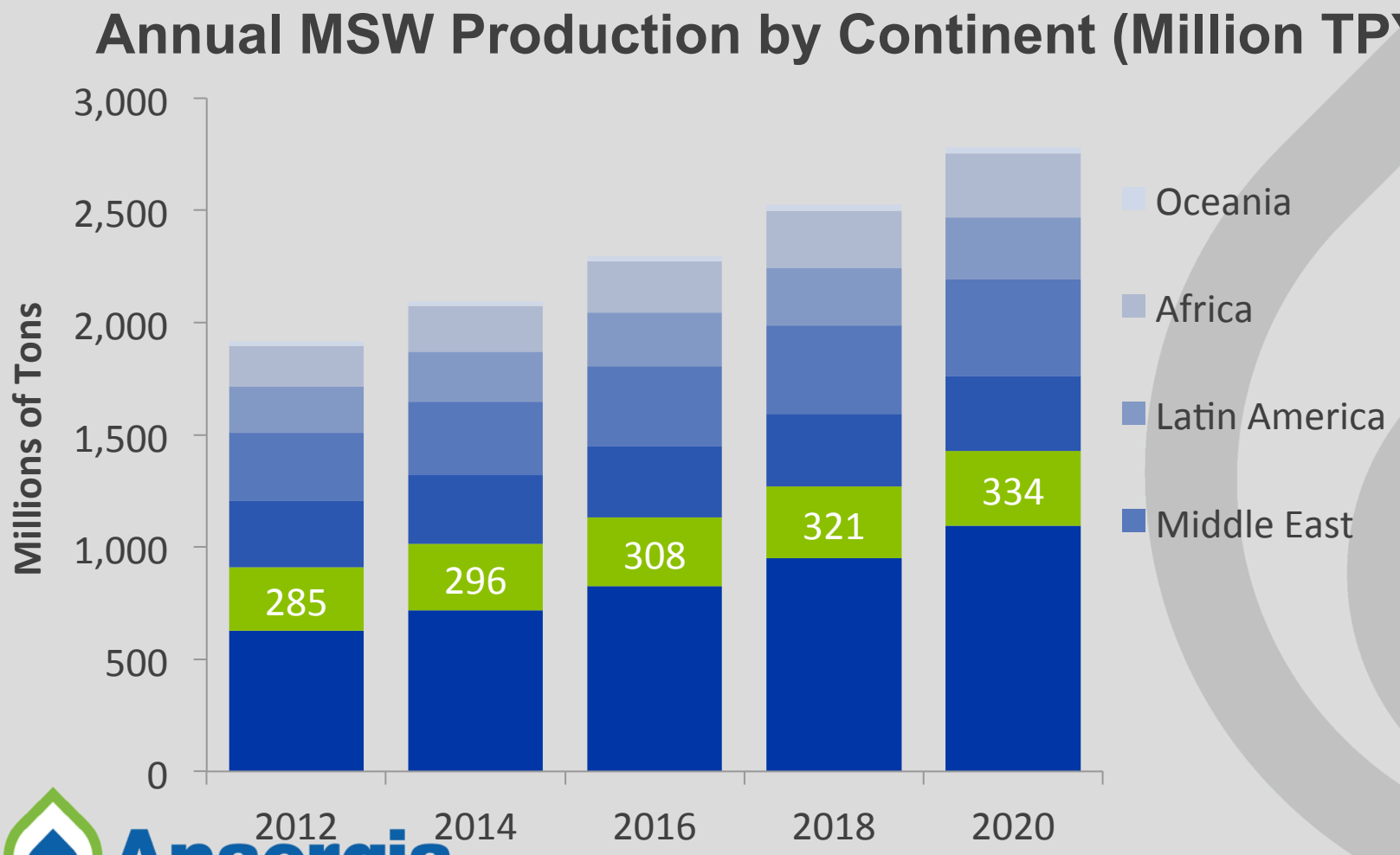
Anaergia

Breaking Barriers to Sustainability

Transforming waste into Energy and Resources

By Karl Dirkes, VP Business Development Waste

Global Waste Generation Increases Each Year



Anaergia

Sources: Adapted from UNEP, BCC Research, EPA, J.W. Levis, IMF, ITAU

Global Waste Generation Increases Each Year

Reasons:

- World population is growing 20%
- GDP is growing 50%

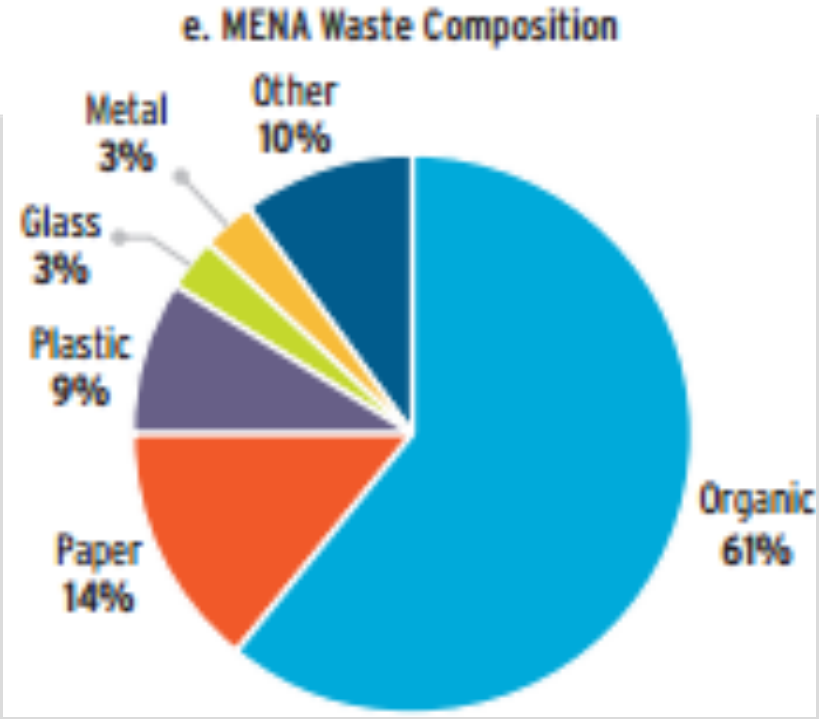
Consequences:

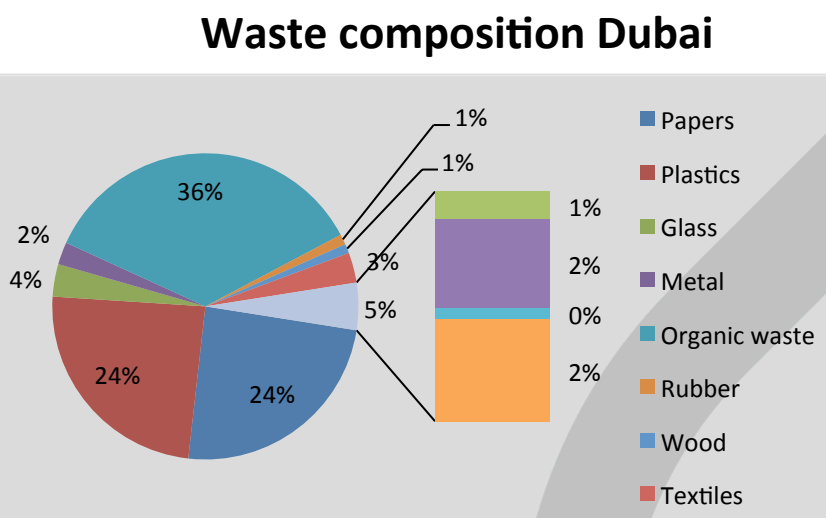
- Growing GDP requires more food and it is expected that the amount of organics in MSW increases

Anaergia

Sources: Adapted from UNEP, BCC Research, EPA, J.W. Levis, IMF, ITAU

Waste composition Municipal Solid Waste (MSW)





Source: Enviro Cities eMagazine, #4 2013

Main fraction of MSW is organic, which is the main cause of environmental pollution (methane, water leakage, odour, dust)

Anaergia

The potential of efficient waste separation

Strong potential to produce a range of competitive products:

- **Recyclables** of high quality
- **In-organic fraction** that is really dry and suitable for production of high-quality fuel
- **Organic fraction** that is clean and suitable for use in anaerobic digestion and as fertilizer thus preventing the loss of the valuable material in landfilling

To date, the potential of recycling organic waste is in its infancy and remains largely untapped

Anaergia

The challenge: efficient separation of organics from rest waste

Current solutions:

1. Separation at source "kerbside collection"
   - Still a lot of contamination
   - Hard to implement for urban areas

2. Mechanical separation at centralized facilities
   - Size-reduction / surface increase approach (shred and sieve, hammer mills, knife-mills,…) not well adapted to highly contaminated waste streams such as MSW or rest waste
   - Often low separation efficiency
   - A lot of organics in in-organic fraction and vice versa
     - ➢ Impacts AD O&M costs and biogas yield negatively
     - ➢ Lots of organics end up in dry in-organic waste stream or rejects

Anaergia

Example: Challenges for AD from waste = how to get a clean organic fraction?

The OREX press: a new approach to central separation of wastes

SEPARATION

high efficiency

Homogenous semi-liquid biogenic fraction

Organic fraction

In-organic fraction

Plastic & Textiles

Paper & Cardboard

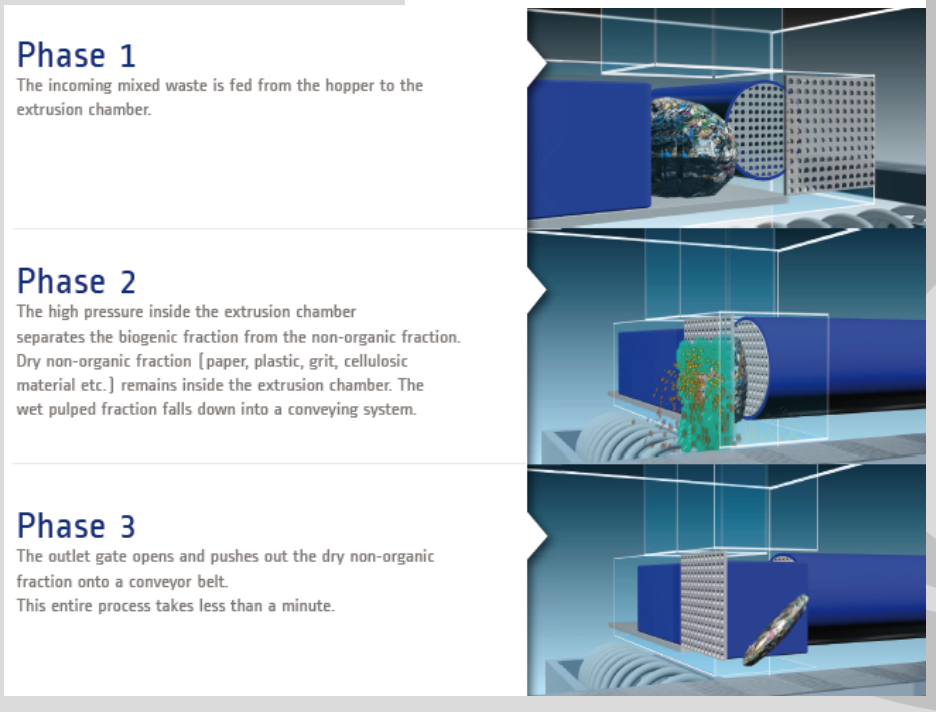
Minerals & Metals

Anaergia

A 3-step extrusion process

High-pressure extrusion: separation into two valuable waste streams that are each more valuable with the absence of the other

Principle: Soluble organic matter behaves like a liquid and is separated from the “dry” in-organic fraction (no water added in process)



Waste separation with OREX press

Result of extrusion process

Dry fraction
- plastics
- textiles
- paper and cardboard
- various minerals
- metals

⇩ High-quality fuel

⇩ recyclables

Biogenic fraction
- liquid biogenic fraction

= raw material for

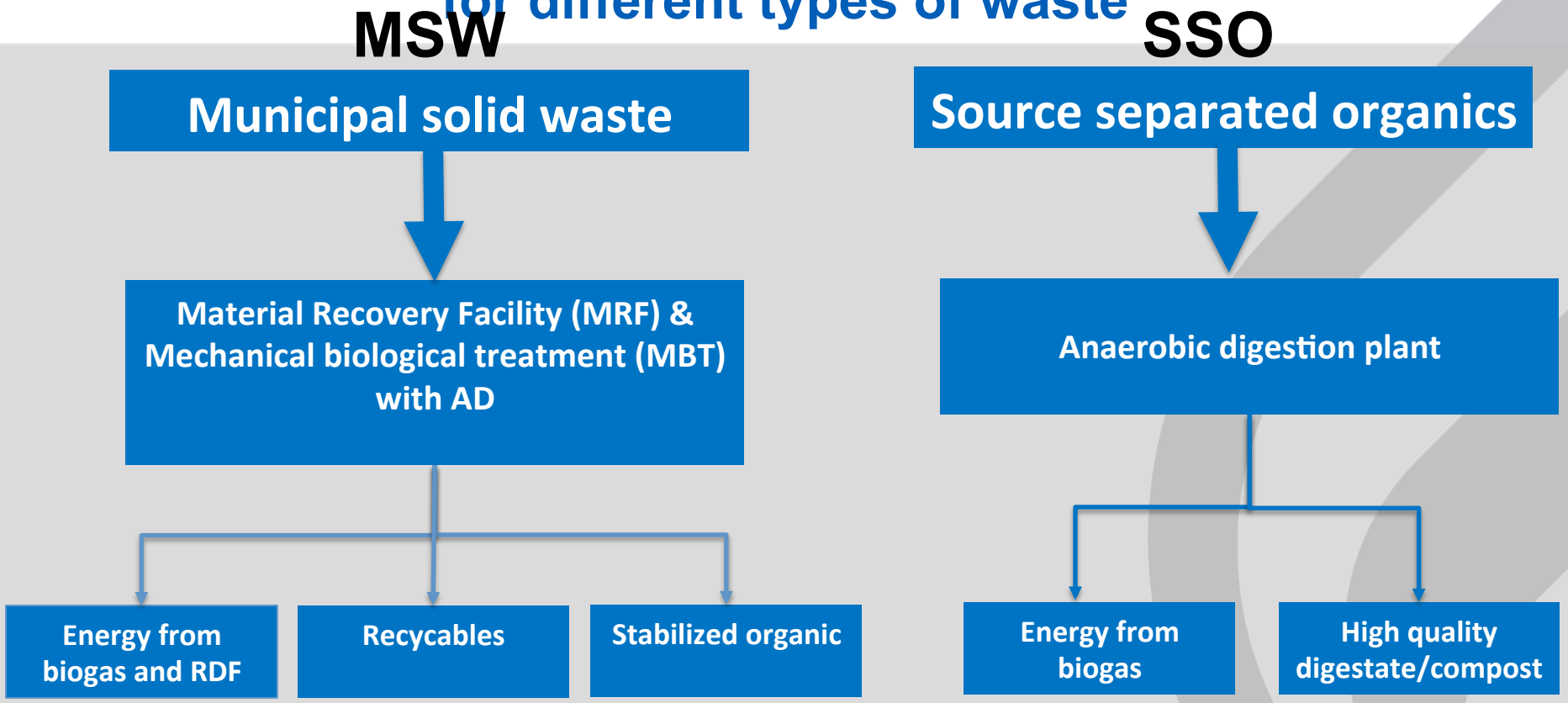
⇩ anaerobic digestion

⇩ fertilizer

Anaergia

Waste Management Options

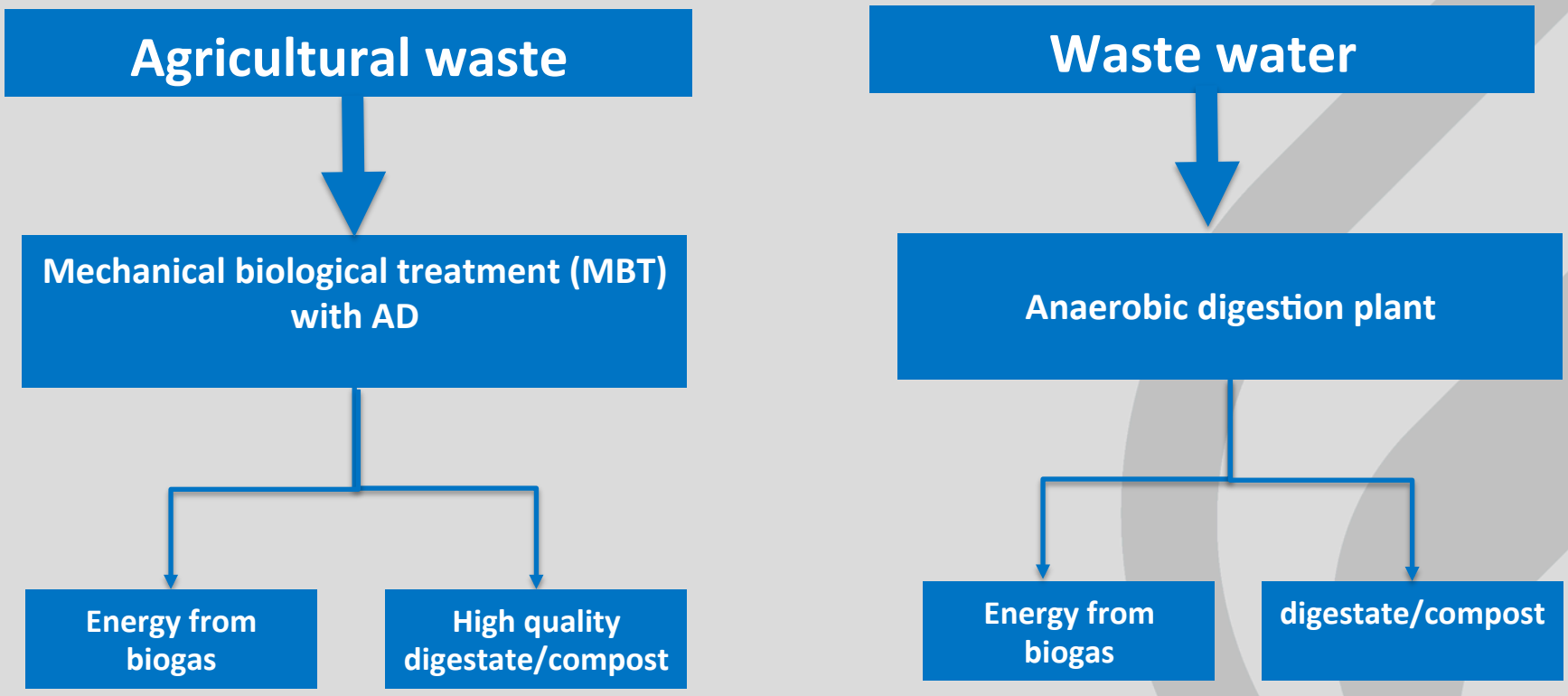
for different types of waste



Anaergia

Waste Management Options

for different types of waste



Anaergia

MSW

- Biodegradable organic fraction 35 – 50 %
- In-organic fraction and paper 50 – 65 %
- Utilization in MRF & MBT plant including sorting and AD plant
- Production of recyclables and RDF from in-organic fraction

Anaergia

Requirements for MSW treatment

The optimal process solution depends on different parameters

- Regional legal requirements
- MSW humidity
- MSW quality (Level of contaminants, yard waste, nitrogen plastics etc.)
- Seasonal fluctuations of MSW quantity and quality
- Co-digestion with other substrates as manure, food leftovers
- Marketing strategy digestate
- Biogas utilization strategy (CHP, Biogas upgrading)

Requirements on plant concept

- Flexibility related to quality and seasonal capacity peaks
- Flexibility related to wide range of feedstocks
- Flexibility related to digestate utilization
- Flexibility related to biogas utilization
- High energy production
- Safe pasteurization
- High plant availability
- Low operating costs
- Safe plant operation

Anaergia

Anaergia offering
- MSW Turnkey plants -

Feedstocks

MSW
+
SSO
+
Agricultural waste
+
Sewage sludge

Key technology

MRF & Mechanical-biological treatment (MBT)

Waste reception
Front end processing
Sanitation
Fermentation
Biogas conditioning
Dewatering

Services
- Basic, detail process engineering
- Purchasing
- Site management
- Commissioning

Supplementary technologies

Sorting /RDF/ Gasification

CHP

Composting

Biogas upgrading

Waste water treatment

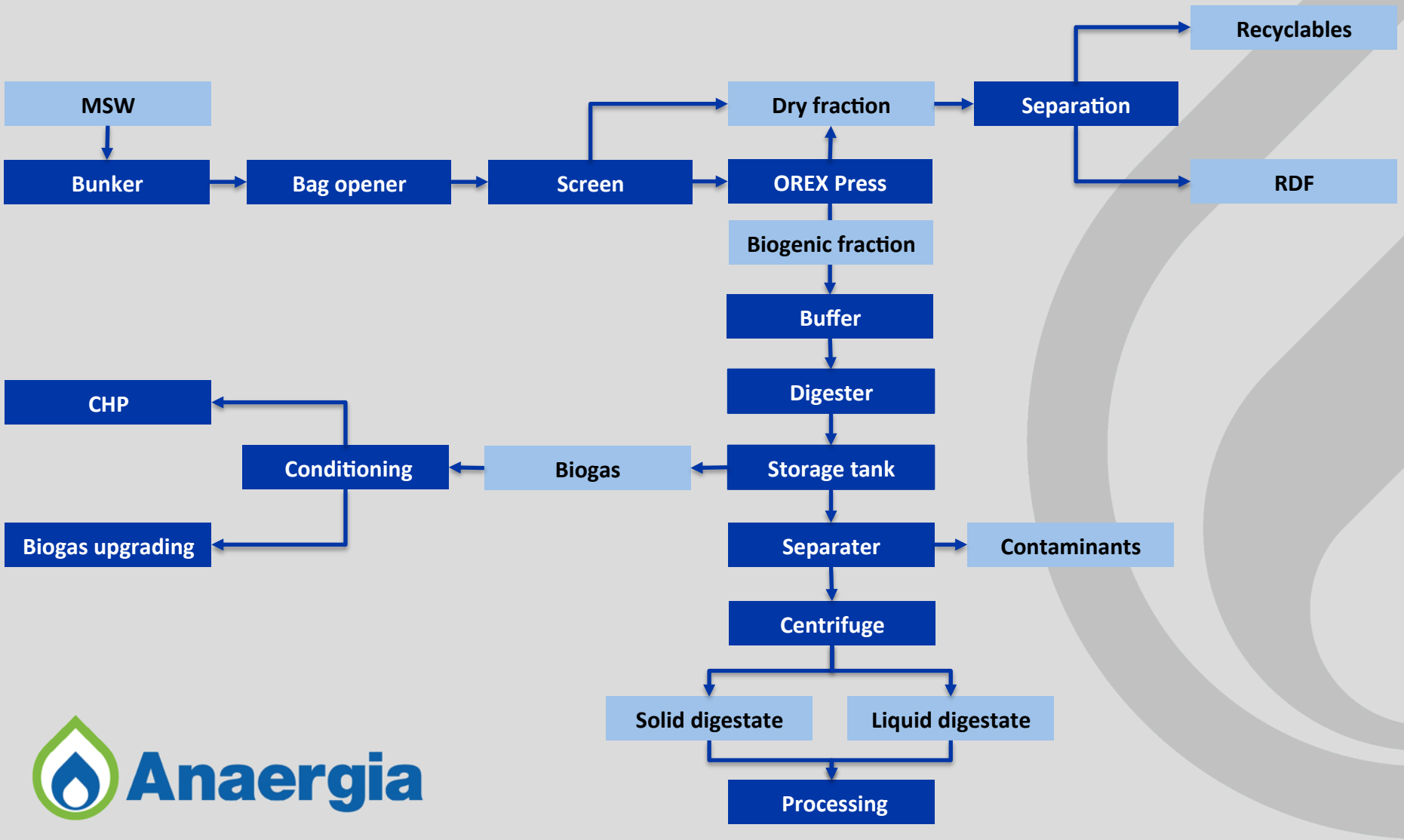
Air treatment

Fertilizer upgrading

Services
- Manage interfaces
- Overall process design
- Purchasing
- Site management
- Supervision commissioning

Anaergia

MSW treatment
- Process flow diagram -



Anaergia

Refuge Derived Fuel (RDF) from MSW

Result of pre-sorting and extrusion by OREX™

The dry non-organic fraction after extracting recyclables and a further separation process consist of **high quality RDF**:

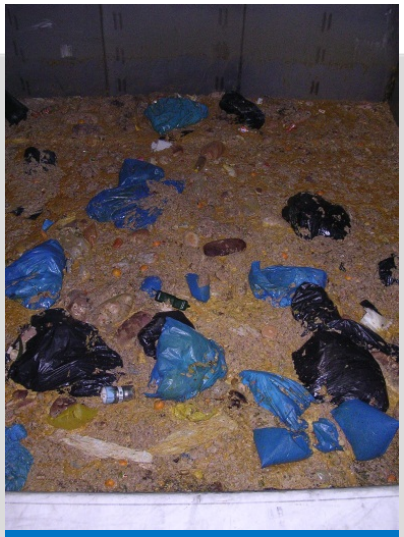
- without much water content;
- with less odour and insects.




Anaergia

SSO/organic waste for use in biogas plants

Biowaste and packaged food



Food left overs

Restaurant waste

Packaged food

Level of contamination and humidity is high

Anaergia

Requirements for SSO treatment

The optimal process solution depends on different parameters

- Regional legal requirements
- SSO humidity
- SSO quality (Level of contaminants, yard waste, nitrogen etc.)
- Seasonal fluctuations of SSO quantity and quality
- Co-digestion with other substrates as manure, food left overs
- Marketing strategy digestate
- Biogas utilization strategy (CHP, Biogas upgrading)

Requirements on plant concept

- Flexibility related to quality and seasonal capacity peaks
- Flexibility related to wide range of feedstocks
- Flexibility related to digestate utilization
- Flexibility related to biogas utilization
- High energy production
- Safe pasteurization
- High plant availability
- Low operating costs
- Safe plant operation

Anaergia

Anaergia offering
- SSO Turnkey plants -

Feedstocks

SSO municipal

SSO commercial

SSO / agricultural waste

SSO / sewage sludge

Key technology

Anaerobic Digestion (AD)

Waste reception
Front end processing
Sanitation
Fermentation
Biogas conditioning
Dewatering

Services
- Basic, detail process engineering
- Purchasing
- Site management
- Commissioning

Supplementary technologies

CHP

Composting

Biogas upgrading

Waste water treatment

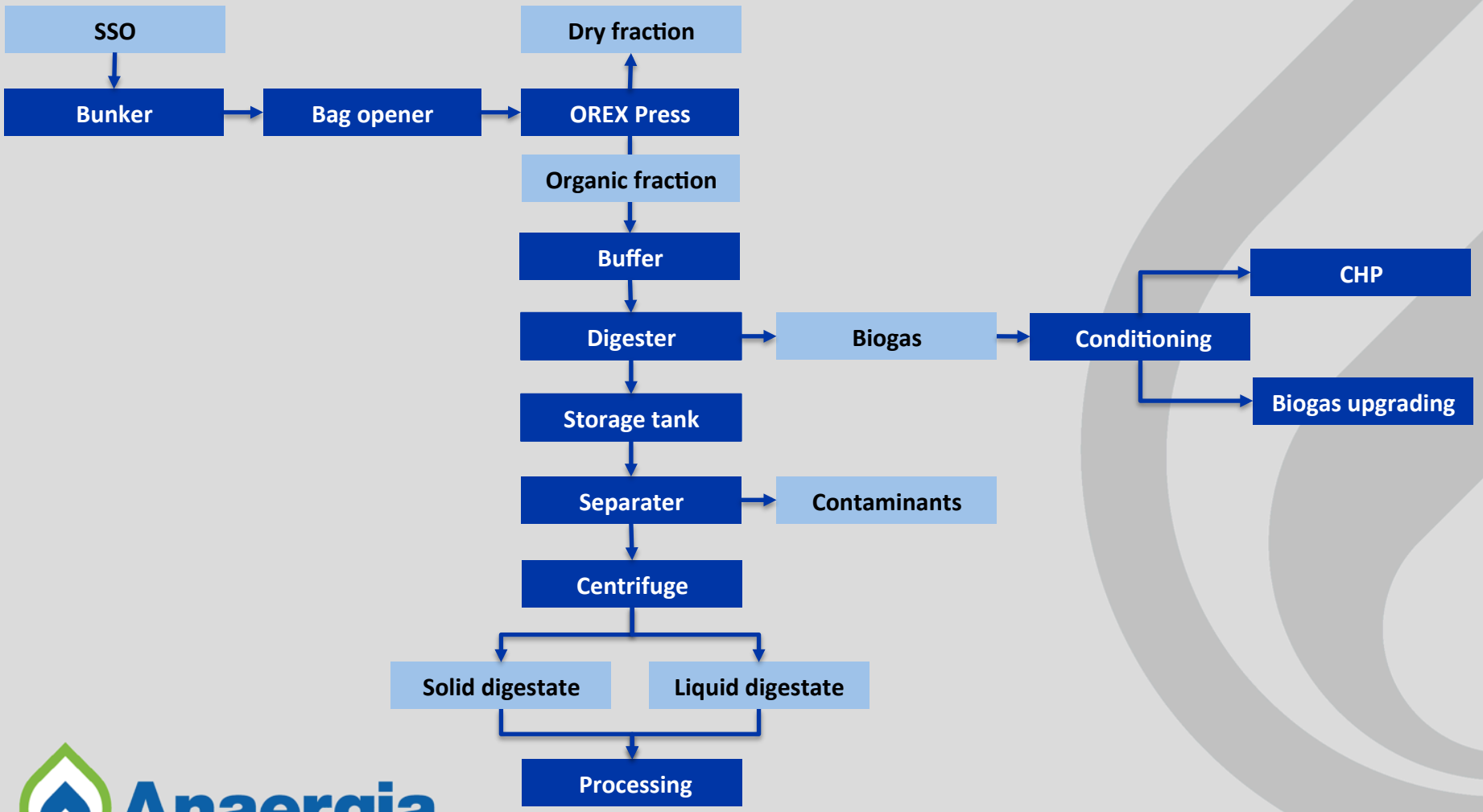
Air treatment

Fertilizer upgrading

Services
- Manage interfaces
- Overall process design
- Purchasing
- Site management
- Supervision commissioning

Anaergia

SSO treatment
- Process flow diagram -



Anaergia

Thank you

Thank you for your attention

Contact person: Karl Dirkes
T + 31 (0) 541 74 50 22
M +31 (0) 6 55 72 82 37

E karl.dirkes@anaergia.com
W www.anaergia.com

Anaergia