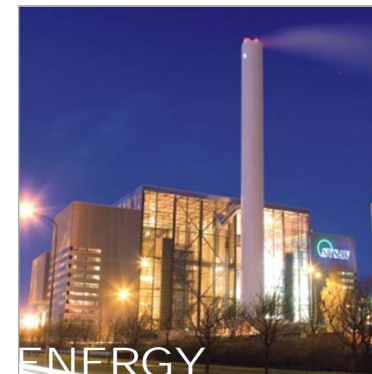
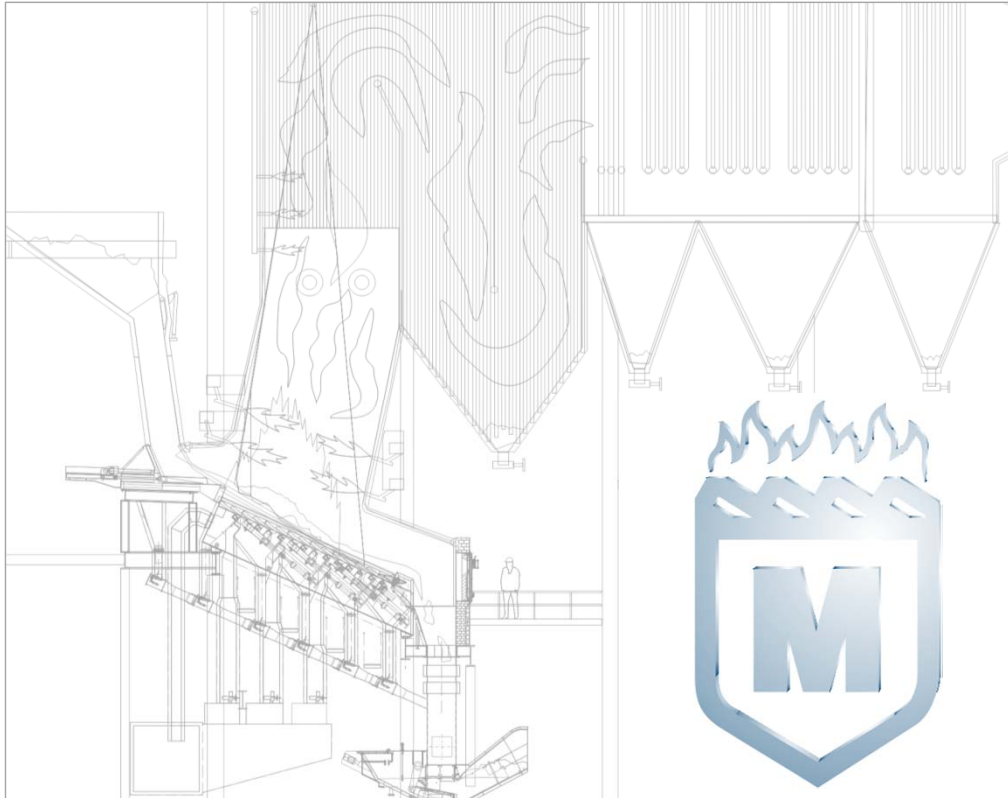


Topics driving us and our systems



Waste-to-Energy: proven technology



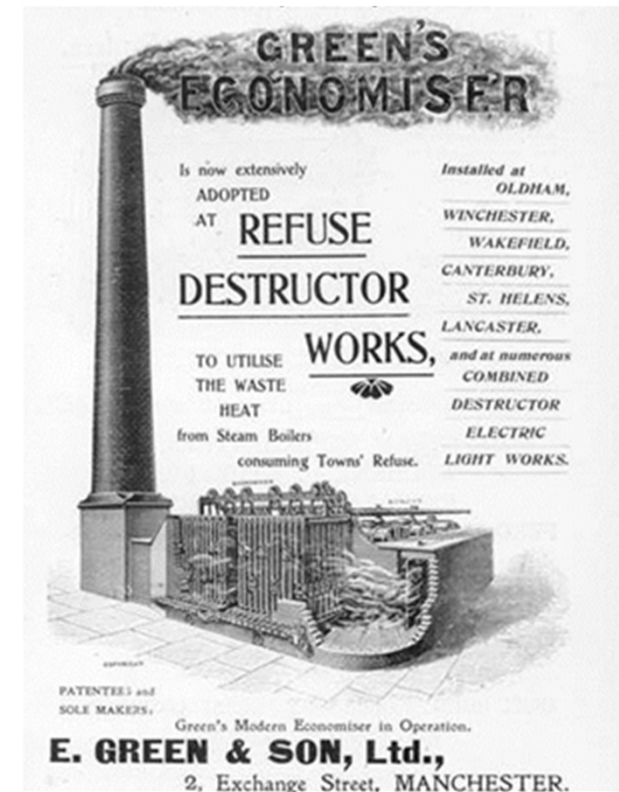
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Introduction

- **Thermal treatment of waste is not a new invention**
- **First waste incineration plants in Europe were built in the middle of the 19th century**
- **Simple, batch type technology - no heat recovery, no flue gas treatment**
- **Main reason was hygiene, plagues had often claimed many lives**

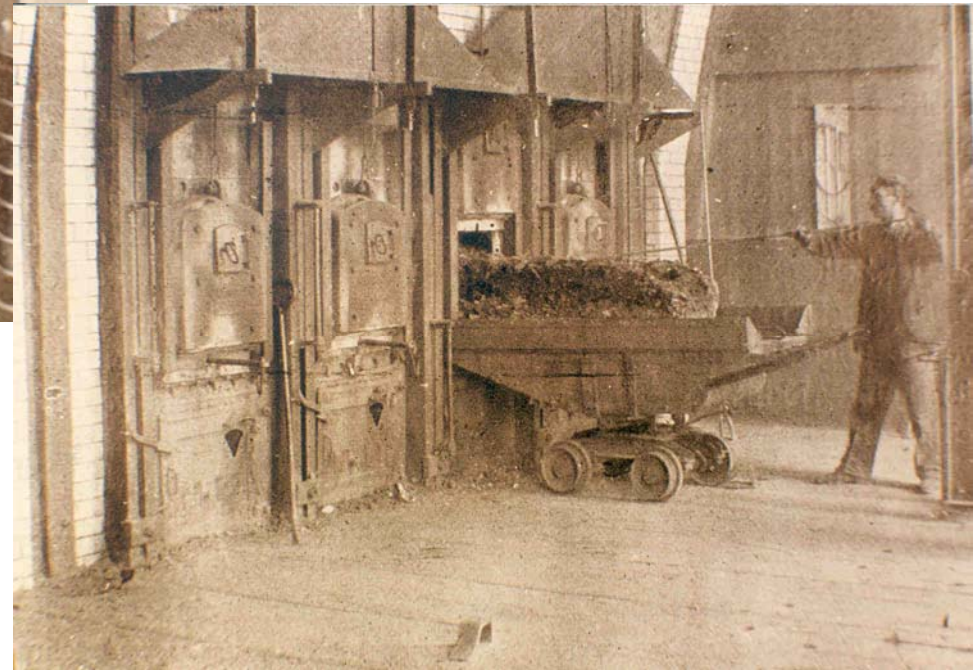
Introduction



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Introduction



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Modern Waste-to-Energy technology

- **Large-scale application of thermal waste treatment (waste-to-energy, energy from waste) only in the beginning of the 1950s**
 - **Landfill space became more scarce**
 - **Environmental consciousness increased**
 - **Financial resources available**
- **Technology substantially improved, by vast majority grate-based**
- **Continuous waste feeding and residue removal**
- **Heat recovery mandatory**
- **Flue gas treatment introduced in several steps**

Cross-section of WtE plant

Balance of plant

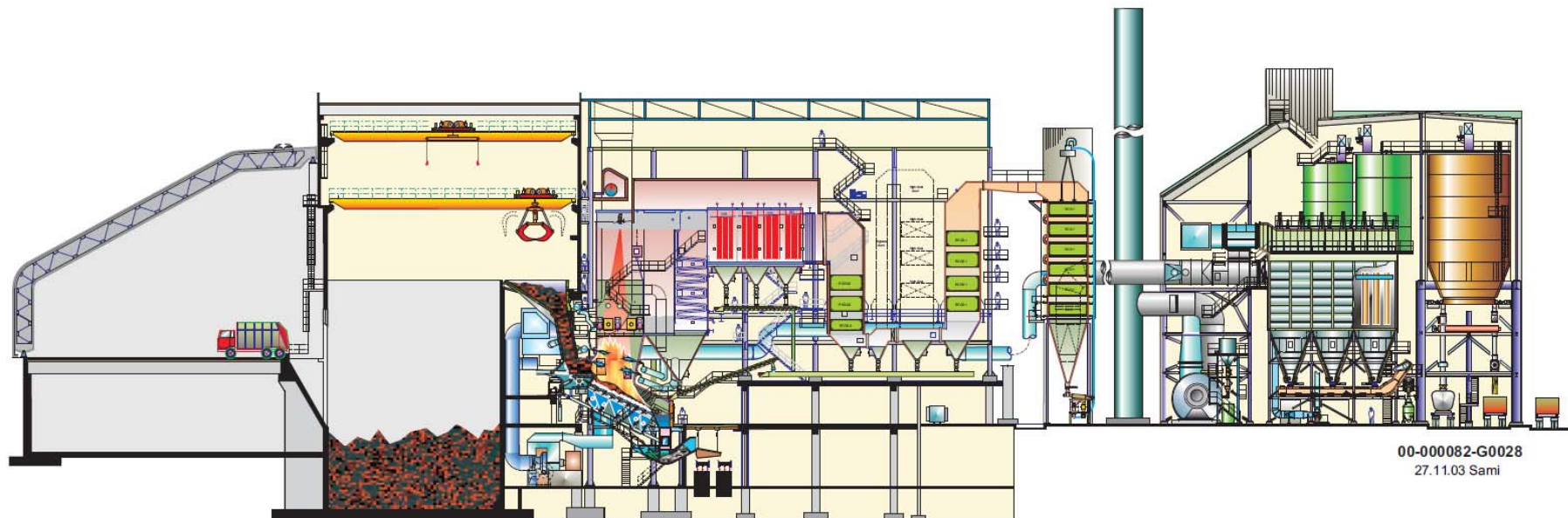
Electrical / control

Energy usage

Civil

Grate / boiler

Flue gas treatment



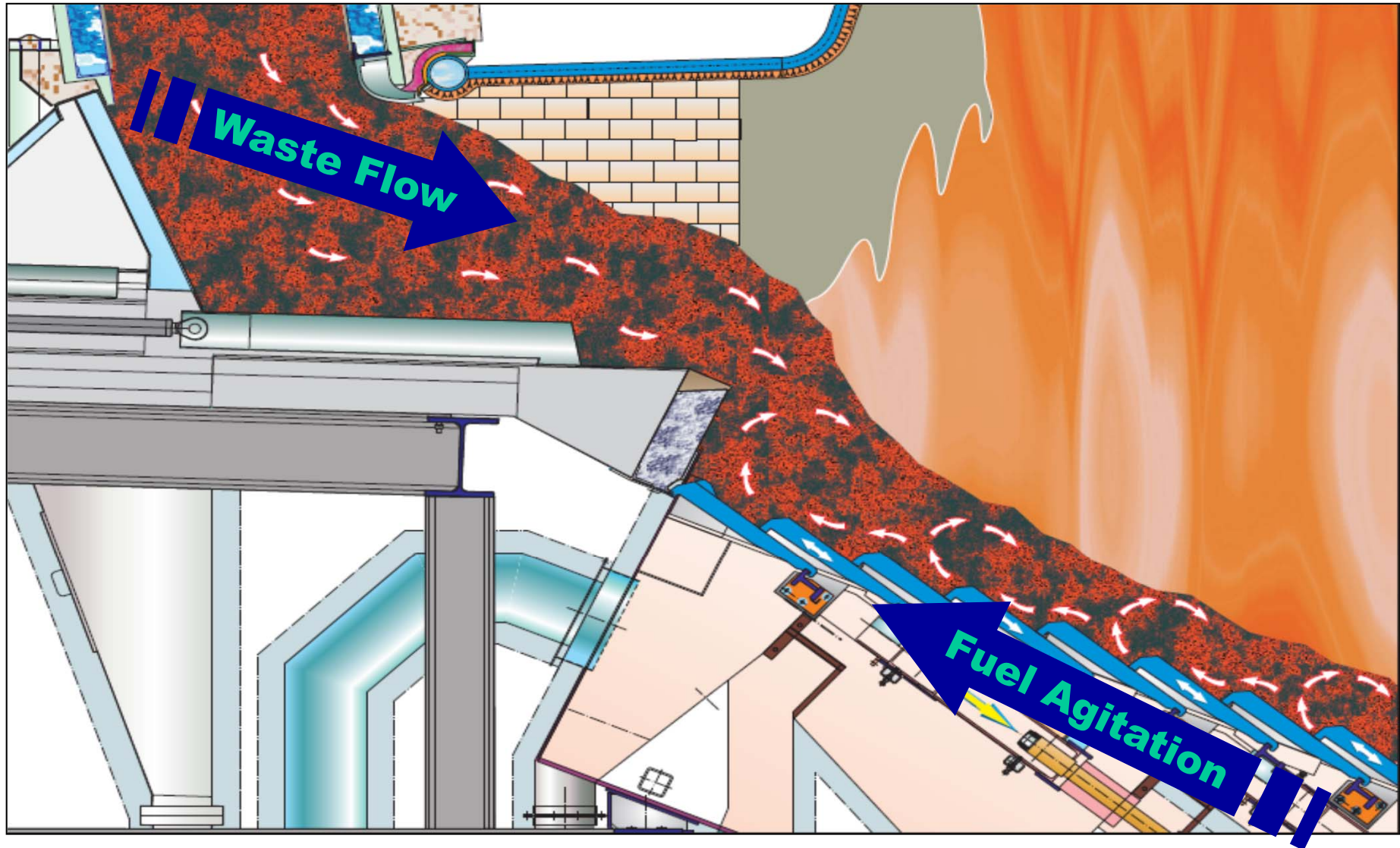
Furnace with 5 grate runs



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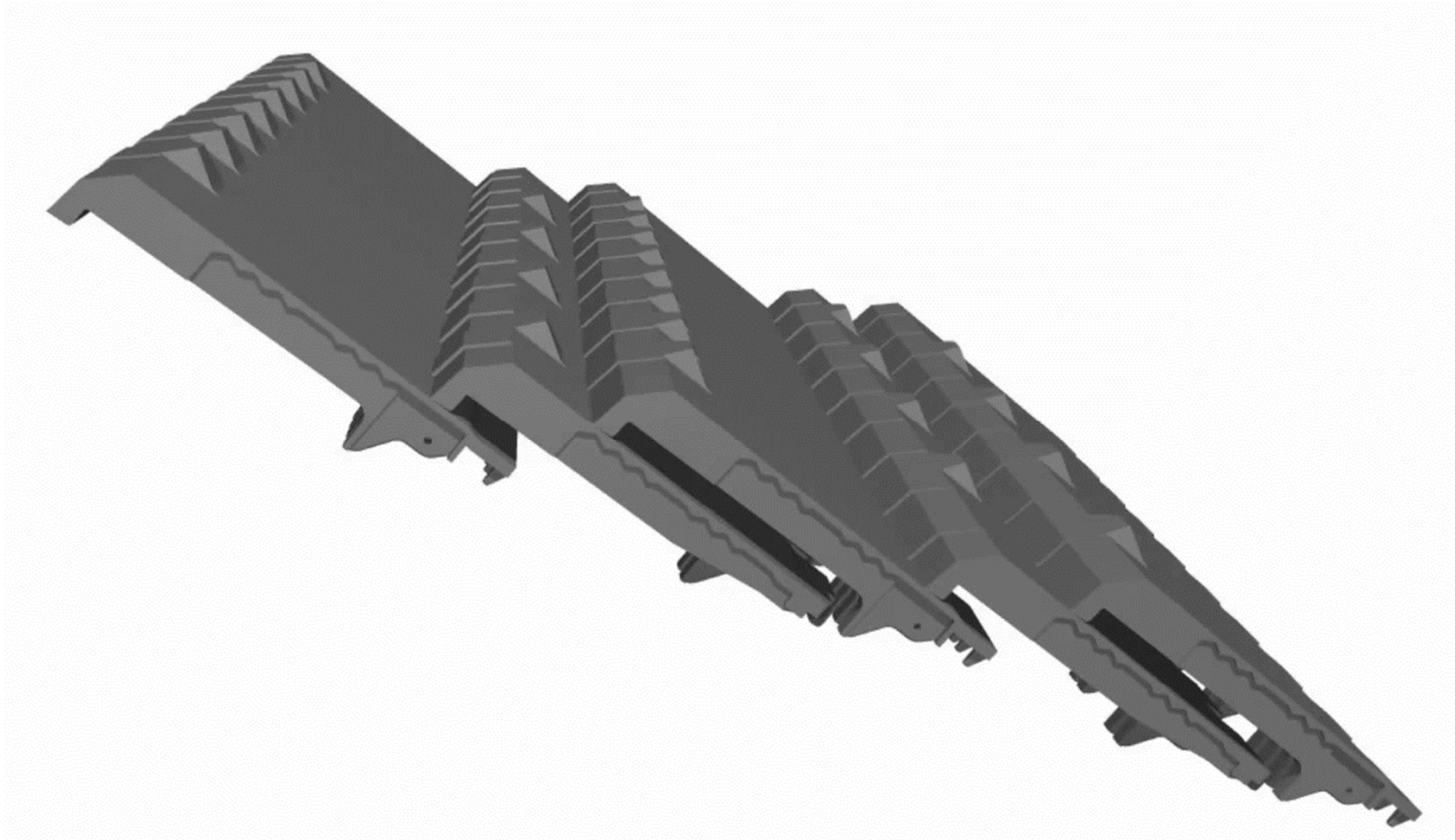
Reverse-acting grate Vario: heart of our plants



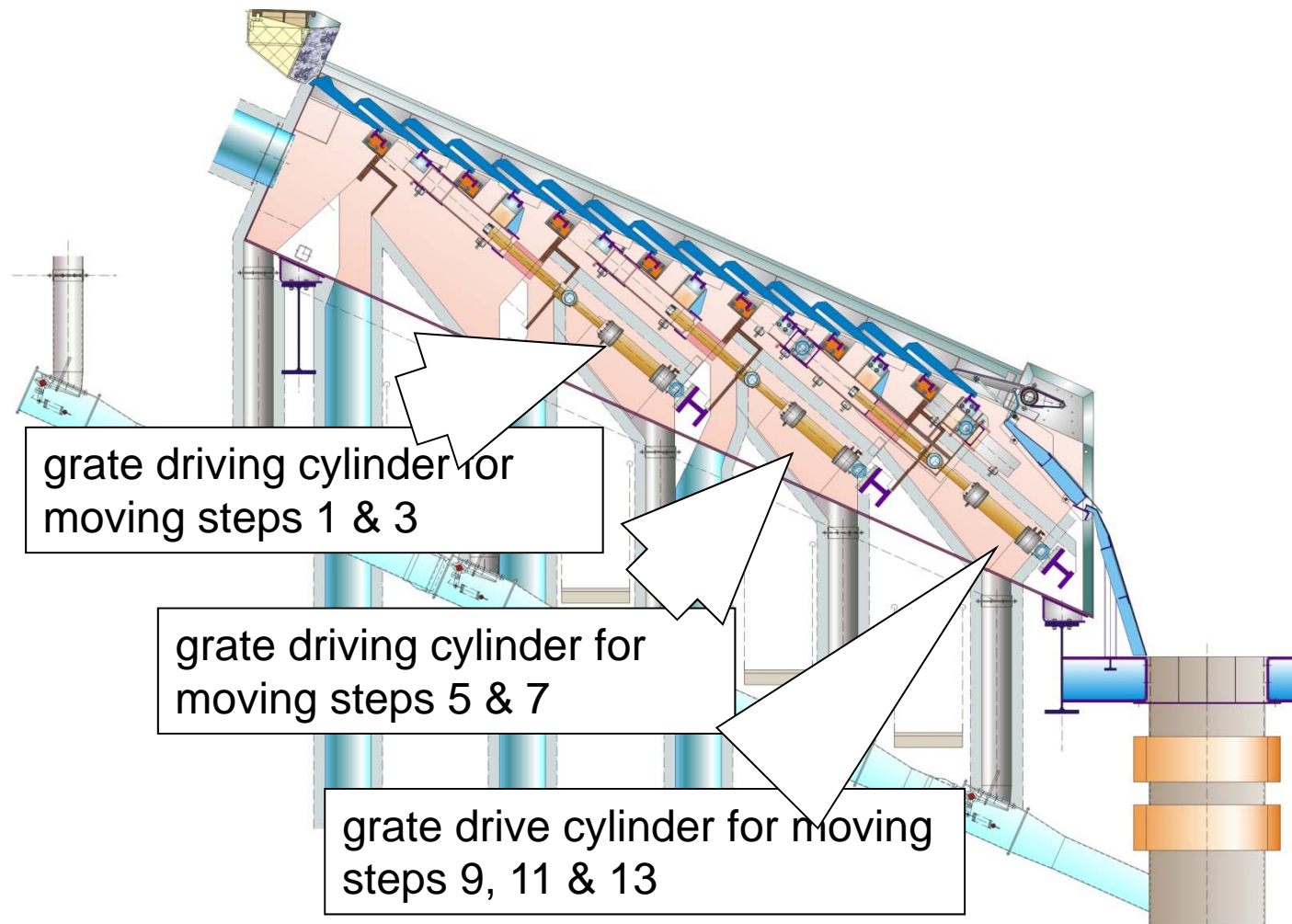
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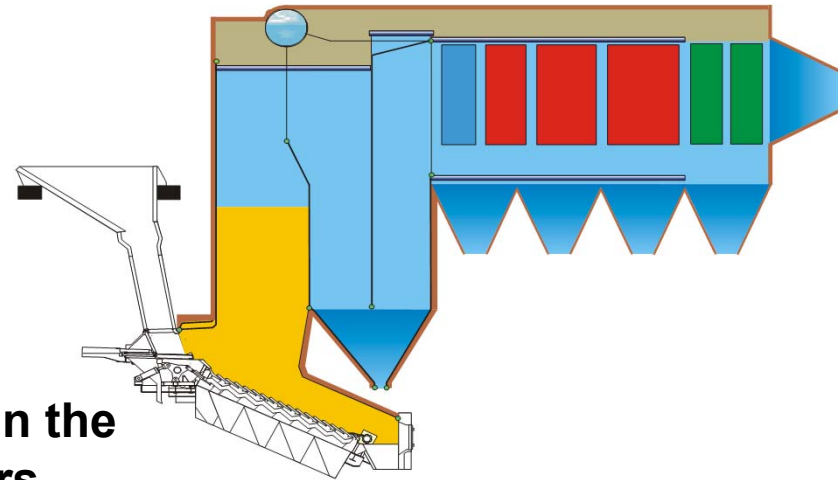
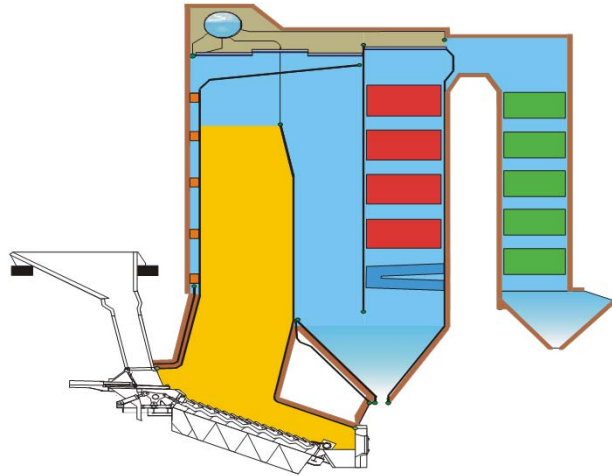
Reverse-acting grate Vario: grate movement



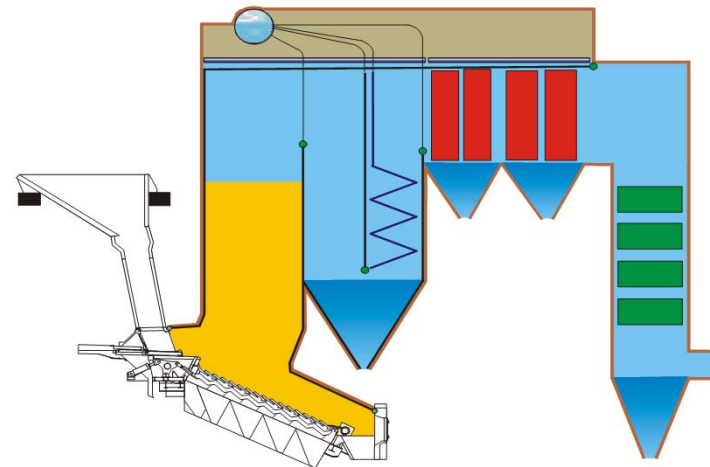
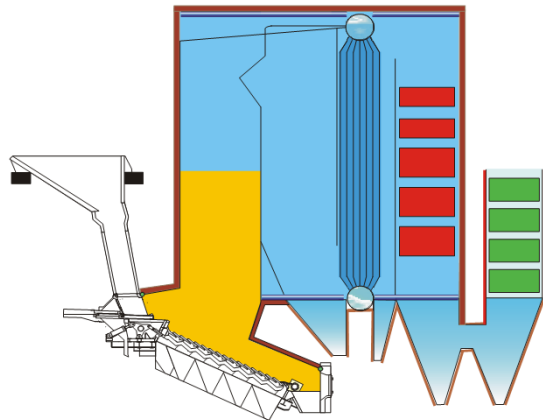
Reverse-acting grate Vario



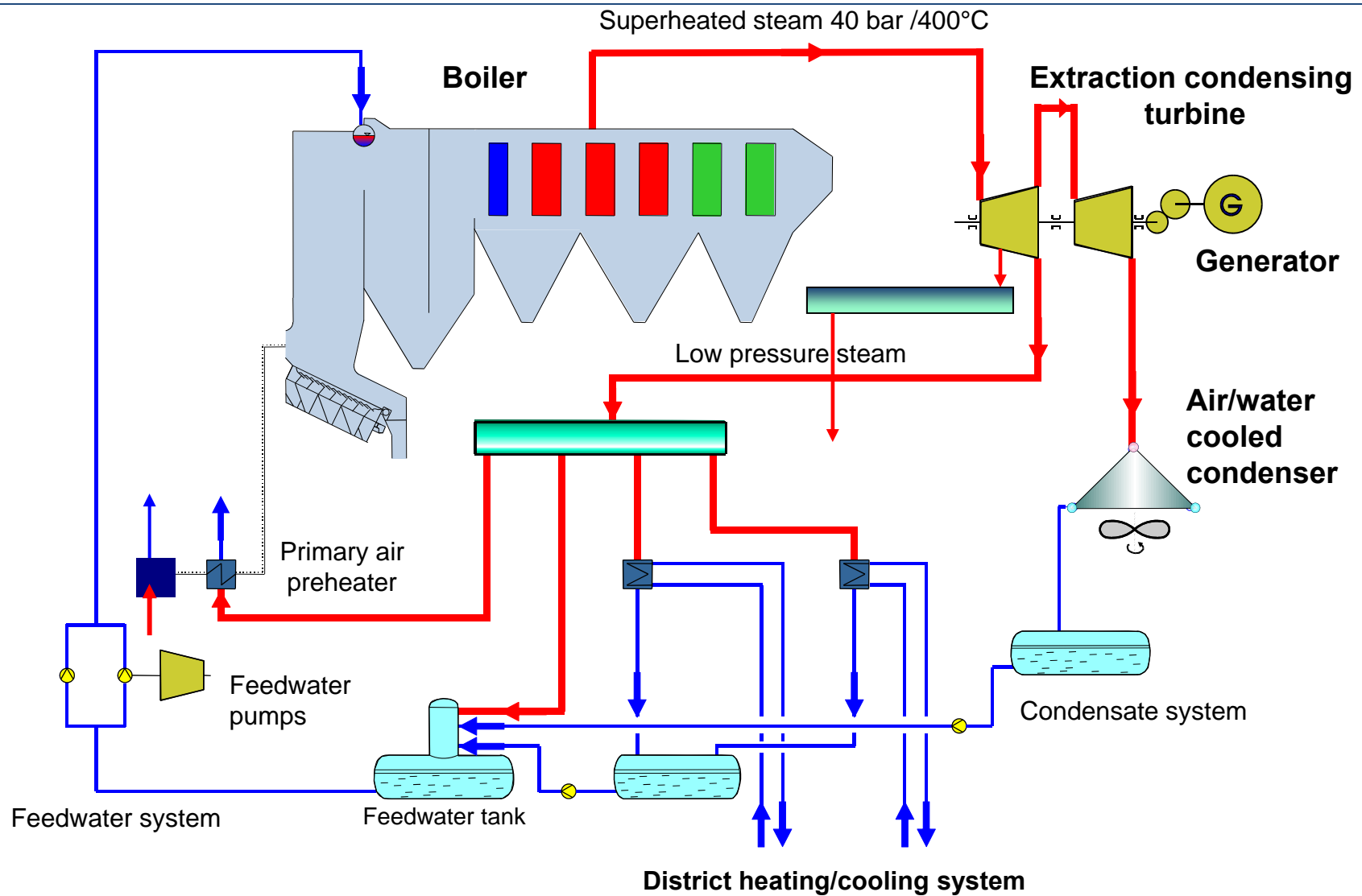
Boiler design



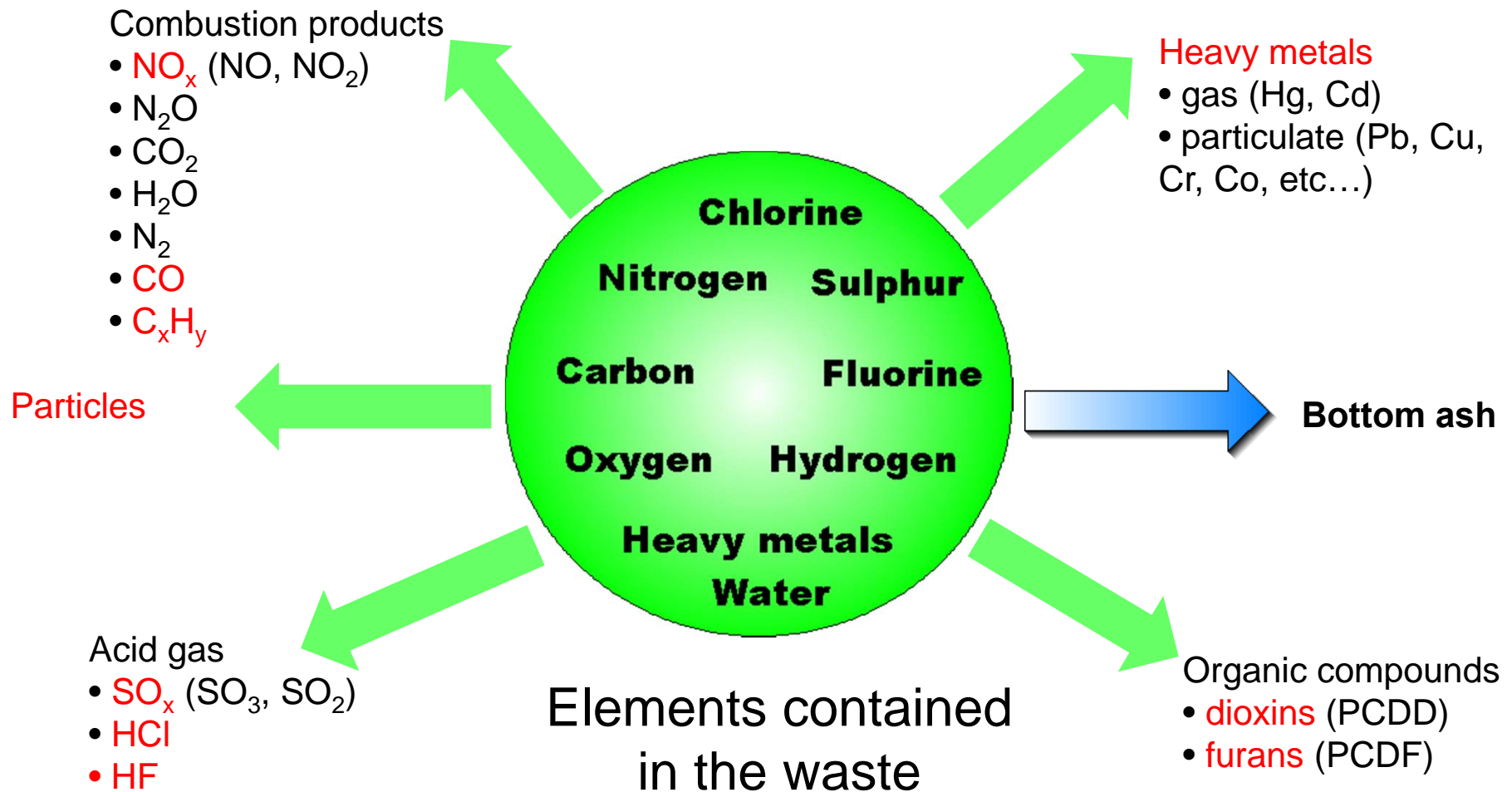
**Extensive experience in the
design of WtE boilers**



Energy recovery



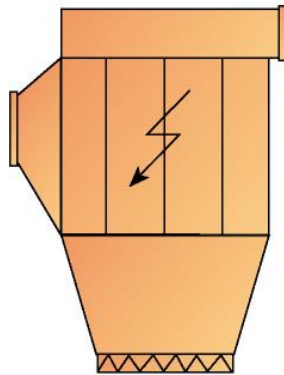
Flue Gas Treatment - Elements in waste / Flue gas after combustion



Flue gas treatment - Components for removal of different pollutants

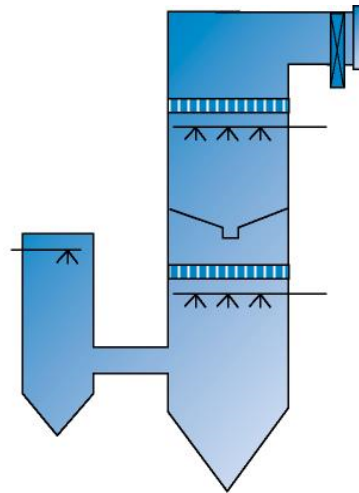
Separation

Removal of particles



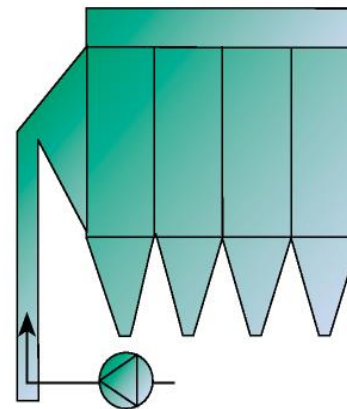
Absorption

Removal of HCl, HF, SO₂



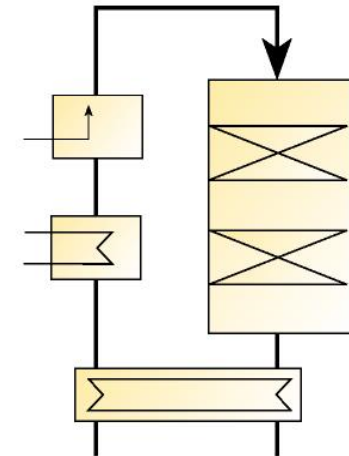
Filtration

Removal of HCl, HF, SO₂, heavy metals, particles, PCDD/F



Reduction

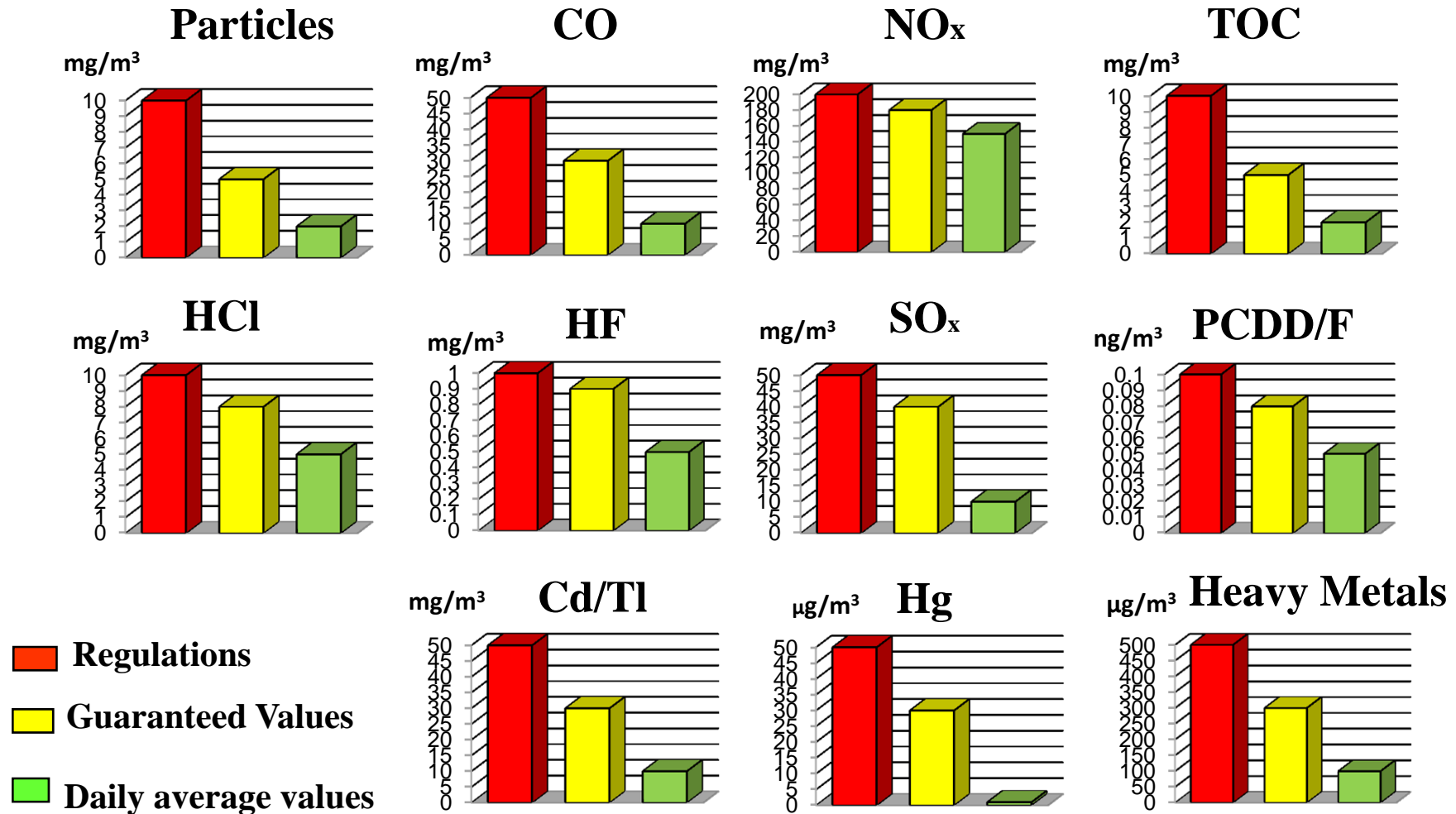
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Waste-to-Energy is the cleanest combustion industry (German example)



Waste types

**Household waste
(after recycling)**



Bulky waste



**Construction & demolition waste
(residues after sorting)**



Sewage sludge



**Hospital waste
(non-pathogenic)**

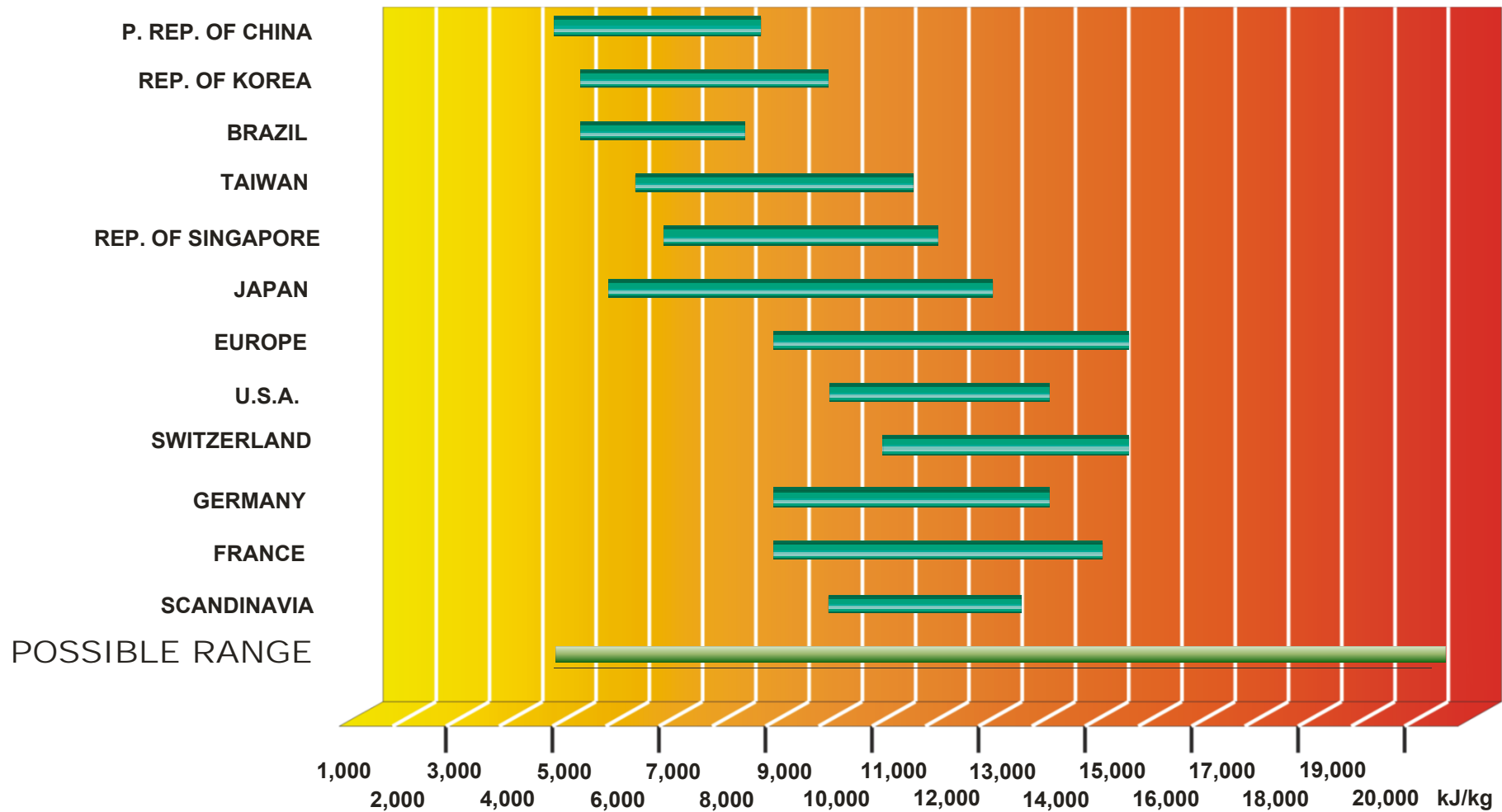
Commercial & industrial waste



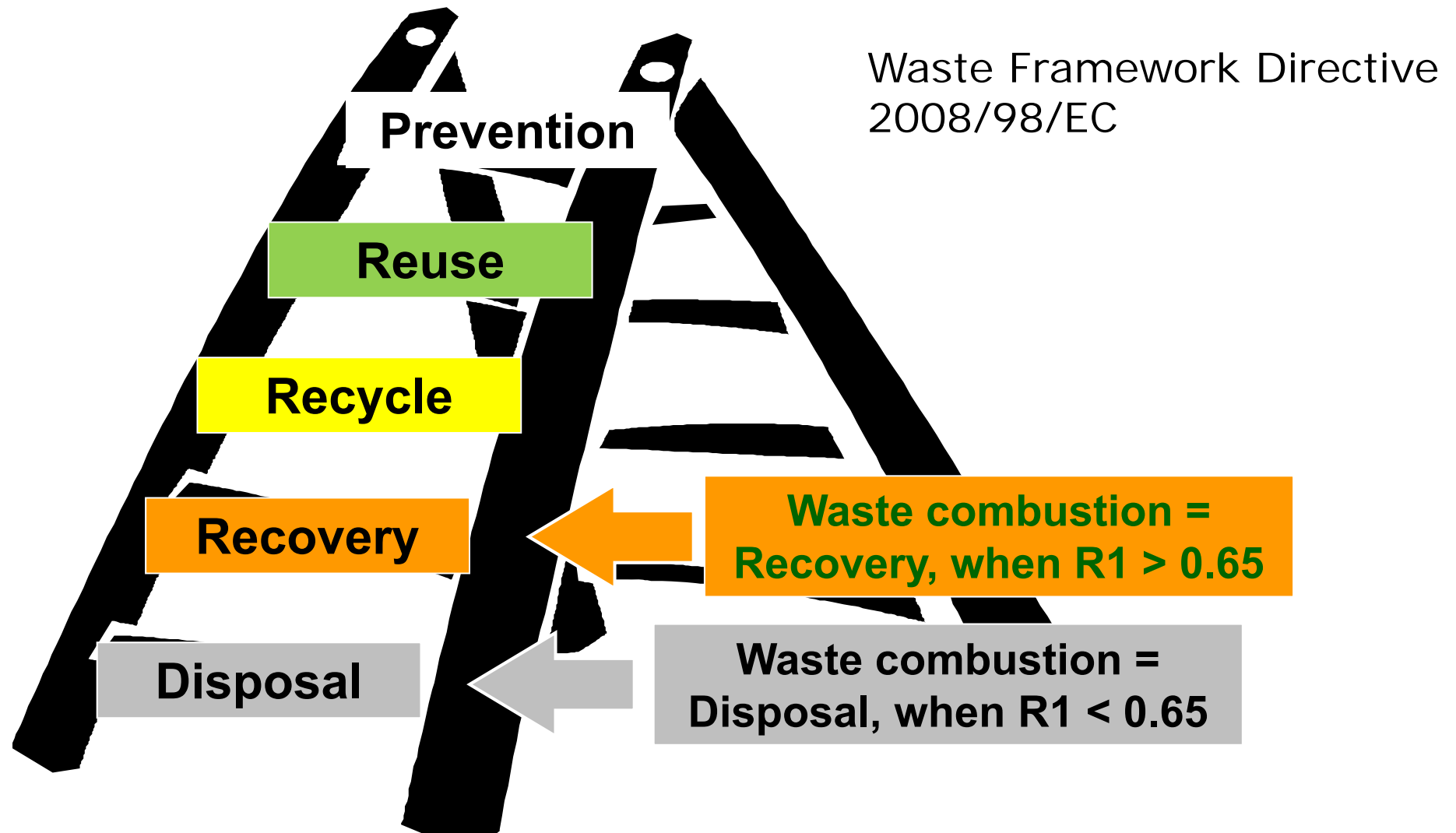
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Reverse-acting grate Vario - flexible to treat Waste all over the World

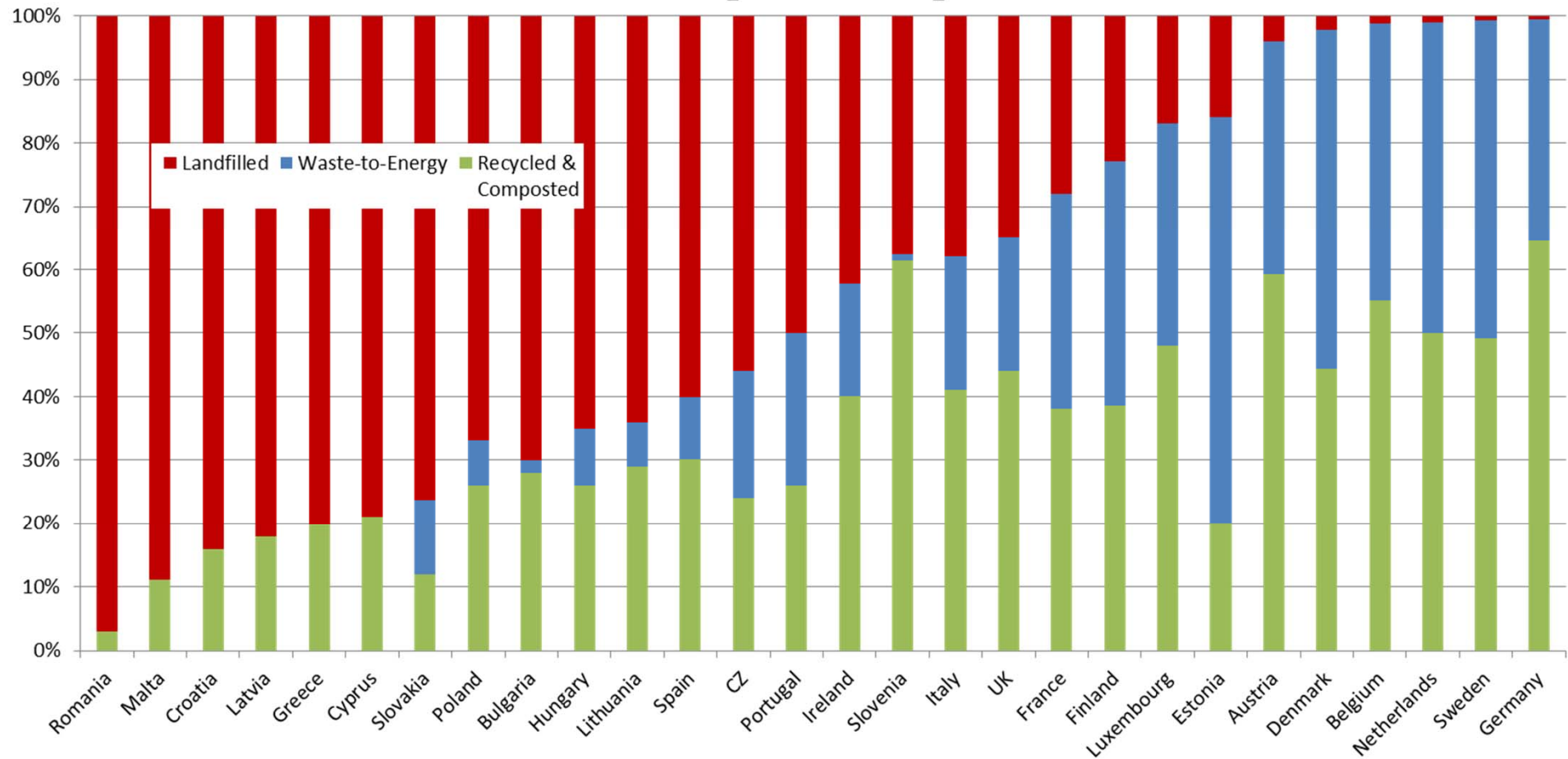


EU waste hierarchy

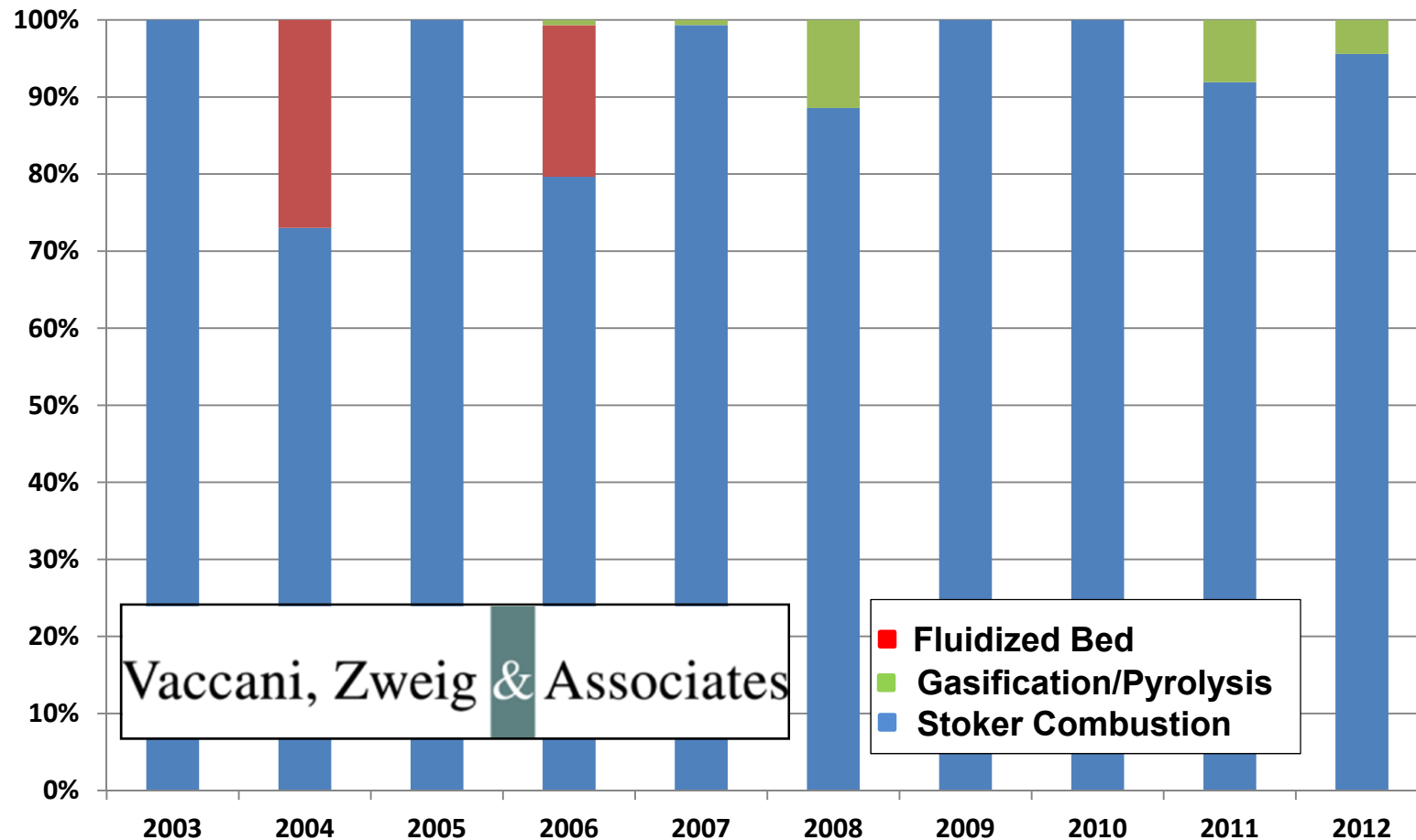


EU waste treatment

2013 MSW Treatment in EU28 [Eurostat]



Market shares of technologies in Europe



Conclusion: clear and sustainable leadership for Grate Combustion Technologies



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Amsterdam / NL



**4 x 30 t/h / 73 MW, th
43 bar / 415 °C**

**2 x 33.6 t/h / 93.3 MW, th
130 bar / 420 °C**

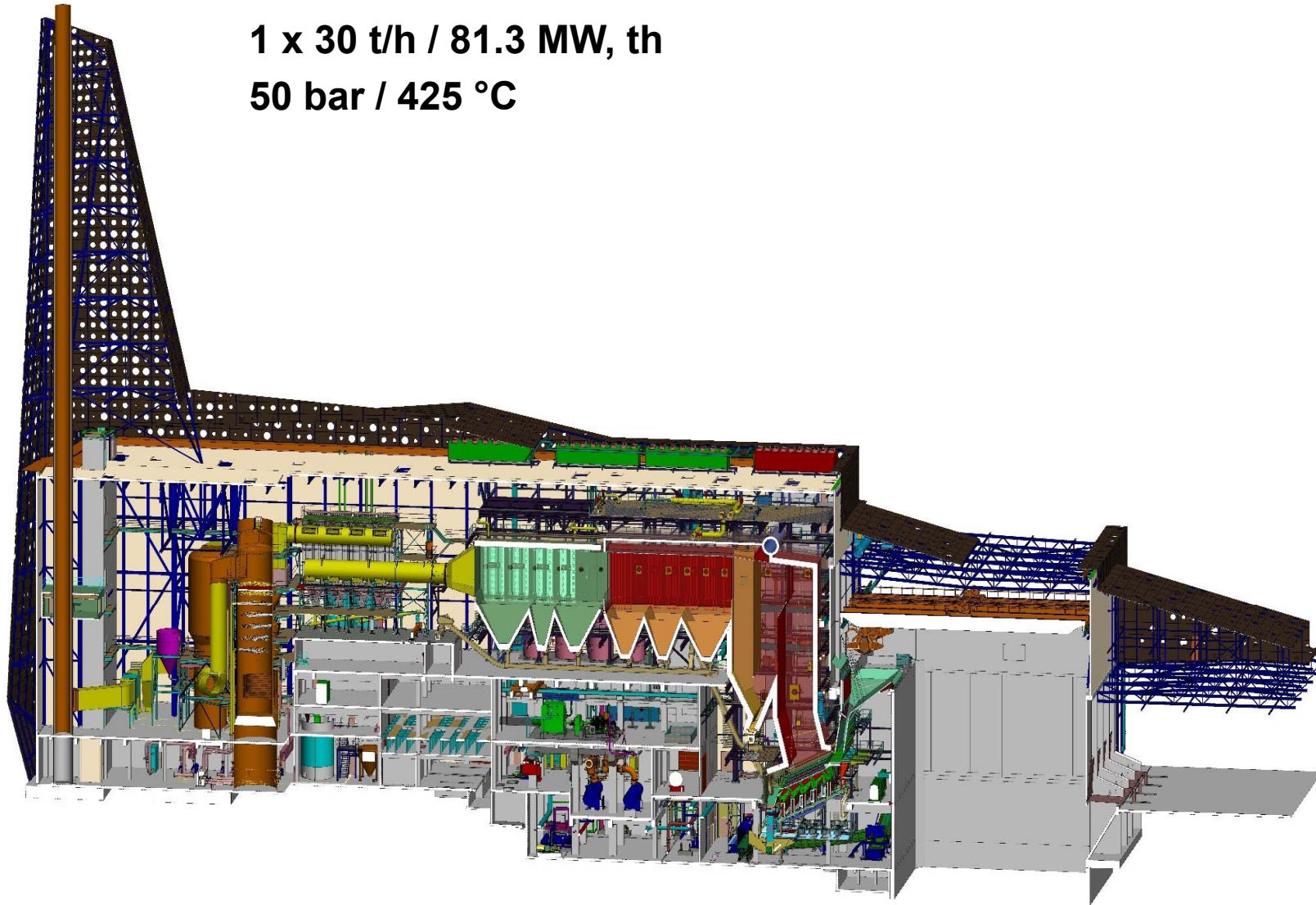


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Roskilde / DK

1 x 30 t/h / 81.3 MW, th
50 bar / 425 °C



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Roskilde / DK



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Roskilde / DK



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Torino / IT

3 x 22.5 t/h / 68.7 MW, th
60 bar / 420 °C



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MARTIN - Company profile

Founded:	1925 (as Josef Martin Feuerungsbau) in Munich
Legal entity:	GmbH
Owner:	Martin family (100 %)
Share capital:	10 million euros
Employees:	220 (approx. 150 engineers)
Turnover:	approx. 100 million euros
Rating (e.g. Deutsche Bank):	iAA-
Companies:	MARTIN GmbH in Munich, DE MARTIN AG (100%) in Wettingen und Matzingen, CH MARTIN Services SAS (100%) in Lyon, FR MARTIN biopower Pty Ltd. (50%), West Perth, AU

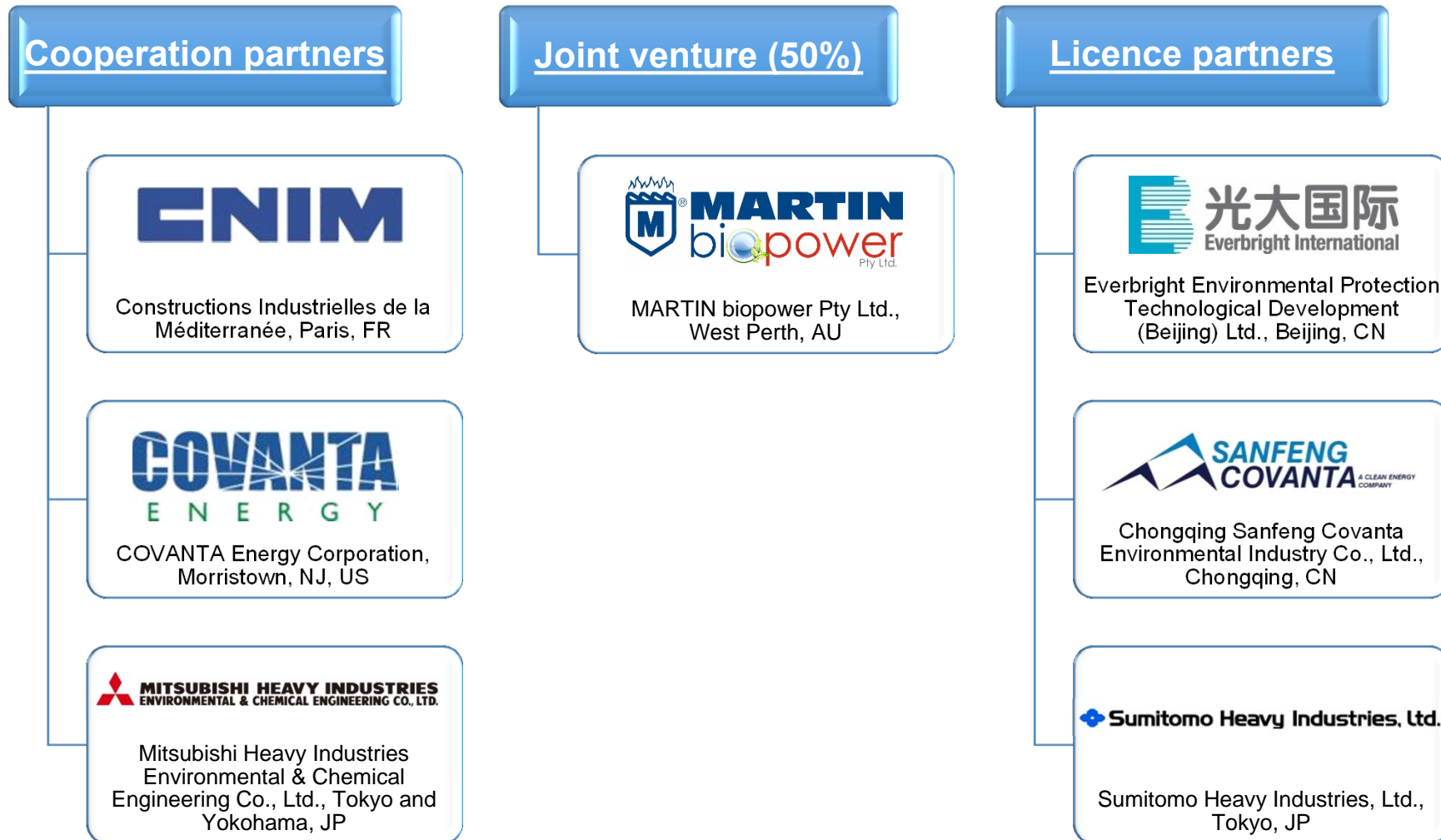


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MARTIN - a global player

Long-term worldwide partnerships

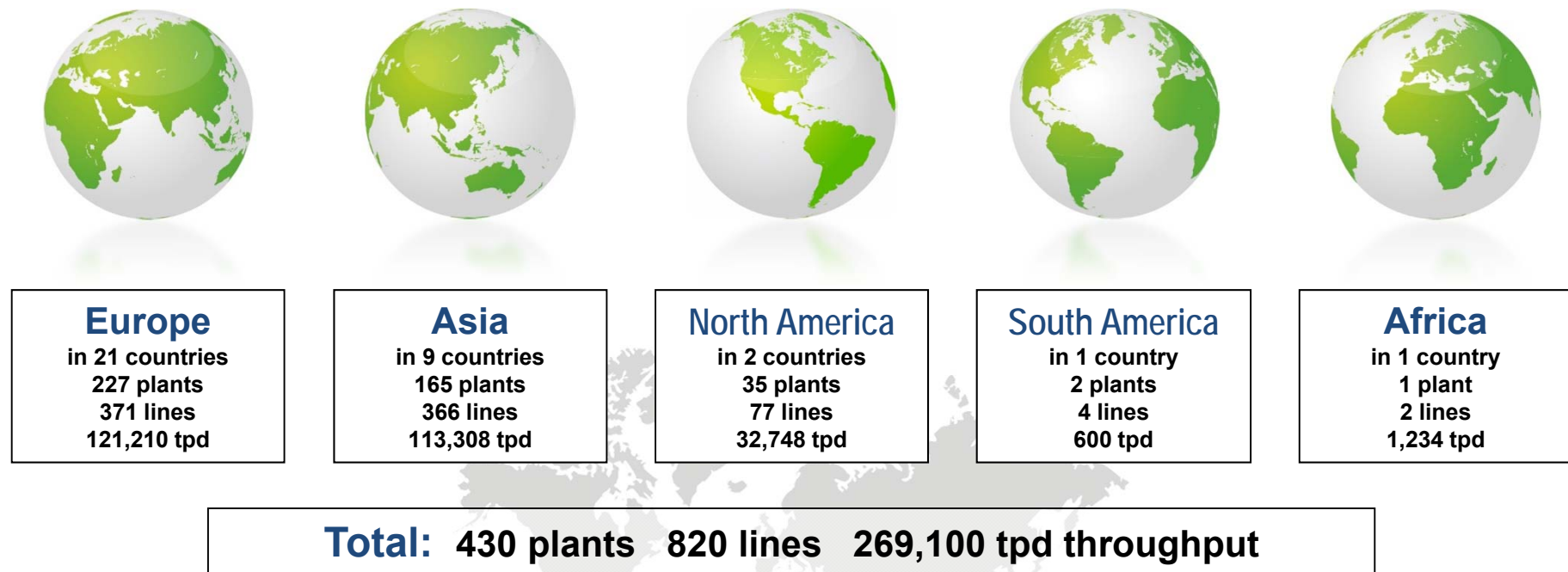


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Benefit from our experience

Plants in 34 countries worldwide



16 Oct. 2015





- A Perth-located Joint Venture of MARTIN GmbH with WA professionals offering the latest Martin Technology (MARTIN reverse-acting grate Vario)
- We offer WtE plants turnkey or key equipment according to client's demands
- We respect local manufacturing / sourcing wherever possible
- We have the largest reference base worldwide and invite you to visit any plant at your own choice (see our Reference List www.martingmbh.de → we arrange your visit - if you like)



Conclusion

- **Net electrical output of 550 - 900 kWh/ton of waste**
- **Net electrical efficiency in the range of 18 - 32 %**
- **Combined heat and power with even higher overall efficiencies (> 90 %)**
- **Locate WtE plant where industry needs heat/cooling or process steam**
- **Energy from WtE Plants is to a large extent CO₂-neutral**

- **Bottom ash is about 25 % by weight**
 - **Minerals that can be used for construction**
 - **Metals that can be recovered**

- **Fly ash / flue gas cleaning residues for disposal, about 3-4 % by weight**



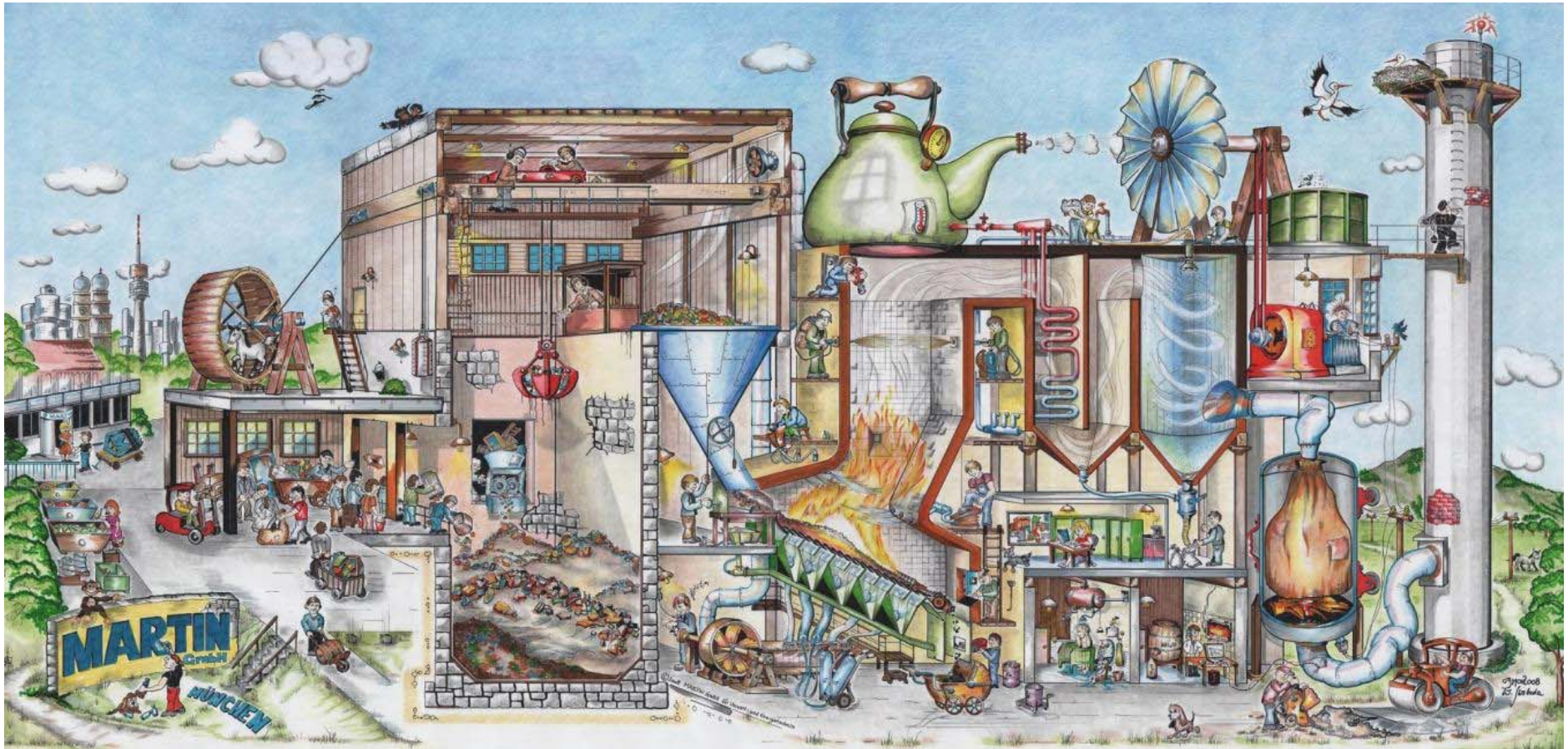
Conclusion

- **Waste-to-Energy technology, grate-based, is well proven, reliable, with high availability (> 90%)**
- **Lifetime of plants is > 25-30 years**
- **Emission regulations are the most stringent of every industry**
- **Actual emissions are only a small contribution**

- **Waste-to-Energy doesn't compete with material recycling (circular economy)**
- **But materials will eventually reach their 'end of life'**
- **Then Waste-to-Energy is the better alternative to landfilling**



Many thanks for your kind attention



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