

Municipal Recovery from Covid-19 Pandemic

Expert Mission: Sustainable Waste Management

Partners of Connective Cities



Commissioned by



Recap of Session 4.0 (10 May 2022)

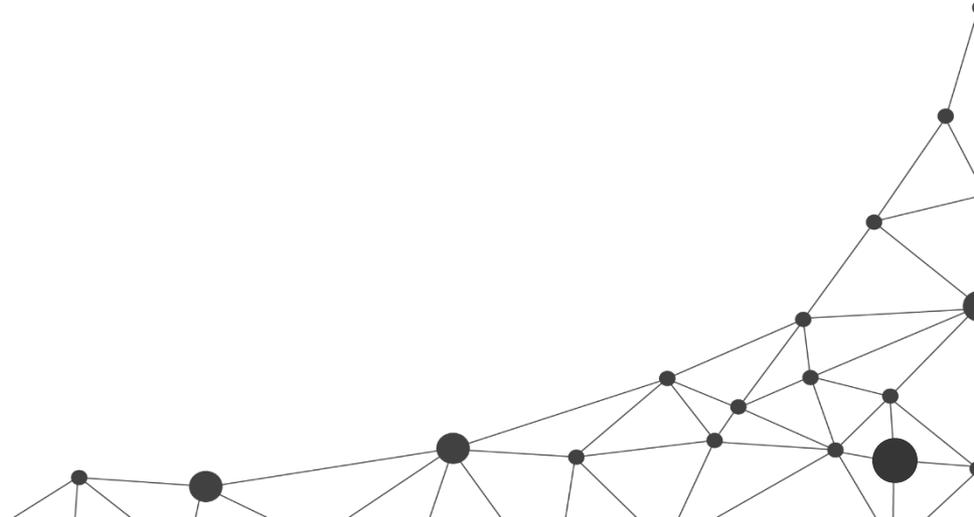
Thematic focus:

- a) **Waste to Energy – how it works / limitations**
- b) **Project Tender by EU for three WM centers in Lebanon**

Based on discussion with participants, the topic of using organic waste to produce energy will be the focus of the fifth session:

experiences with biowaste in Berlin and also from Ljubljana, Slovenia, and Lebanon

Proposal for a 6th session on the 4th Oct 2022.





5th Survey - July 26th, 2022

Waste Management Issues - Exchange with experts from six Lebanese Municipalities



Ressource Abfall GmbH

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mail@ressource-abfall.de

Exchange via BigBlueButton

Lebanon & Elze (Germany)

www.ressource-abfall.de

Agenda from my side:

- 1) Short update: What did you do in waste management since last meeting
- 2) Short review of MoM 4th Survey
- 3) Key issues for today:
 - a) Biowaste production of energy and fertilizer(s) at BSR
 - b) Biowaste production of energy and fertilizer(s) at SNAGA (vokasnaga) Ljubljana, Slovenia
 - c) Small scale energy production from biow. in Indie
- 4) Waste incineration plant project from Lebanese Municipality
- 5) Next Meeting



Short review of MoM 4th Survey

2)

See file:

[2022-05-10_Municipalities+Part-2-Survey-2_Waste-Man_GIZ-Summary-V-f.pdf](#)

Biowaste – production of energy and fertilizer(s) at BSR

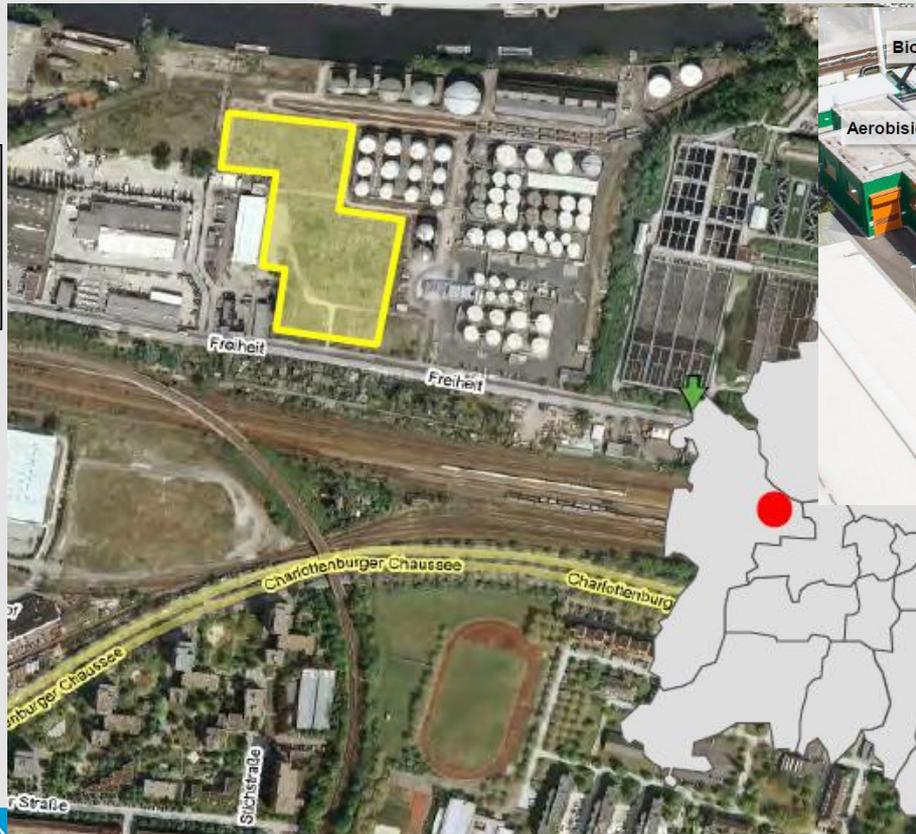
3 a)



- BSR Berlin – Truck with delivering biowaste to treatment plant in Berlin-Ruhleben

Biowaste – production of energy and fertilizer(s) at BSR

3 a)



BSR Berlin AD plant – plus external composting facility / ies – without photos

Biowaste – production of energy and fertilizer(s) at BSR

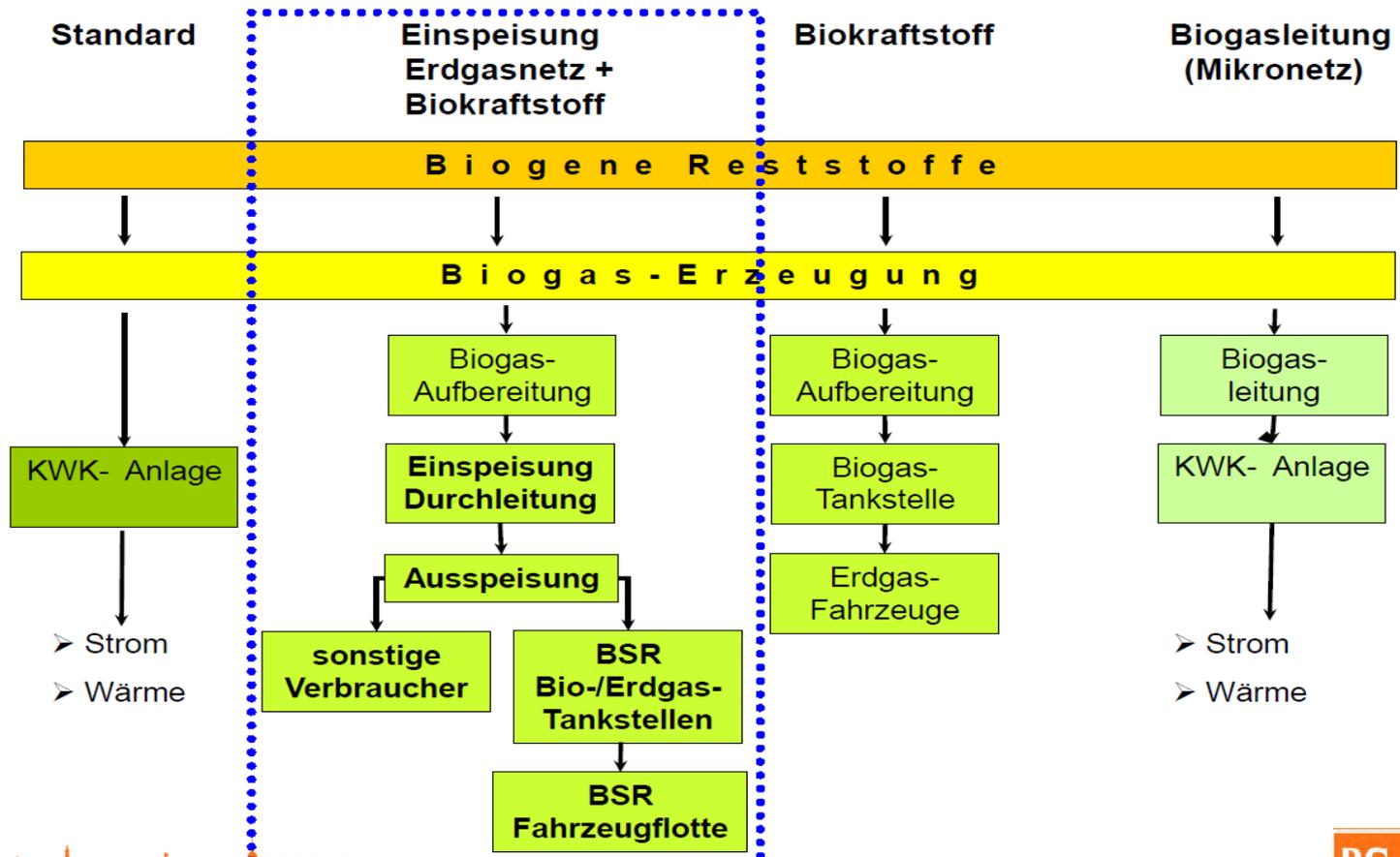
3 a)



Biowaste – production of energy and fertilizer(s) at BSR

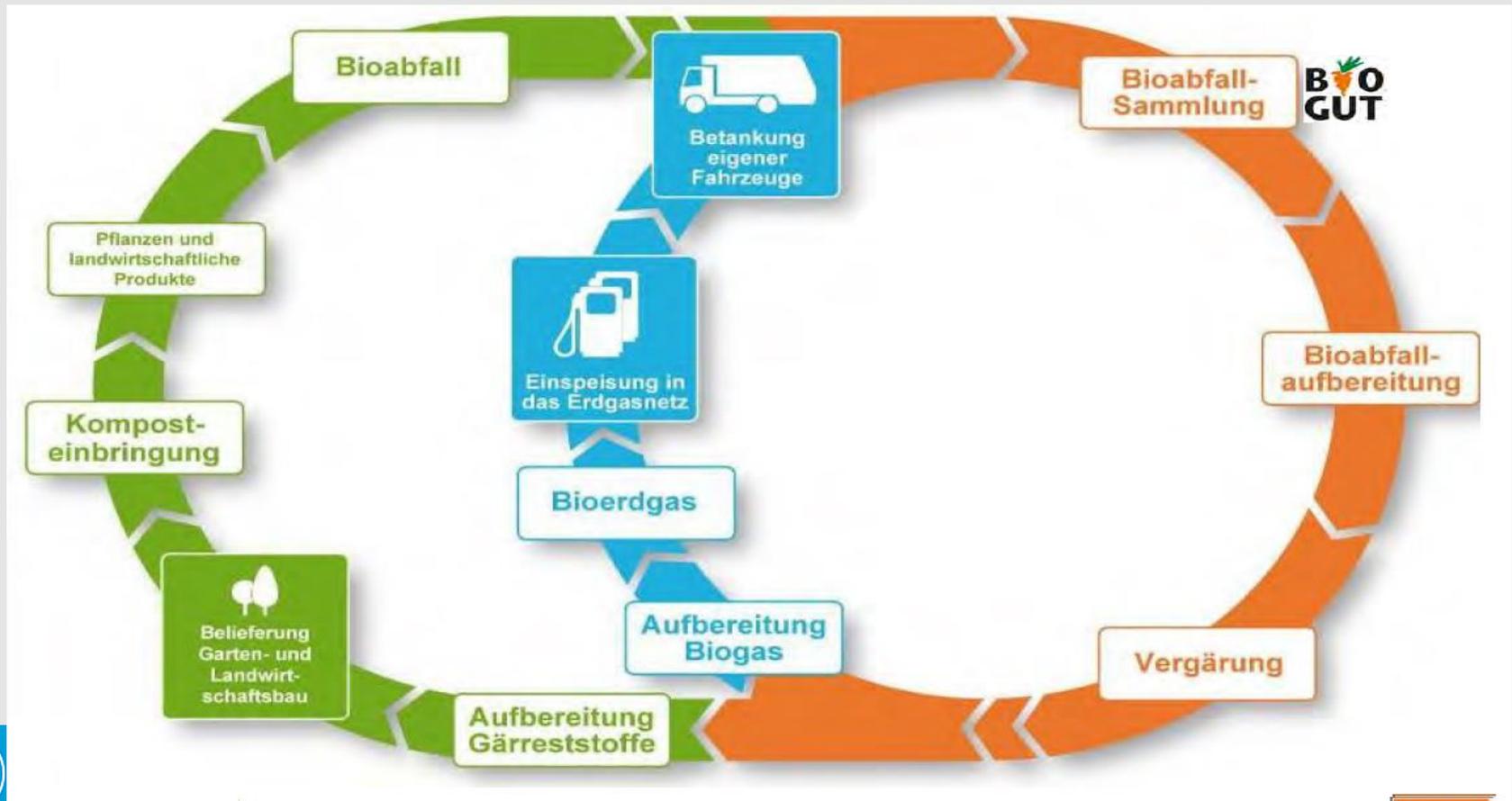
3 a)

Biogas - Verwertungsmöglichkeiten



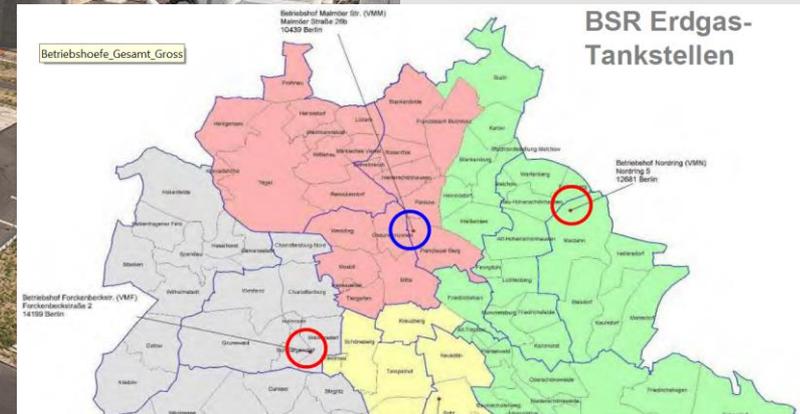
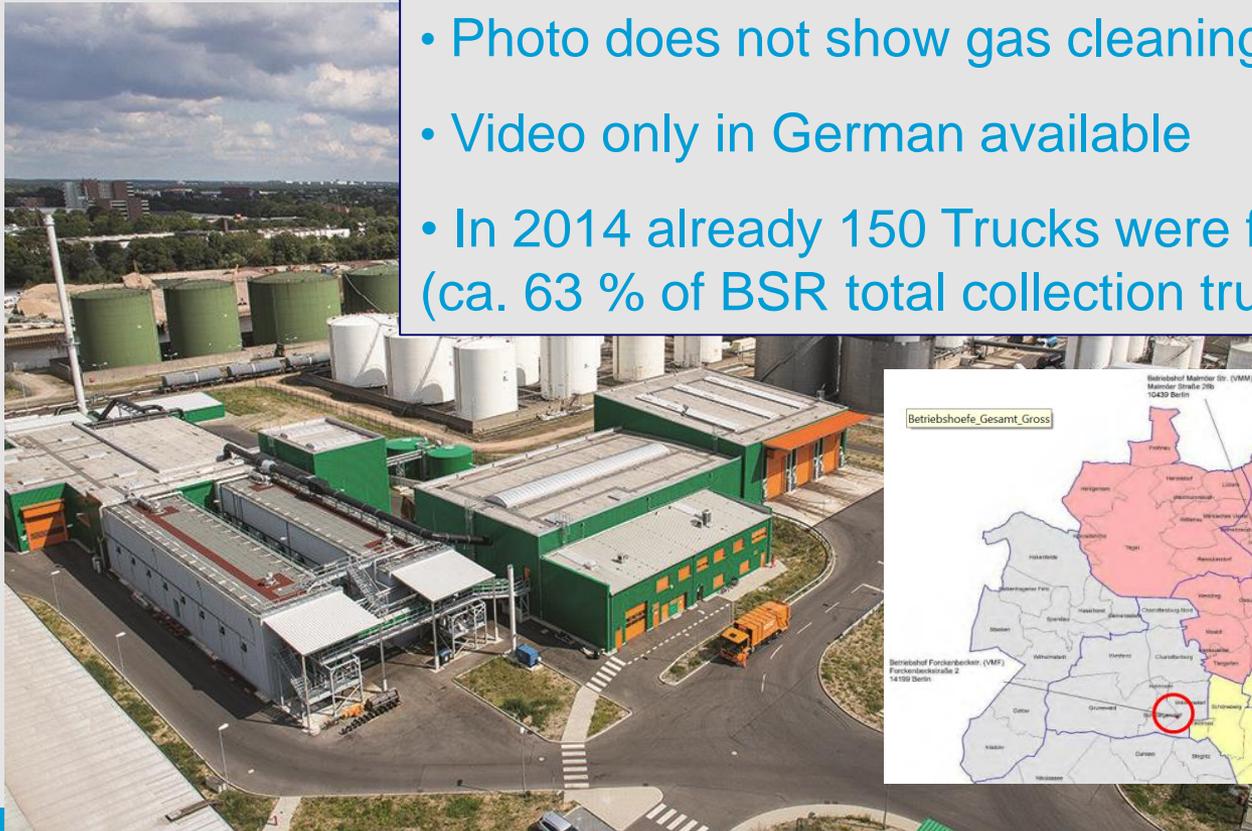
Biowaste – production of energy and fertilizer(s) at BSR

3 a)



Biowaste – production of energy and fertilizer(s) at BSR

- Photo does not show gas cleaning to SNG-quality
- Video only in German available
- In 2014 already 150 Trucks were fuelled with SNG (ca. 63 % of BSR total collection trucks; > 50% km)



3 a)

Biowaste at RCERO, Ljubljana, Slovenia

3 b)

SNAGA – now VOKA-SNAGA – is public utility for city of Ljubljana plus several surrounding municipalities



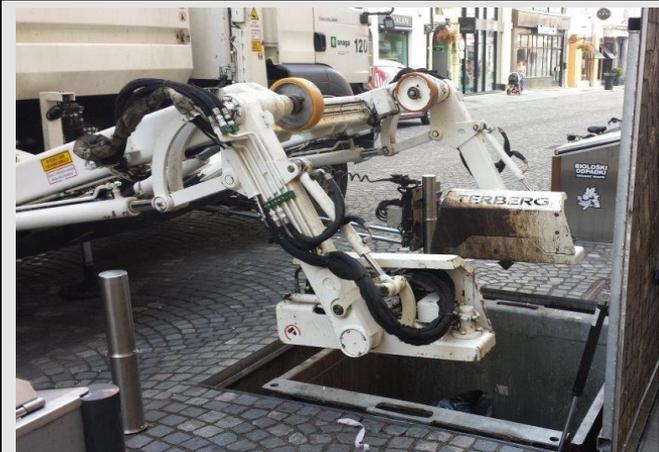
F-01: Underground collection points in central city and neighbouring areas, Ljubljana, Photo taken from SNAGA



F-02: Normal biowaste collection bins, Ljubljana, Photo taken from SNAGA



F-03: RCERO site, Ljubljana, Photo taken from SNAGA



F-04: Emptying of underground bin – here residual waste, Ljubljana

Biowaste at RCERO, Ljubljana, Slovenia

Biowaste is digested to biogas. This gas is used in CHP-units => electricity, mainly to grid and heat for process.



Compost is marketed.



F-05: Part of delivery hall for biowaste, RCERO, Ljubljana



F-06: Biowaste input at unloading from regular collection truck, RCERO, Ljubljana



F-07: Biowaste input after discharge from truck, seasonally wet, RCERO, Ljubljana



F-08: Biowaste input after discharge from truck, also some green waste trunks, RCERO, Ljubljana

3 b)

Biowaste at RCERO, Ljubljana, Slovenia

Biowaste is digested to biogas. This gas is used in CHP-units => electricity, mainly to grid and heat for process.



Compost is marketed.



F-09: Biowaste input after discharge from truck, here green waste and trunks, RCERO, Ljubljana,



F-10: Coarse Shredder – for bag opening and trunks prior screening and anaerobic digestion, RCERO, Ljubljana



F-11: Coarse Shredder in operation, RCERO, Ljubljana



F-12: Between two lines for Anaerobic digestion – one is for biowaste, RCERO, Ljubljana

Biowaste at RCERO, Ljubljana, Slovenia

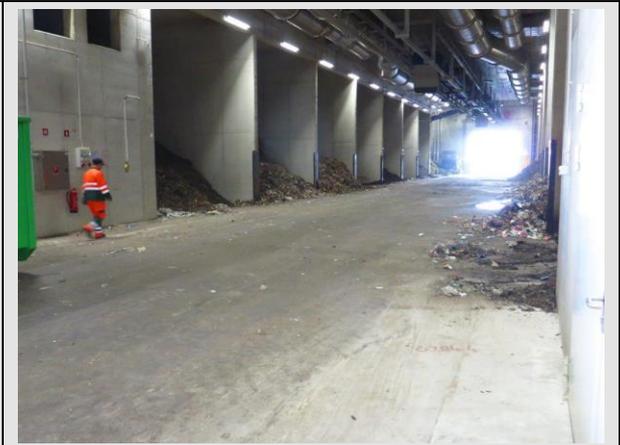
Biowaste is digested to biogas. This gas is used in CHP-units => electricity, mainly to grid and heat for process.



Compost is marketed.



F-13: Tunnel for stabilisation of biowaste after digestion, RCERO, Ljubljana,



F-14: Tunnel area for stabilisation – smaller part is for biowaste, RCERO, Ljubljana



F-15: Part of dewatering machinery – also for biowaste, RCERO, Ljubljana



F-16: One of the first windrows for final composting, RCERO, Ljubljana

Biowaste at RCERO, Ljubljana, Slovenia

Biowaste is digested to biogas. This gas is used in CHP-units => electricity, mainly to grid and heat for process.



Compost is marketed.



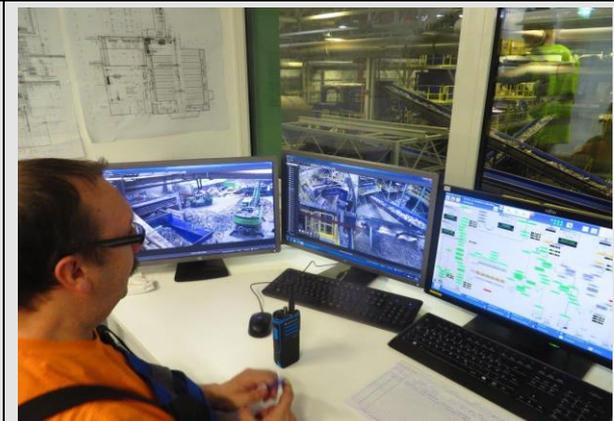
F-17: Windrow for final composting after turning – background final treatment machinery, RCERO, Ljubljana



F-18: Turning machine for windrows, final composting stage, RCERO, Ljubljana



F-19: Final product: compost of high quality, RCERO, Ljubljana



F-20: Plant control centre, screens and cameras for process supervision – not only for AD and composting, RCERO, Ljubljana

Biowaste – production of energy and fertilizer(s) – few notes from India -

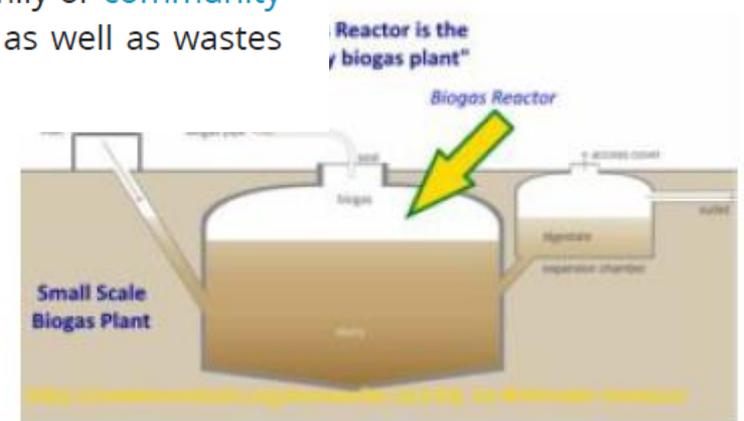
3 c)

Home Biogas and Community-Scale Digesters in India

Biogas has been used extensively in the rural areas of such countries as India, for many years.

The gas has historically, mostly been generated from family or **community biogas plants** using human and other domestic wastes as well as wastes from domestic animals, as substrates.

All from
Biogas in India 2019
ebook Anaerobic-
Digestion.com



Schematic of a small-scale Biogas Reactor

Biowaste-composting in India – about 2010

3 c)

Examples from Southern India



F-01: Very simple composting plant in Southern India



F-02: Some of the small windrows -



F-03: Final compost, very fine material screened to a few mm size



F-04: New large scale composting plant in construction at Madurai, Tamil Nadu



Please consider:

- a) Waste Management issues are “long and winding roads”
- b) Stick to your priorities and try to commit mayors and other decision makers
- c) close the gap between the legal setting and the reality on local level
- d) Try to get more money for waste management issues
- e) Separate organic fractions and get them composted (into high quality product for agriculture)
- f) Improvement takes time – also in Waste Management

5)





Next Survey: Tuesday,

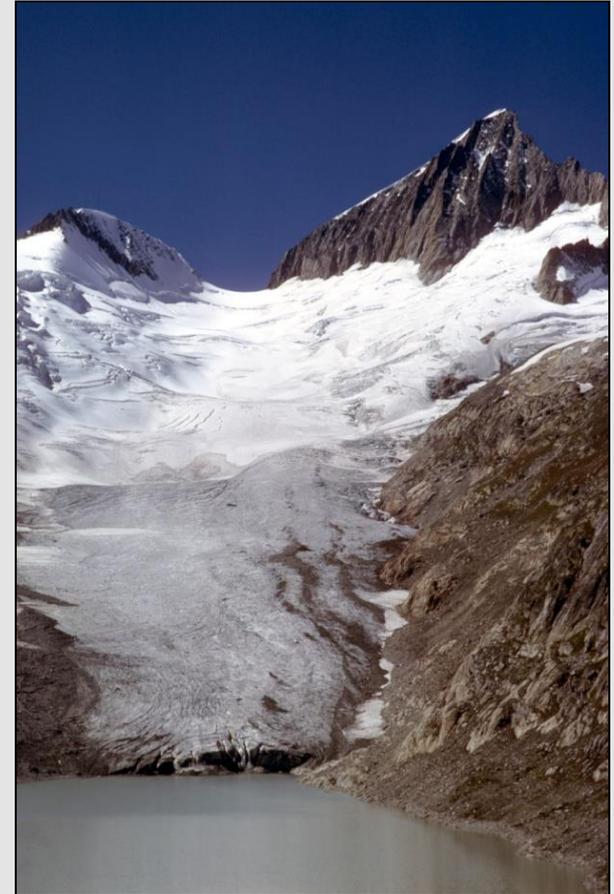
Oct. 4th at 14:00 CET

Stay strong !

Thanks for your attention!

For further information:

Mail@ressource-abfall.de



Waste incineration plant project from Lebanese Municipality

Main Activities

1. ... ;
2. ... ;
3. ... ;
4. ... ;

4



Who We Are

- Sicomo S.a.l.

The company was established in the Bekaa valley since 1978 and it specializes in Paper and Carton recycling

- Energeco S.a.l. (Sister company of Sicomo)

Waste Management and Waste to Energy Specialists with more than 16 years of experience

In 2011, Energeco supplied the first and only officially permitted WtE in Lebanon



The Municipal Waste Burden





The Options

- Usually Waste Collectors are left with only 3 options:
 - Setup a special sorting/recycling plant
 - Find an old sand mine for landfilling
 - Convert the waste to energy / Waste Valorisation



Why W2E

- Recycling very difficult and requires the use of highly polluting elements, Costly equipment and High Energy Consumption
- No land owner would accept to have the rejects stored in his property
- Proven technologies showed potential advantages into reducing all kind of waste with or without production of energy



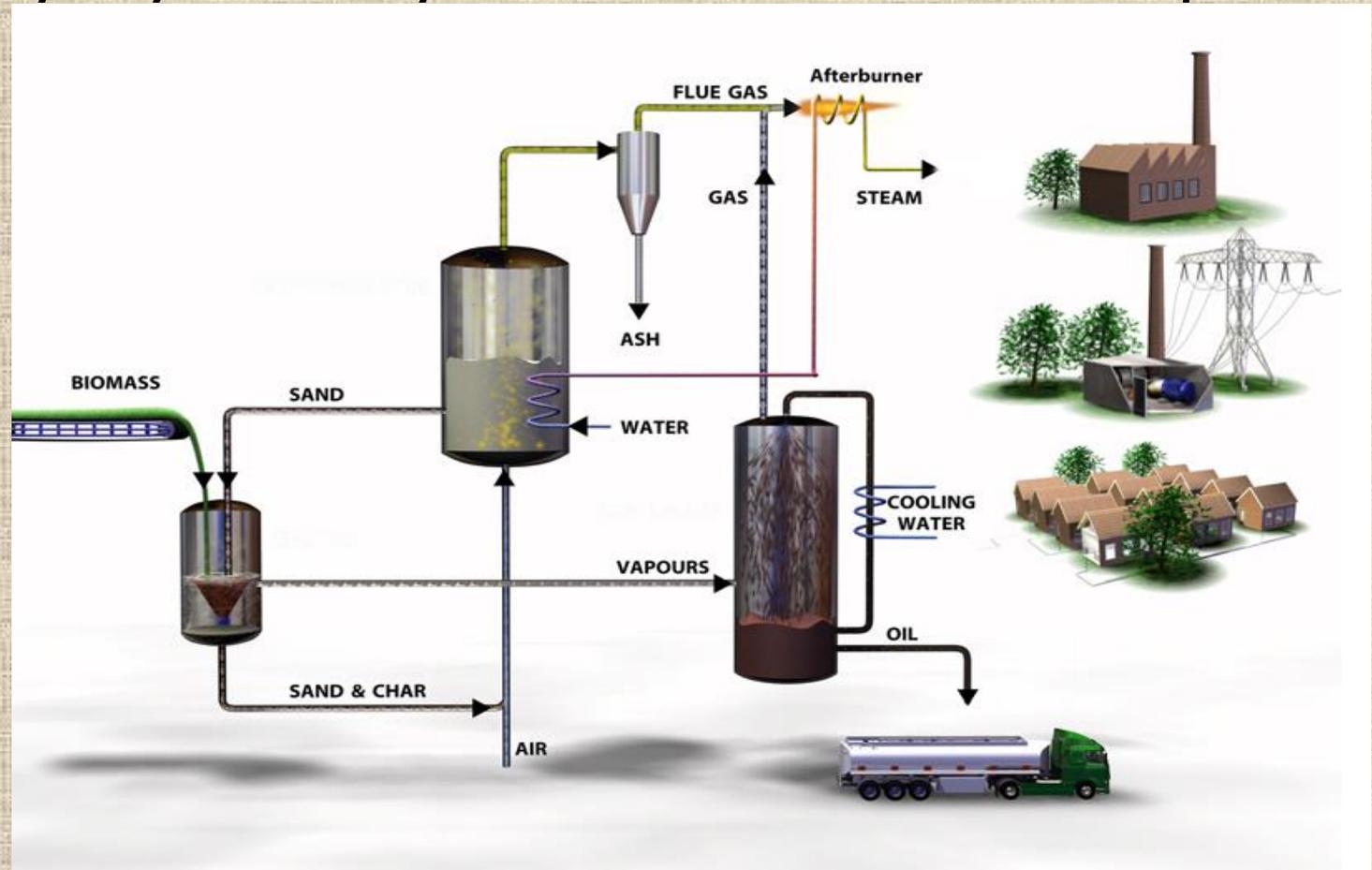
Combustion Types

- ▶ Incineration (excess of air - complete oxidation) – *Not Recommended*
 - Mass Burn + Excessive Dioxin production



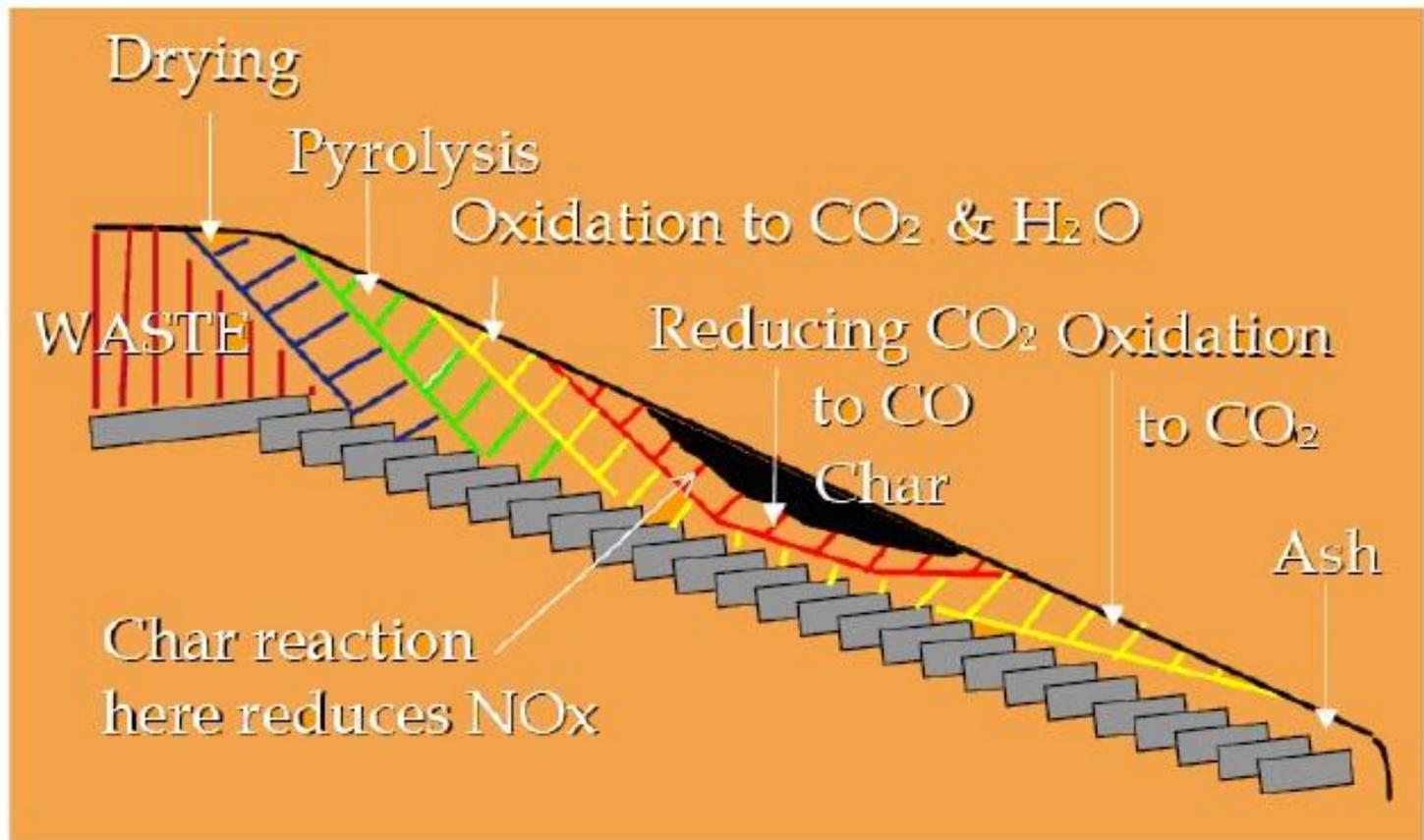
Combustion Types

- Pyrolysis: Only sorted materials / Complicated



Combustion Types

► Gasification - *Opted Process*



Profile of the waste bed combustion in grate furnace designs



General Considerations

- One Ton of waste creates 3.5 MW of thermal energy (eq. to 300 kg of fuel oil) powers 100 homes

Energy content of different waste types

Medical waste at around 24 MJ/kg (5735 kCal/kg)

Industrial and Household waste at around 16 MJ/kg (3823 kCal/kg)

Oil and Plastic wastes at around 35 MJ/kg (8363 kCal/kg)

- High capital cost – around 700 us\$/kWthermal
- Skilled operators are required
- Some materials are noncombustible
- Some materials (wet) require supplemental fuel

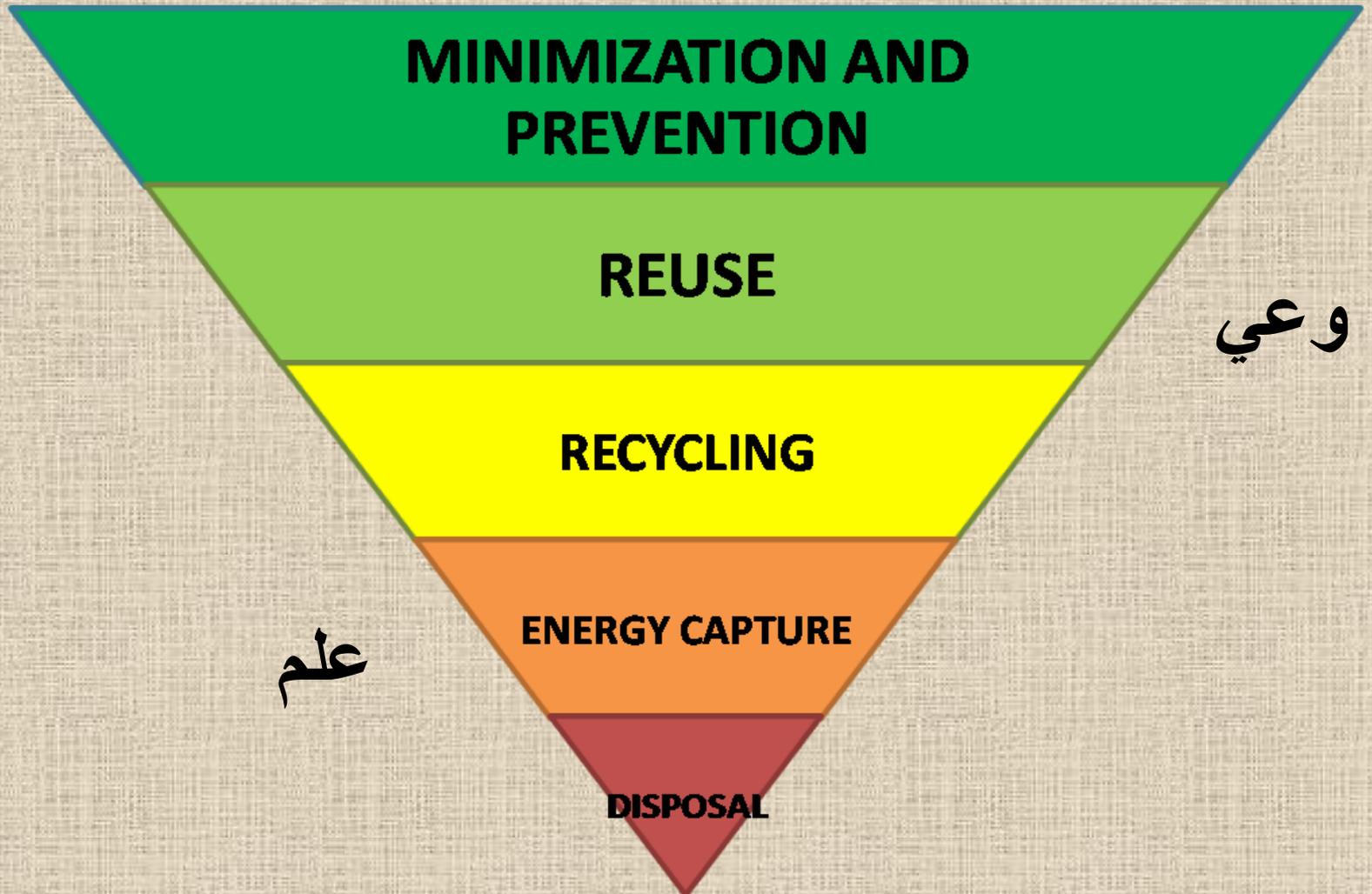


Waste Management Guiding Principles

- Follow the Pyramid
- Decentralize
- Enhance defined schemes:
 - The 3Rs
 - Maximize Valorisation
 - Minimum Landfilling (<10%)
- Protect Health & Environment
- Balance the Economical aspect with the Social Interest

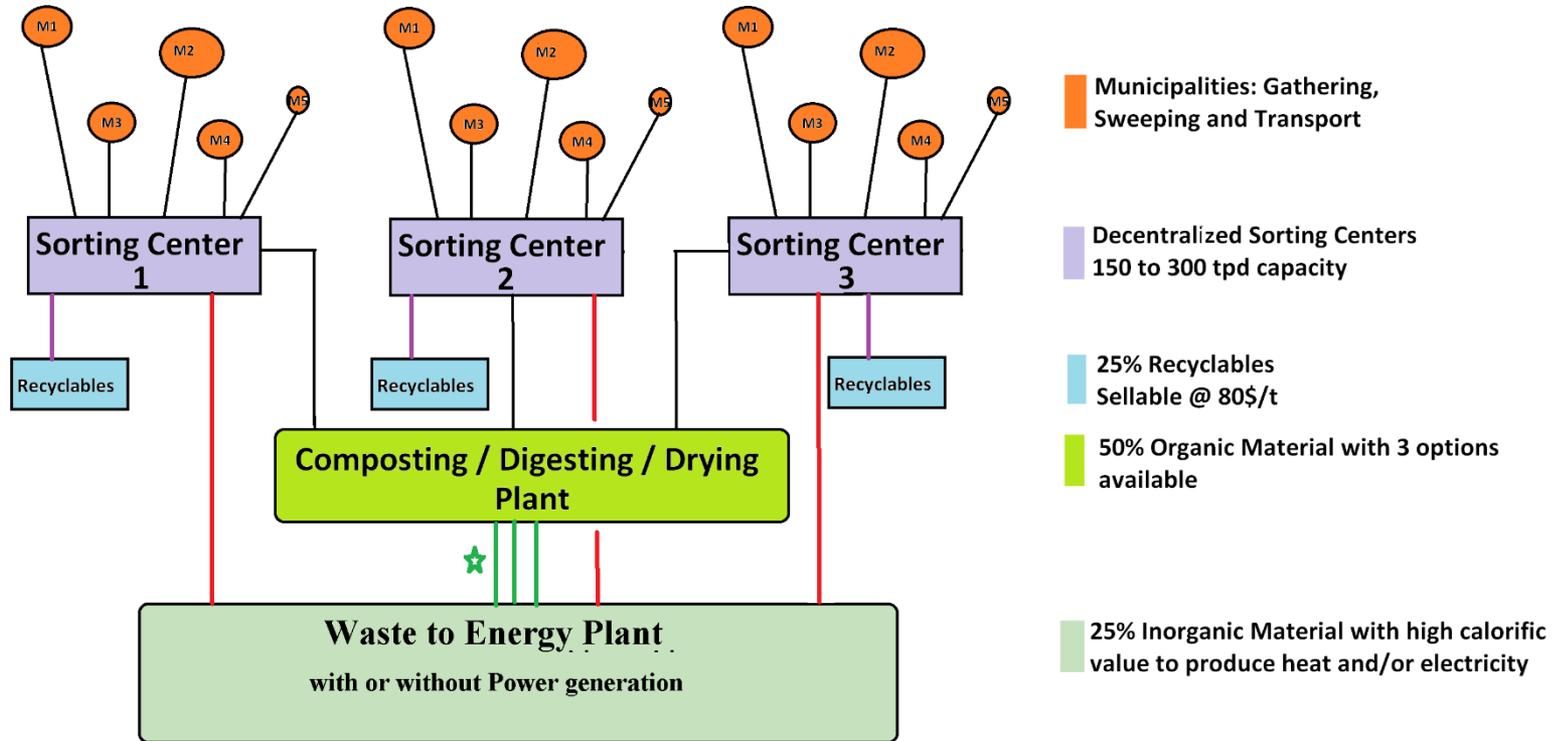


Waste Management Pyramid





A Decentralized Solution



★ Green RDF in case Compost or Digestate
cannot be used in Agriculture

Typical Swedish Architecture



JAPAN: TOKYO: WASTE INCINERATOR IS KEY TO GREENER CITY



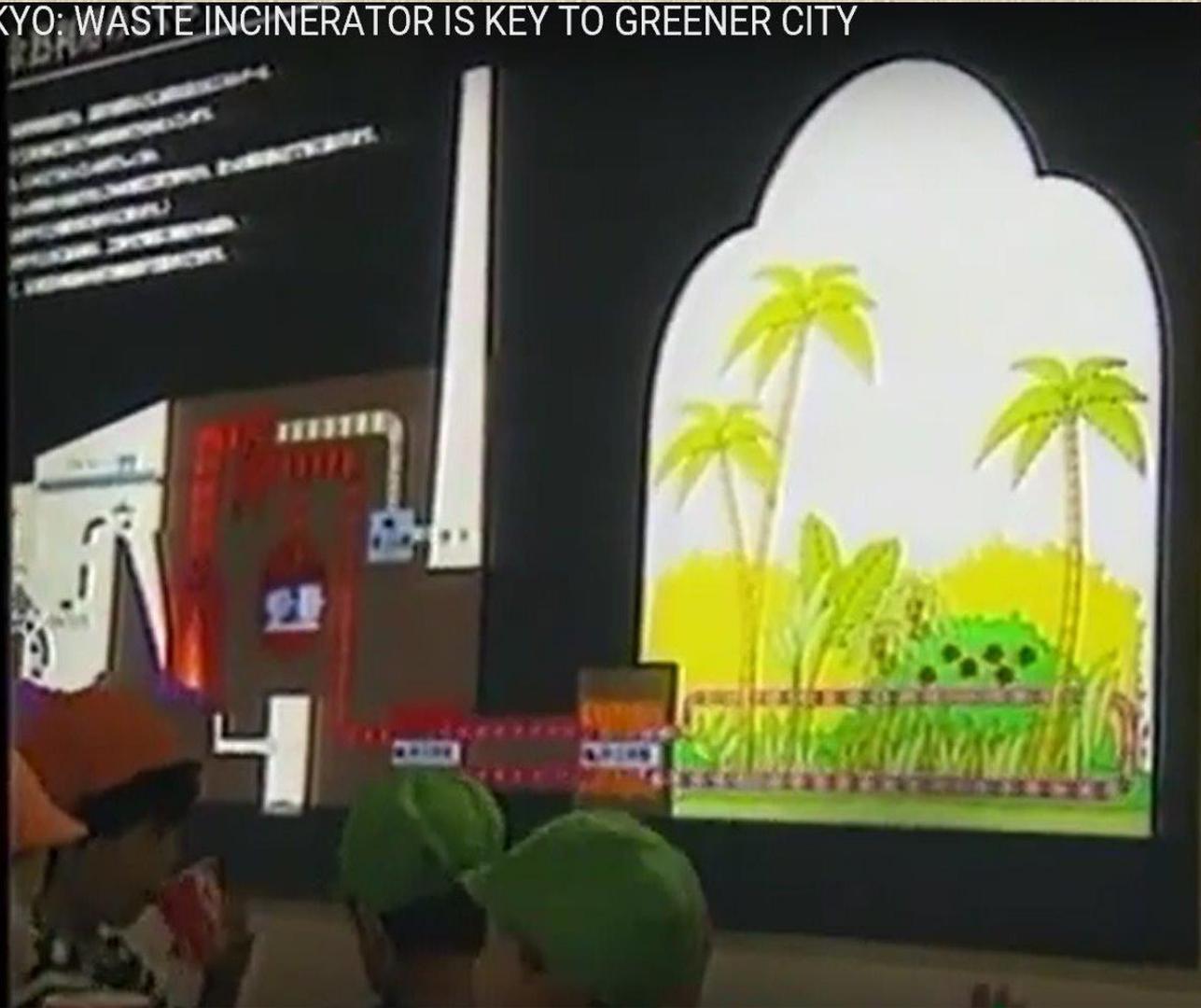
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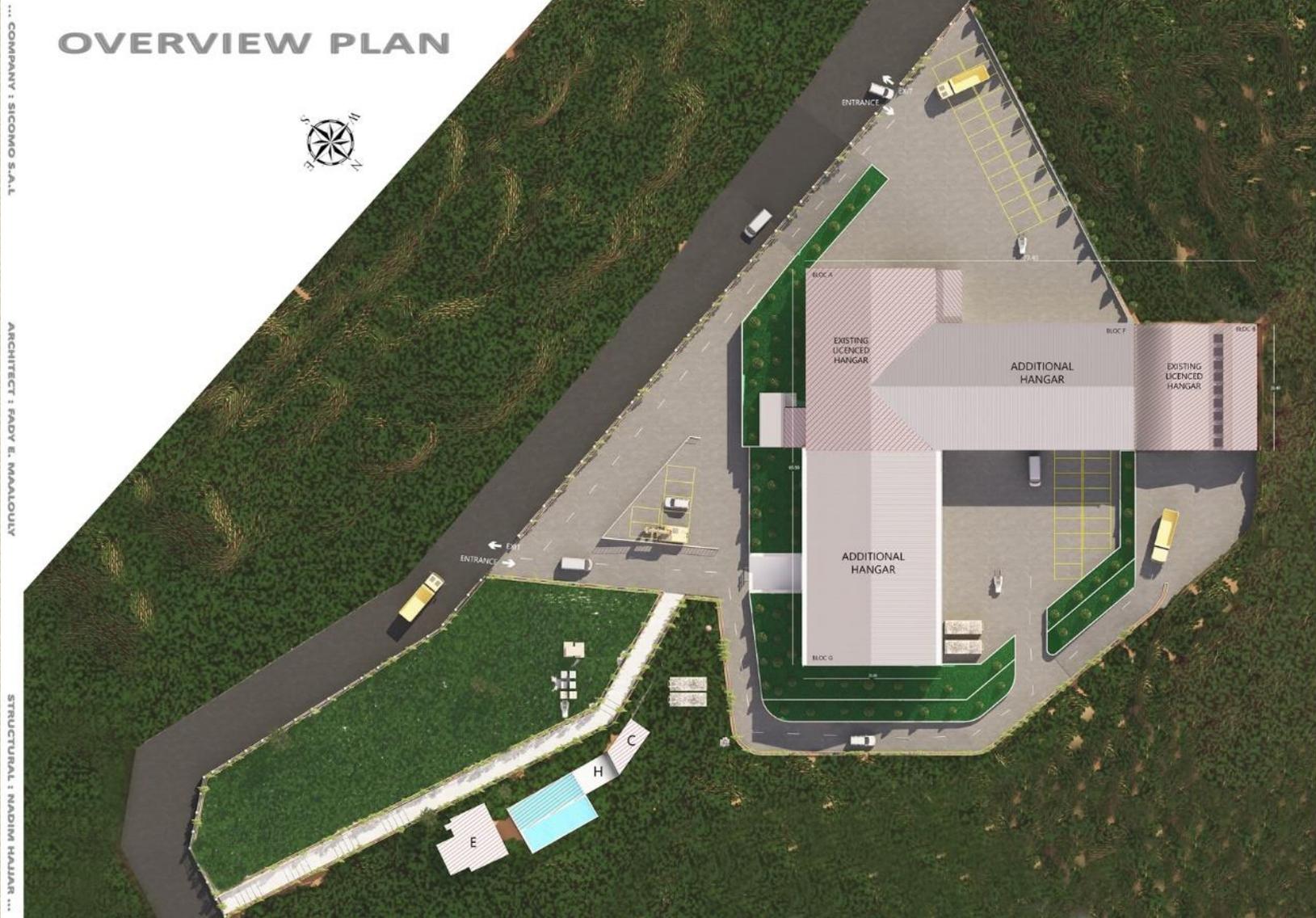


Vienna





Solid Waste To Energy Top View





Solid Waste To Energy Main Entrance View



... COMPANY : SICOMO S.A.L

ARCHITECT : FADY E. MAALOULY

STRUCTURAL : NADIM HAJJAR ...



Solid Waste To Energy Reception Area View



... COMPANY : SICOMO S.A.L.

ARCHITECT : FADY E. MAALOUY

STRUCTURAL : NAJIM HALJAR ...





Solid Waste To Energy





Sicomo Plant - BEKAA





CHP Layout

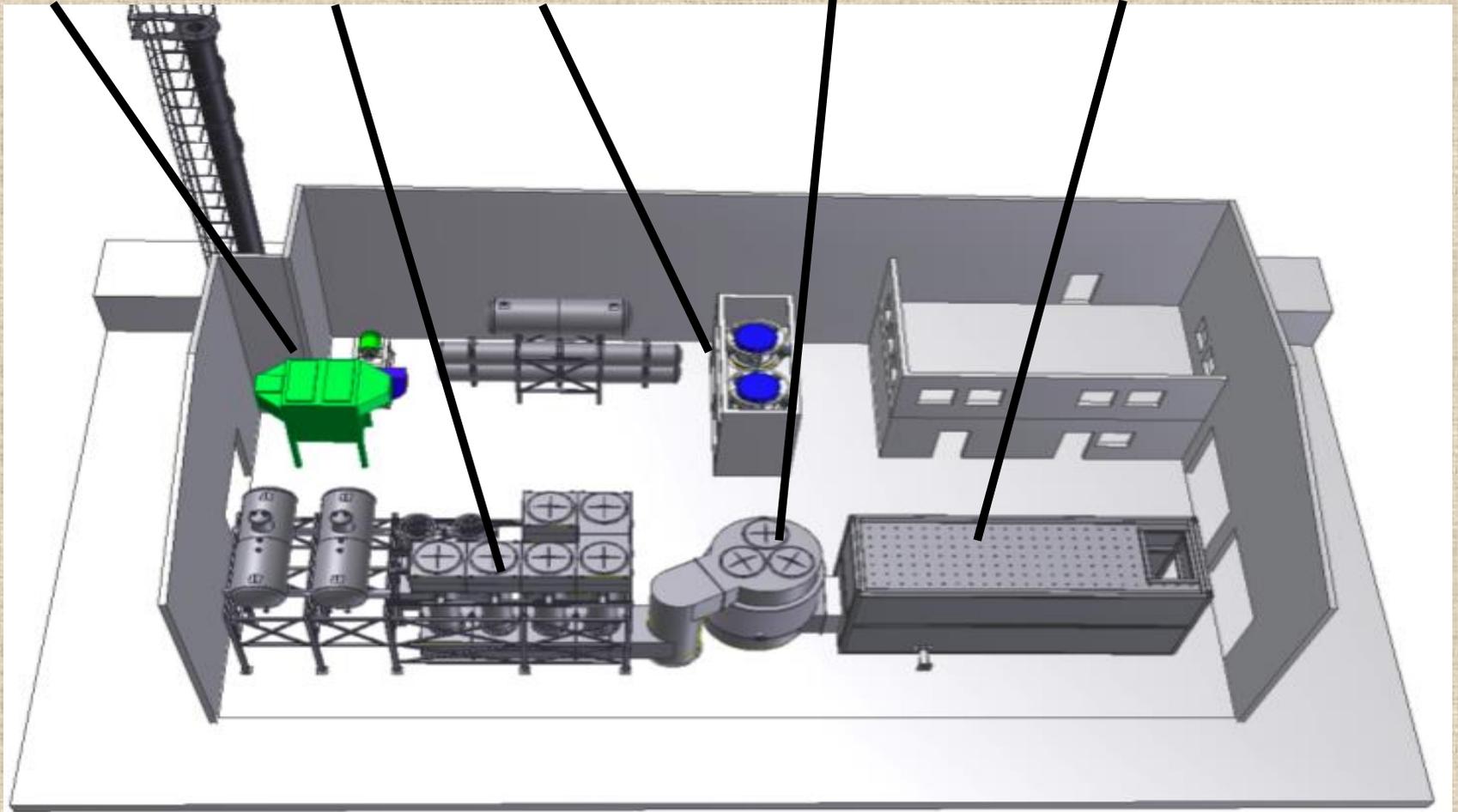
Cyclone & Bag filters

Steam Boiler

Steam Turbine

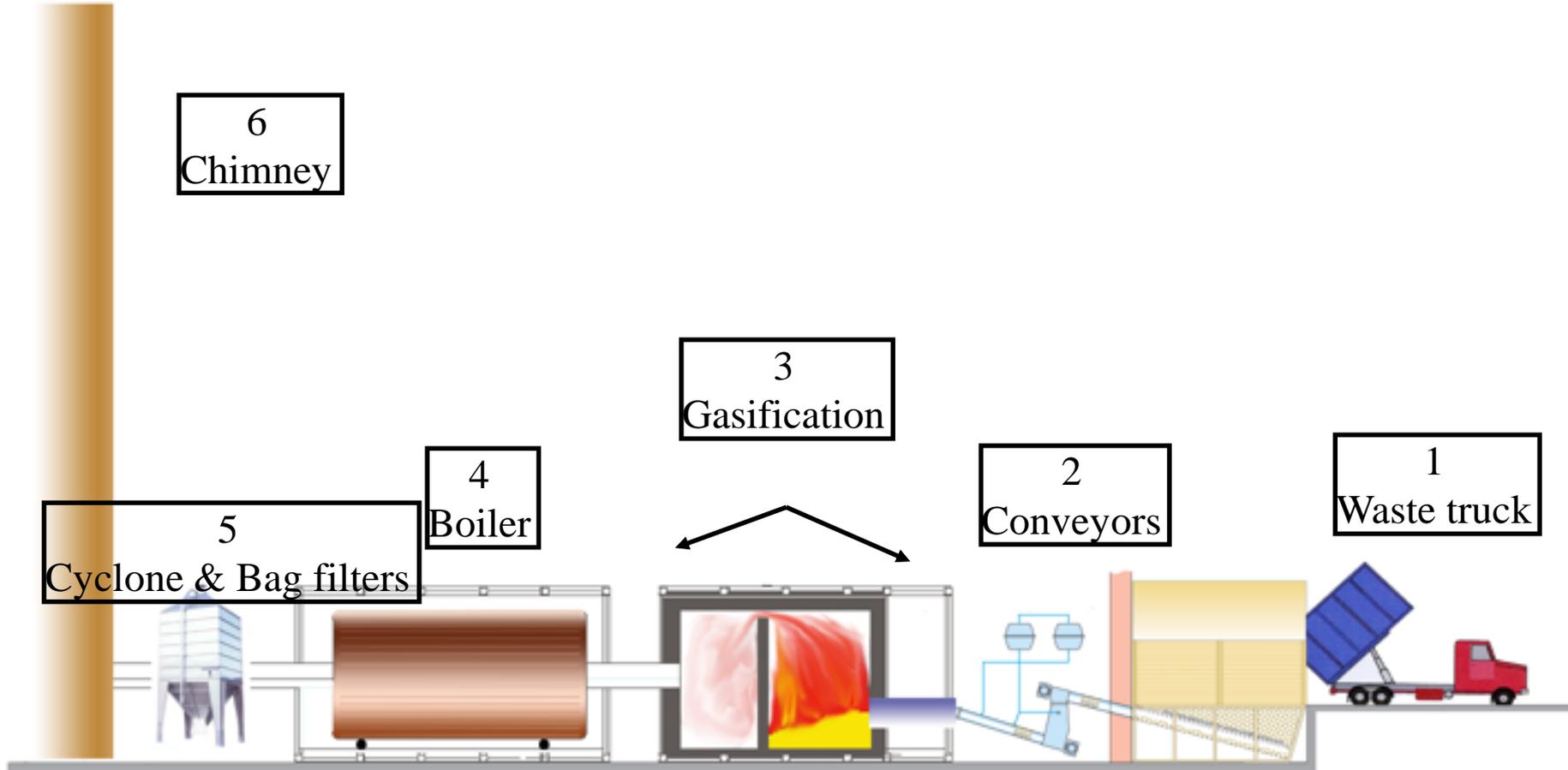
Super Heater

Furnace





Moving Grate System





Sweds experience



- General practice in Scandinavian countries
- Long experience, intensified since 1973 oil crisis
- They specialize in small to medium sized units
- They import MSW from Europe
- Very strict about environment issues

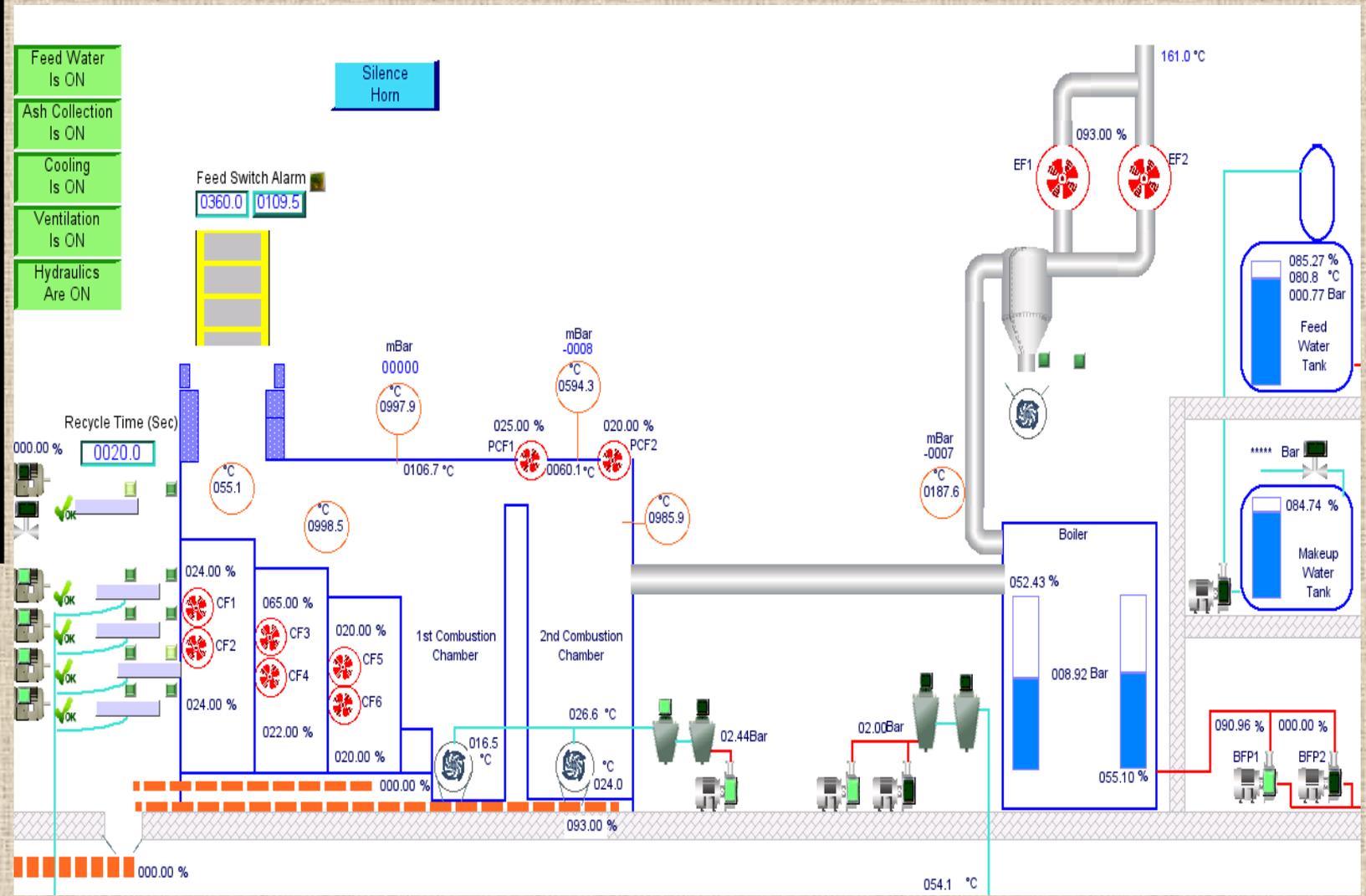


Minimizing Pollution

- Remove certain waste components
Sorting at the source – No PVC
- Good Combustion Practices
Homogenous and consistent feeding
- Emission Control Devices
Continuous monitoring
- Advanced Emission Cleaning Filters

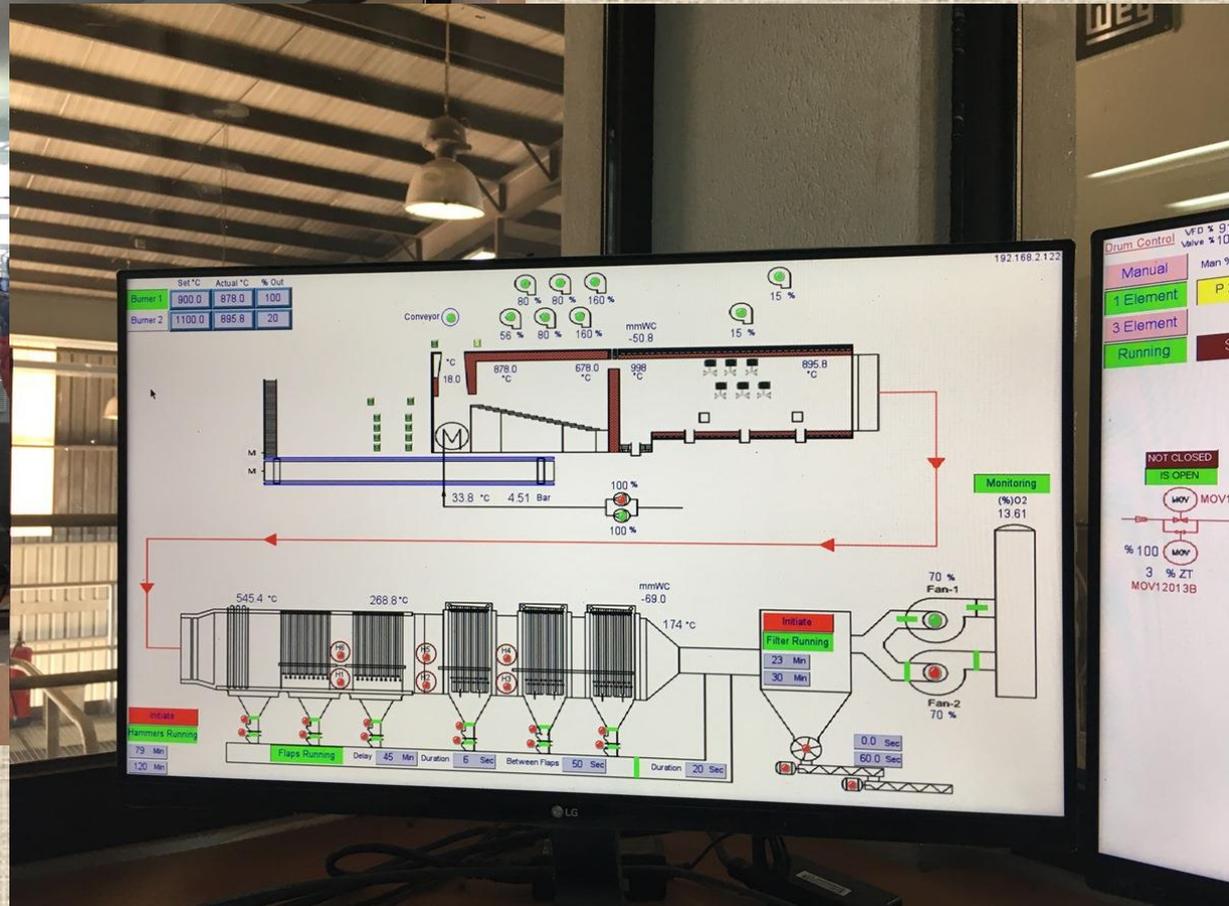


Operation Monitoring Control



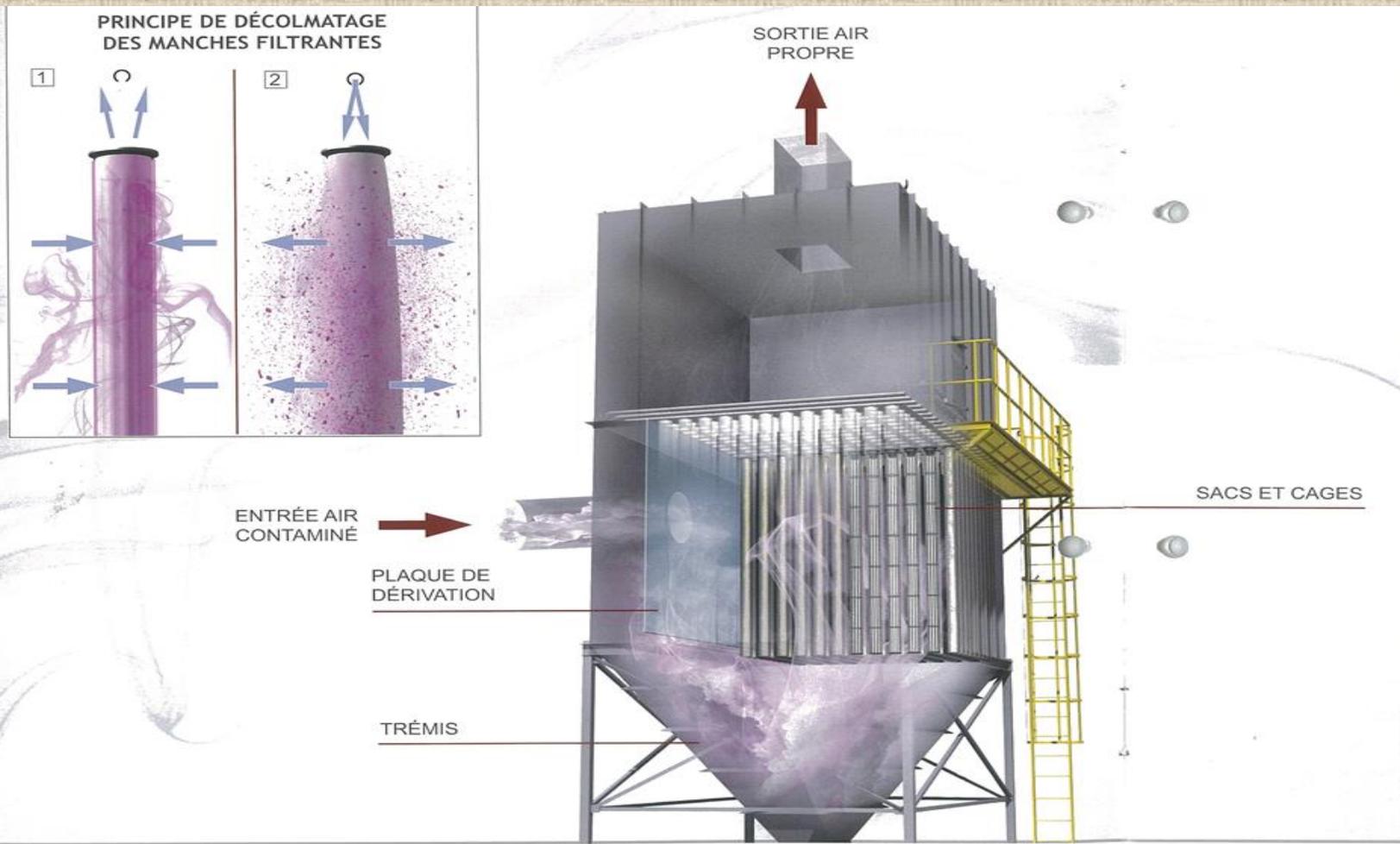


Sicomo Plant - BEKAA





Air Pollution Control



- 1 L'air vicié est filtré et forme un gâteau de poussière à la surface externe de la manche.
- 2 Le jet d'air pulsé provoque une expansion de la manche éjectant ainsi le gâteau de poussière accumulé vers la trémie.



Air Pollution Guarantee

AIREX
INDUSTRIES

Montréal, August 5th 2015

M. Karim Haddad
Deputy General Manager
Sicom - Kabellas
Lebanon

Guarantee of performance
Project no: PH14-109

M. Haddad

This letter is to confirm to you that the proposed dust collector model 396-10TPR-6 meets your local atmospheric emissions requirements. Based on the data you sent us, the system will run at a maximum of 35 500 Nm³/h @ 183°C and the inlet dust concentration is considered at 300 mg/Nm³.

Our filters have an operating overall efficiency up to 99.96% @ 1 µm. With this efficiency, the emission rate after filtration will be 0.120 mg/Nm³ respecting your local regulation of 30mg/Nm³.

The calculations has been in respect of the data from Apave's report number 8164984-001-1 dated November 13th 2014 and your email dated 2015-06-24.

Regards,


Guy PRUD'HOMME, ing./P. Eng.
President





Ash from process

- Third Party (APAVE-France) advanced tests showed no harmful elements
- Heavy metals detected are within acceptable limits for mix in concrete and for road construction

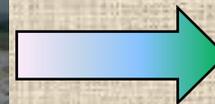
PCCD/F Bottom ASH	N	ng ITEQ/kg sec	54,2			9912		-	-	SO
							-	-	-	-
PCDD/F FlyASH	N	ng ITEQ/kg sec	774,2			774,2		-	-	SO
							-	-	-	-

VLE⁽¹⁾: V aleur L imite d'E mission
 C/NC⁽²⁾: C onforme/ N on C onforme
 SO: S ans O bjet



Expected results

- Waste reduction: > 90% in weight
- Waste reduction: > 95% in volume
- Replacement of fossil fuels
- Reduction in global warming gas emissions



Wrapping up

Focus of next session

