



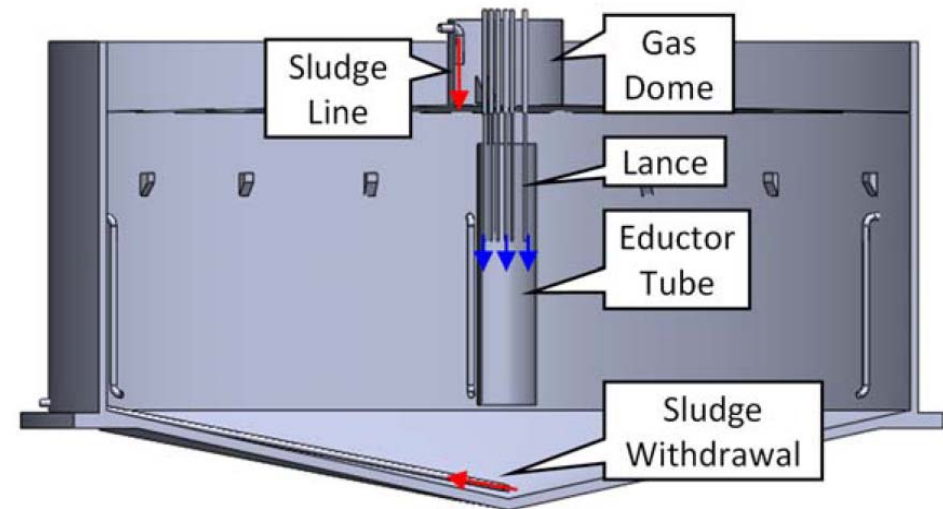
ETP Sludge Digestion Capacity Upgrade

Richard Lovett, Infrastructure Planning Team

29 August 2017

Eastern Treatment Plant

- ADWF: 350 ML/d (2.2m PE)
- PSTs, ASP, Tertiary Treatment
- PS (110 t/d), WAS (65 t/d) pre-thickened, fed to 8 no. MADs:
 - 7700 kL
 - Gas Mixed (>95% active)
 - 2.5%TS
 - 15d HRT @ 37°C
 - VSD ~55%
- Digested sludge to drying pans
- Biosolids stockpiled/opportunistic reuse (C2 T1)



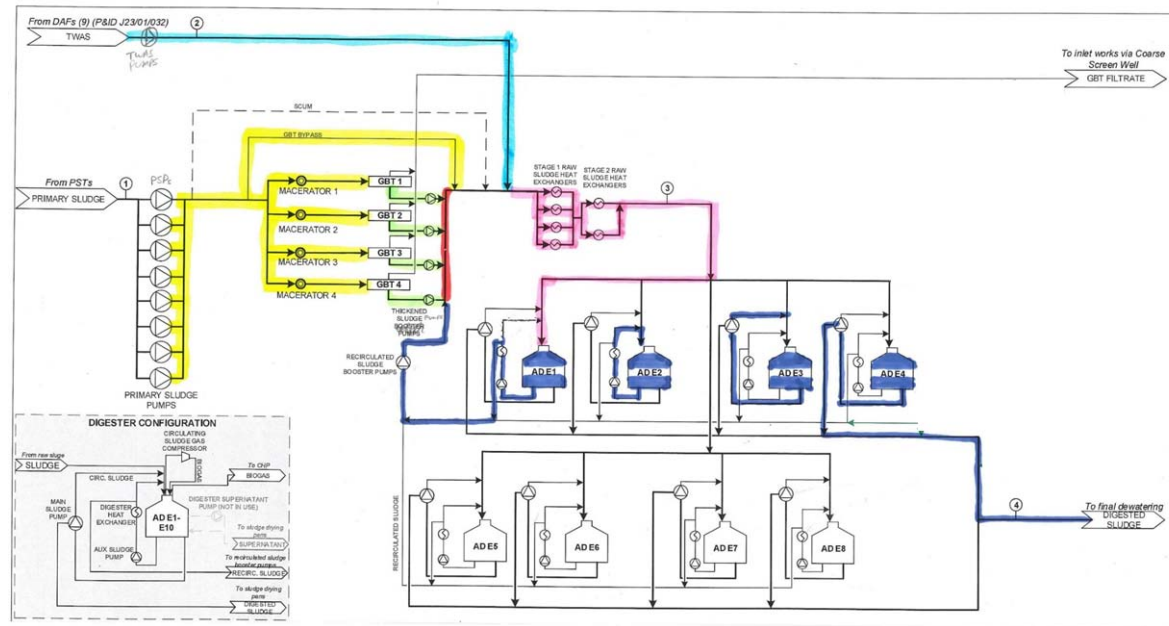
Option Selection: Process

- Context:
 - Digesters last upgraded 1995
 - Developments in digestion and pre-treatment
- Single/multi-phased digestion, pre-treatments, thickening
- Criteria:
 - Whole of Life Cost (NPC)
 - Operability, maintainability
 - Risks – safety, construction, process



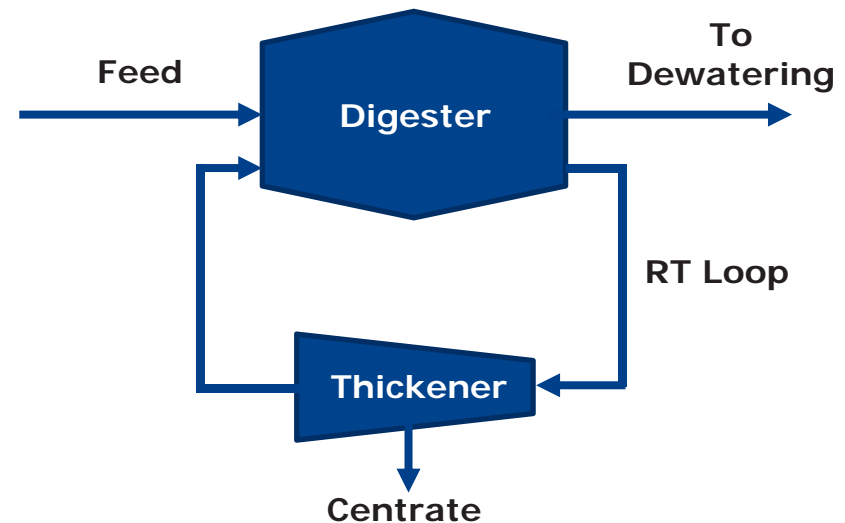
Option Selection: Site-Specific Factors

- T1 grade via stockpiling (3 yrs)
- Existing process complexity
- Asset age/condition
- Recalcitrant organics: UVT, ozone demand



Recuperative Thickening

- Benefits:
 - Superior NPV
 - Faster implementation, potential for staging
 - Operational flexibility, low process risk
- SRT decoupled from HRT (15d target)
- Extensively used at Sydney Water WWTPs
- Visits to: Liverpool, Warriewood, Melton, Mt Martha
- RDTs selected



Bench Scale Digestion Testing

- Site-specific sludge properties
- To improve understanding of:
 - RT (current upgrade)
 - THP (future option)
- Parameters:
 - Process performance: VSD, dewaterability, rheology
 - Risks: Odour (TVOSC), ozone demand

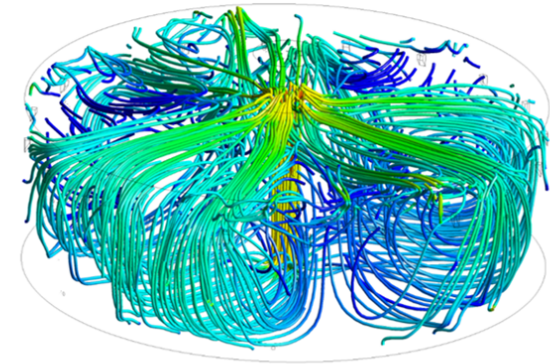
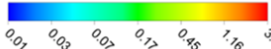


Chilling samples for air freight to Brisbane

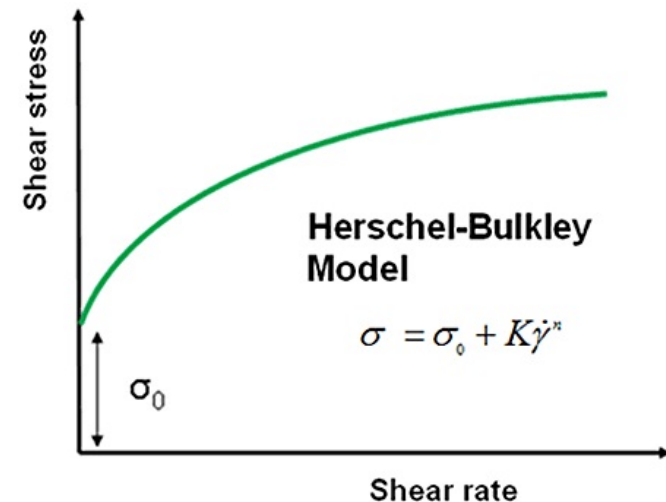
Equipment Limitations Assessment

- Implement RT to maximum extent feasible
- Digester sludge thickness increasing; limitations imposed by existing assets:
 - Pumping (“Fathom” network model)
 - Mixing (CFD modelling)
 - Heating
- Sewage sludge rheological testing:
 - Complex, non-Newtonian behaviour
 - Site-specific

sludge w tracer.Superficial Velocity
Streamline 1 [m s⁻¹]



With Gas Mixing On – 2.5% ds



Staged Implementation

	Stage 1	Stage 2
Design Thickness	3.5%	4.0%
Design Year	2027	2036
New Equipment	RDTs (6 no.)	RDTs (4 no.)
Upgraded Equipment		
• Pumping	Pump replacement/booster PS for withdrawal to SDPs	Pump upgrades for recirculation cycle
• Mixing	-	Digester 1-4 mixing upgrade
• Heat Exchangers	Digester HEX (3 no.)	Raw Sludge HEX (2 no.)

- Flexibility:
 - Stage 2 timing (performance, load growth)
 - Alternative technologies
 - Sidestream deammonification (centrate)

Conclusion

- Site-specific factors – process configuration, existing assets, sludge characteristics, capability
- Experimental testing and modelling to explore limitations
- Looking outward, learning from other utilities
- Challenging application of RT – integration complexity, pumping
- Staged approach – flexibility
- Thanks:
 - Colleagues at ETP
 - GHD, AWMC, CH2M, RCS
 - Sydney Water, Western Water, South East Water