



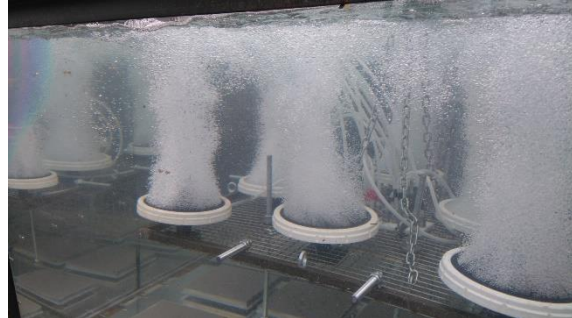
Desai-Zimmerman Fluidic Oscillator (DZFO)

- Low oscillation onset – good turn down
- Frequency virtually independent of flow rate
- Low frequency dispersion
- Lower friction losses than TZFO
- Asymmetric loading possible

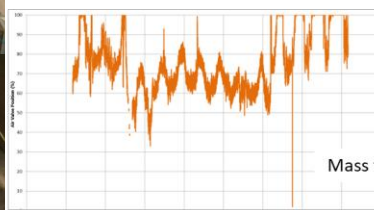
Hammarby Sjöstadsverk, Stockholm, Sweden



- Fully operational pilot plant
- Inlet from taken from Stockholm Water's Henriksdal WwTW (1:3600 scale) – 1L/s
- Reactor 4 retrofitted with 4x DN9.5 DZFOs and 8x9" EPDM disc diffusers
- Capacity = 40m³/hr
- **53% improvement in mass transfer**



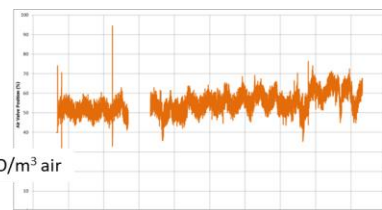
Control



Control

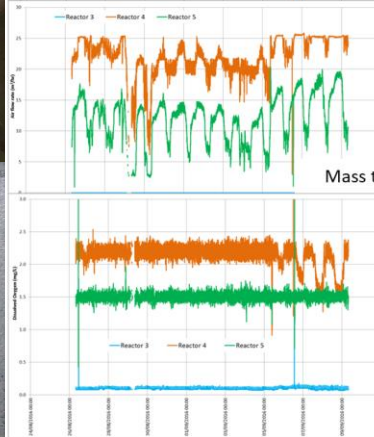
Time = 336 hours
 Total influent = 6,863m³
 Total air flow = 7,286 m³
 Average DO = 2.14 mg/L
 Total DO = 14.7kg
 Mass transfer efficiency = 2.02g DO/m³ air

Fluidic oscillator

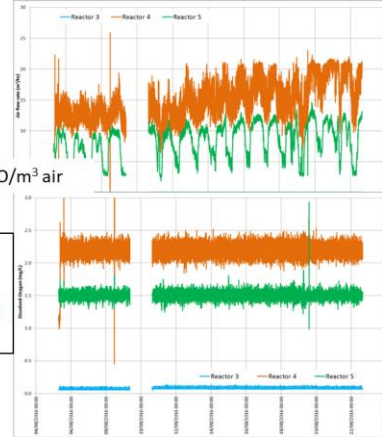


Oscillator

Oscillator = 4 x DN3
 Time = 386 hours
 Total influent = 8,117m³
 Total air flow = 5,774 m³
 Average DO = 2.19 mg/L
 Total DO = 17.81kg
 Mass transfer efficiency = 3.08 g DO/m³ air



53.0% improvement in mass transfer efficiency with fluidic oscillation



Bristol, UK



Installation Details

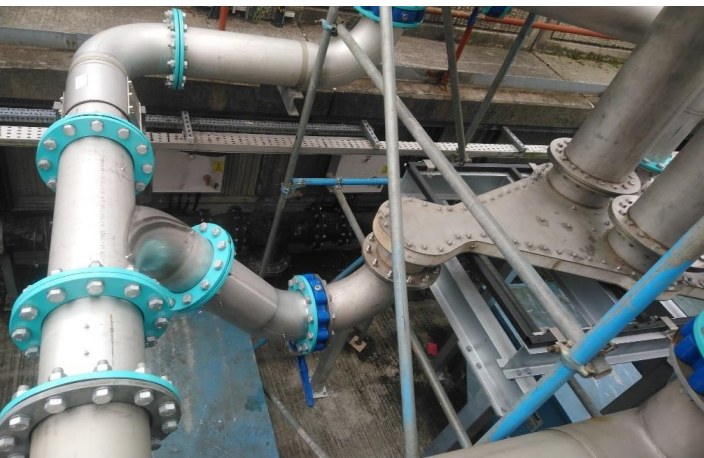
- Fully operational plant
- FTFT – 250 L/s
- DZFO installed between two basins to feed all 4 ASPs
- Normal operation ongoing

Oscillator Details

- DN250
- Materials of construction – acetal, stainless, EPDM (450kg)
- Capacity = 2,400m³/hr (inlet flow) = 1,460m³/hr @ 650mbar (discharge flow)

Mass Transfer - $\alpha k_L a$

- Mixed liquors
- 2400m³/hr (inlet flow)
- 90% increase in $\alpha k_L a$ (Control=2.36h⁻¹, Oscillator 4.48h⁻¹)
- 7.6% (50mBar) increase in P (P_{Control}=660mBar, P_{Oscillator}=710mBar)



Mass Transfer – Normal Operation

- Set points
- DO = 1.1mg/L (zone 2), 0.9mg/L (zone 3)
- Pressure = 660mBar
- Pre-installation (22 days)
 - Daily inlet flow = 44L/s
 - Daily blower power = 1443kW/day
- Post-installation (4 days)
 - Daily inlet flow = 80 L/s
 - Daily blower power = 1177kW/day

- **81% increase in inlet flow**
- **18% blower power reduction**

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