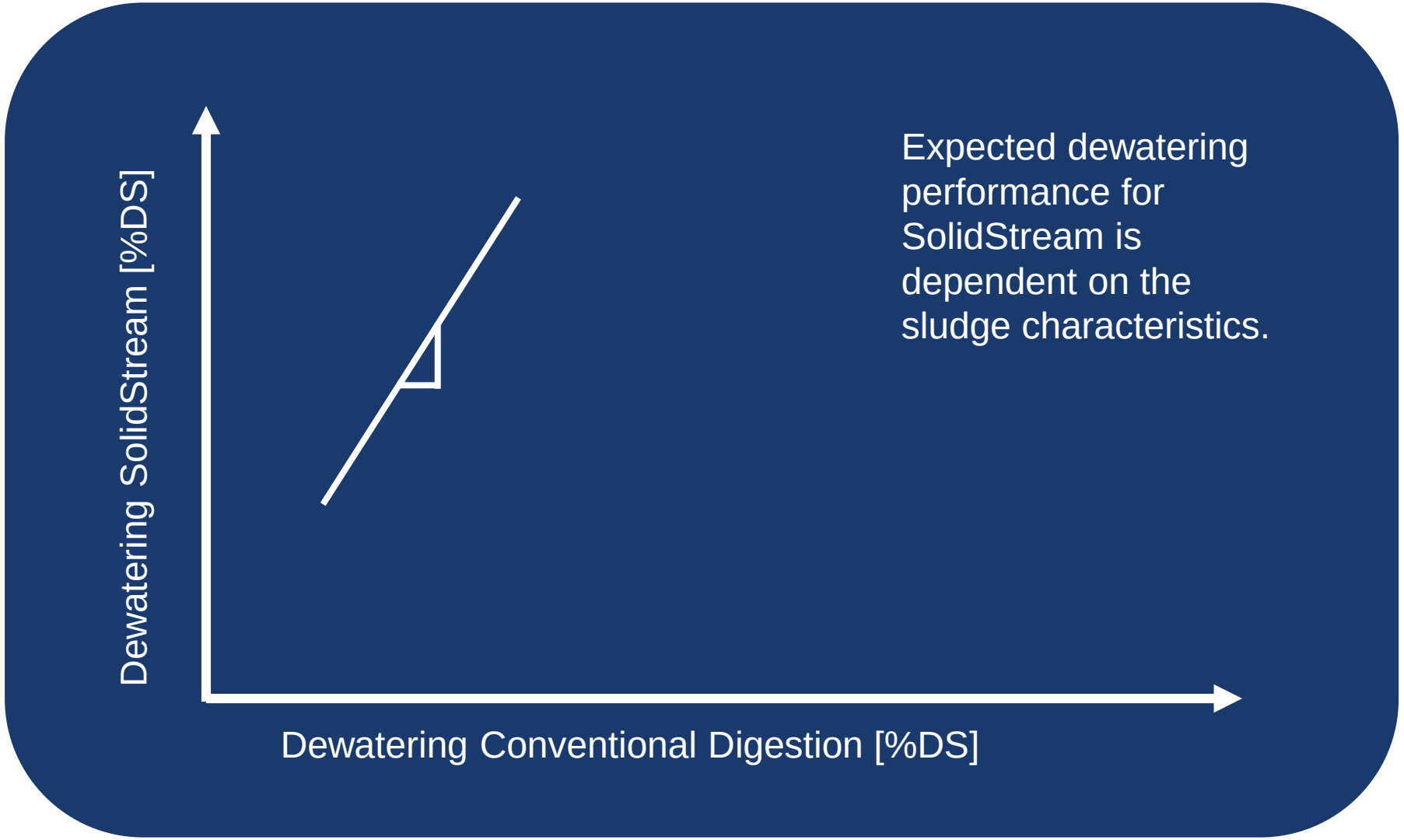
SolidStream benefits



Reduced steam consumption compared to conventional THP

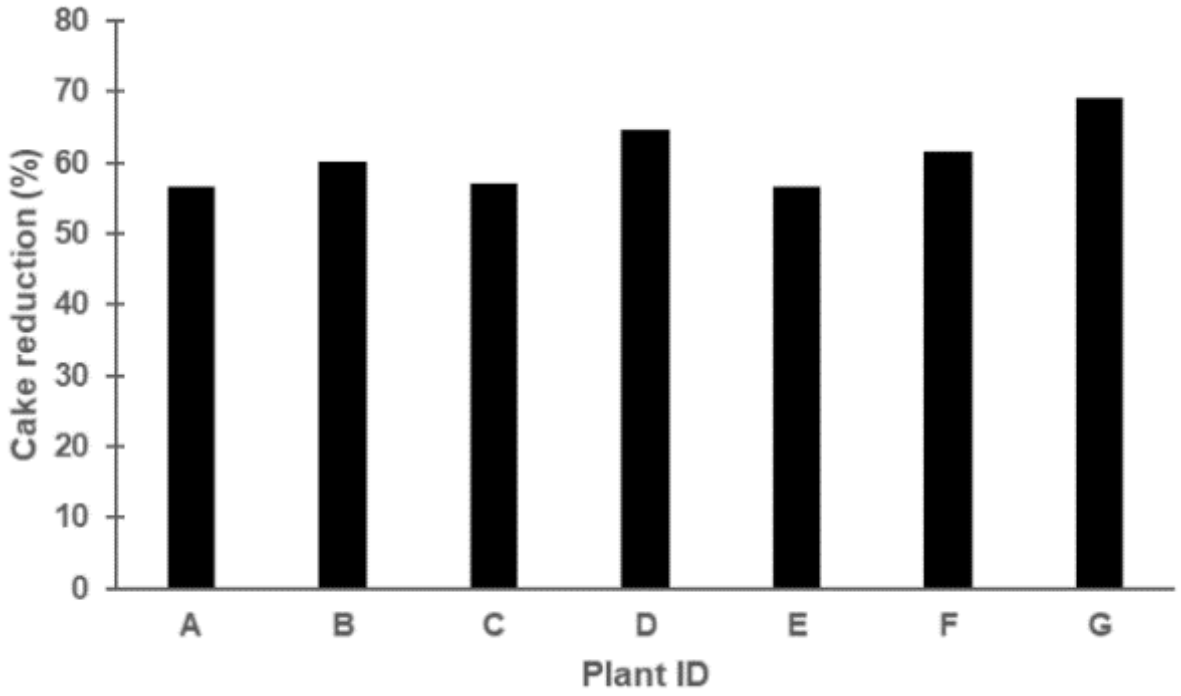
- Pre-digested reduces the DS load to THP
- Pre-heated sludge to THP after digestion

Better dewatering performance compared to conventional AD



Cake reduction

Lab scale tests: Expected total cake reduction compared to conventional AD



Cake reduction is a combined effect of:

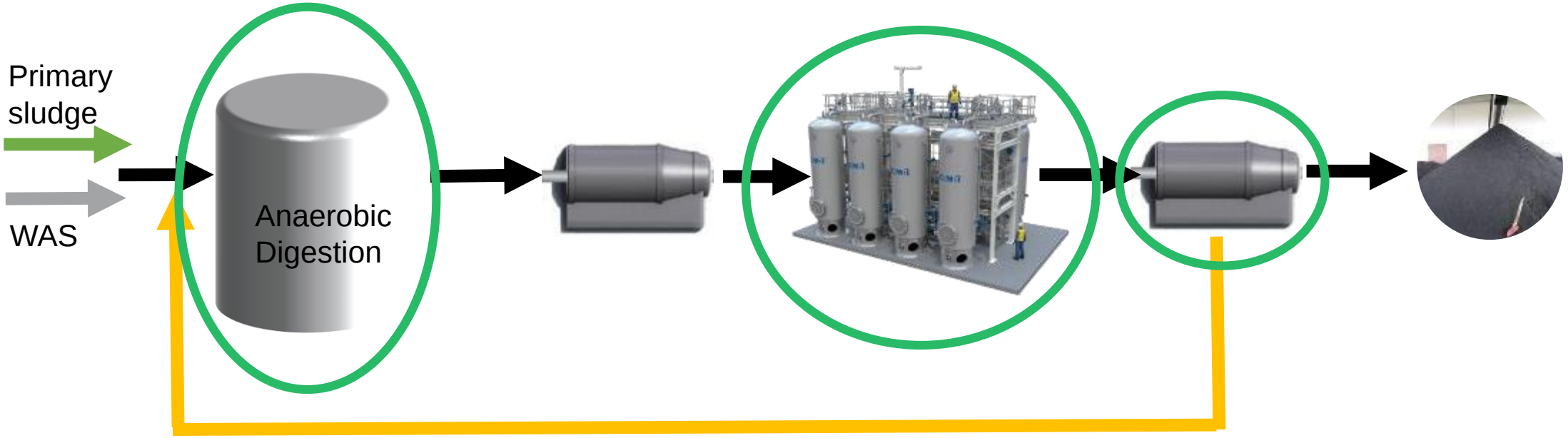
- Increased dewatering performance
- Increased Volatile Solids Reduction

Source and further reading:
Svennevik, O.K. Molokwu, O. Rus, E. Nilsen P. THE EFFECT OF DIGESTER STABILITY AND PAD-THP ON DEWATERING. European Biosolids and Organic Resources Conference 13 – 14th November 2018, Leeds

How does SolidStream increase biogas production?

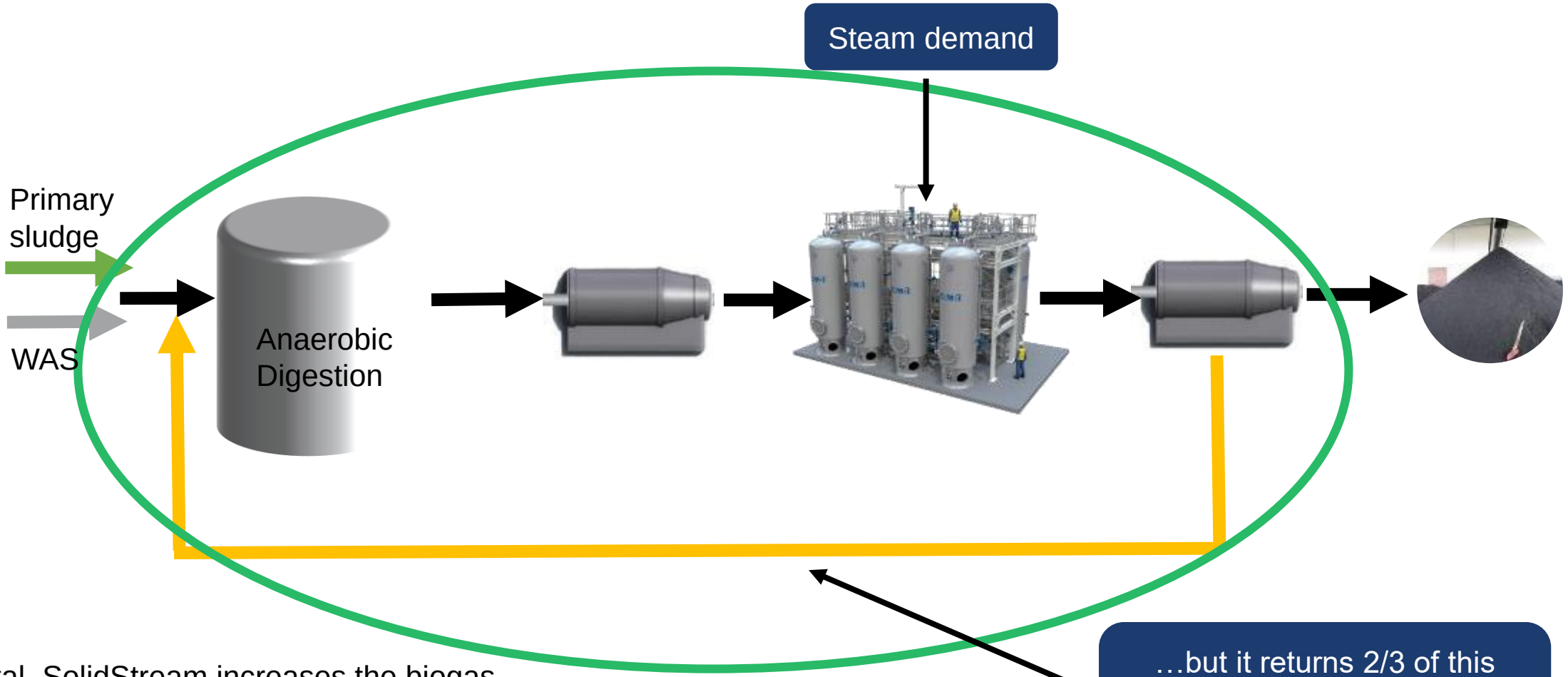
Step 3. The returned COD are converted to biogas, with a conversion rate of >80%

Step 1. In the thermal hydrolysis 20%-30% of the remaining particulate COD will be solubilized



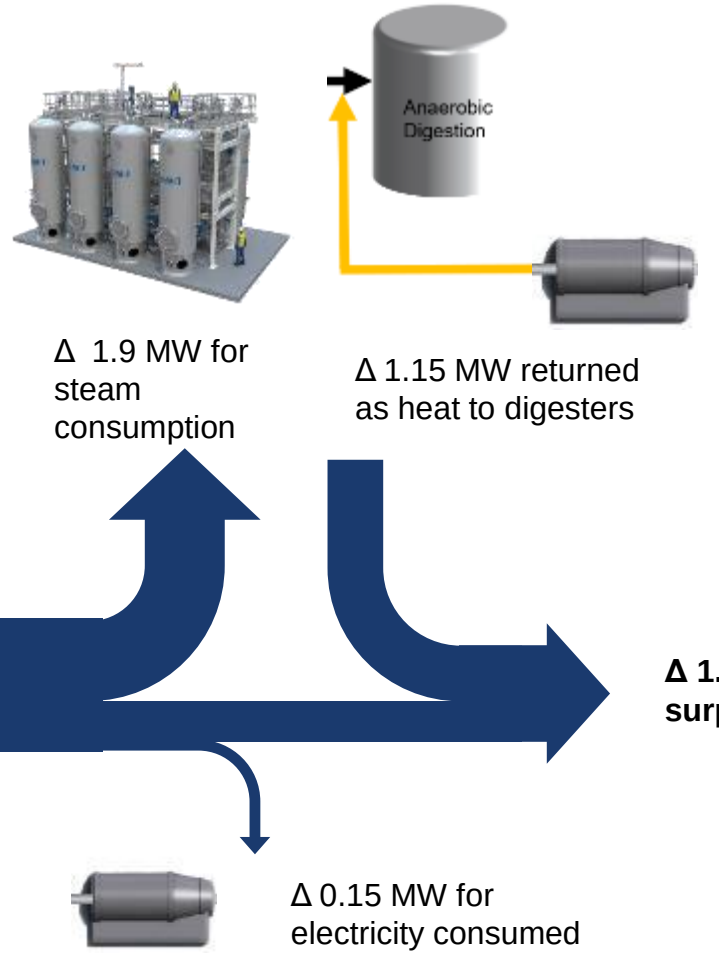
Step 2. In the direct dewatering, the solubilized COD and some of the particulate COD are separated from the sludge cake and returned to the digesters @ 4%DS.

How does SolidStream increase biogas production?



In total, SolidStream increases the biogas production of with 25%-45% compared to conventional AD.

The energy balance of SolidStream



Within target with CHP integrated:

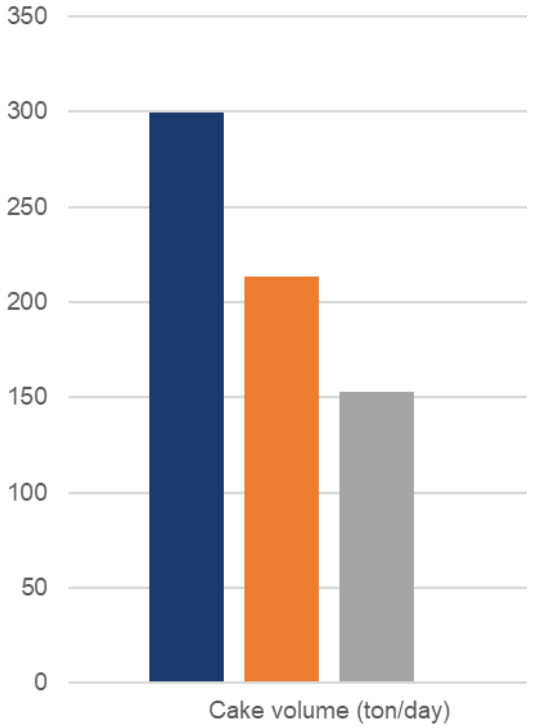
- 1MWh electricity produced per ton DS feed to digester
- WWTP being self supplied with electricity

Typical values for mixed sludge, 100 tDS/d feed to digesters

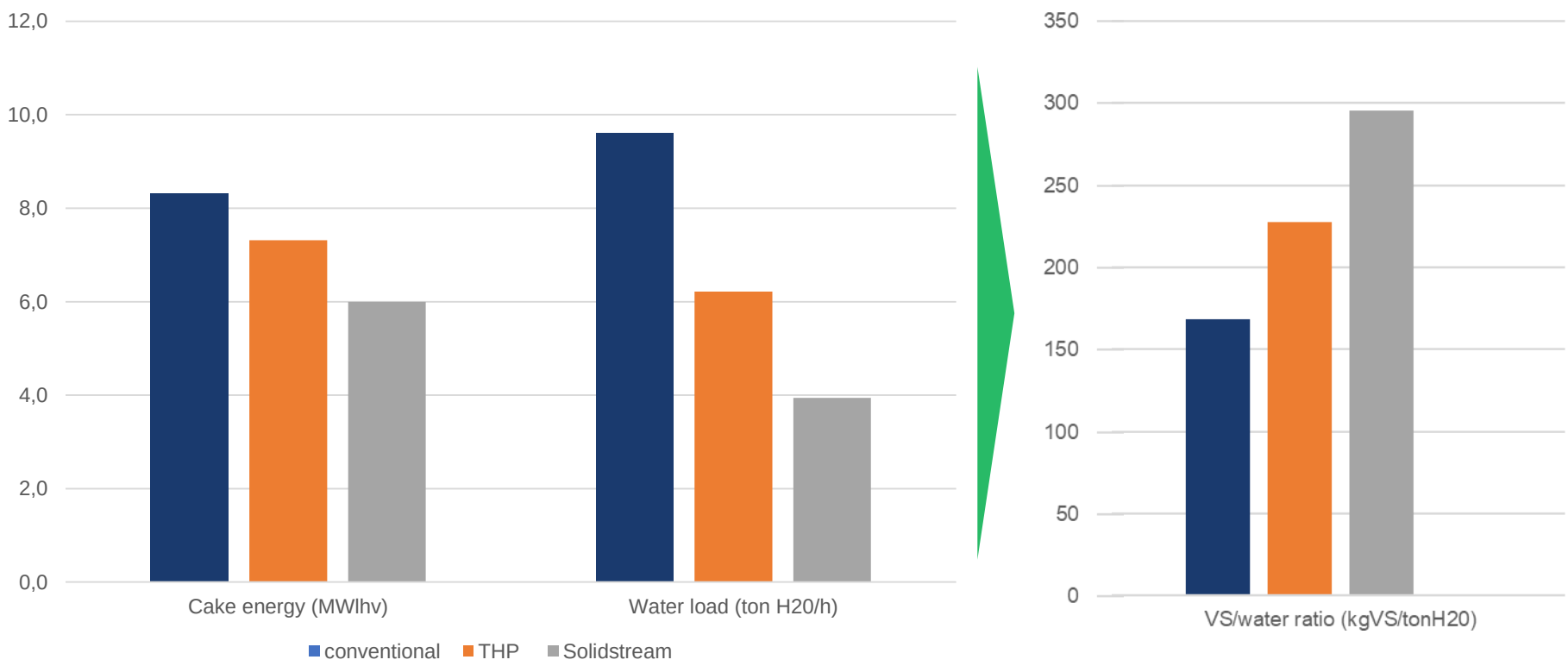
*All numbers are SolidStream compared to conventional mesophilic digestion.

SolidStream in an incineration market

Volume effect



Energy effect



Base: 100tDS/day – 30%PS/70% WAS – 70% VS

Conclusions

- ✓ Cambi THP is a proven and established technology optimizing digester volume and improving dewatering

- ✓ Solidstream THP:
  - Can be retrofitted to existing conventional digesters
  - Further improves sludge dewatering and reduces cake volumes
  - Results in an improved overall energy balance and net energy production
  - Reduces both the thermal load and the water load to the incineration plant
  - Could improve throughput of existing mono-incinerators
  - Increase VS/water ratio and can potentially result in higher degree of net energy recovery

- ✓ THP and Solidstream can contribute to the goals of Water Authorities in terms of climate action and circular economy

THANK YOU FOR YOUR ATTENTION

QUESTIONS?

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Case Study – SolidStream at AmperVerband, Germany

Case Study – SolidStream at AmperVerband

Case Study

- Size of plant:
  - ~200 000 PE
  - 12tDS/d to digesters
- Challenge:
  - Sludge cake sent to incineration
  - Cost of electricity consumed at wwtp
- **Solution: Cambi SolidStream in operation since 2015**

Case Study – SolidStream at AmperVerband

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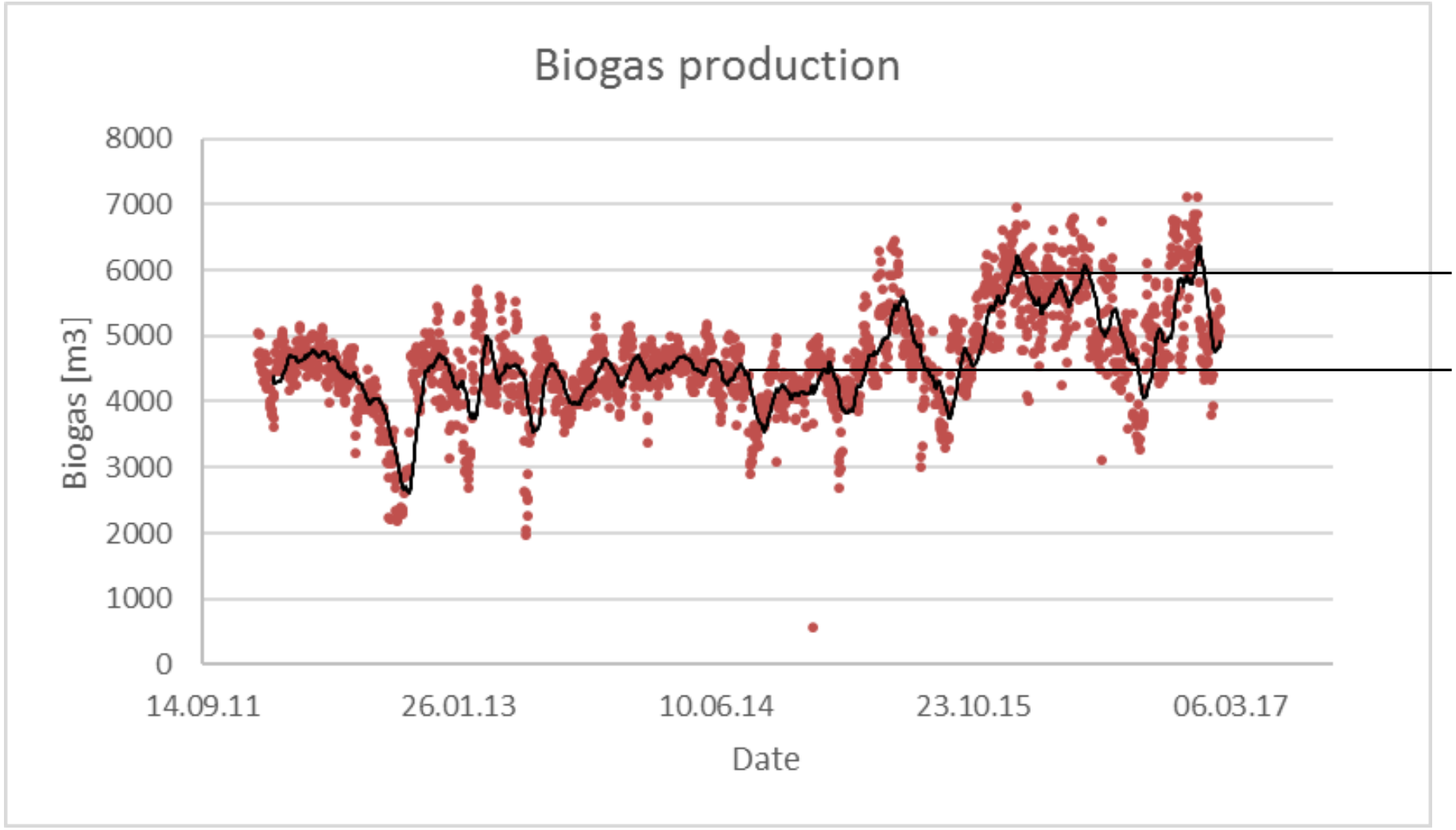


Case Study – SolidStream at AmperVerband

Base Case, conventional

58% Primary

42 %WAS

4400 tDS/yr

83% VS

HRT=25

55 % VSR

69%VS

25% DS

9 100 t/yr Cake

SolidStream case, actual numbers 2017

HRT=19

75 % VSR

55 % reduced wet ton cake to incineration

34 % increased biogas to electricity production

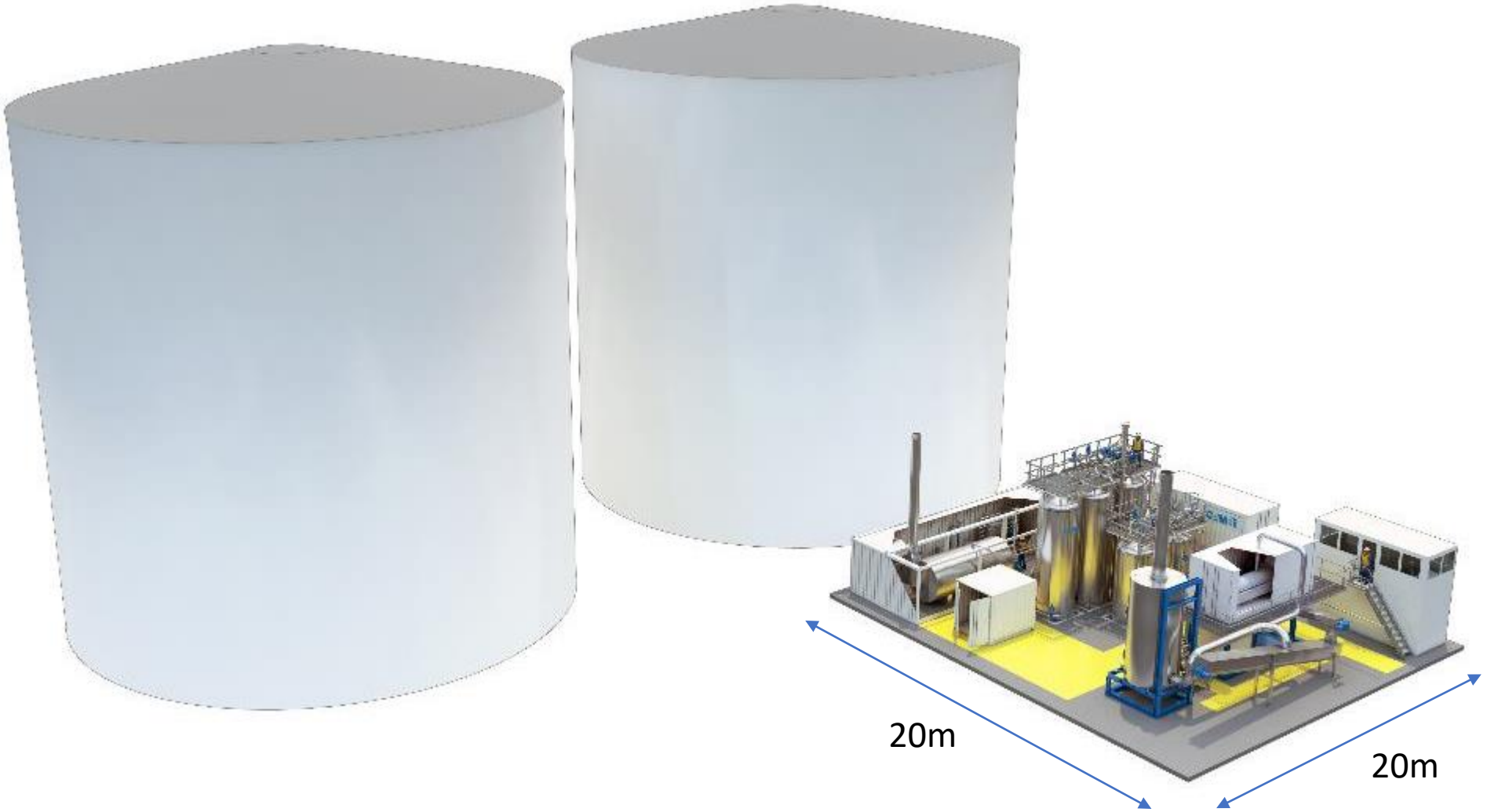
55% VS

38% DS

4 050 t/yr Cake

Source:
Kolovos, A. Kjorlaug O. and Nilsen, P.J. Development and Assessment of a model for Cambi's SolidStream process using "Sumo" wwtp Simulaiton Software.
European Biosolids and Organic Resources Conference 15-16 November, Edinburgh, Scotland

Cambi SolidStream – modular and limited in size



Note: Dimensions may vary for larger plants

Cambi Services – also offered for SolidStream