



Innovative and BREF proven material recycling of MSWI bottom ashes

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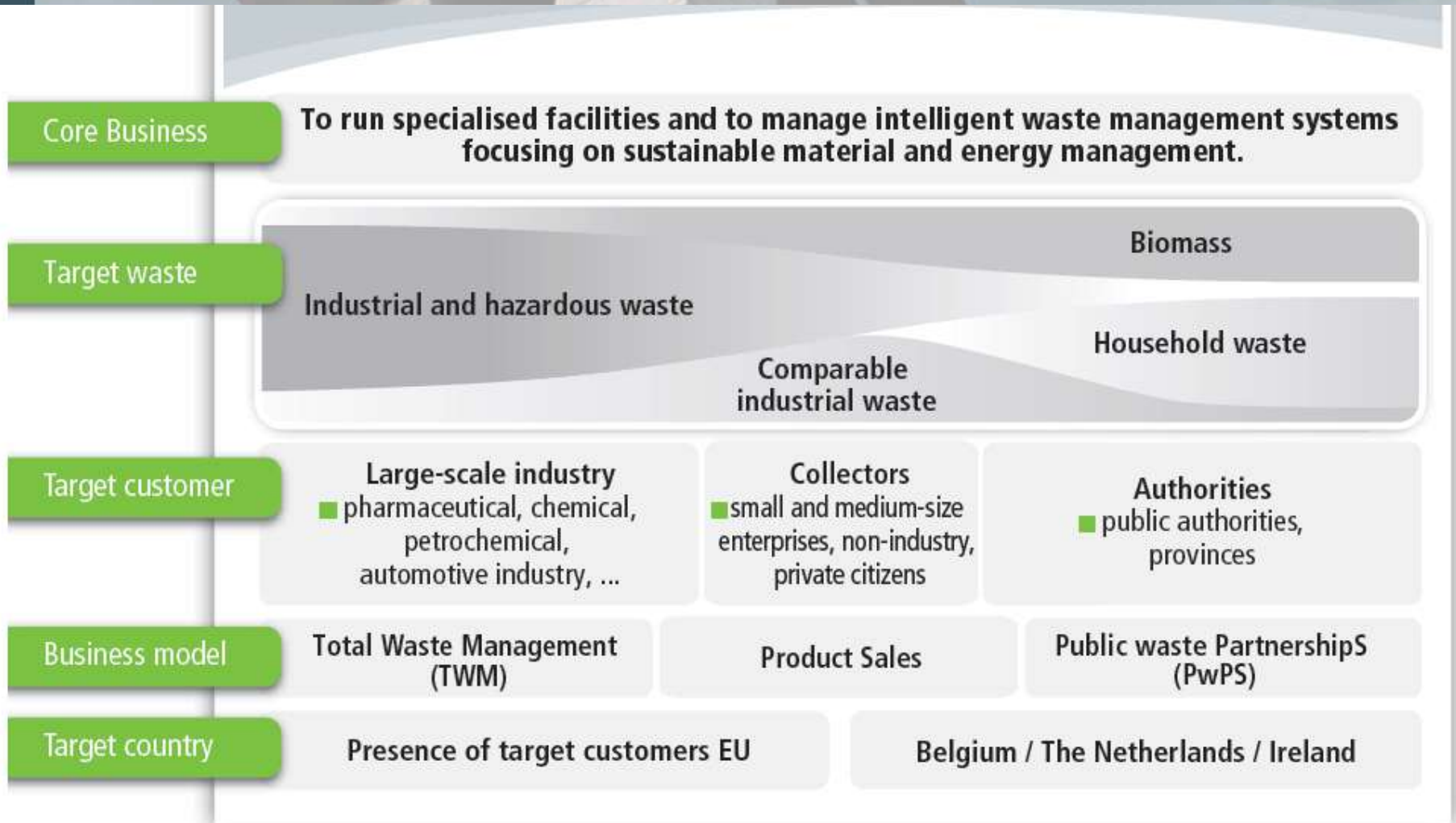
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- Indaver today
- EU 's long term ambition
- Waste-to-Energy plants in Belgium
- Wet treatment of bottom ashes:
 - history
 - technology
 - actual performance
- Restrictions: legal, market, socio-economical
- Conclusion

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Indaver today: strategy & core business



Indaver today: solid company



Solid
Profitable
Cost efficient
Not listed
-> independant
International
player



Stable shareholder structure

75% DELTA (multi-utility group with turnover of 1.5 bio EUR/Y)
16% VMH (Flemish Environmental Holding)
9% industry : BASF, Bayer, J&J, Borealis, Solvay, TC.

- Turnover 2010: 500 Mio EUR
- Management of 4 Mio tonnes/year
- 1.600 employees

Values

- Safety & quality = top priority
- Continuous improvement
- Cost leadership
- Mutual trust
- Transparency in all actions & communication

► Sustainable long term vision

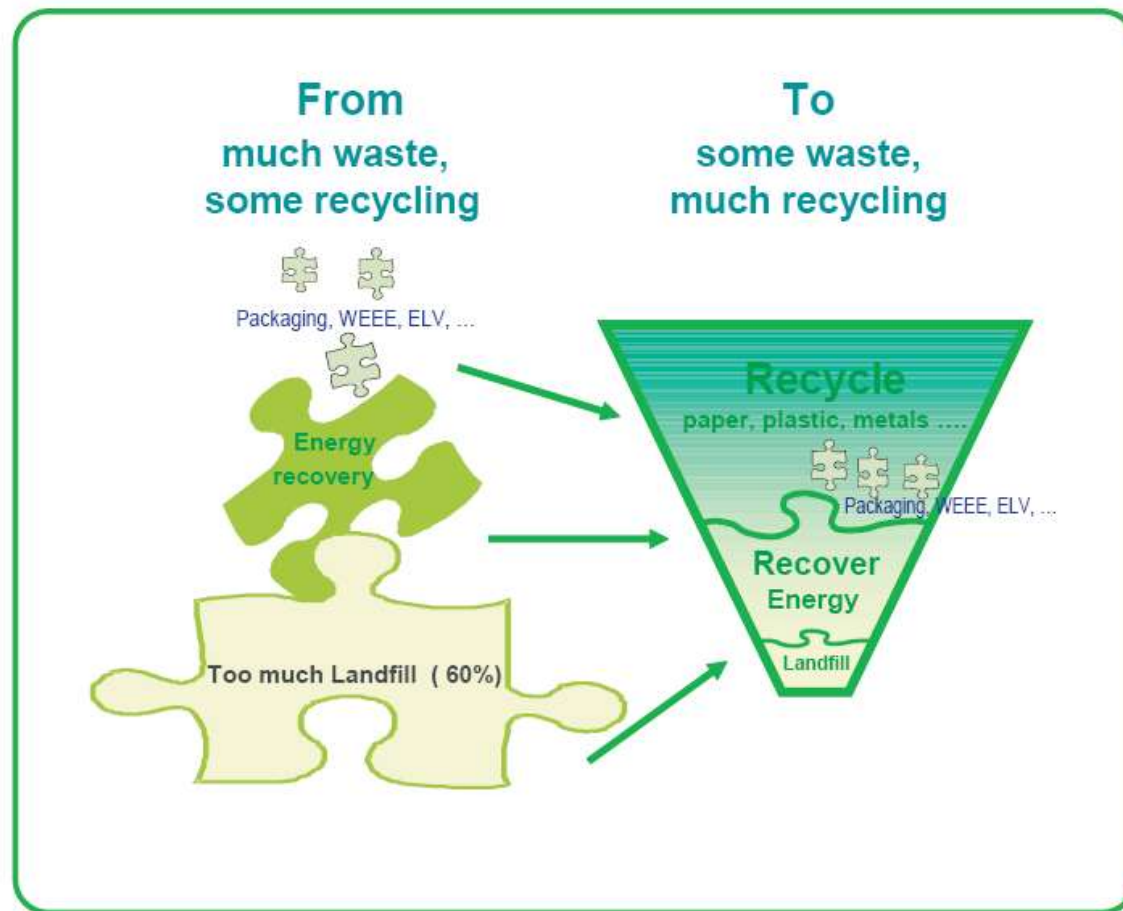
Indaver today: sites within the EU



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EU long term ambition: strategy



Source: EU Waste Policy. The story behind the strategy. European Commission

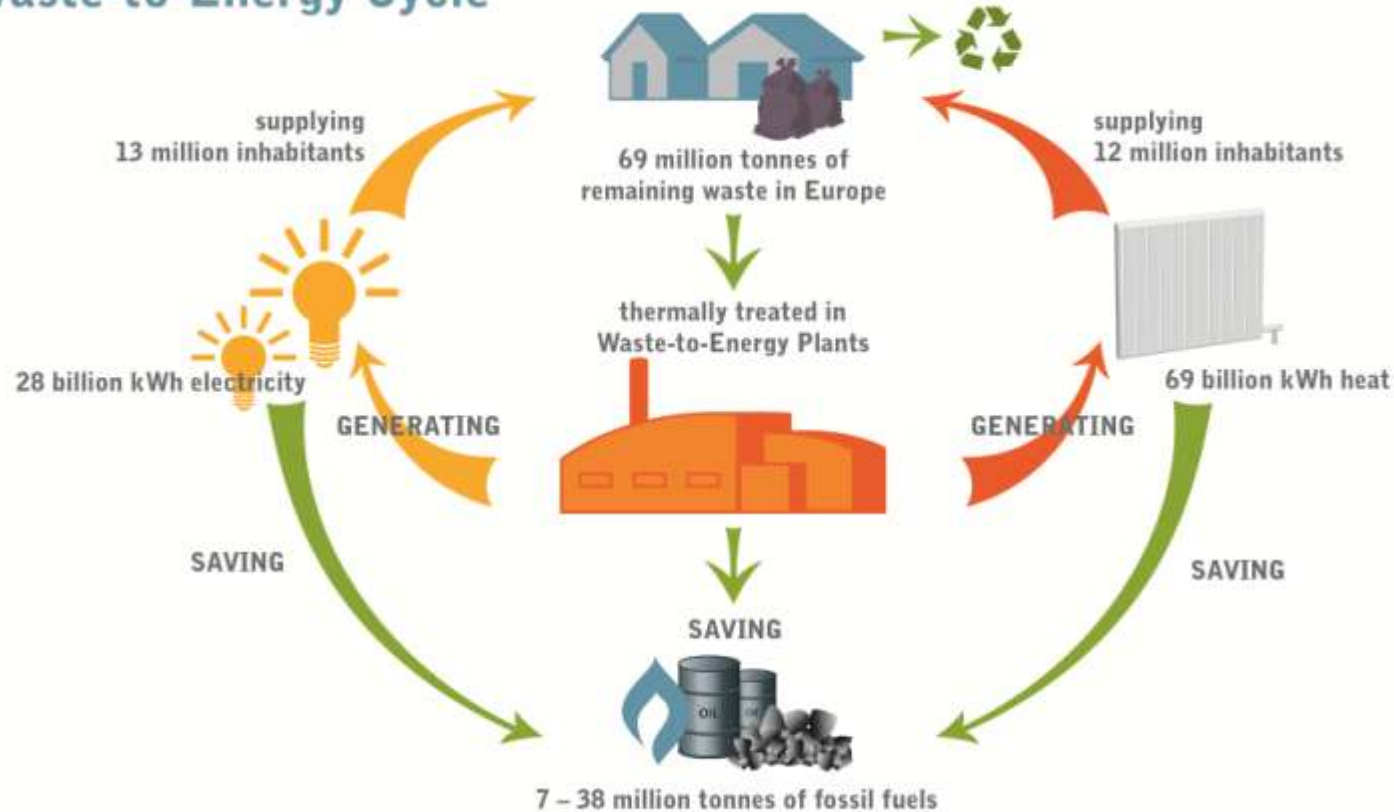
EU long term ambition: legal framework

- Waste Frame Directive 2008/98 (former 75/442)
 - Increase energy recovery
 - Min. energy efficiency of MSWI required to become R1 installation
 - Increase recycling rates of materials
 - Introducing concept of “end of waste”
 - Developing EoW criteria

=> modern “RECYCLING SOCIETY”

EU long term ambition: energy recovery today

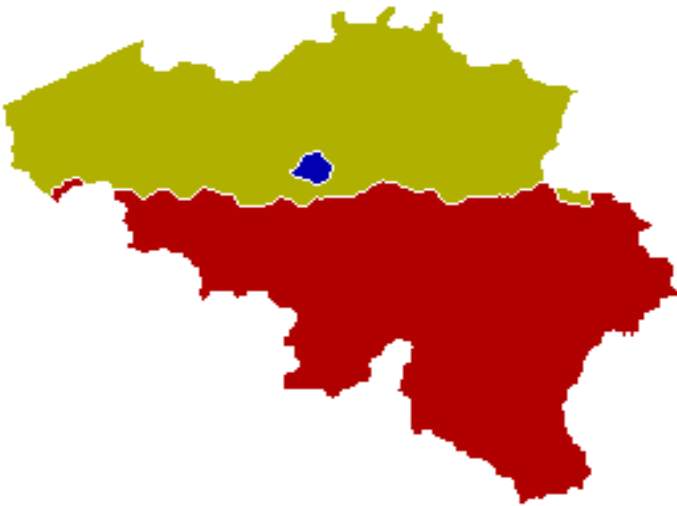
Waste-to-Energy Cycle



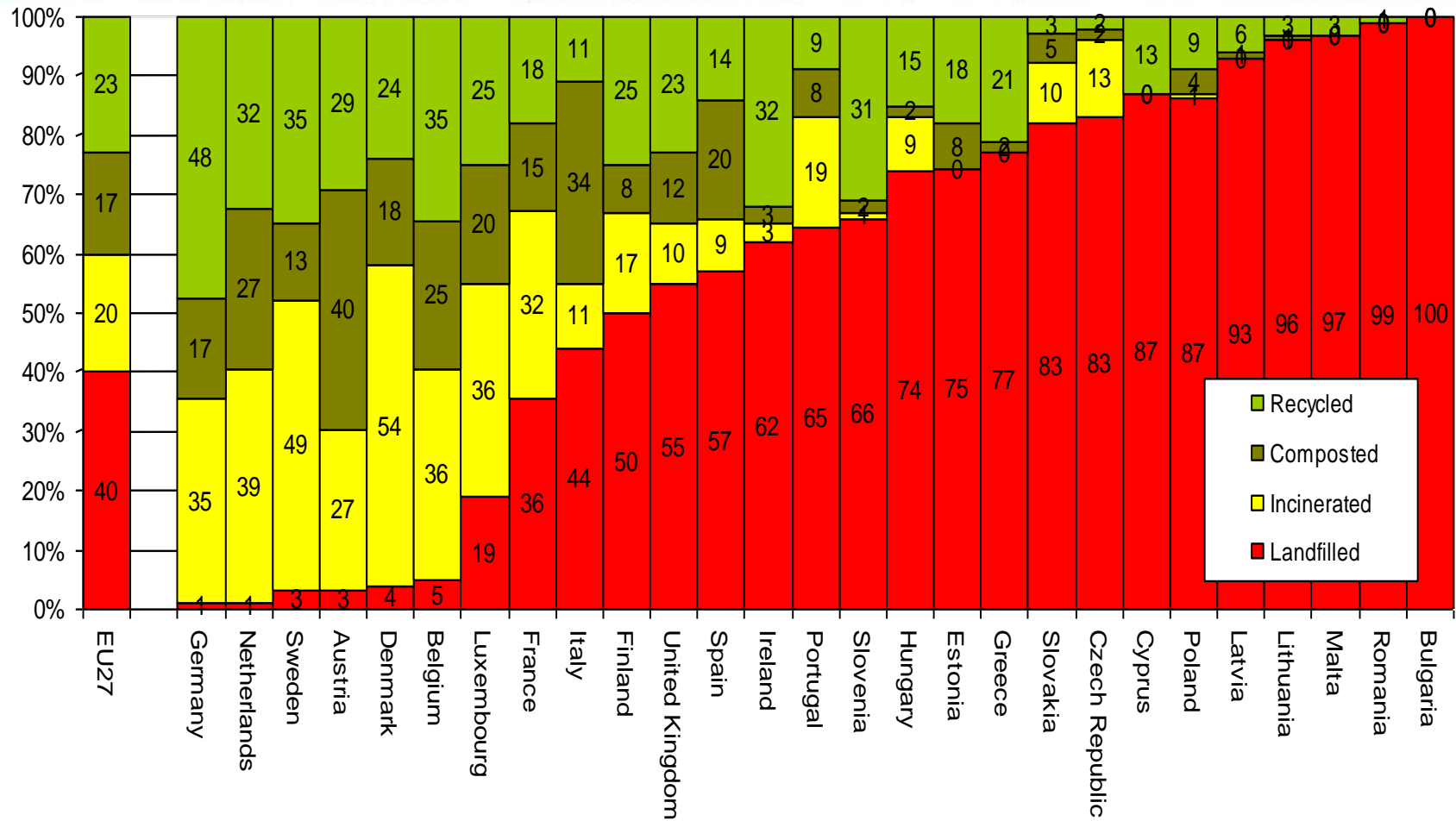
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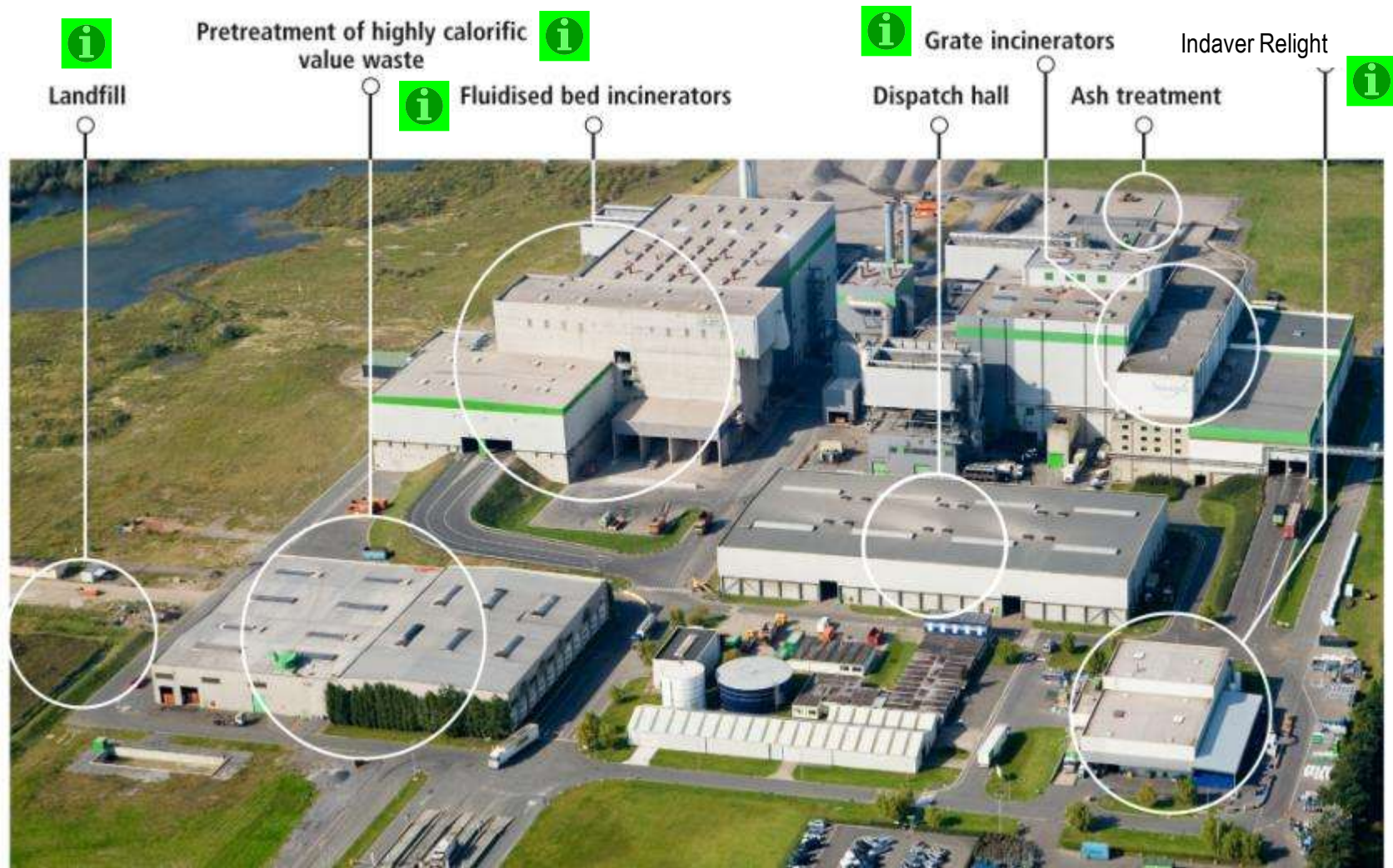
W-t-E plants in Belgium



W-t-E plants in Belgium: recycling rates



W-t-E plants: Indaver plant Doel (near Antwerp)

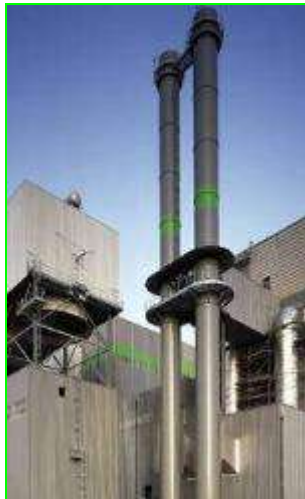


W-t-E plant: Indaver plant Doel



366 000 T/Y

Steam recovery
&
electricity
generation

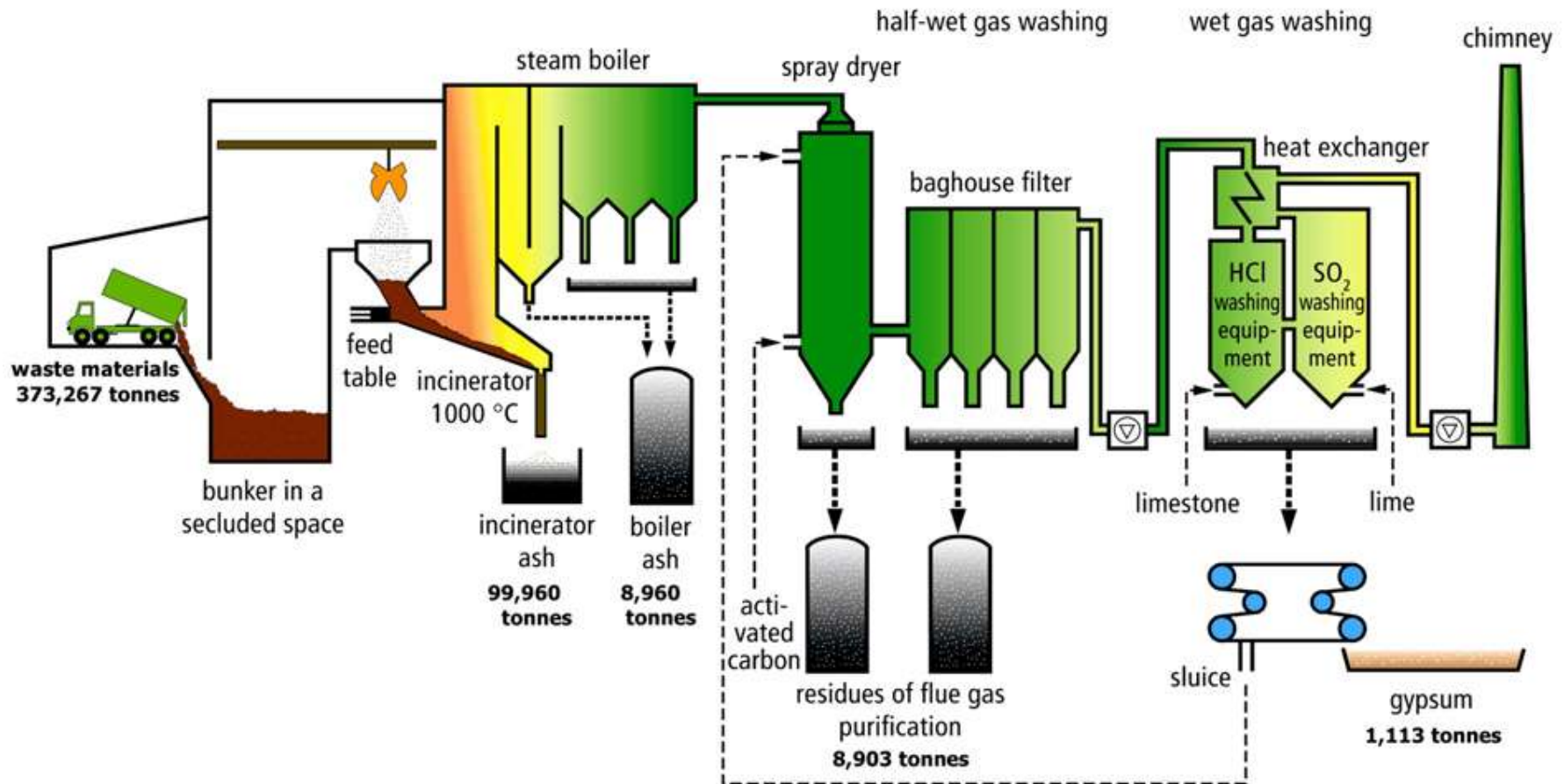


- Thermal treatment of
 - MSW
 - Comparable non haz industrial waste
 - Non-infectious medical waste
 - Non haz sludges (limited quantity)

- Grate incinerator technology
 - 3 lines

W-t-E plant: mass balance Indaver plant

Grate incinerator



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Wet treatment of bottom ashes: history

■ Driving forces:

1. EU's strategy and Waste Frame Directive
2. EU BREF Waste Incineration
 - Recover ferrous & non ferrous metals
 - Fractionate bottom ashes in a wet or dry process followed by natural or accelerated carbonation of the aggregates
3. Indavvers strategy
 - ...sustainable material management...

■ Threats

- Landfill taxes (actual “non bis in idem” on bottom ashes)
- WAC landfill, ban on landfill, space, permit, ..

Wet treatment of bottom ashes: history

- 1996: kick-off research-project
- Targets:
 - Converting process residues into useful “secondary raw materials” according Flemish legislation
 - Avoiding the need for landfill space
 - Replacing raw materials
- Project-team:
 - Indaver
 - IPAS (Industrial Processing & Analytical Systems)
 - VITO (Flemish Institute for Research)

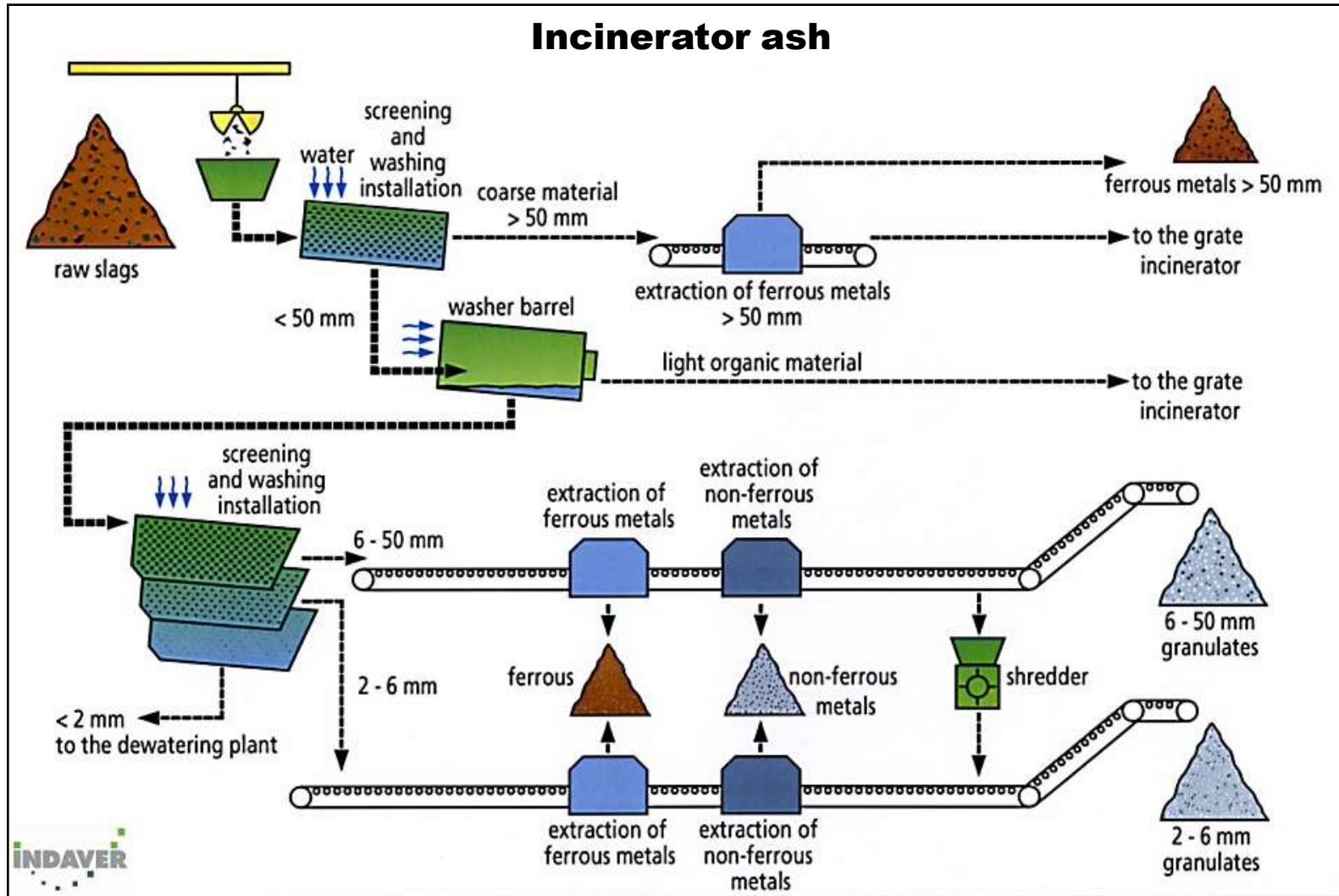
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Wet treatment of bottom ashes: technology

- Start up facility: 2000 (capacity 165 kT/year)
- Technology: wet process
 - Washing:
 - flotation of organics & wash out of salts
 - Sieving & separating:
 - removing metals & stones using a robust bar-sieve
 - Granulates on granular size
 - Ferrous / non ferrous metals
 - Ageing granulates
 - During 3 months in 5 – 10m high heaps in open air on paved floor

Wet treatment of bottom ashes: technology



Wet treatment of bottom ashes: technology



Bar sieve removing large parts of metal & stones



Sieving & washing



Sieving and washing



Magnetical removal of ferrous metals



Ageing the granulates (2-6 mm, 6-50 mm)



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Wet treatment of bottom ashes: actual performance

- High sieving efficiency
 - High quality ferrous / non ferrous metals
 - Granulates respect high environmental standards
- Organic fraction easily removed
- Soluble salts washed out
- Need for water:
 - Re-use of rainwater
 - Limited amount is “consumed”, maximum re-circulating
 - No discharge. Instead, re-use water as process water elsewhere

Wet treatment of bottom ashes: actual performance

Fraction	Application	% (w/w) of bottom ash
F – metal	Recycling, highest quality	8.5
NF- metal	Recycling, highest quality	1.0
Granulate 2 – 6 mm	Granular or monolithic	14
Granulate 6 – 50 mm	applications in constructions	27
Total of “free use” application		50.5
Sand 0.1 – 2mm	Controlled application in construction on landfill (covering)	32
Total of application with further monitoring		32
Sludge < 0.1 mm	Landfill	8
Organic	Returned to grate furnace	1
Others	landfill	8.5
Total to be disposed of		17.5

Wet treatment of bottom ashes: actual performance



Raw bottom ashes



Sand 0.1 -2 mm



Granulate 2-6 mm



Granulate 6-50 mm

Wet treatment of bottom ashes: actual performance

Use of the granulates has to be approved by authorities

- Certificate of re-use (OVAM, Flemish Waste Agency)
 - Scope: use as a granular application (foundation material)
 - the granulate has to fulfil all VLAREA requirements
 - is on the list of waste streams that can become secondary raw materials
 - has to meet up specific limits concerning :
 - leaching of metals
 - total concentration of organic components
 - total concentration of metals (= target values)

Wet treatment of bottom ashes: actual performance

	Fraction granulate		VLAREA CMA 2/II/A.9.1. (leaching test) Limit value
	2 – 6 mm	6 – 50 mm	
Dioxins (PCDD / PCDF)	< 5 pg TEQ/g	< 5 pg TEQ/g	
PAH (individual values)	< 0.03 mg/kg DM	< 0.03 mg/kg DM	
Leaching metals (mg/kg)			
Arsenic (As)	< 0.025	< 0.05	0.8
Cadmium (Cd)	< 0.01	< 0.01	0.03
Chromium (Cr) (total)	< 0.03	< 0.05	0.5
Copper (Cu)	0.17 – 0.50	0.04 – 0.49	0.5
Lead (Pb)	< 0.03	< 0.10	1.3
Nikkel (Ni)	< 0.025	< 0.05	0.75
Zinc (Zn)	< 0.03	< 0.10	2.8

Wet treatment of bottom ashes: actual performance

■ Some comments:

- dioxins & PAH concentrations :
 - Very low
- leaching criteria (column test NEN7343 / two step leaching EN12457-3):
 - Cu is the only critical parameter
 - Leachability influenced by content organic matter (fulvic acids ?)
 - Ageing necessary
- total amount of metals (not mentioned in the table):
 - Zn and Cu > target value

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Restrictions: legal

- EoW status within EU
 - Flemish approach on “secondary raw materials” limited within own region
 - Depending on member state, granulate is still waste or ???
- No harmonization on environmental standards between member states
 - leaching conditions
 - Parameter set: metals, organics, POP's, ...
 - Limit values

Restrictions: market

- Perception on the use of W-t-E granulates still negative
- Demand for huge amounts for construction works
 - Granulates play minor role, compared to C&D granulates
 - Negative prices
- Good market prices on ferrous / non ferrous necessary to keep facility economically feasible

As a result of that: granulates mainly used for end capping of Flemish landfills for non haz waste

Restrictions: socio - economical

- Need for further facilitating role of authority
 - Take the lead in the re-use of granulates in construction works
 - Developing legal framework for long temporary term storage to obtain huge amounts
 - Avoid taxes or restriction on permit conditions for the use of granulates as construction material on landfill sites, as long as alternatives are not mature and /or available

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Conclusion

Indaver has invested in a BREF proven technology, according:

- EU BREF Waste Incineration, 2006
- VITO BAT on ash treatment, 2008
- Technology based on the wet process and integrated in the plant of Doel to optimize the use of water

BUT.....

Conclusion

- Local authorities should take the lead in using W-t-E granulates
- EU should set technical & environmental criteria as a End of Waste material
- Construction industry should be encouraged

Further background information

BW2E

- Belgian Waste to Energy
- Representing all Belgian WtE plants
- www.bw2e.be

CEWEP

- Confederation of European Waste-to-Energy Plants (niet gevaarlijk afval)
- Representing 380 WtE plants in EU
- www.cewep.com

EURITS

- European Union for Responsible Incinerators & Treatment of Special waste
- 26 members with 36 plants for industrial (haz) waste
- www.incineration.info



INDAVER

