

WASTEWATER SUCCESS STORY

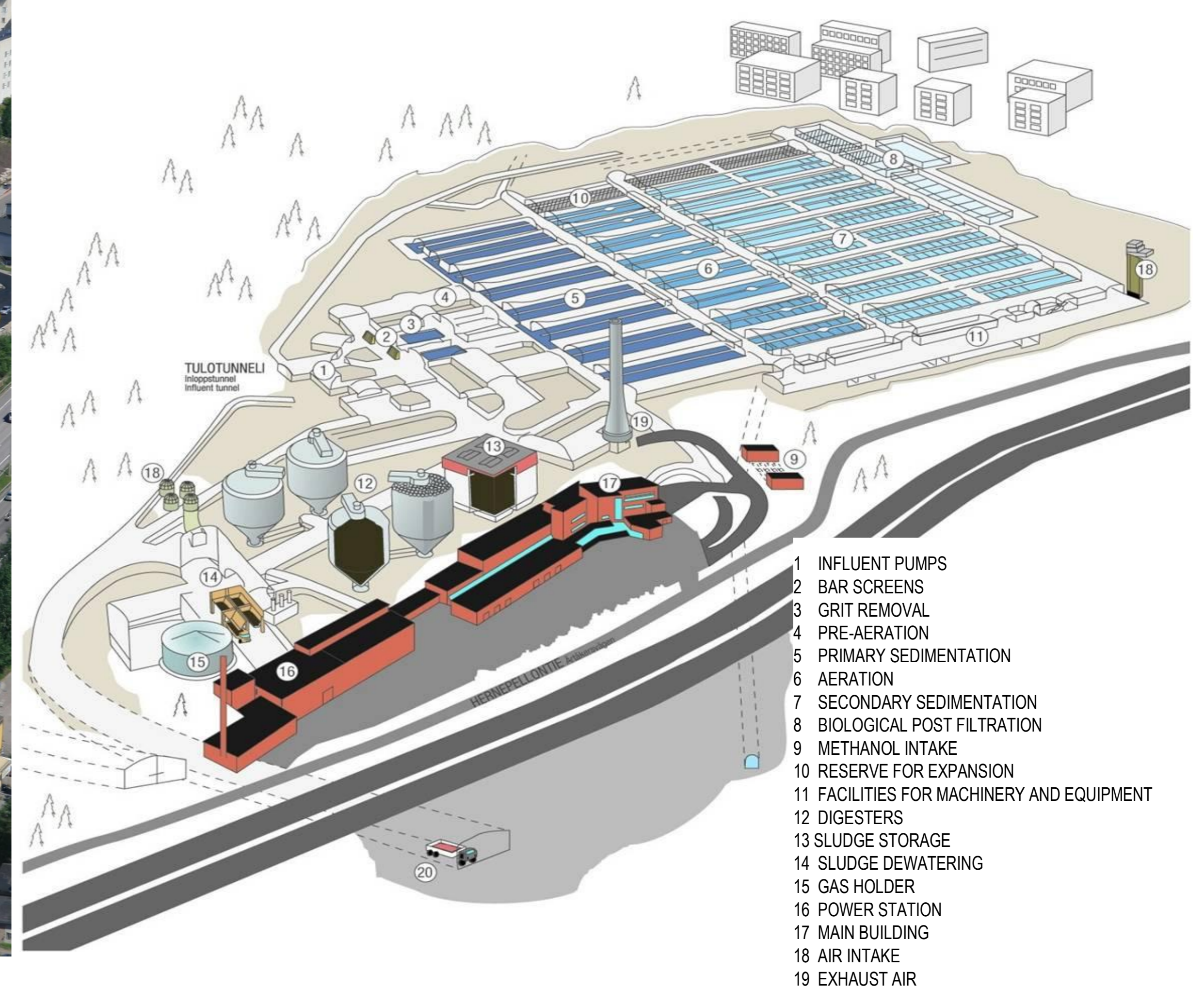
Vision of Energy Neutral Wastewater Treatment at Viikinmäki WWTP Helsinki, Finland Helsinki Regions Environmental Services HSY

OVERVIEW OF WASTEWATER PROJECT:

Viikinmäki WWTP process facilities have been excavated into bedrock. Underground area of the plant is 14 hectares. The facility serves a population equivalent of 800,000 inhabitants in the Helsinki metropolitan area of Finland and the average wastewater flow rate is 280,000 m³/d, when the wet weather peak flow can be as high as 800,000 m³/d. Viikinmäki WWTP is specialised for nutrient removal and operational level of nitrogen removal is 90% and phosphorus removal rate is 97%. The water treatment track has traditional mechanical-chemical-biological treatment process. The sludge treatment process is based on mesophilic digestion process which retention time is 16 days followed by dewatering procedure with four centrifuges.

In addition to solids loading generated by Viikinmäki itself, the plant accepts the liquid organic waste material from food industry, catering and aviation. The facility of Viikinmäki produces annually about 65,000 tons of dewatered sludge in average of DS 29% and the sludge is further processed by composting for green building and agricultural purposes. Total energy consumption is 40.1 GWh/a.

ACTUAL ANNUAL EMISSION REDUCTIONS: 2,100 MTCO₂E



BIOGAS INFORMATION

- Four (4) mesophilic complete mix digesters, operated parallel 2+2 and capacity 4*10,000 m³
- Biogas production 12.3 Mm³/a
- Average methane content in biogas 65%
- Biogas treatment process: activated carbon unit mainly due to siloxanes, H₂S is not a problem due to chemical precipitation of phosphorus
- Biogas end use is combined heat and power by the WWTP operators and final use onsite electricity/thermal
- Capacity of generation (4.6 MW), 4 different models of MWM GmbH (1994, 2009, 2012)
- Own electricity production 24.7 GWh (2011) which is 61,8% of total consumption
- Own heat production (2011) by CHP 27.5 GWh and by heat recovery 4.1 GWh, which is 100% of total heat consumption

COST & REVENUE INFORMATION

Investment Cost of one (1,5 MW) gas engine: US\$ 1,400,000
Operation & Maintenance (US\$/year): 115,000 / gas engine
Actual electricity offsets (US\$/year): 3,300,000

Actual heating/other benefits (US\$/year): 2,300,000
Other revenue streams: Investment subsidiary system for recyclable energy investments (15-40%)
Actual payback period: 10 years

PROJECT HIGHLIGHTS

- Plant has been able to increase energy self-sufficiency from 45% to 60% (1998-2012) based on:
 - Improving wastewater process and digester optimization
 - Investing new, more energy efficient gas engines
 - Increasing the capacity of the new generation gas engines
 - Improving energy management at the plant (i.e., active hunting of energy savings)
 - Utilizing of liquid organic wastes

FUTURE VISIONS

- ORC (Organic Rankine Cycle) will be implemented at Viikinmäki power plant in the end of 2013
 - Based on ORC technology the heat of the exhaust gas can be utilized as a electrical energy
- Energy Management Project continue and it is implemented in all actions.
 - Next big step is improvements in ventilation control
- Digester operation improvements:
 - Pretreatment of feed sludge (thickening)
 - Increase of retention time (16 d → 20 d)
- Energy self-sufficiency targeted to be 70% before 2015

SYSTEM PHOTOGRAPHS

POWER



AIRATION



SPECIAL WWTP RELATED ENERGY FEATURE IN HELSINKI

- Helsinki Energy utilizes excess heat of treated wastewater in Helsinki city's district heating system
- Plant name is Katri Vala Heating and Cooling plant
- Combined heating and cooling plant
- Heating energy PE 70,000
- Helsinki Energy operates the plant

FOR MORE INFORMATION

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