Center for Water and Sanitation (CWAS), CRDF, CEPT University
in partnership with
Global Sanitation Centre of Excellence (GSCOE), TECHIN, IIT Palakkad, and
Bill & Melinda Gates Foundation

Details of ISO 31800: 2020 – Faecal sludge treatment units

04th April 2024
17:00 to 18:30 (IST)

Webinar 4
Details of ISO 31800: 2020 – Faecal sludge treatment units
April 04th, 2024 | 17:00 – 18:30 (IST)

Time (IST)	Sessions	Presenters
17:00-17:05	Welcome address	GSCoE, BMGF and CWAS
17:05-17:10	Why is ISO 31800 needed?	Mr. Sun Kim ISO PC 305 Chair Non Sewered Sanitation (NSS) Standards and Compliance
17:10– 17:40	Scope and technical requirements of ISO 31800 and ISO 31800 certification process	Mr. Chris Chan Manager, Projects TUV SUD
17:40 – 17:55	Potential application of ISO 31800: Combustion and pyrolysis example	Mr. Mansour Fall PMP -Liaison officer at FSMA
17:55 – 18:10	Potential application of ISO 31800: Supercritical water oxidation FSTU by 374Water	Prof. Marc Deshusses Professor, Civil and Environmental Engineering and Global Health Duke Global Health Institute
18:10 – 18:15	Status of adoption of ISO 31800	Mr. Sun Kim ISO PC 305 Chair Non Sewered Sanitation (NSS) Standards and Compliance
18:15 – 18:25	Q&A	
18:25 – 18:30	Closing remarks for ISO webinar series	GSCoE, BMGF and CWAS

Session Moderator

Dr. Devasena M

Chief Technical Officer
Global Sanitation Center of Excellence
IIT Palakkad

Key Speakers

Mr. Chris Chan

Manager, Projects
TÜV SÜD

Mr. Mansour Fall

PMP -Liaison officer at FSMA

Prof. Marc Deshusses

Professor, Civil and Environmental Engineering
and Global Health, Duke Global Health Institute

Mr. Sun Kim

ISO PC 305 Chair - Non-Sewered Sanitation
(NSS) Standards and Compliance

Introduction to ISO Standards for Non-Sewered Sanitation (NSS)

Session-1
ISO 31800:2020 Faecal Sludge Treatment Units

CWAS CENTRE FOR WATER AND SANITATION
CRDF CEPT UNIVERSITY
BILL & MELINDA GATES foundation
IIT PALAKKAD

ISO STANDARDS FOR
NON-SEWERED SANITATION (NSS)

ISO 31800:2020 Faecal Sludge Treatment Units

Sun Kim
ISO PC 305 Chair
ISO PC 318 Chair (former)
SGK Consulting
4 April 2024

CWAS CENTER FOR WATER AND SANITATION
CRDF CEPT UNIVERSITY
BILL & MELINDA GATES foundation
IIT PALAKKAD

The Sanitation Crisis

- **2.2 billion** people lack safely managed services for water*
- **3.5 billion** people lack safely managed sanitation*
- **419 million** people still open defecate*
- Diarrheal disease kills **>400,000** children under the age of 5, every year

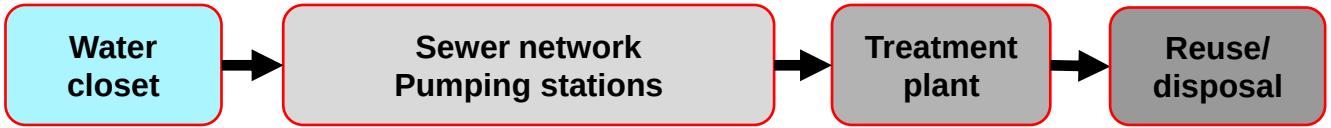
Women and Girls

- **Imprisonment by daylight**
  - The only time available to defecate maybe after dark.
- **Reduced school enrollment and attendance**
  - The lack of safe, separate and private sanitation and washing facilities particularly during menstruation.
- **Burden of caring for the sick**
  - Caring for the sick adds to their already heavy workload.
- **Impact on pregnant women**
  - About 44 million pregnant women have sanitation-related hookworm infections that pose a considerable health burden in developing societies.

* WHO & UNICEF Joint Monitoring Programme (JMP) "Progress on household drinking water, sanitation and hygiene | 2000-2022: special focus on gender (2023)

Sanitation Service Chain

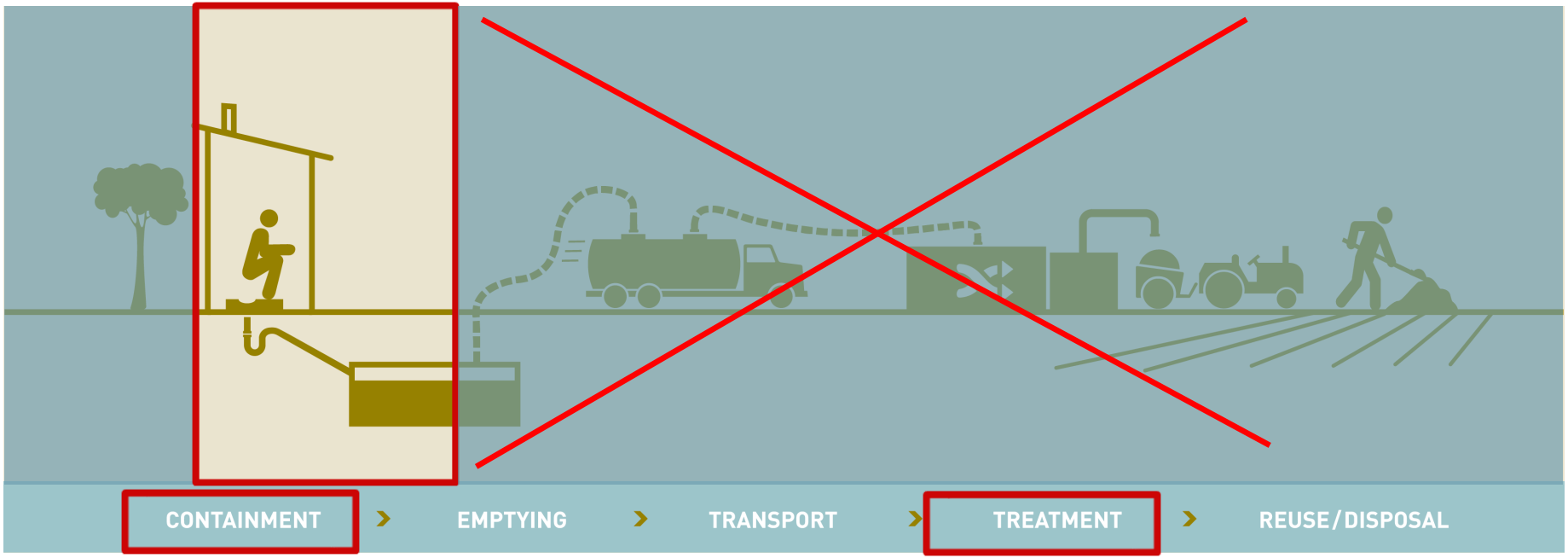
Sewerage



Fecal Sludge Management for non-sewered systems

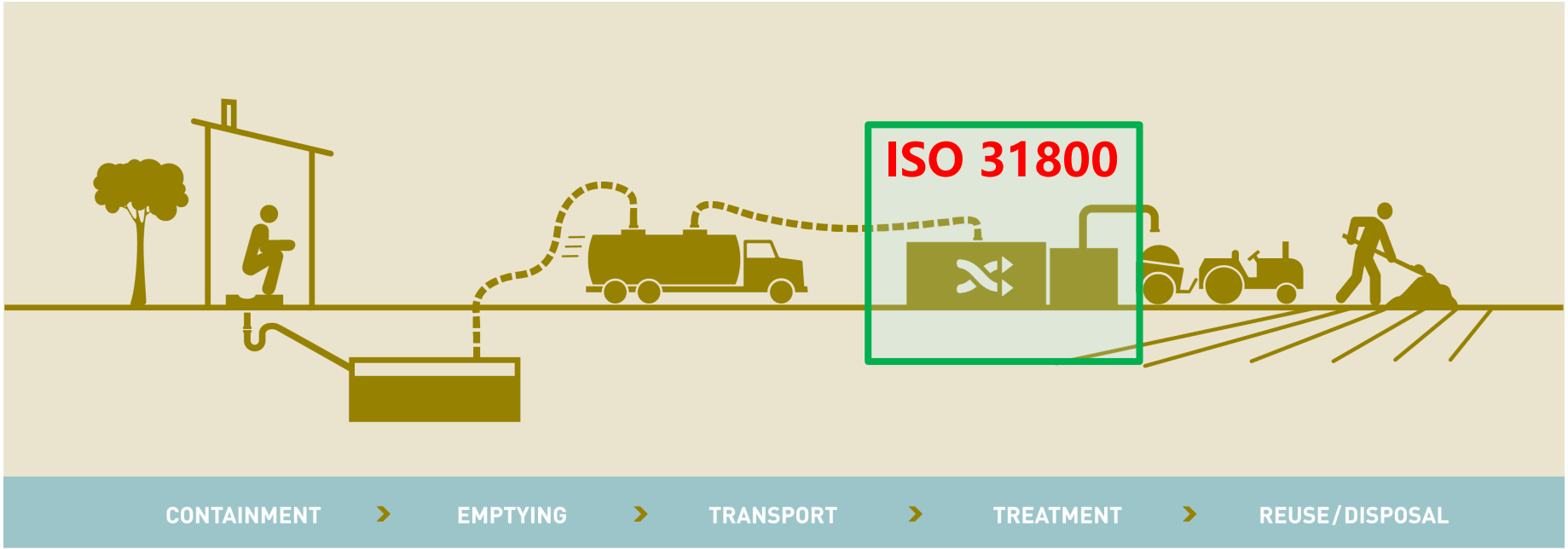
ISO Standards – FSM Overlay

ISO 30500



ISO Standards – FSM Overlay

ISO 24521



ISO 31800 Key Aspects

- **FSTU as a key part of a FSTP**
  - **Design, performance, & test requirements**
  - **Technology-neutral**
    - **Dry Combustion** (Engr. Mansour Fall)
    - **Pyrolysis** (Engr. Mansour Fall)
    - **Supercritical Water Oxidation** (Prof. Marc Deshusses)
    - **Mechanical Vapor Recompression** (sedron.com/varcor)
  - **Focused on faecal sludge treatment**
    - **but may include other materials**
  - **Can be energy neutral or positive for inputs defined by manufacturer**
  - **Treatment for human health and safety**
    - **pathogens, pollutants, emissions, etc…**
  - **Limit odor & noise**
  - **Since many of the ISO 31800 requirements are more stringent than most local and national requirements, those products meeting the standard will generally comply**

New Non-Sewered Sanitation Industry

Enabling environment

Enhanced demand for affordable aspirational sanitation

Implementation of quality standards

Marketplace readiness

Supportive regulatory environment

Access to financing

Readily available competitive products

THANK YOU

CWAS CENTER FOR WATER AND SANITATION
CRDF CEPT UNIVERSITY

BILL & MELINDA GATES foundation

IIT PALAKKAD

Introduction to ISO Standards for Non-Sewered Sanitation (NSS)

Session-2
Introduction to ISO 31800 – Faecal sludge treatment units –

Energy independent, prefabricated, community-scale, resource recovery units – Safety and performance requirements

CWAS CENTRE FOR WATER AND SANITATION
CRDF CEPT UNIVERSITY

BILL & MELINDA GATES foundation

IIT PALAKKAD

ISO STANDARDS FOR
NON-SEWERED SANITATION (NSS)

Introduction to ISO 31800 –

Faecal sludge treatment units – Energy independent, prefabricated, community-scale, resource recovery units – Safety and performance requirements

Chris Chan
Manager, Projects
Corporate Sustainabilty Office
TÜV SÜD

Contents

Overview of ISO 31800

1. Introduction to ISO 31800

- Target Audience
- Objectives
- Required Content
- Sustainability

2. Standard Applications

- Non-Sewered Communities
- Water Scarce Areas
- Ensure Safe Sanitation

3. Technical Requirements

- Performance
- Safety
- Operability
- Maintainability

4. Energy Independence Assessment

- Requirements
- Recommended Template

5. Performance Testing

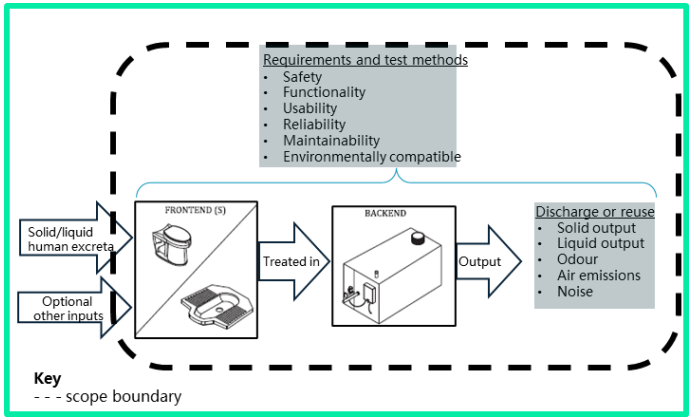
- Human Health
- Environmental
- Air Emissions
- Odour
- Noise

Comparisons between ISO 30500 and ISO 31800

(1) Scope 30500

Scope: general safety and performance requirements for design and testing as well as sustainability considerations for Non-Sewered Sanitation Systems (NSSSs)

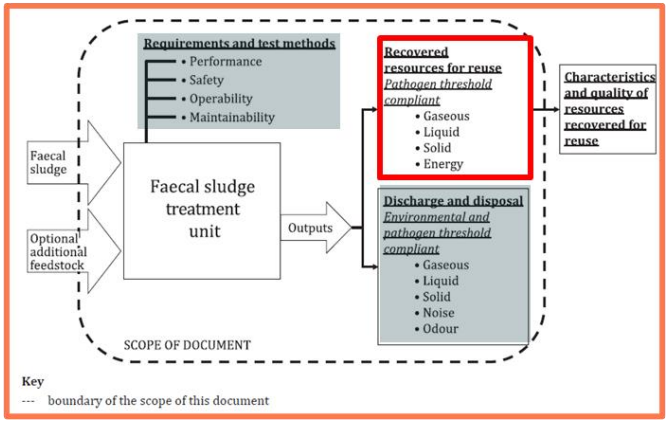
- User interface + treatment unit
- Household-scale
- No connection to sewer or electrical grid
- Output is safely disposed or reused
- 32 days of lab testing + 5 months of field testing



(2) Scope 31800

Scope: requirements and test methods to ensure performance, safety, operability and maintainability of community-scale resource recovery Faecal Sludge Treatment Units (FSTUs)

- Treatment unit
- Community-scale
- No connection to sewer or electrical grid
- Output is safely disposed or reused
- Recommended test sequence minimally 6 days



4. General Requirements

Treatment unit input

- **Primarily treat faecal sludge** from human excreta, with the need for energy independence.
- **Secondary inputs** (e.g.biomass) may be treated, without the need for energy independence.
- Manufacturers shall specify **range of values input** to achieve energy independence [5.2.1] or positive [5.2.2] status.
- Manufacturers shall specify the range of defined input for when treatment unit is in energy independent or positive mode.

5.2.1 Energy independence:

Operate off-grid relying on primarily faecal sludge as a fuel source.

5.2.2 Energy positive:

Energy independent while generating excess electricity for applications beyond the treatment unit.

Table 1 — Example of treatment unit input specifications

Input type	Input parameter	Units	Range of values of parameter (compliant operation, energy independence not required)	Range of values of parameter (energy independent and/ or energy positive for testing)
Faecal sludge	Throughput (dry basis)	kg/h	≤37,5	20,0 to 37,5
	Calorific value	MJ/kg	≥9,0	≥15,0
	Solids content	% solids	≥10,0	≥15,0
	Inorganic content	% mass, dry basis	≤25,0	≤15,0
Other inputs	Throughput (dry basis)	kg/h	≤20,0	
	Calorific value	MJ/kg	≥12,0	
	Solids content	% solids	≥15,0	

NOTE 1 Parameters and values in Table 1 are for illustration purposes only.

NOTE 2 Not all possible combination of these parameter values may be viable simultaneously.

NOTE 3 Other formats for presenting the extended range of input parameters, such as graphs may be used; choice of format is at the discretion of the manufacturer.

Examples of input specifications templates are provided in Annex A.

4. General Requirements

Treatment unit input

- **Primarily treat faecal sludge** from human excreta, with the need for energy independence.
- **Secondary inputs** (e.g.biomass) may be treated, without the need for energy independence.
- Manufacturers shall specify **range of values input** to achieve energy independence [5.2.1] or positive [5.2.2] status.
- Manufacturers shall specify the range of defined input for when treatment unit is in energy independent or positive mode.

5.2.1 Energy independence:

Operate off-grid relying on primarily faecal sludge as a fuel source.

5.2.2 Energy positive:

Energy independent while generating excess electricity for applications beyond the treatment unit.

Table 1 — Example of treatment unit input specifications

Input type	Input parameter	Units	Range of values of parameter (compliant operation, energy independence not required)	Range of values of parameter (energy independent and/ or energy positive for testing)
Faecal sludge	Throughput (dry basis)	kg/h	≤37,5	20,0 to 37,5
	Calorific value	MJ/kg	≥9,0	≥15,0
	Solids content	% solids	≥10,0	≥15,0
	Inorganic content	% mass, dry basis	≤25,0	≤15,0
Other inputs	Throughput (dry basis)	kg/h	≤20,0	
	Calorific value	MJ/kg	≥12,0	
	Solids content	% solids	≥15,0	

NOTE 1 Parameters and values in Table 1 are for illustration purposes only.

NOTE 2 Not all possible combination of these parameter values may be viable simultaneously.

NOTE 3 Other formats for presenting the extended range of input parameters, such as graphs may be used; choice of format is at the discretion of the manufacturer.

Examples of input specifications templates are provided in Annex A.

Example of input specification templates

Table A.1 — Sample table specifying input parameters for thermal processes

Parameter		Comments
Input type: e.g. faecal sludge, urine, biomass		
Origin: e.g. faecal sludge received from non-sewered sanitation service provider; sludge left exposed to air on drying beds for an average of 5 days		[Provide as much detail as possible e.g. recommended types of pre-processing required.]
Throughput (kg/day)		[Provide maximum, minimum, and design values]
Particle size (mm)		[If diameter and length are not suitable forms of measure, other formats may be used and clearly indicated.]
D_x =	x = maximum diameter	
L_y =	y = maximum length	
Moisture content, *M* (*M*%, as received) — ISO 18134-1 or ISO 18134-2		[Prepare report based on the total mass of the test sample (wet basis).]
M% =		
Ash content, *A* (mass %, dry basis) — ISO 18122		[Provide maximum, minimum, and design throughput]
A% =		
Calorific value, *Q* MJ/kg or kWh/kg dry basis, or **Energy density, *E*** MJ/m³ or kWh/m³ bulk volume, — ISO 18125		[Provide maximum, minimum, and design throughput]
Bulk density, *BD* kg/m³ as received — ISO 17828		
BD =		
Nitrogen, N (mass %, water free basis) — ISO 16948		[Maximum value should be specified.]
N% =		
Arsenic, As (mg/kg, dry mass basis)		[Maximum value should be specified.]
As =		
Cadmium, Cd (mg/kg, dry mass basis)		[Maximum value should be specified.]
Cd =		
Chromium, Cr (mg/kg, dry mass basis)		[Maximum value should be specified.]
Cr =		

Separate tables for each type of feedstock

A.1 Thermal processes (As shown)

A.2 Biological processes

A.3 Trace elements

Recommended input parameters with International Standards measurements.

Report and document alternative methods, if used.

Output of mass (composition and amount) of trace elements depends on the input; trace elements may not be fully removed.

Table A.1 - continued

Parameter	Comments
Copper, Cu (mg/kg, dry mass basis)	[Maximum value should be specified.]
Cu =	
Mercury, Hg (mg/kg, dry mass basis)	[Maximum value should be specified.]
Hg =	
Lead, Pb (mg/kg, dry mass basis)	[Maximum value should be specified.]
Pb =	
Molybdenum, Mo (mg/kg, dry mass basis)	[Maximum value should be specified.]
Mo =	
Nickel, Ni (mg/kg, dry mass basis)	[Maximum value should be specified.]
Ni =	
Selenium, Se (mg/kg, dry mass basis)	[Maximum value should be specified.]
Se =	
Zinc, Zn (mg/kg, dry mass basis)	[Maximum value should be specified.]
Zn =	
Sulphur, S (mass %, water free basis) — ISO 16994	[Maximum value should be specified.]
S% =	
Chloride, Cl (mass %, water free basis) — ISO 16994	[Maximum value should be specified.]
Cl% =	
Other: Rheology	

Technical Requirements

ISO 31800

Technical Requirements

Performance

- Maximum technical availability
- Minimal downtime

Safety

- HAZOP Study & Risk Assessment
- Safety protocols during incidents
- Sanitary, mechanical and electrical requirements

Operability

- Anthropometric & ergonomic design

Maintainability

- Adjustment & maintenance requirements

Product Literature

ISO 31800

Product Literature

Required Content

- **System information**
- **Safety and maintenance instructions**
- **Task complexity**

Sustainability

- **Consumables**: quantities required for operation
- **GHG emissions**: Measurements of CO_2, N_2O, CH_4
- **Resource-recovered products**: type, concentration, valuable substances

Energy Independence Assessment

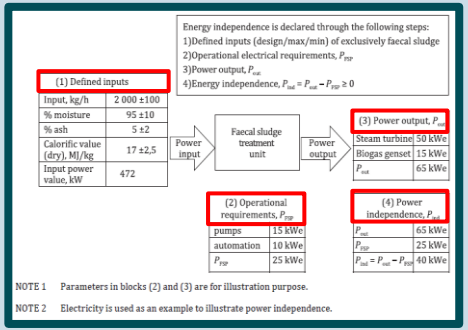
ISO 31800

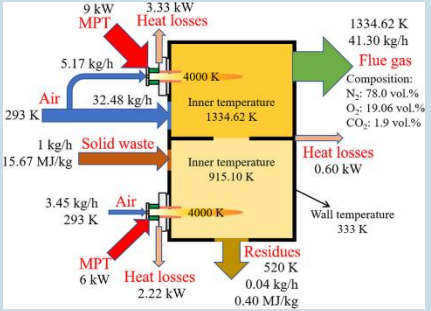
Energy Independence Assessment

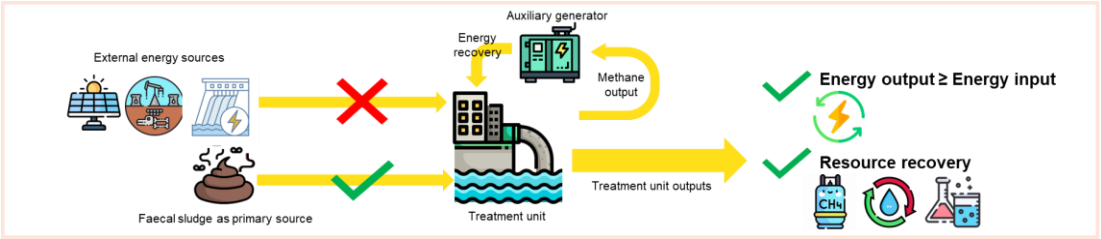
Requirements (to be given by manufacturer)

- List of treatment unit operations
- Assumptions for:
- **energy input** and **useful energy output** for major operations
- **Input mass flows**
- **Calorific value** of dry solids
- **Net accessible energy value of input** per hour during steady state.

Example of Energy Balance







Performance testing

Two test conditions to be tested while operating in energy independent mode:

- **Upper throughput limit** of defined input range
- **Lower throughput limit** of defined input range

1. Defined input shall not deviate by +/- 5% (operating in upper and lower throughput limit)
2. Any preventative maintenance activities and durations shall be accounted for and specified by the manufacturer.
3. If maintenance results in downtime, it shall not be part of the entire test duration

Table 11 — Recommended test sequence

No	Test(s)	Test duration[c]	Remarks
0	Start-up: Follow start-up procedure according to the manufacturer's instructions	Not applicable	The timeframe depends on the duration of the start-up period required to achieve system operability and stability. This duration shall be specified by the manufacturer.
1	Solid and effluent	1 day, for 8 h[a]	Refer to 11.5 for details of sampling planning
2	Air emissions (except dioxins and furans) Odour measurement	1 day, for 8 h[a]	Refer to 11.6 for air emissions, and 11.7 for odour for details of sampling planning
3	Air emissions — Dioxins and furans	At least 3 days, for 8 h/day[a,d]	One sample per day. A total of three are required.
4	Noise measurements	1 day, for 8 h[a]	Refer to 11.8 for details of sampling planning Test shall be conducted on a day without other testing activities[b]

[a] 8 h excludes time for setting up of equipment, adjustment, calibration, etc.

[b] This is done to have the least disturbance.

[c] If not specified, test may be carried out in parallel with other test(s).

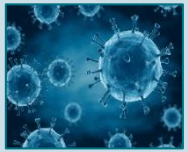
[d] As concentrations to be measured are very low (>0,18 ng/m³). An accumulation for at least 6 h on the adsorbent is necessary to reach the detection threshold. With the preparation and follow-up time, only one measurement per day is possible.

Performance Testing

ISO 31800

Performance Testing & Thresholds

1. Human Health



- Bacteria
- Virus
- Protozoa
- Helminths

2. Environmental

- COD
- BOD
- TSS
- Total N
- Total P
- Temperature
- Transition Metals

3. Air Emissions

- CO
- NO_x
- SO_2
- Total dust
- Dioxins and furans
- Arsenic
- Cadmium
- Mercury
- Oxygen
- Moisture content

4. Acoustics

- A-weighted equivalent sound level

5. Odour

- Includes human assessors


Mehr Wert.
Mehr Vertrauen.
Add value.
Inspire trust.
Thank You
Contact for any enquiries:
Chris.chan@tuvsud.com

Introduction to ISO Standards for Non-Sewered Sanitation (NSS)

Session-3
Potential application of ISO 31800:
Combustion &
Pyrolysis example

CWAS CENTRE FOR WATER AND SANITATION
CRDF CEPT UNIVERSITY
BILL & MELINDA GATES foundation
IIT PALAKKAD

ISO STANDARDS FOR NON-SEWERED SANITATION (NSS)

Potential application of ISO 31800: Combustion & Pyrolysis example

Mansour Fall
Expert Eng
Independent consultant of BMGF

CWAS CENTER FOR WATER AND SANITATION
CRDF CEPT UNIVERSITY
BILL & MELINDA GATES foundation
IIT PALAKKAD

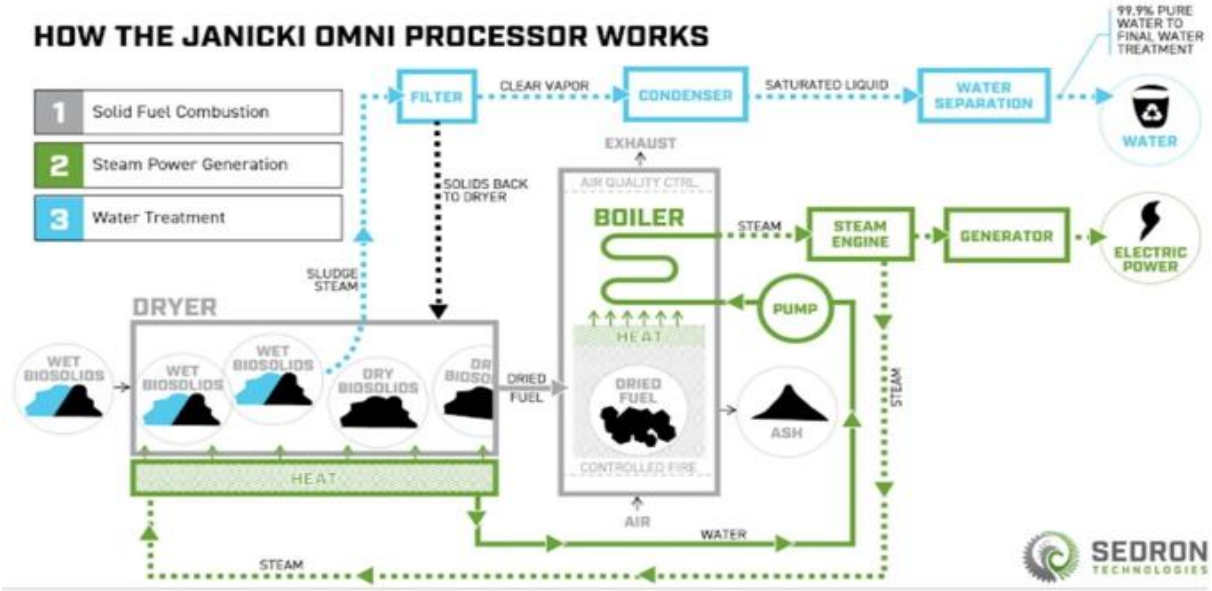
OMNIPROCESSOR CONCEPT

An industrial unit that process the sludge thermally to kill pathogen while reducing the volume and generate some bioproduct .

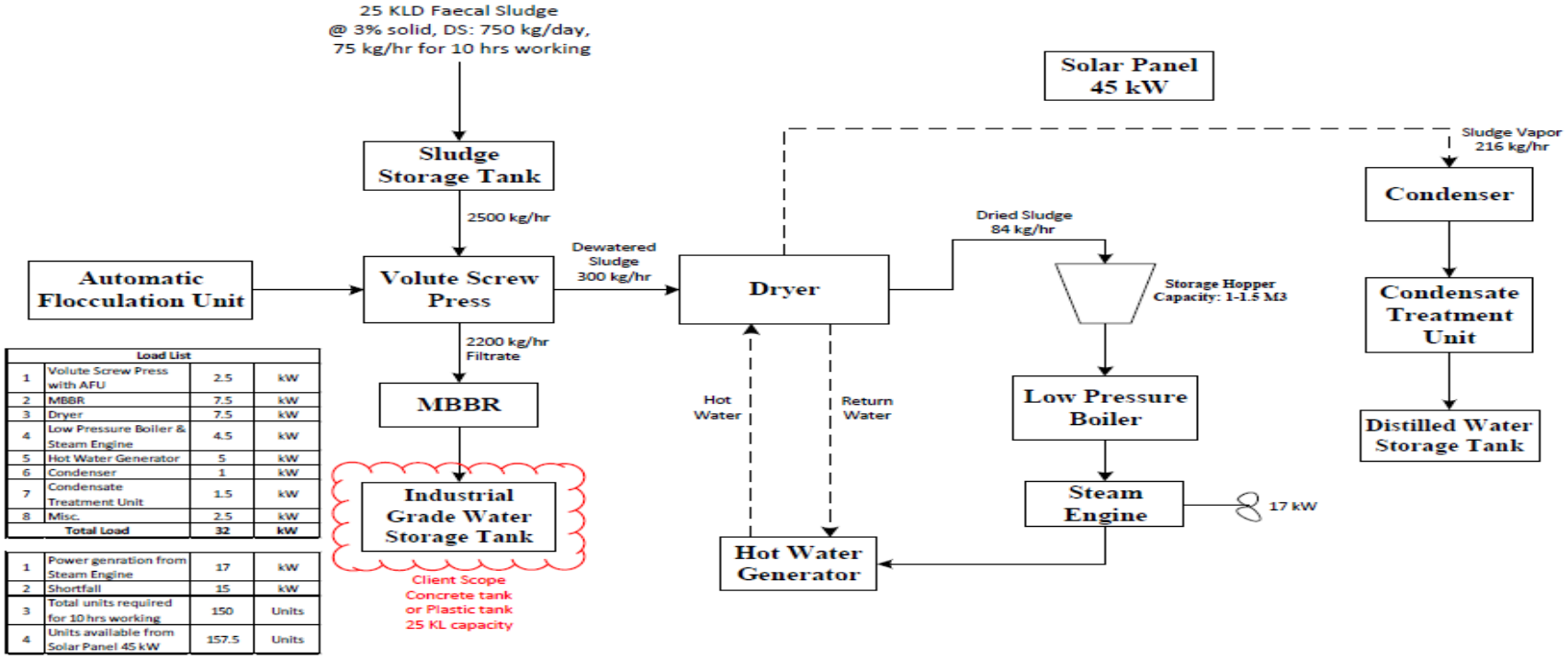
Combustion OP C-OP

What is combustion

A combustion reaction is usually a reaction that produces fire. Combustion takes place at an elevated temperature. It is a heat releasing (exothermic), redox chemical reaction that usually occurs between a fuel and oxidizing agent (mostly oxygen of the atmosphere).



2nd generation Op

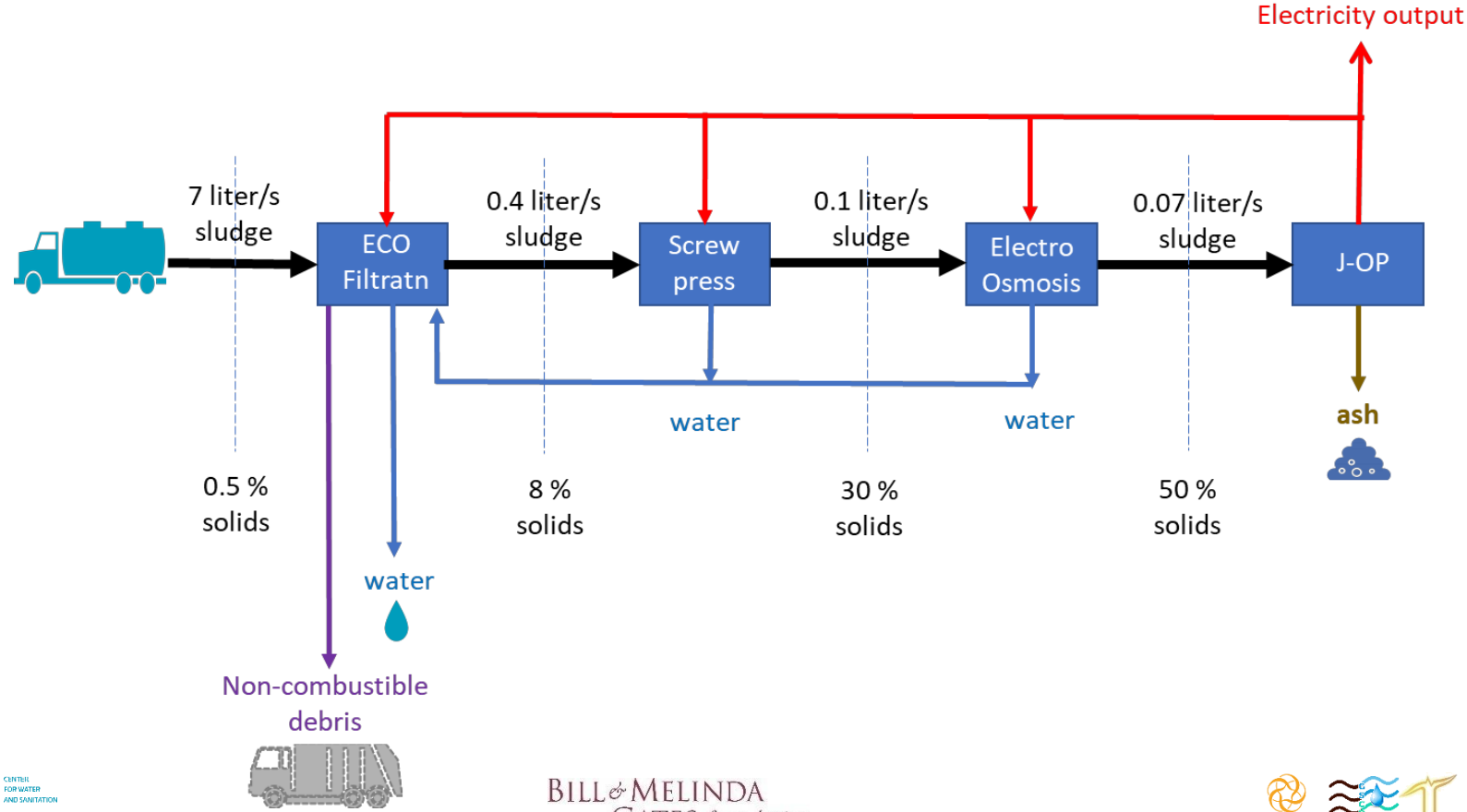


Load List			
1	Volute Screw Press with AFU	2.5	kW
2	MBBR	7.5	kW
3	Dryer	7.5	kW
4	Low Pressure Boiler & Steam Engine	4.5	kW
5	Hot Water Generator	5	kW
6	Condenser	1	kW
7	Condensate Treatment Unit	1.5	kW
8	Misc.	2.5	kW
	Total Load	32	kW

1	Power genration from Steam Engine	17	kW
2	Shortfall	15	kW
3	Total units required for 10 hrs working	150	Units
4	Units available from Solar Panel 45 kW	157.5	Units

Note:
1. Start-up power through DG Set/Battery Bank
2. Minimum required dry basis CV of sludge = 14 MJ/kg
3. Space required = 850 M2

3rd generation OP




3rd Generation
C-OP

PYROLYSE OP

What is Pyrolysis ?
It is the heating of an organic material, such as biomass, in the absence of oxygen. Biomass pyrolysis is usually conducted at or above 500 °C


WAI P-OP


J-Omiprocessor
installed in
Dakar Senegal


Pavers block

Fertilizer r

Coolant for car engine

THANK YOU

CWAS CENTER FOR WATER AND SANITATION
CRDF CEPT UNIVERSITY

BILL & MELINDA GATES foundation

IIT PALAKKAD

Introduction to ISO Standards for Non-Sewered Sanitation (NSS)

Session-4
Potential Application of ISO 31800:
Supercritical Water Oxidation by 374Water

CWAS CENTRE FOR WATER AND SANITATION
CRDF CEPT UNIVERSITY
BILL & MELINDA GATES foundation
IIT PALAKKAD

ISO STANDARDS FOR
NON-SEWERED SANITATION (NSS)

Potential Application of ISO 31800: Supercritical Water Oxidation by 374Water

Marc Deshusses, Ph.D.

Duke University & 374Water Inc.

CWAS CENTER FOR WATER AND SANITATION
CRDF CEPT UNIVERSITY

BILL & MELINDA GATES foundation

IIT PALAKKAD

Evolution timeline

BILL & MELINDA GATES foundation

Reinvent the Toilet

2011

2013

Duke UNIVERSITY

374WATER°

- Social impact, cleantech company
- About 30 employees worldwide

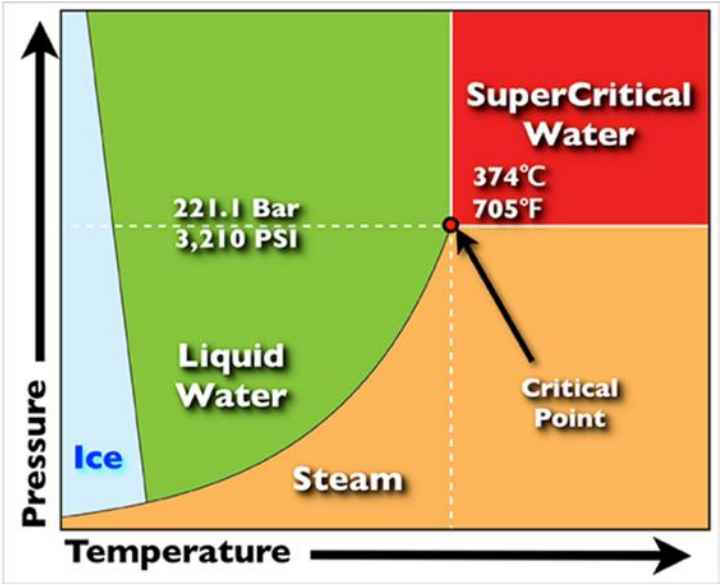
July 2018

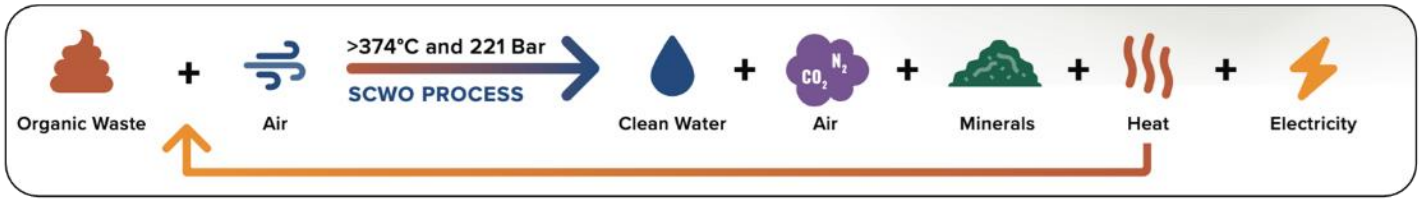
Nasdaq

2022 (“SCWO”)


Shifting the waste paradigm
This barrel is an
87 kWh
worth of dump!
The same energy as
in 10 L of
gasoline
or a Tesla
battery pack

What is SCWO ?





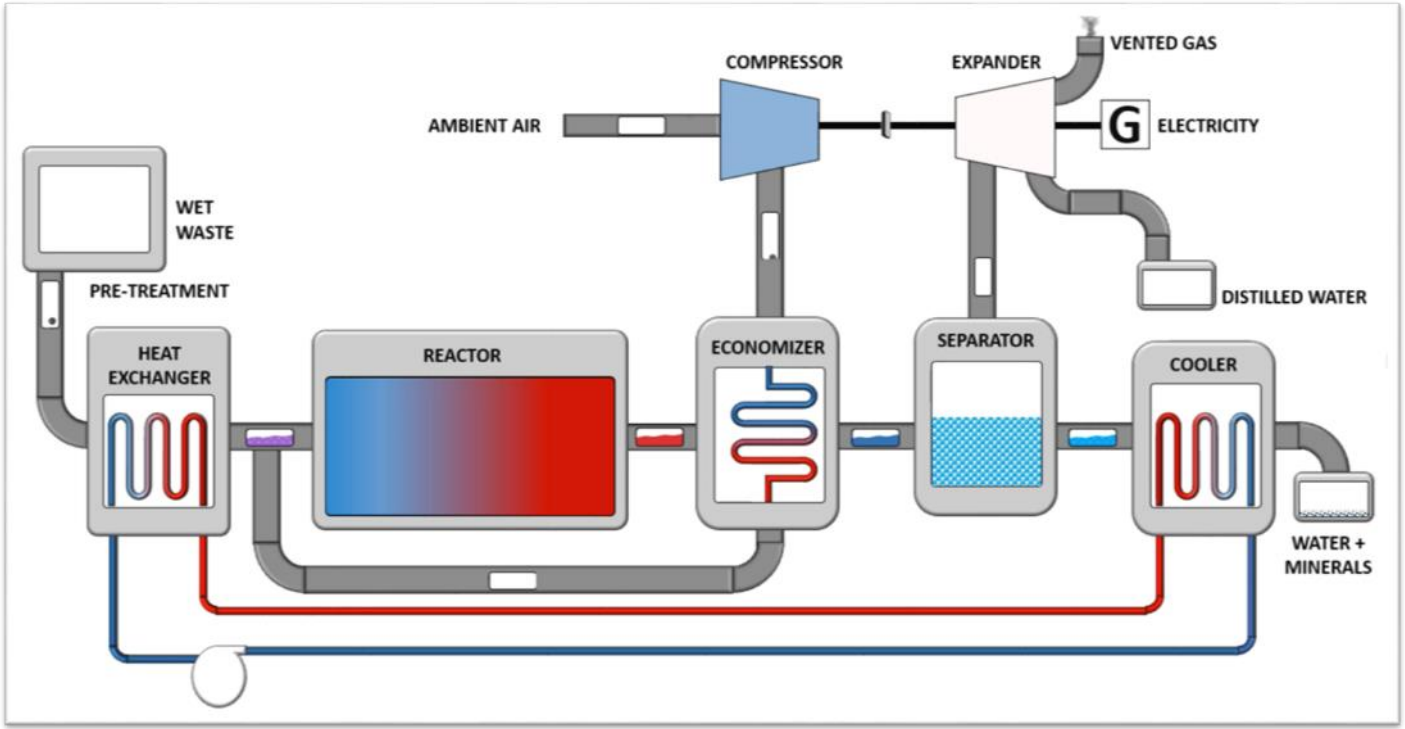
SCWO converts organic waste into clean water, heat, electricity and CO_2 in ***seconds!***

SCWO is a transformative technology

- Process is compact and scalable
- Treat waste at the source eliminating transportation and greenhouse gases
- Recover and reuse water, energy and nutrients
- Decentralized, prefabricated, compact and modular units
- Energy efficient, sustainable and resilient

Duke pilot SCWO system

How AirSCWO™ works



Wastes treated so far …

Primary sludge

Dewatered secondary sludge

Digested sludge

Animal wastes

Food waste

Landfill leachate

Stockpile AFFF

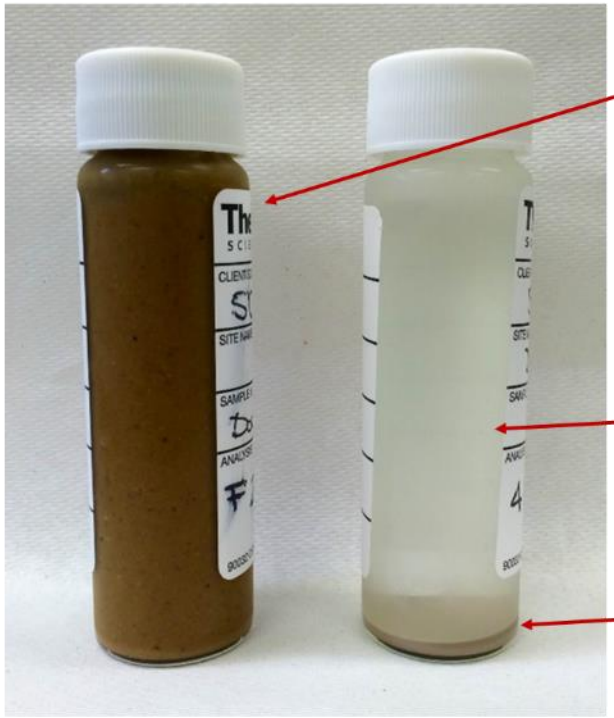
AFFF rinsate

Microplastics

… and the list goes on

- Pharmaceuticals
- Chemical wastes (F, Br, Cl)
- Ag waste/fermentation waste
- Waste cooking or motor oil
- FOG (fat, oil and grease)
- GAC
- Spent IX resin

It always comes out the same...



Feed

Effluent

Minerals

Landfill
Leachate

Plastic

Primary Sludge

Biosolids

Food Waste

Typical performance for biosolids and wastewater sludges

Parameter	Influent	Effluent
COD (mg/L)	160,000 - 220,000	50-200
VSS	10-18%	<1%
Total N (mgN/L)	2000-15,000	20-500
NH_3 (mgN/L)	300-600	5-100
NO_2^- (mgN/L)	0-20	<5
NO_3^- (mgN/L)	100-300	<10
PO_4^{3-}	2000-6000	20-150
pH	6-8	6-7
Conductivity (µS/cm)	3000-5000	100-300

Treatment of micro-pollutants

Experimental Approach

- Spiked contaminants in IPA/water and in biosolids

Results

- **Ibuprofen** and **acetaminophen**: spiked 10 mg/L each

Effluent: ND at < 1 µg/L **Elimination > 99.99%**

- **Triclosan**: spiked: 100 µg/L

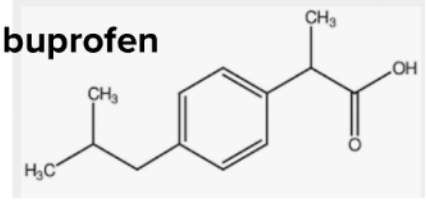
Effluent: ND at < 0.1 µg/L **Elimination > 99.9%**

- **Tetrabromobisphenol A**: spiked: 13 g/L

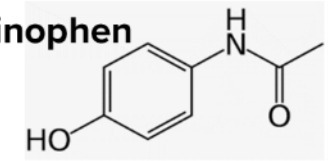
Effluent: ND at < 1 mg/L **Elimination > 99.99%**

SCWO treatment is waste agnostic

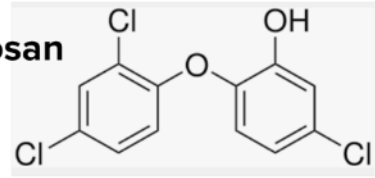
Ibuprofen



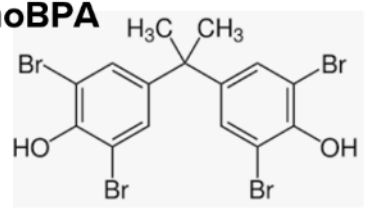
Acetaminophen



Triclosan



TetrabromoBPA



CWAS CENTRE FOR WATER AND SANITATION
CRDF CEPT UNIVERSITY

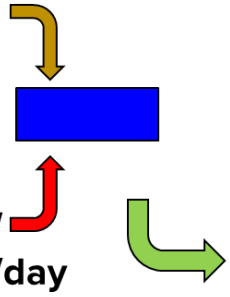
BILL & MELINDA GATES foundation

IIT PALAKKAD

Energy Balances (Projections)

AirSCWO 6
(2024)

6 wet ton/day

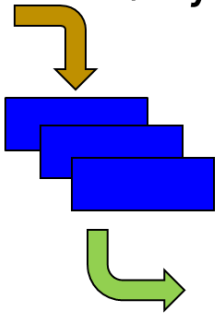


10 kW
240 kWh/day

Heat:
2.4 MWh(thermal)/day

AirSCWO 30
(2025)

30 wet ton/day

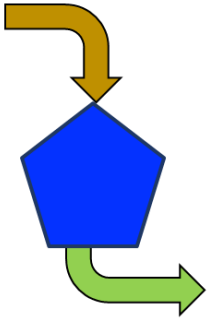


Electricity: 12.5 kW
300 kWh/day

Heat: 12
MWh(thermal)/day

AirSCWO 200
(tbd)

200 wet ton/day



Electricity: 167 kW
4000 kWh/day

Heat: 80
MWh(thermal)/day

374Water's AirSCWO™ systems

AirSCWO™ 6 = 6 wet ton/day (target about 15% dry solids)
To be deployed to OC San (California)

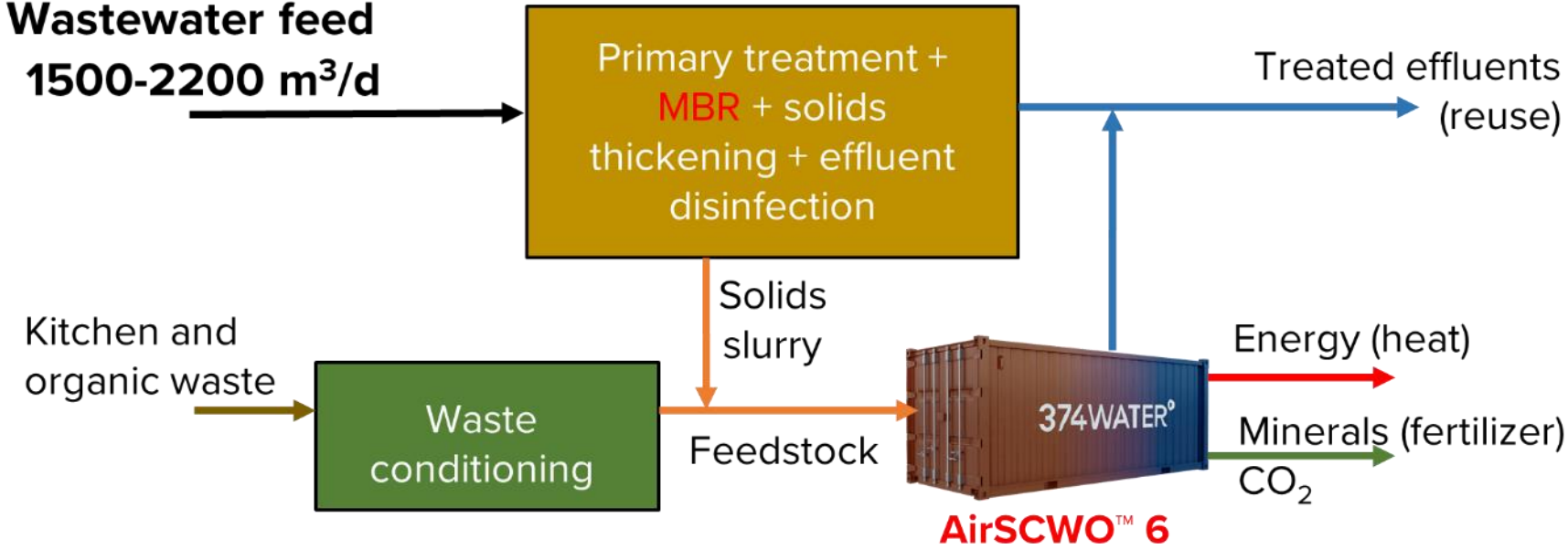
AirSCWO and ISO 31800

Criterion	Threshold or Requirement	AirSCWO value (preliminary)	Comment
Energy independence	Operate off-grid solely on FS	Not met AS 6 Will be met AS 30	Need sludge at 15% DS
Liquid and solid output, human health	See Tables 3 and 6	Will meet all health criteria	T > 500 °C
Solid trace elements	See Tables 4 and 5	Tbd	Largely input dependent
BOD	<25 mg/L	ND	
COD	<100 mg/L	50-100 mg/L	
pH	6-9	6-7	
Vent: CO	440 mg/m^3	45 mg/m^3	
Vent: NOx	880 mg/m^3	0.02 mg/m^3	
Vent: SOx	2000 mg/m^3	0.1 mg/m^3	
Odor	Dispersion calc.	Will likely pass	Very low odor

374Water will likely pursue ISO 31800 certification for its AirSCWO systems

Decentralized Sanitation / Mixed-Use Development

AirSCWO™ – Membrane Bioreactor (MBR) Combination for Sewage Treatment



FSM Project in Progress: The Homa Bay Blueprint, Kenya

- Partnered with key organizations, local government, and national university
- Deploy an AirSCWO unit, build data hub
- Determine impact
- Build a pathway to scale

For information, see: https://gpfd.org/

CWAS CENTRE FOR WATER AND SANITATION
CRDF CEPT UNIVERSITY

BILL & MELINDA GATES foundation

IIT PALAKKAD

Conclusions

- SCWO is an effective technology for biosolids and fecal sludge management
- All organic contaminants are mineralized and all pathogens are eliminated during treatment
- The process does not require chemicals or consumables
- Resources are recovered
- AirSCWO™ systems will soon be deployed commercially

Contacts:

Marc Deshusses: md@374water.com

Sunny Vishwanathan: sv@374water.com

CWAS CENTRE FOR WATER AND SANITATION
CRDF CEPT UNIVERSITY
BILL & MELINDA GATES foundation
IIT PALAKKAD

THANK YOU

CWAS CENTER FOR WATER AND SANITATION
CRDF CEPT UNIVERSITY

BILL & MELINDA GATES foundation

IIT PALAKKAD