
from sludge
to resources
biosolids management
solutions for
local authorities
ready for the resource revolution
suez

summary

SUEZ AT A GLANCE

key facts & figures

SUEZ VALUE PROPOSITION

integrated approach

BIOSOLIDS MANAGEMENT

challenges and opportunities for the cities

SUEZ'S EXPERTISE

define the optimal treatment solution for sludge reduction and recovery

SUEZ'S REFERENCES

throughout the world


SUEZ at a glance
key fact & figures
SUEZ

CIRCULAR ECONOMY

leading the resource revolution to ensure sustainable growth

key figures

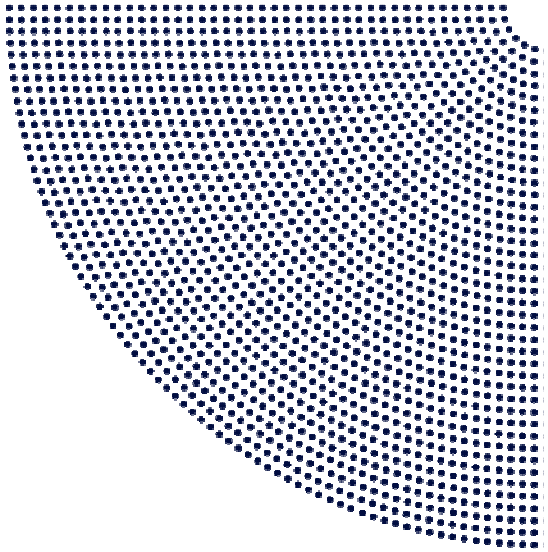
€15.9bn turnover in 2017

450,000+ industrial and business customers

€120m dedicated to R&D in 2017

90,000+ employees worldwide

5 continents where SUEZ is present



we help cities and industries optimize water management, recycling and waste recovery

figures for 2017

7.3bn cubic meters drinking water produced worldwide

4.7bn cubic meters drinking water distributed worldwide

1.02bn cubic meters wastewater recycled worldwide

4.8bn cubic meters wastewater depolluted worldwide

33m people benefiting from waste collection services

43m tonnes of waste treated

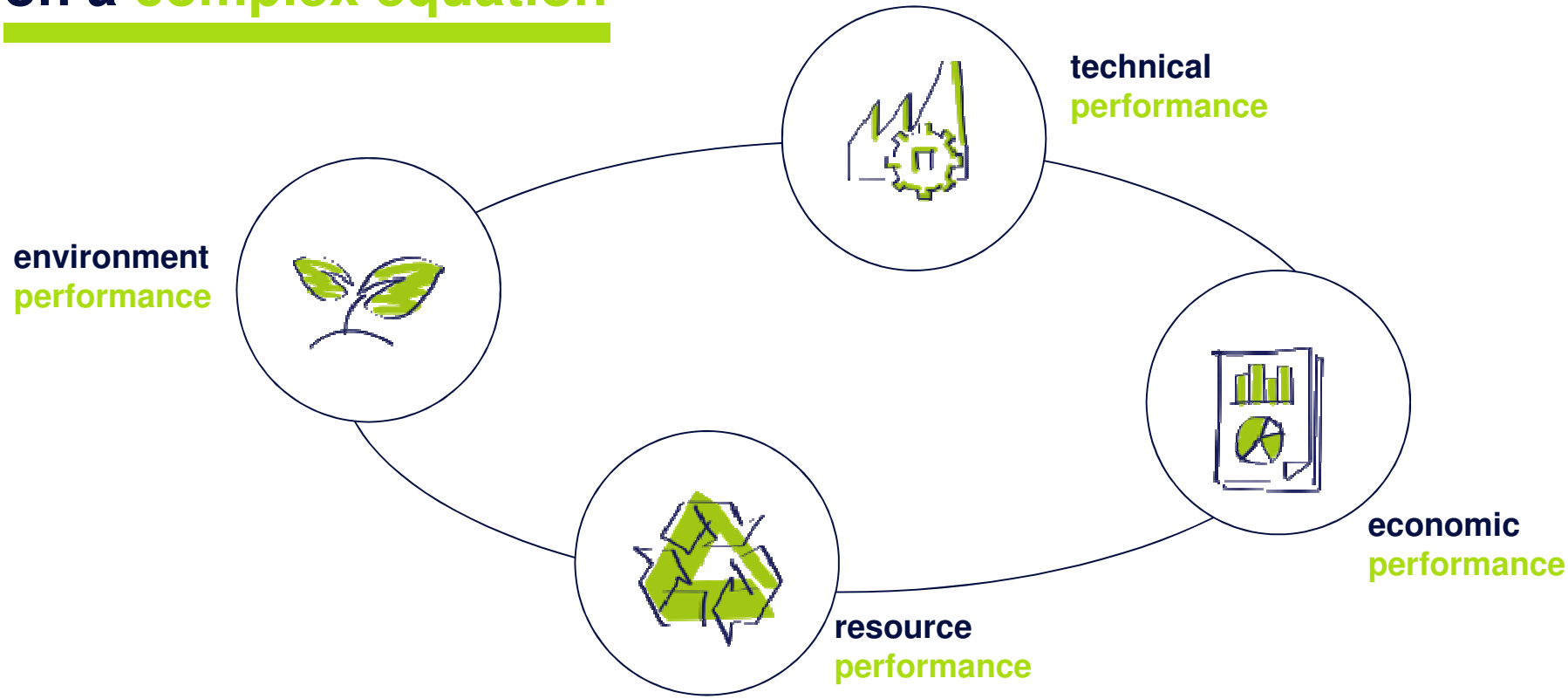
3.4m tonnes of hazardous waste treated

10.2m tonnes of recovered material from sorting centers

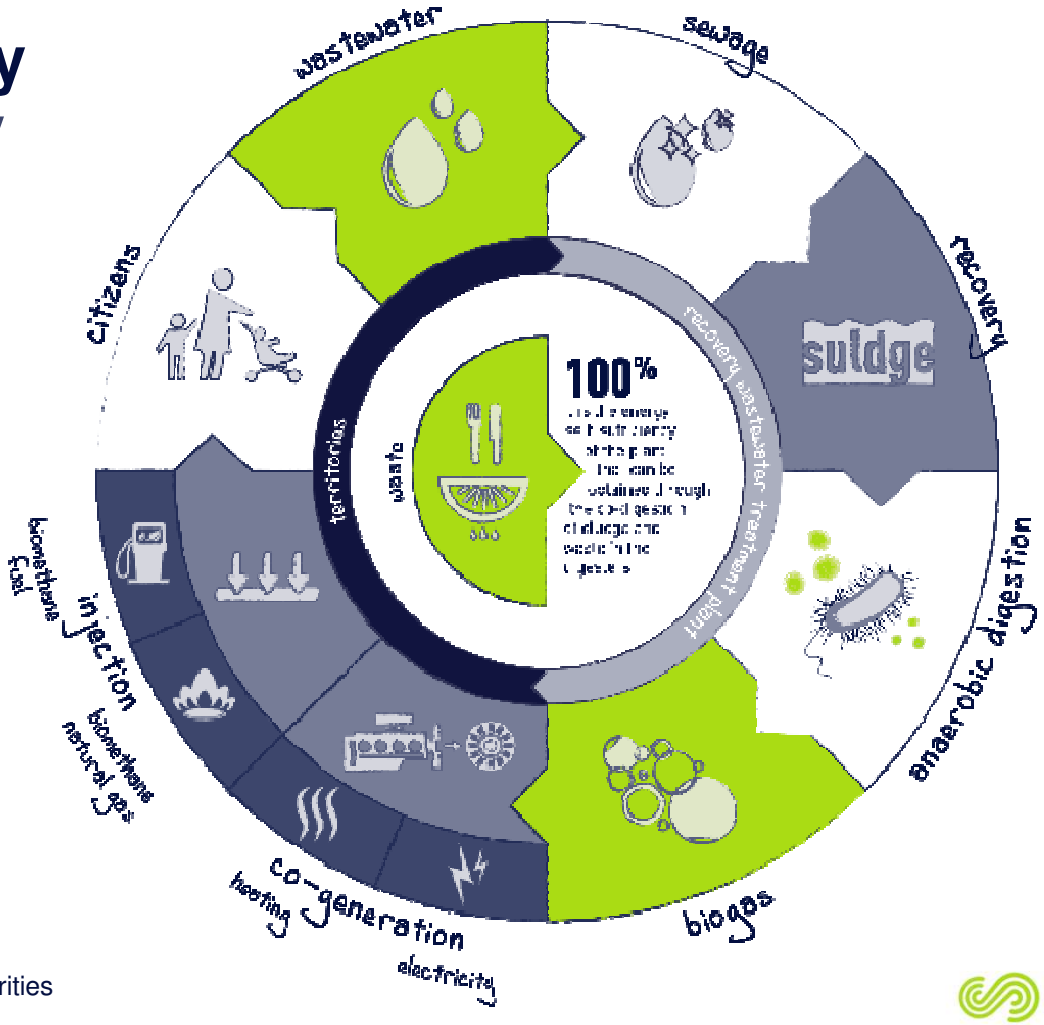
SUEZ value proposition

integrated approach

performance over time depends on a complex equation



from a linear economy
to a circular economy



don’t buy a facility,

buy long-term performance
for your sludge treatment

procure DB and O&M
in a single package

biosolids management

challenges and opportunities for the cities

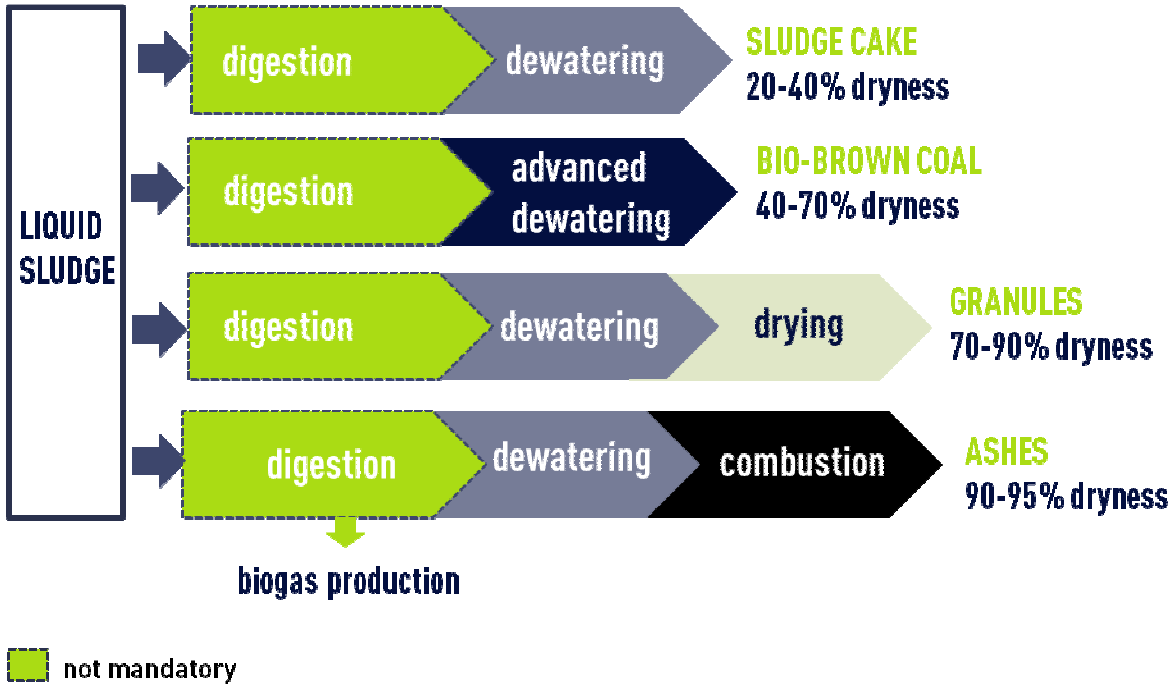
main concerns

- **Cope with sludge production**
- **Reduce sludge volume to reduce associated costs** (transportation, disposal,..)
- **Reduce energy consumption of the plant**
- **Make biosolids a valuable product**
- **Increase the energy independence of territories**
- **Minimize environmental impact** (footprint reduction, odor management)


SUEZ’s expertise
define the optimal treatment solution
for sludge reduction and recovery
SUEZ

sludge treatment solutions

reduce sludge volume and recover resources



turning dried sludge into energy

- once dried, sewage sludge can be used as combustible (high calorific value)
- biogas production from sludge is an alternative to fossil fuels (oil, gas, coal) and its calorific value is comparable to wood

recover for agricultural purpose

- enriching the soil without fossil fertilizers and reducing carbon footprint from fertilization
- soil enhancers

ultimate sludge reduction

- eliminating the sludge produced by wastewater treatment, with help of thermal treatments

SUEZ's expertise

KEY SUCCESS FACTORS

for local authorities

REDUCTION OF SLUDGE VOLUME

to reduce associated costs (transportation, disposal)

RECOVER ENERGY

towards the energy independence of the territories

RECOVER PRODUCTS

for agricultural reuse (compost, fertilizer, soil enhancer)

PATHOGEN REDUCTION

produce high value product

SUEZ'S SOLUTIONS FOR BIOSOLIDS

overview

LEADING EDGE SOLUTIONS

to guarantee the future of our resources


key success
factors
for local authorities
SUEZ

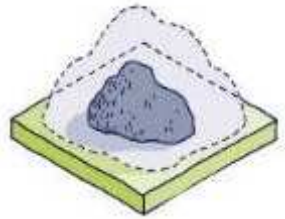
factors to be considered

- **local context**
  - anticipation of the sludge production growth
  - regulation and standards for use and disposal of sewage sludge on your territory
  - environmental policy
  - water tariff

- **site specific aspects**
  - location (close to cement factory, landfill, …)
  - footprint availability
  - existing process (digestion, CHP, …)


reduce sludge
volume
SUEZ

sludge volume reduction alternatives

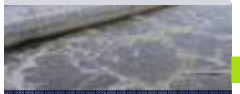


sludge reduction approach:

- reduce the volume of wet sludge
- reduce the dry mass of sludge

digestion

sludge mass reduction and biogas production

from liquid	thickening	mechanical dewatering	advanced dewatering	thermal/solar drying	combustion
to thickened sludge	to sludge cake	to bio-brown coal	to high granules	to ashes	
					
dryness from 0.3-1.0 %	dryness < 6%DS	dryness to 15-40%DS	dryness to 40-70%DS	dryness to 70-90%DS	ultimate sludge reduction

WHY?

optimize the subsequent conditioning, stabilization and dewatering stages by reducing structure sizes and operating costs

Improve suitability for final usage (conventional adopted system for land spreading by farmers)

use as combustible for energy production

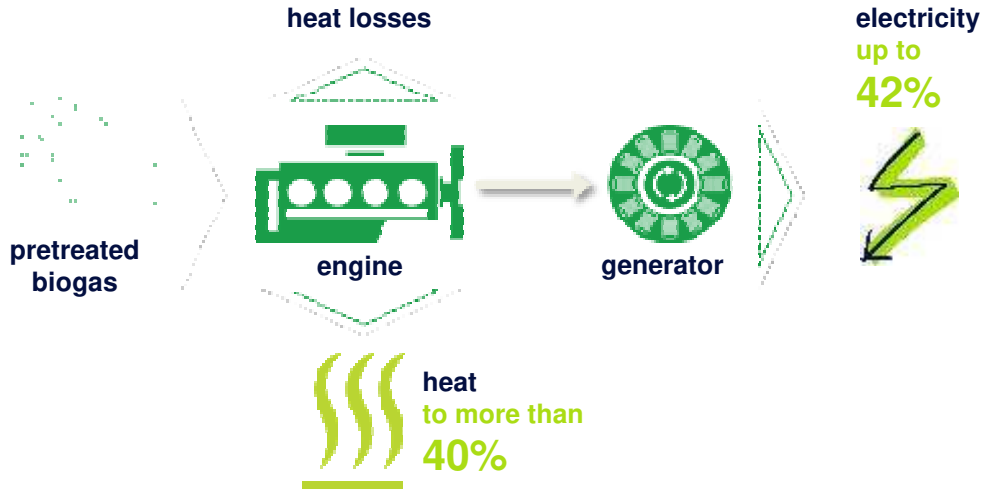
soil enhancers

produce end-product (fertilizers) easy to store and market

when no recovery as biosolids land spreading is possible


sewage sludge
as renewable energy

biogas to electricity and heat: cogeneration

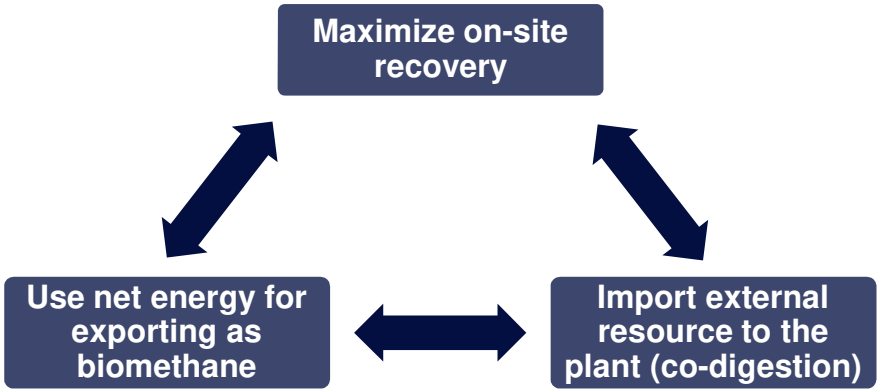


Benefits

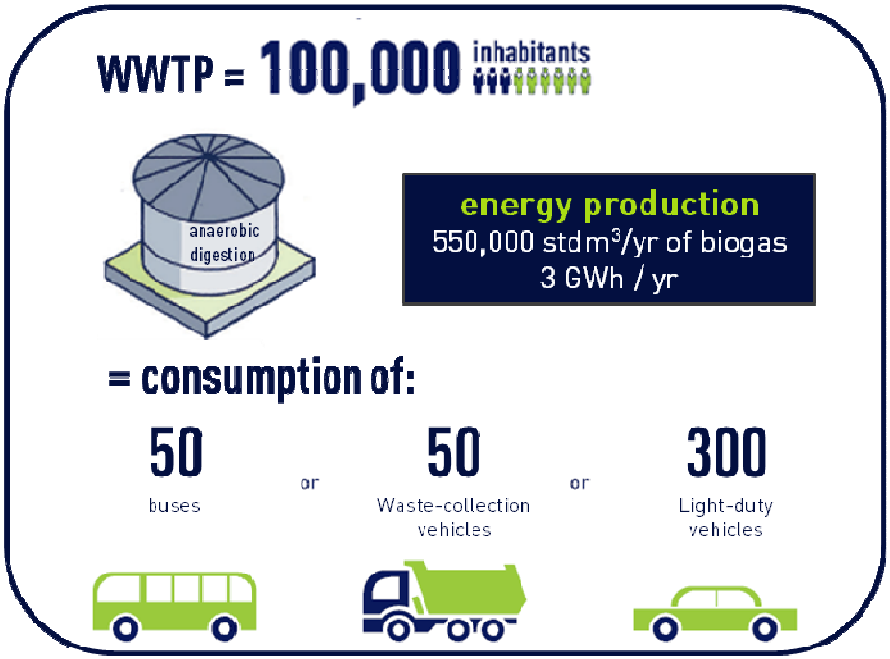
- On-site recovered energy and heat (self-sufficient)
  - recovered heat can be used for digester heating
- Production & sale of electricity
- Heat injection into the grid for urban and industrial heating
- Applicable on any plant size

global efficiency can reach more than 80%

biogas to biomethane



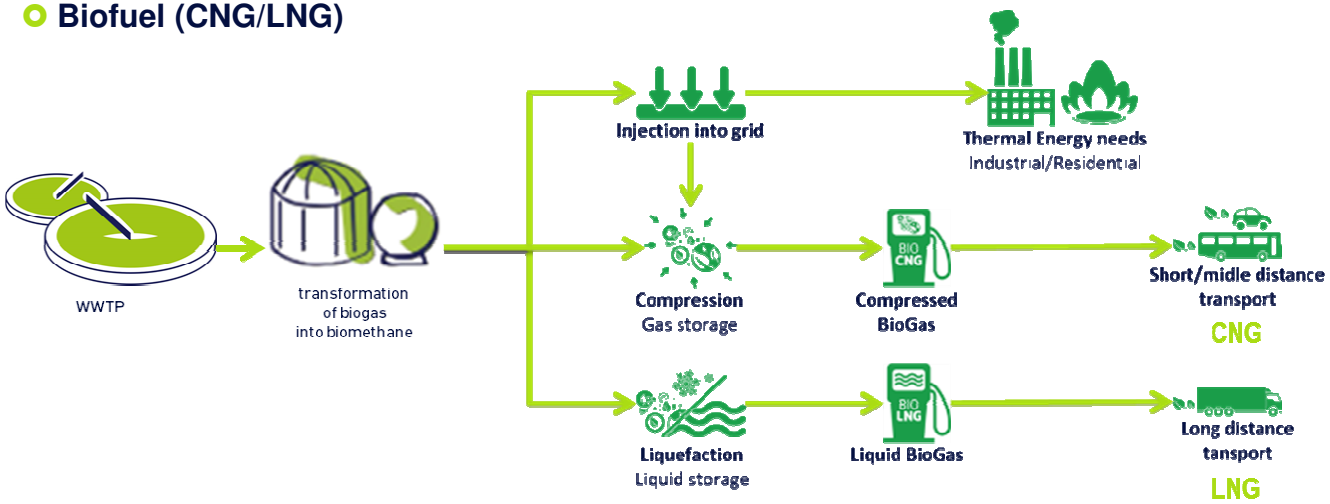
the best pivot for internal and external energy usages



from wastewater to energy systems

biomethane may have many applications:

- directly injected into the grid for Energy needs
- Biofuel (CNG/LNG)



biomethane used as biofuel
2 forms, the same advantages

climate change
carbon-free neutral carbon footprint
-80%
greenhouse gas emission

living environment
vehicles vibrations softeniing
-50%
noise emissions

energy independence
production of 3,000 MWh in fuel for a 100,000 inhabitant territory = **1.4** million liters of gasoil saved

public health
no fine particles (classified as carcinogenic by WHO)
-80%
NOx emission (nitrogen oxide)


Recover
end-products
nutrient, combustible, fertilizer, soil enhancer
SUEZ

nutrients recovery

an increase interest in alternative solutions for phosphorus recovery

considering that:

- **20%** of current world demand of phosphorus could be covered by recovery from wastewater
- **80%** of phosphorus extracted from phosphate ores is intended for fertilizers

the solution is:

to convert phosphorus present in wastewater into valuable fertilizer to help our clients take a step forward towards **sustainable development** and **circular economy**

benefits:

- **better slow release fertilizing effect** compared to chemical fertilizer
- **lower the environmental footprint**: the struvite is an alternative to phosphate rock extracted from mines that has a high carbon footprint
- **reduce maintenance cost** with controlled struvite precipitation


pathogen
reduction
produce high value product
SUEZ

pathogen reduction

take your sludge to an hygienized product (class A biosolids)

treatment restrictions associated with end usage

The sanitation stage intends to reduce the presence of pathogenic agents to produce **a final product of high quality** that can be reuse for agricultural purposes.

The expectation regarding sludge sanitation depends on:

- **sludge end-usage**
- and **local regulations and standards**

This stage can be assured in a biological, chemical or physical ways.

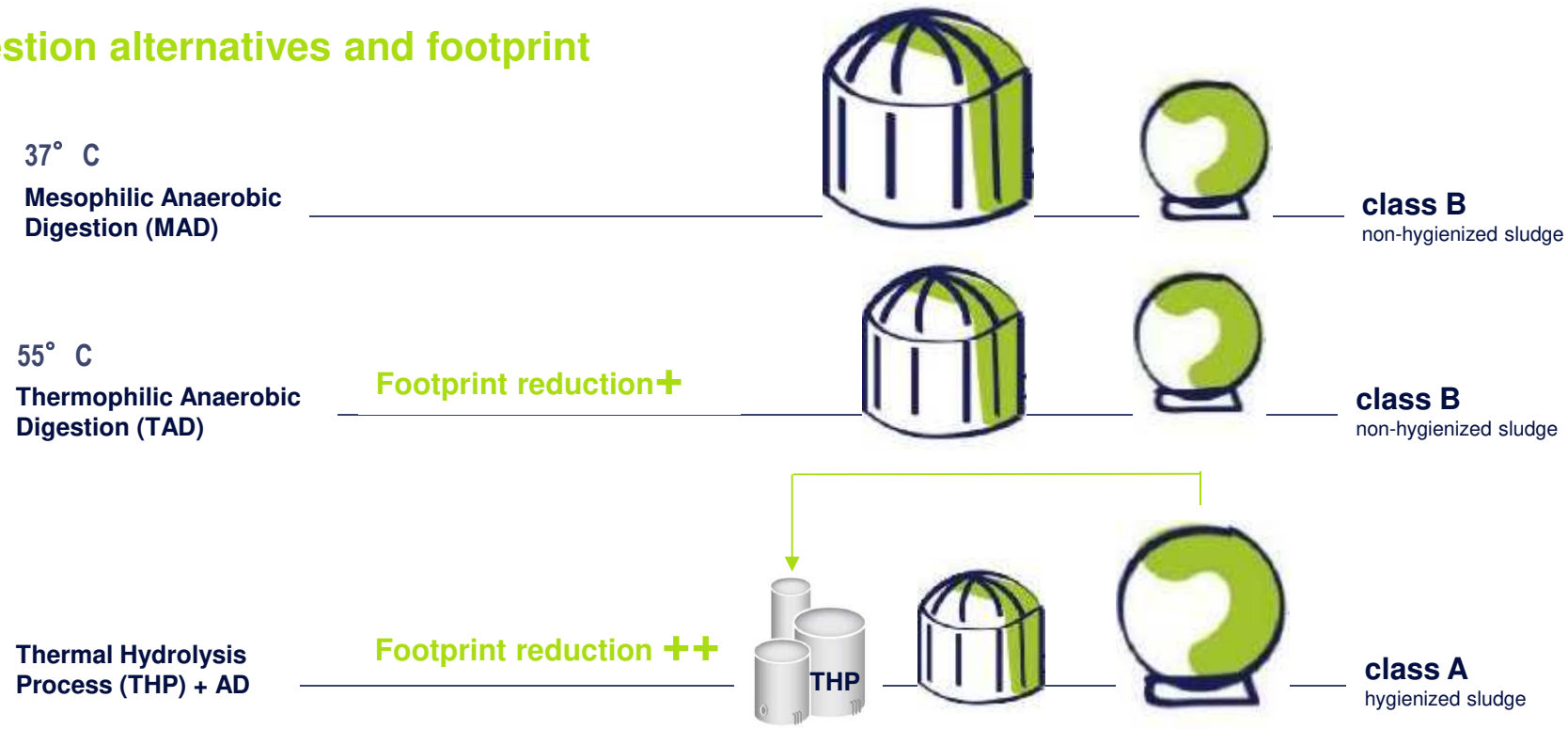
processes
to **further** reduce **pathogens**

Class A Biosolids definition
Sludge pasteurization as per *EPA* 40 CFR 503*: **"Enhanced treated sludge will be free from *Salmonella* and will have been treated so as to ensure that 99.9999% pathogens have been destroyed (i.e. a 6 log reduction)"**

*** EPA: United States Environmental Protection Agency**

technologies towards compactness and higher quality of treatment

digestion alternatives and footprint



SUEZ's solutions for biolosids

overview

our technologies to bear on your business challenges

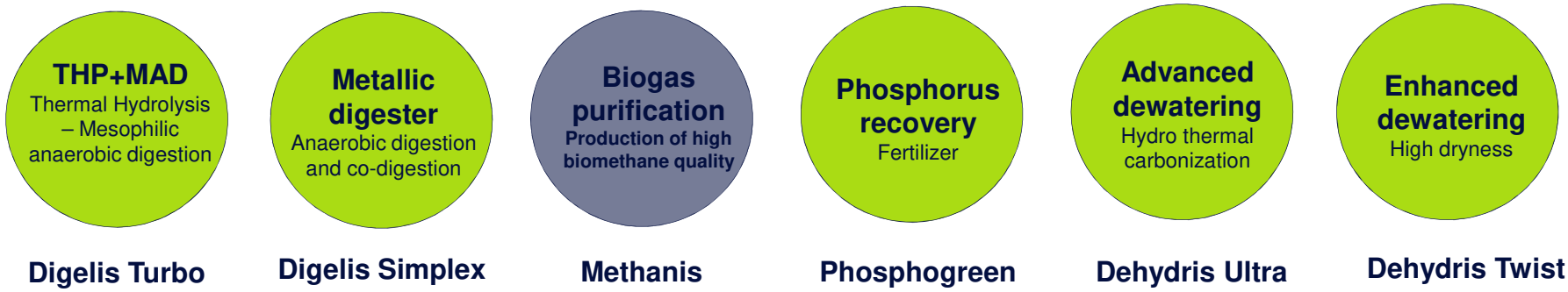
for greenfield and brownfield

Minimize sludge volume	Pathogen reduction Class A	Energy recovery	High value end-product	Lower footprint	Prepare plants to handle external substrates (Co-AD)
Thickening Dewatering Advanced Dewatering Mesaphilic Anaerobic Digestion (MAD) Solar drying Thermal drying Combustion	Thermophilic+Mesophilic (2PAD) Advanced Anaerobic Digestion (ADD) Advanced Dewatering Thermal drying	Carbon (biogas) Carbon (methane, CO2) Heat recovery Auto-thermicity Energy efficiency	Phosphorus recovery Advanced Dewatering Drying Combustion	Advanced Anaerobic Digestion Thermophilic Anaerobic Digestion Digestion with integrated gasholder Thermal drying (allows to reduce the sludge storage area)	Metallic digestion (MAD; TAD) AAD
Drainis Turbo Centrifuges, belt press, filter press Dehydris Twist Dehydris Ultra Digelis (MAD) Heliantis Evaporis LT and LE Thermylis	Evaporis LE Digelis Duo (2PAD) Digelis Turbo (AAD) Dehydris Ultra (thermal conditioning)	Digelis Solutions Thermylis+ (Dehydris Twist+Thermylis) Thermylis 2R Thermylis 2S Methanis	Phosphogreen Dehydris Ultra Evaporis LT and LE Thermylis	Digelis Turbo Digelis Fast Digelis Smart design Evaporis LT and LE	Digelis Simplex design Digelis Turbo Digelis Fast Dehydris Ultra


leading edge
solutions
to guarantee the future of our resources
SUEZ

SUEZ leading edge processes

around biosolids



for biosolids

for gas

our references

among our references

enhanced dewatering

with **Dehydris™ Twist**
(degremont® process)

MILAN SAN ROCCO (Italy)

Municipal wastewater

1,050,000 PE

Start up date: 2004

Type of sludge: DIGESTED SLUDGE

- Sludge thickening (GDD)
- Boosted sludge dewatering using piston press technology (1 unit) Dehydris™ Twist
- Followed by Thermal drying to obtain 65% to 90% dryness

Max. dewatering: **28-32%** DS
Sludge destination: CEMENT WORKS

WEYERSHEIM (France)

Municipal wastewater

30,000 PE

Start up date: 2014

Type of sludge: DIGESTED SLUDGE

- Sludge thickening on GDE screen
- Anaerobic digestion on Digelis™ Smart (Simplex design) and biogas valorisation
- Cogeneration
- Boosted sludge dewatering using piston press technology (1 unit) Dehydris™ Twist

Max. dewatering: **30%** DS
Sludge destination: INCINERATION

CHATEAUBOURG (France)

Drinking Water Plant

12,000 m^3/d

Start up date: 2013

Type of sludge: DRINKING WATER SLUDGE

As raw water had high level of organic matter and pesticides, the client sought an appropriate treated adapted for the final use of the sludge. The soil-spreading approach that was initially planned involved large sludge treatment and storage facilities. SUEZ therefore proposed a multi-use solution with boosted sludge dewatering using piston press technology (2 units) Dehydris™ Twist

Max. dewatering: **42%** DS
Sludge destination: MULTI-USE

among our references

thermal drying

with **Evaporis™ range**
(degremont® process)

CORK (Ireland)
Municipal wastewater
448,000 PE
Start up date: 2004

Thin film evaporator & belt filter (2 units) ➔ Evaporis™ LE

- Evaporation capacity: 3,600 kg/h
- Type of sludge: MIXED DIGESTED
- Type of drying: MIXED
- Energy: GAS

Dry solids inlet: 27%
Dry solids outlet: 90% (pellets)

MEITRATZHEIM (France)
First in France to recover conventional **wastewater** and **agri-food wastewater** (local sauerkraut industry) by methanization in order to produce electricity and heat
204,000 PE
(65,000 for urban wastewater)
Start up date: 2012

Thin film evaporator & belt filter (1 unit) ➔ Evaporis™ LE

- Evaporation capacity: 872 kg/h
- Type of sludge: MIXED DIGESTED
- Type of drying: MIXED
- Energy: NATURAL GAS

Dry solids inlet: 23%
Dry solids outlet: 90% (pellets)

SAINT MARCELLIN (France)
Municipal wastewater
45,000 PE
Start up date: 2012

Thermal drying on belt dryer (1 unit) ➔ Evaporis™ LT

- Type of drying: DIRECT
- Energy: BIOGAS

Dry solids inlet: 26%
Dry solids outlet: 90% (pellets)

CHONGQING (China)
Municipal wastewater
640,000 PE
Start up date: 2009

Thin film evaporator and belt filter (3 units) ➔ Evaporis™ LE

- Evaporation capacity: 5,910 kg/h
- Type of sludge: MIXED DIGESTED SLUGE
- Type of drying: MIXED
- Energy: GAS (in the future biogas)

Dry solids inlet: 26%
Dry solids outlet: 90% (pellets)

among our references

solar drying

with **Heliantis™**
(degremont® process)

DIGNE LES BAINS
(France)
Municipal wastewater
35,000 PE
Start up date: 2010

- Thickening on draining tables
- Dewatering on centrifuge
- Solar drying under greenhouse Heliantis™
- 147 m² of photovoltaic panels

Sludge production:
370 t DS/year
Dryness output: 70%
Total area: 1,440 m²
Sludge reuse: Agriculture

FOLSCHVILLER
(France)
Municipal wastewater
29,000 PE
Start up date: 2013

- Thickening of mixed sludge on GDD
- Metal compact digester LIPP of 600 m^3 with integrated gasometer Digelis Smart (Simplex design)
- Cogeneration of power of 28kW electric for biogas valorization
- Dewatering on press filter
- Solar drying under greenhouse Heliantis™

Sludge production:
320 t DS/year
Dryness output: 70%
Total area: 1,334 m²
Sludge reuse: Agriculture

PORTO SANTO
(Madeira, Portugal)
Municipal wastewater
20,000 PE
Start up date: 2012

- Sludge dewatering on centrifuge
- Solar drying under greenhouse Heliantis™

Sludge production:
800 t DS/year
Dryness output: 70%
Total area: 736 m²

GRADO
(Spain)
Municipal wastewater
25,000 PE
Start up date: 2008

- Sludge dewatering on centrifuge
- Solar drying under greenhouse Heliantis™

Sludge production:
163 t DS/year
Dryness output: 70%
Total area: 1,032 m²

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among our references

combustion

with **Thermylis™** range
(degremont® process)

sludge transformation **into a mineral product**

VALENCE
(France)
Municipal wastewater
150,000 PE
Start up date: 2004

- Dewatered by 2 centrifuges, then storage in a silo of 120 m^3
- Combustion by thermal oxidation on fluidized bed Thermylis™

Capacity:
500 kg/MS/h

Reuse in a **cement plant**

LE HAVRE Edelweiss
(France)
Municipal wastewater
415,000 PE
Start up date: 2011

- Dewatered by 3 press filters and then removed by thermal oxidation on fluidized bed Thermylis™
- Type of sludge: SBR sludge + skinning

Capacity:
1,200 kg/DS/h per unit (1 unit)

LAKE VIEW
(Canada)
Municipal wastewater
446,616 m^3/day
Start up date: 2009

- Dewatered by centrifuges and combustion by thermal oxidation on fluidized bed Thermylis™
- Type of sludge: sewage sludge

Capacity:
4,173 kg DS/h per unit (4 units)

SHANGYANG
(Shenzen city, China)
Municipal wastewater
3,000,000 PE
Start up date: 2013

- Dewatered by centrifuges, pre-drying and combustion by thermal oxidation on fluidized bed Thermylis™ 2S
- Type of sludge: biological/fresh mixed sludge

Capacity:
800 t/day

among our references

biomethane

injection **into the natural network**

STRASBOURG-LA-WANTZENEAU (France)
Municipal wastewater
1,000,000 PE
Start up date: Sept. 2015

- **400** Nm³/h biogas
- First WWTP in France to inject biomethane into the natural gas network
- Heating of 5,000 households

CORNIGUEL (Quimper, France)
Municipal wastewater
250,000 PE
Start up date: 2017

- **210** Nm³/h biogas
- Biomethane injection into the natural gas network

LES MUREAUX (France)
Municipal wastewater
120,000 PE
Start up date: 2018

- **100** Nm³/h biogas
- Biomethane injection into the natural gas network

LA FARFANA (Chile)
Municipal wastewater
3,700,000 PE
Start up date: 2015

- **2,800** Nm³/h biogas
- Biomethane injection into the local gas network

among our references

biomethane

biofuel production

LA ROCHE SUR FORON (France)

Municipal wastewater

90,000 PE

Start up date: February 2014

- Pilot: 50 Nm^3/h biogas
- **BioCNG** filling station
- Operation of the facility

GRENOBLE (France)

Municipal wastewater

400,000 PE

Start up date: April 2016

- 500 Nm^3/h biogas
- Biomethane injection into the natural gas network
- Utilisation as **BioCNG** for the 70 buses of the city
- Operations for 15 years facility

among our references

energy recovery

cogeneration

AS SAMRA
(Jordan)
Municipal wastewater
2,300,000 PE
Start up date: 2008

- Biogas production: 4 gas holders (2 x 5,000 m^3 + 2 x 4,000 m^3)
- Power production: more than **80%** of the plant's energy requirement are met using endogenous energy resources

PANAMA City
(Panama)
Municipal wastewater
1,000,000 PE
Start up date: 2013

- Biogas from the sludge provides **100%** of the electricity needed for the sludge zone (representing 18% of the plant's total energy needs)
- Reuse in cogeneration (700 kW)

MAPOCHO-EL TREBAL (Chile)
Municipal wastewater
2,715,300 PE
Start up date: 2012

- Biological sludge is treated using the Digelis™ Turbo which produces an increased amount of biogas. The biogas produced is used for cogeneration, covering **60%** of plant electric needs and at term **100%** of the needs.
- From 2012 reduction of dewatered organic volume by 26%
- 4,600 tones of CO_2 saved

among our references

nutrients recovery

with **Phosphogreen™**
(degremont® process)

phosphorus recovery

ÅBY (Aarhus,Denmark)
Municipal wastewater
84,000 PE
no primary treatment
Start-up date: 2013

inlet of the plant:
105 kg/d P_{tot}
450 kg/d N_{tot}

outlet: 300 kg/d struvite (incl. 37 kg P/d)

~ 35% of the phosphorus entering the plant is recovered

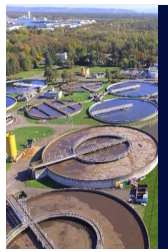
HENNING (Denmark)
Municipal wastewater
150,000 PE
primary treatment
Start-up date: 2015

inlet of the plant:
240 kg/d P_{tot}
1200 kg/d N_{tot}

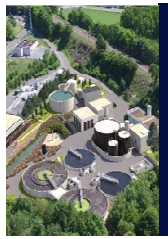
Outlet: 290 kg/d struvite (incl. 36 kg P/d)

~ 15% of the phosphorus entering the plant is recovered

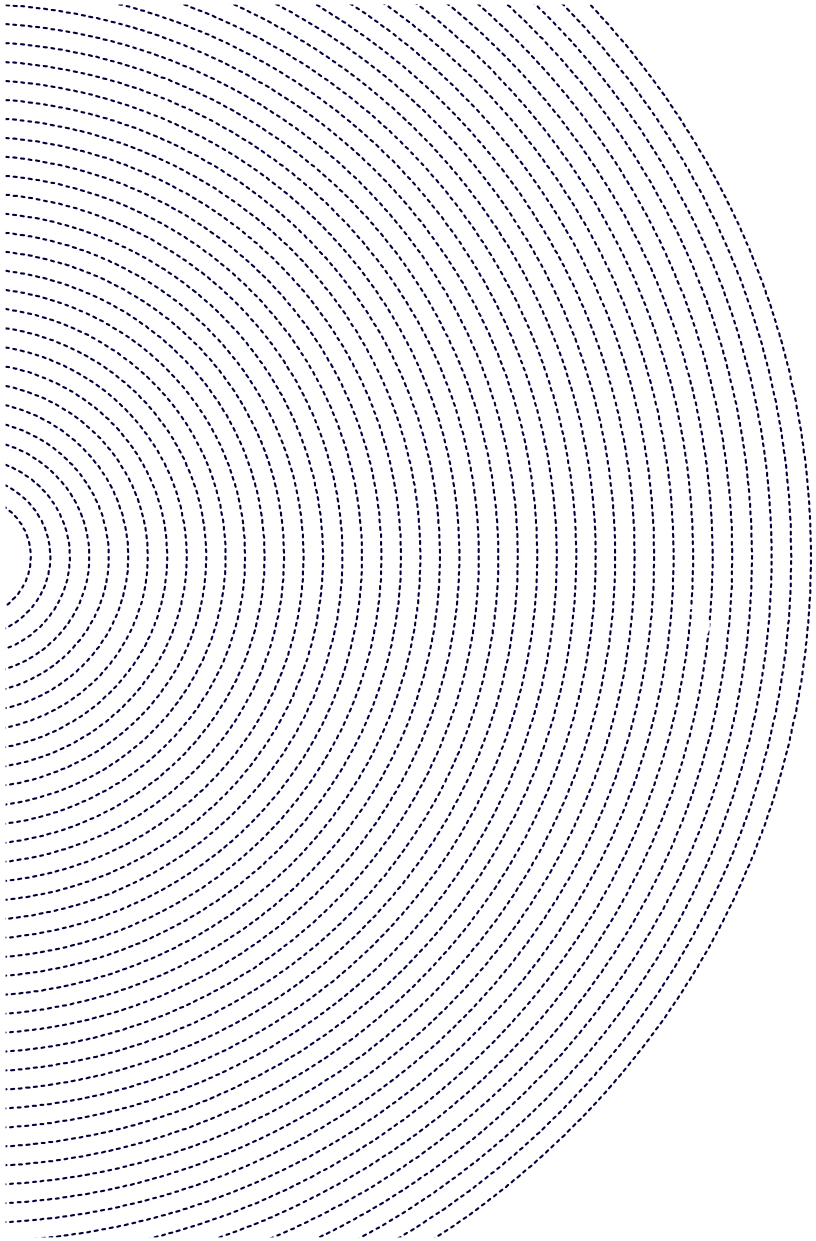
MARSELISBORG (Denmark)
Municipal wastewater
200,000 PE
primary treatment
start-up date: 2018
outlet: 828 kg/d struvite (incl. 103 kg P/d)
~ 45% of the phosphorus entering the plant is recovered



SAUSHEIM (Mulhouse,France)
Municipal wastewater
490,000 PE
primary treatment
start-up date: 2020
outlet: 241 kg/d struvite (incl. 30 kg P/d)



VILLIERS-ST-FREDERIC (France)
Municipal wastewater
40,000 PE
primary treatment
Start-up date: 2019
outlet: 118 kg/d struvite (incl. 15 kg P/d)



Q & A