

# Outotec

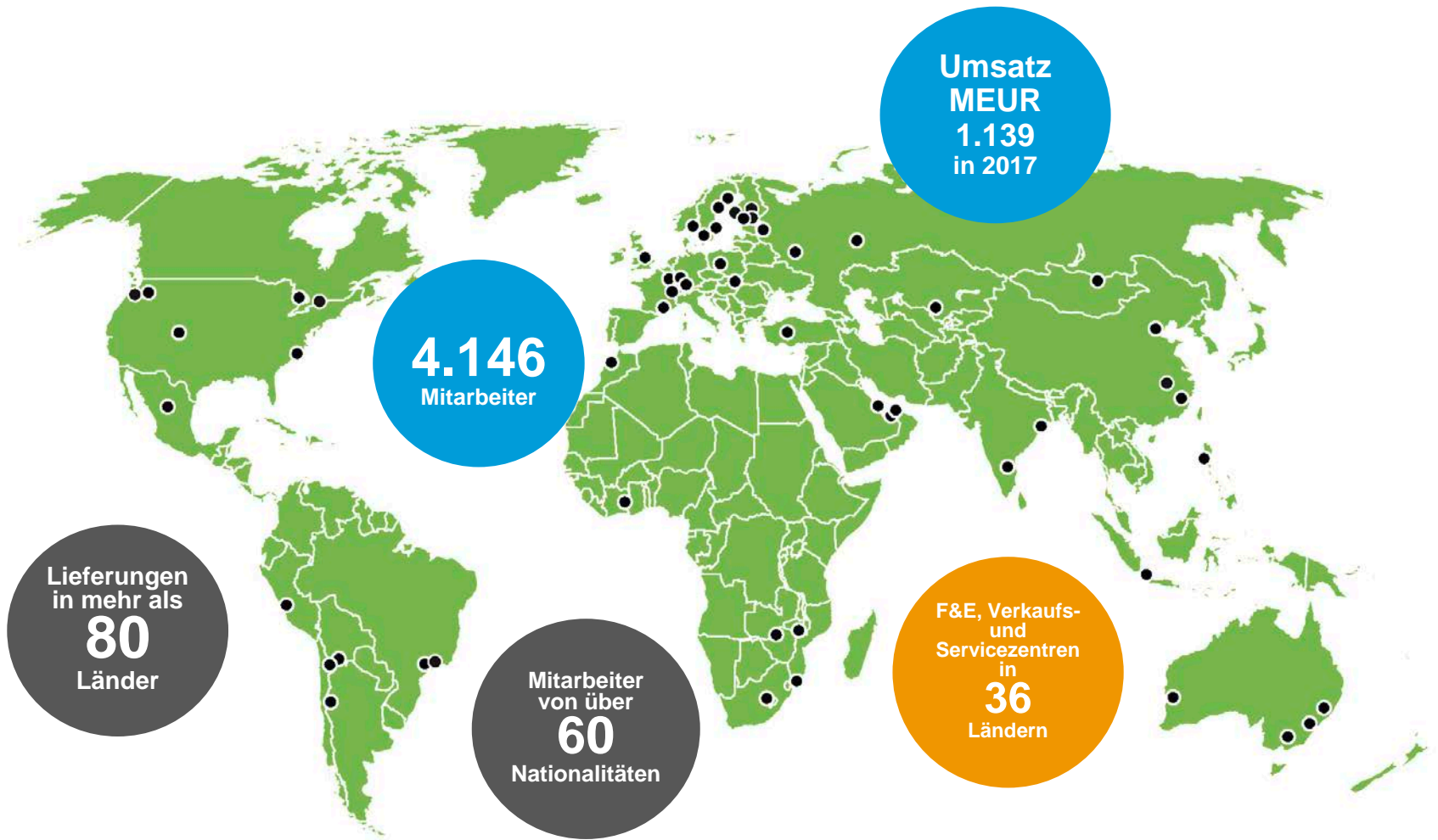
## Centralized Sludge Incineration

Reuse, Recover, Recycle

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# Outotec



# Sludge disposal canton Zürich - Strategy

- In year 2005 canton Zürich launched the strategy for coordinated sewage sludge disposal
- The reason for that:
  - Disposal security for the whole canton
  - Possibility for phosphorous recovery
  - Energy usage
  - Costs for disposal
- In year 2010 the decision was made to build a centralized sewage sludge incineration plant in Zürich Werdhölzli
- Since 2015 the delivery of dewatered sludge from the whole canton to the incineration plant is taking place → the plant is in operation

# Facts and numbers in canton Zürich

- 100 000 t/a sludge formation with 20-40% DM in more than 70 waste water treatment plants
- 70 000 t/a sludge needs to be transported



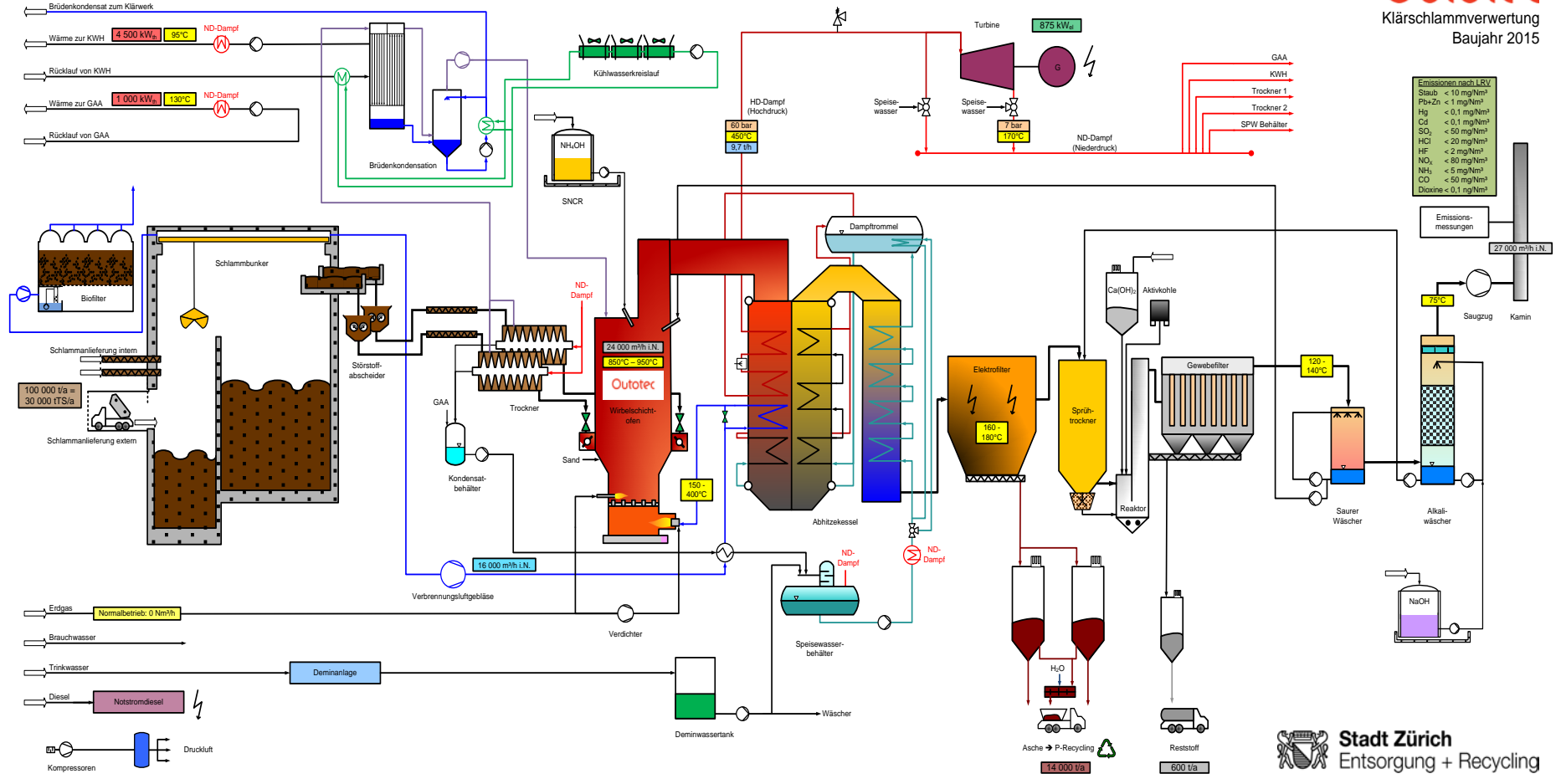


# Sewage sludge utilization plant in Zürich



# Process Flow Diagram

KSV Zürich Verfahrenstechnisches Prozessschema



**Outotec**  
 Klärschlammverwertung  
 Baujahr 2015

**Stadt Zürich**  
 Entsorgung + Recycling



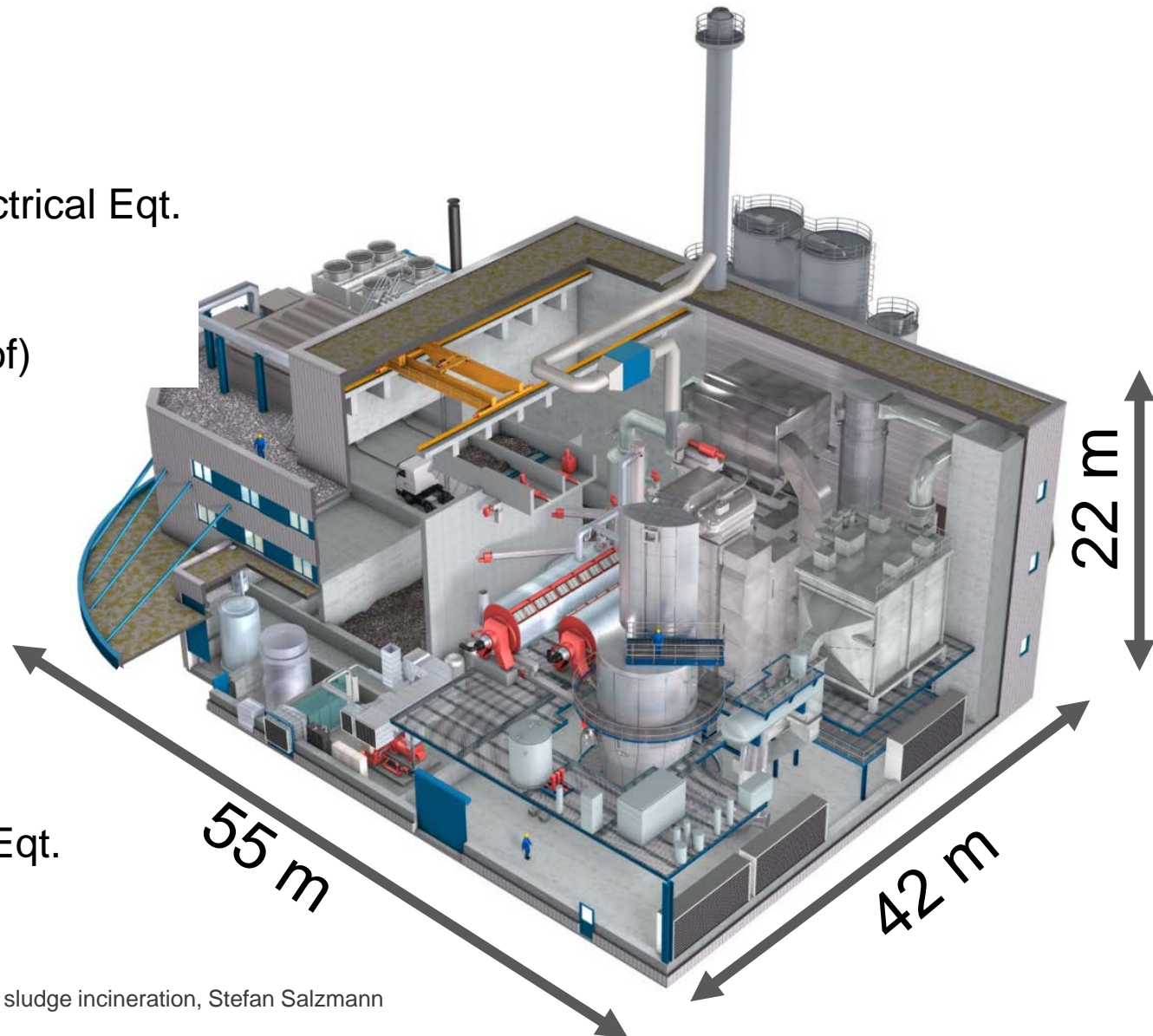
# North elevation

## Solid Building

- Sludge Bunker
- Rooms for Electrical Eqt.
- Central HVAC
- Control Room
- Biofilter (on roof)

## Incineration Hall (Structural Steel)

- Main Process Eqt.



# Main guaranties and achieved values for the nominal capacity

Description	Unit	Guarantee	Achieved	Comment
Power production	kWh/h	875	910	Higher heating value
Power consumption	kWh/h	850	< 830	
Process and potable water	m <sup>3</sup> /h	5	5	
Natural gas	Nm <sup>3</sup> /h	420 MWh <i>per year incl. star-up</i>	0 <i>in operation</i>	
Caustic soda NaOH	kg/h	62	155	Guarantee based on 0,5% S in sludge, actual 1,0 – 1,2%
Lime hydrate Ca(OH) <sub>2</sub>	kg/h	19	20	
Ammonia water NH <sub>4</sub> OH	kg/h	45,3	< 5	In normal operation rarely needed
Activated carbon	kg/h	1,25	< 1	Continuously Hg measurement
Sand	kg/h	2,5	0	Depends on sand amount in sludge
Heat output	kWh/h	4'450	4'550	



# Operational data KSV for 2016

Parameter	Value	Unit
Hours of operation	7'388	h
Revision acc. to plan	987	h
Unplanned disturbance	244	h
Unplanned disruption (sludge not available)	165	h
Burned sludge	84'131	t
Steam production	60'435	MWh
Power production	5'282	MWh
Power consumption	5'694	MWh
Heat production (usefull heat)	27'715	MWh
Sludge ash	13'404	t
Residue from flue gas cleaning	709	t

# Emissionslimits for Switzerland and Europe

Parameter	Switzerland LRV (Luftreinhalte- verordnung)*	Europe Guideline 2010/75	Unit
CO	50	50	mg/m <sup>3</sup> i. N.
SO <sub>2</sub>	50	50	mg/m <sup>3</sup> i. N.
HCl	20	10	mg/m <sup>3</sup> i. N.
HF	2	1	mg/m <sup>3</sup> i. N.
Dust	10	10	mg/m <sup>3</sup> i. N.
NO <sub>x</sub> als NO <sub>2</sub>	80	200	mg/m <sup>3</sup> i. N.
NH <sub>3</sub>	5	non	mg/m <sup>3</sup> i. N.
Cd	0,1		mg/m <sup>3</sup> i. N.
Cd + Tl		0,05	mg/m <sup>3</sup> i. N.
Hg	0,1	0,05	mg/m <sup>3</sup> i. N.
Pb + Zn	1		mg/m <sup>3</sup> i. N.
Sb, As, Pb, Cr, Co, Cu, Mn, Ni, V		0,5	mg/m <sup>3</sup> i. N.
Dioxine und Furane	0,1	0,1	ng TEQ/m <sup>3</sup> i. N.

\*daily average

# Achieved yearly emissions 2017, Average

Parameter	Switzerland LRV (Luftreinhalte- verordnung)*	Achieved (average of the CEMS in 2017)	Unit
CO	50	2,1	mg/m <sup>3</sup> i. N.
SO <sub>2</sub>	50	7,2	mg/m <sup>3</sup> i. N.
HCl	20	0,1	mg/m <sup>3</sup> i. N.
Staub	10	2,3	mg/m <sup>3</sup> i. N.
NO <sub>x</sub> als NO <sub>2</sub>	80	41,6	mg/m <sup>3</sup> i. N.
NH <sub>3</sub>	5	2,2	mg/m <sup>3</sup> i. N.
Hg	0,1	0,01	mg/m <sup>3</sup> i. N.

\*daily average

# Zürich – successful in operation since 2015





# Down stream process for ash from SIP

- Ash from SIP contains 10–22 % of  $P_2O_5$
- > 99.8 % of the ash is removed as “clean ash” in the ESP of the SIP
- A long list of different process developments are known → wet or thermal
- Outotec’s Ashdec process converts ashes into a plant available P-fertilizer
- Trials with ashes from SIP have shown positive results on P-solubility in neutral Ammonium Citrate.



# Summary

## Sludge Incineration Zürich

- Successful in operation since 2015

## AshDec

- Thermochemical process with alkaline compound
- Low residue amount
- Possible integration to incineration plant
  
- P recovery > 95 %
- $P_{NAC} > 80 \%$



NAC = Neutral ammonium citrate

Outotec



Sustainable use of  
Earth's natural resources