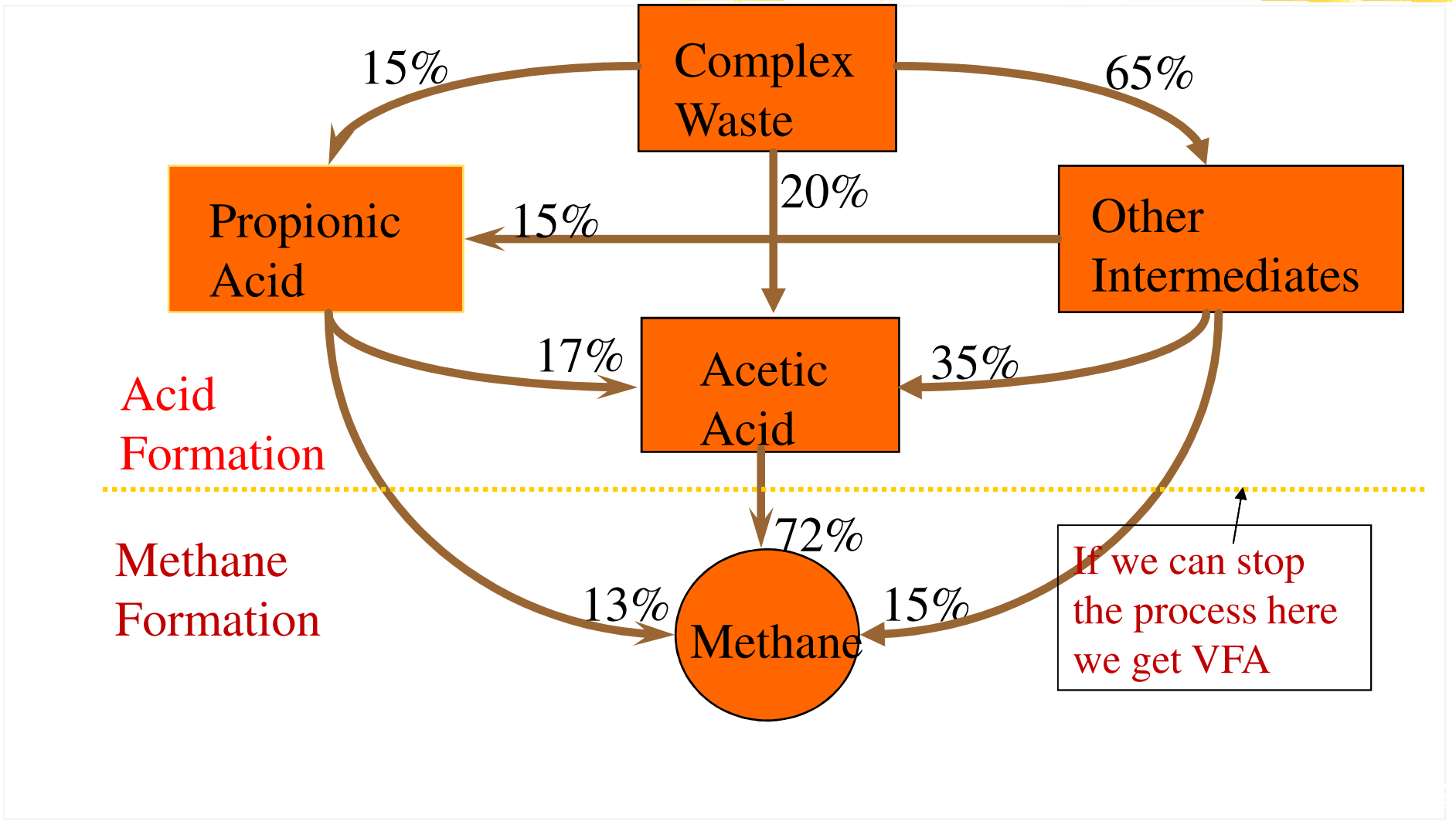
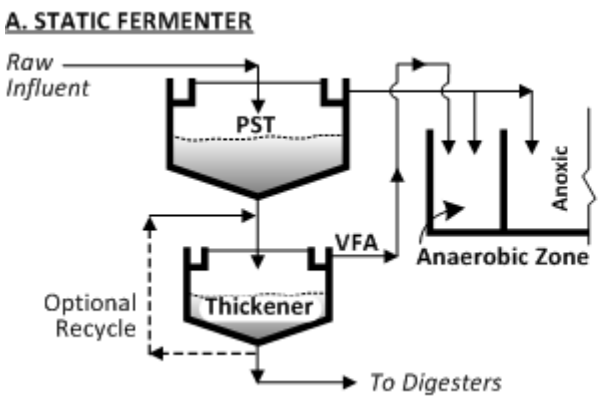
Fermentation processes to improve EBPR

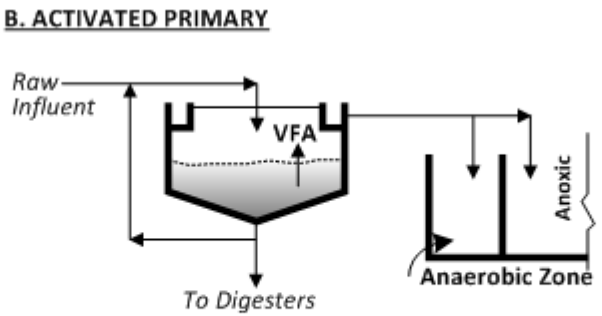
September 16, 2015

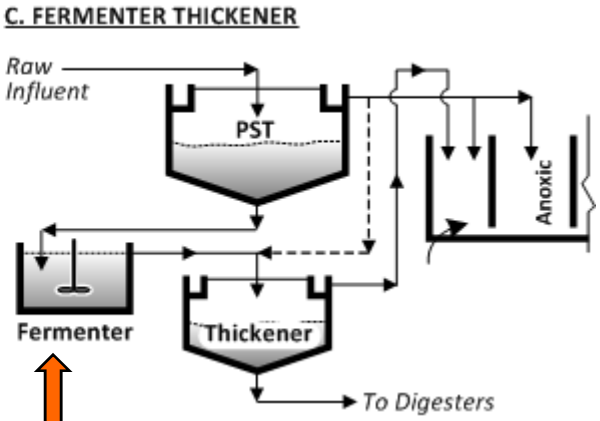
Volatile Fatty Acids Are Fermentation End Products – before slower growing Methane producers take over

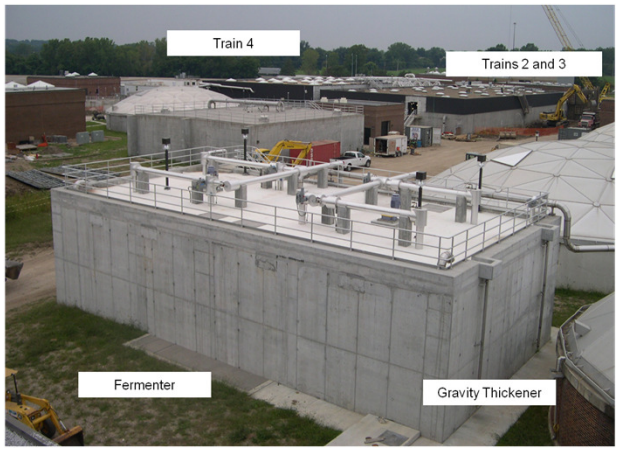


VFA from Fermenters



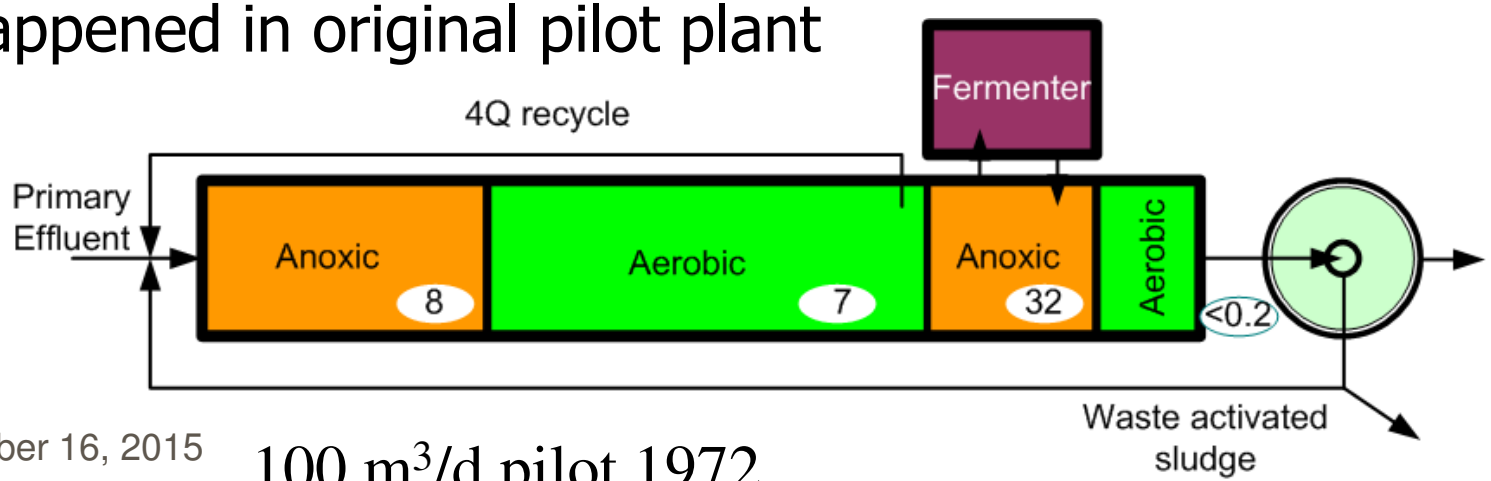






Mixed liquor recycle Fermenter (MLF)

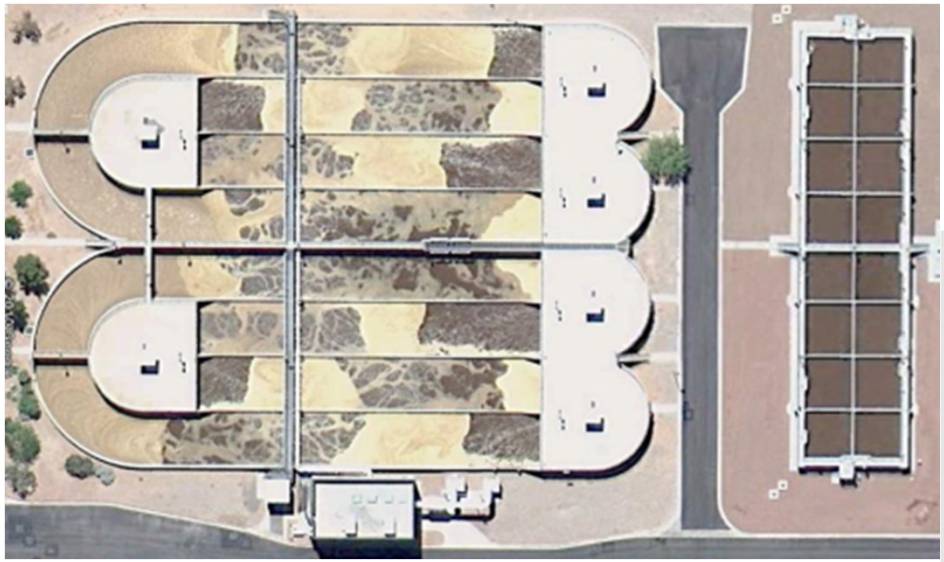
- From experience at a number of plants fermentation of some of the mixed liquor was successful in achieving BioP and reducing nitrates
- Mostly influent wastewater has very low VFA and even low rbCOD that could be fermented in the anaerobic zone
- Solution – ferment some of the mixed liquor as happened in original pilot plant

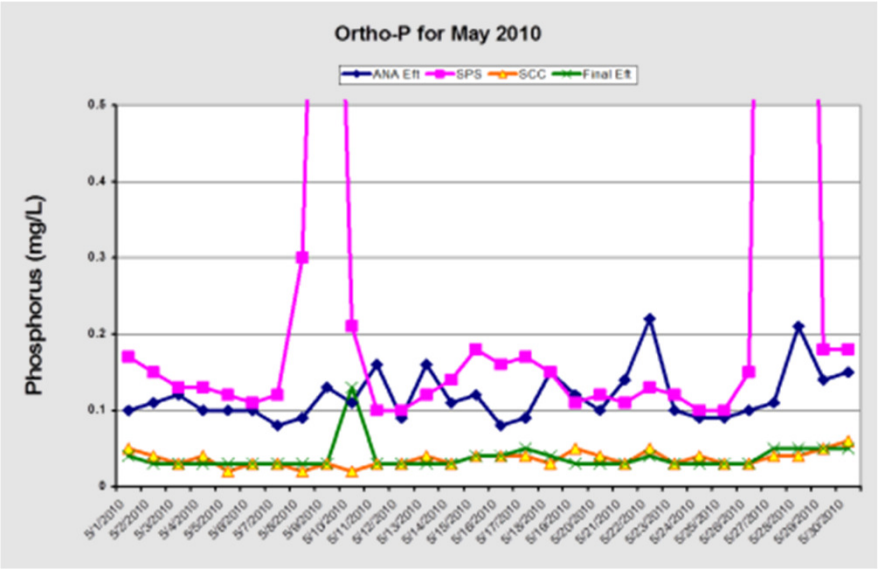


100 m^3/d pilot 1972

VFA from fermenting mixed liquor or RAS

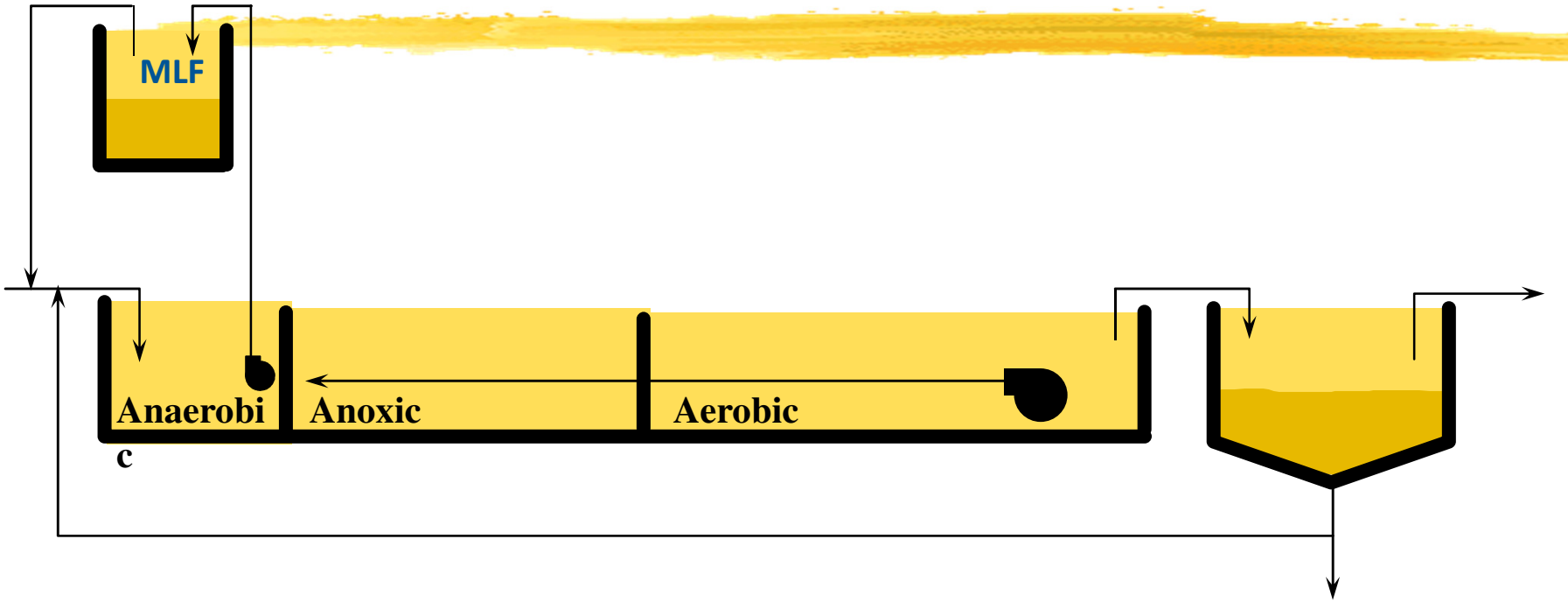
- Carousel retrofit to BNR
- Aeration added to channels
- 3 AN 3 AX zone added
- Nitrates added to sewers destroyed VFA
- Switched off mixer in one anaerobic zone

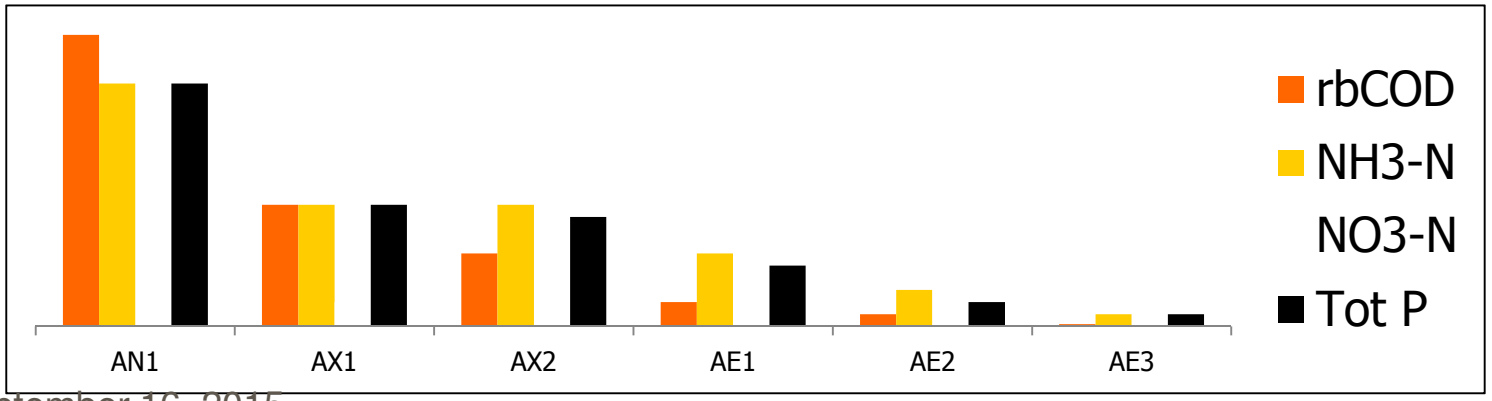




Mixed Liquor Fermentation

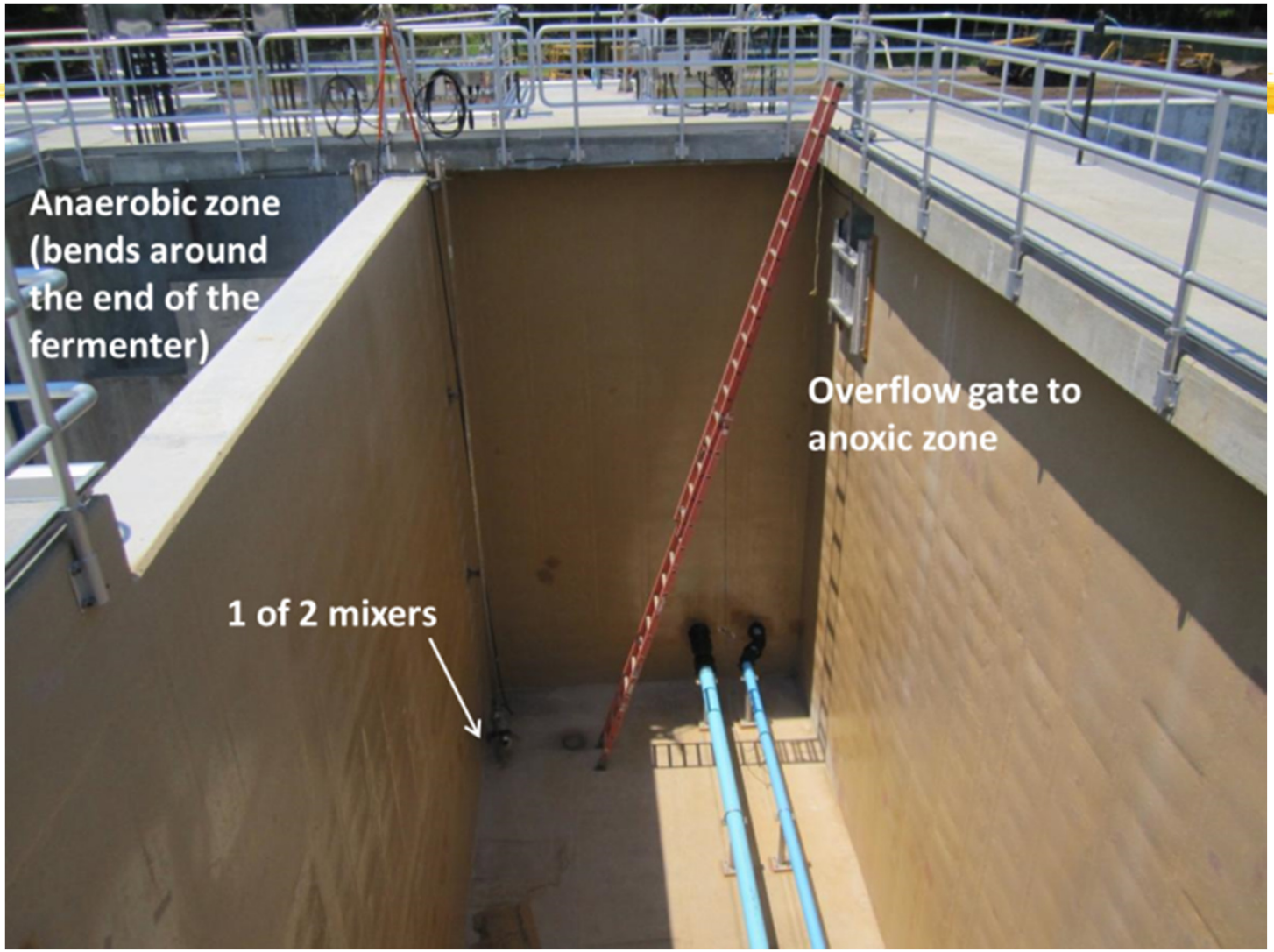
MLF Theory



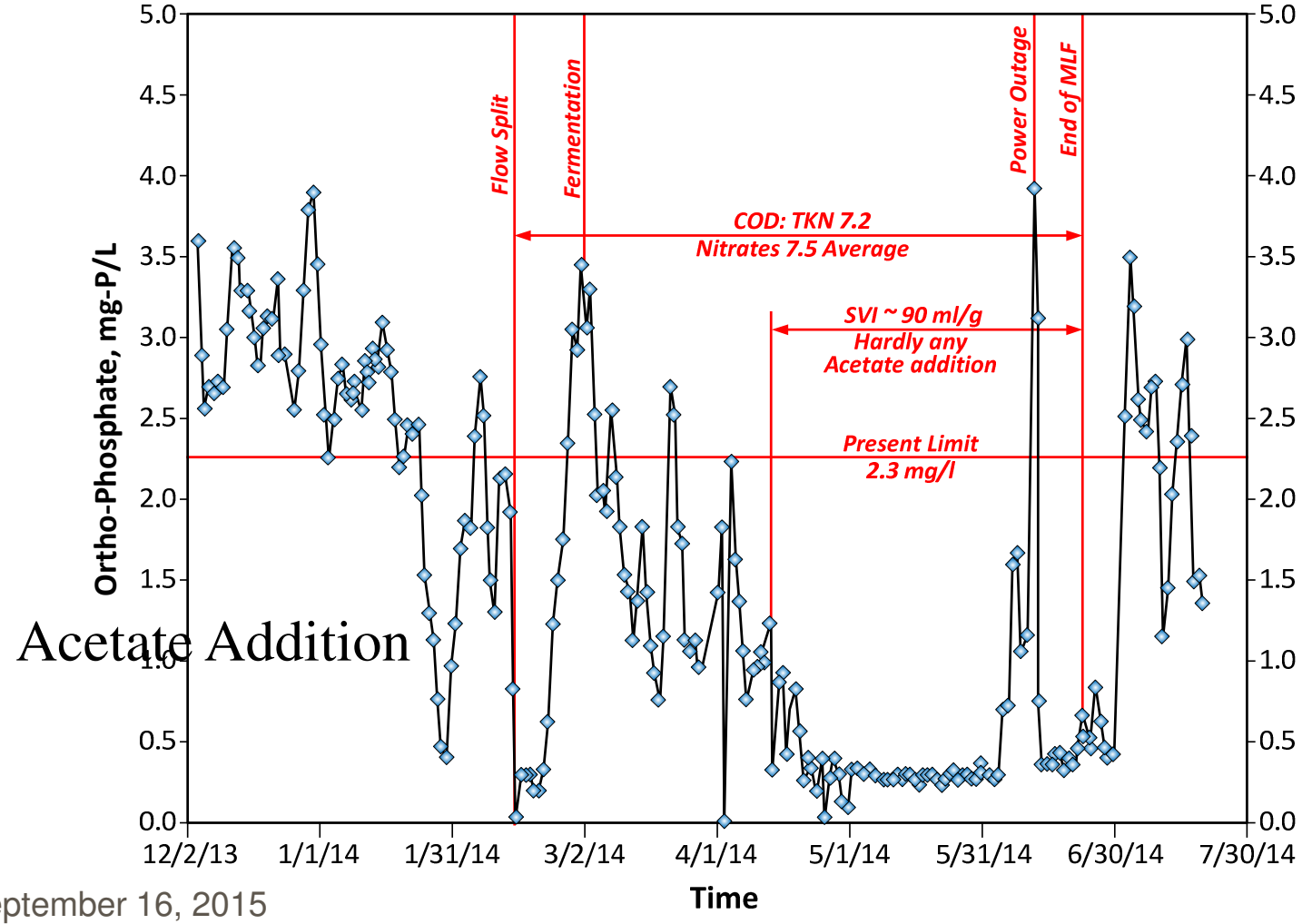


Mixed Liquor Fermentation

Olathe Cedar Creek Installation

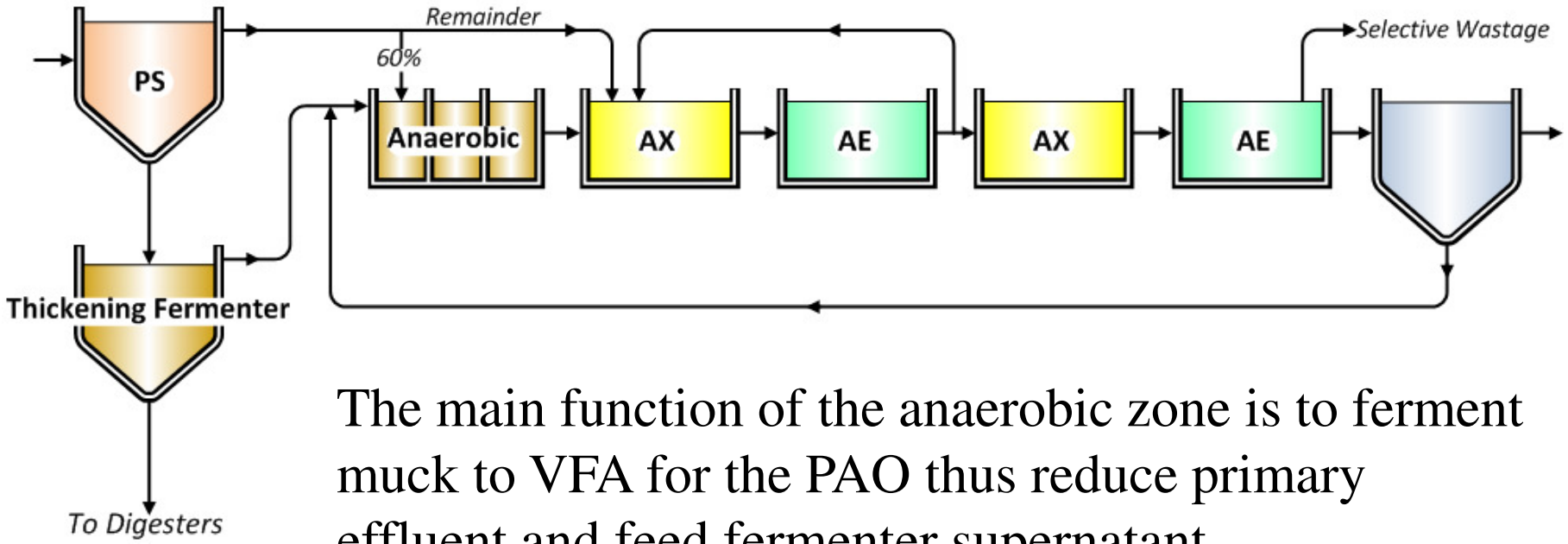


Results from Stage 2 pilot studies using MLF



Acetate Addition

Anaerobic zone as RAS Fermenter



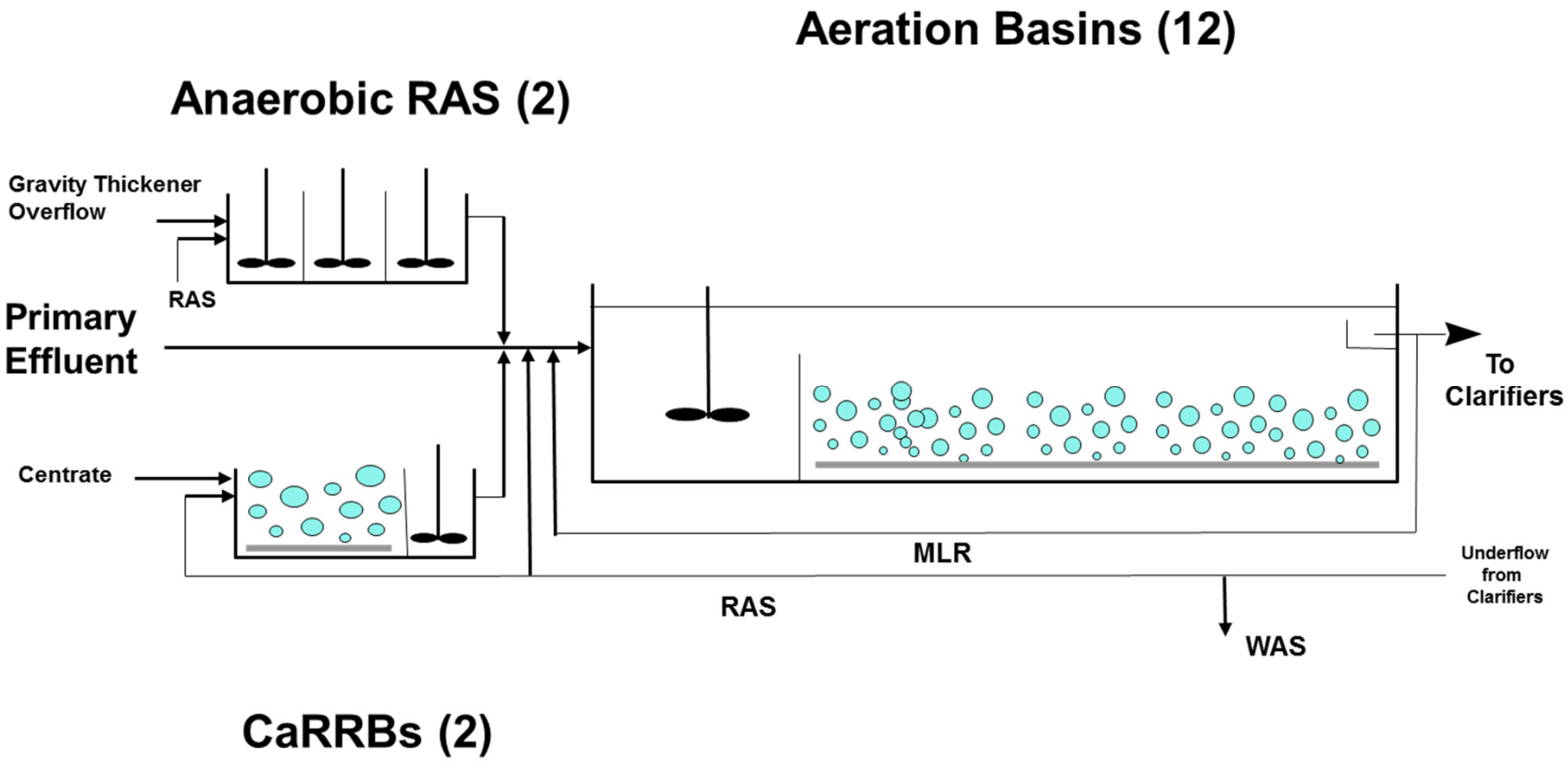
The main function of the anaerobic zone is to ferment muck to VFA for the PAO thus reduce primary effluent and feed fermenter supernatant.

It is possible that with RAS fermentation one selects for PAO such as *Tetrasphaera* as opposed to *Candidatus Accumulibacter phosphatis*

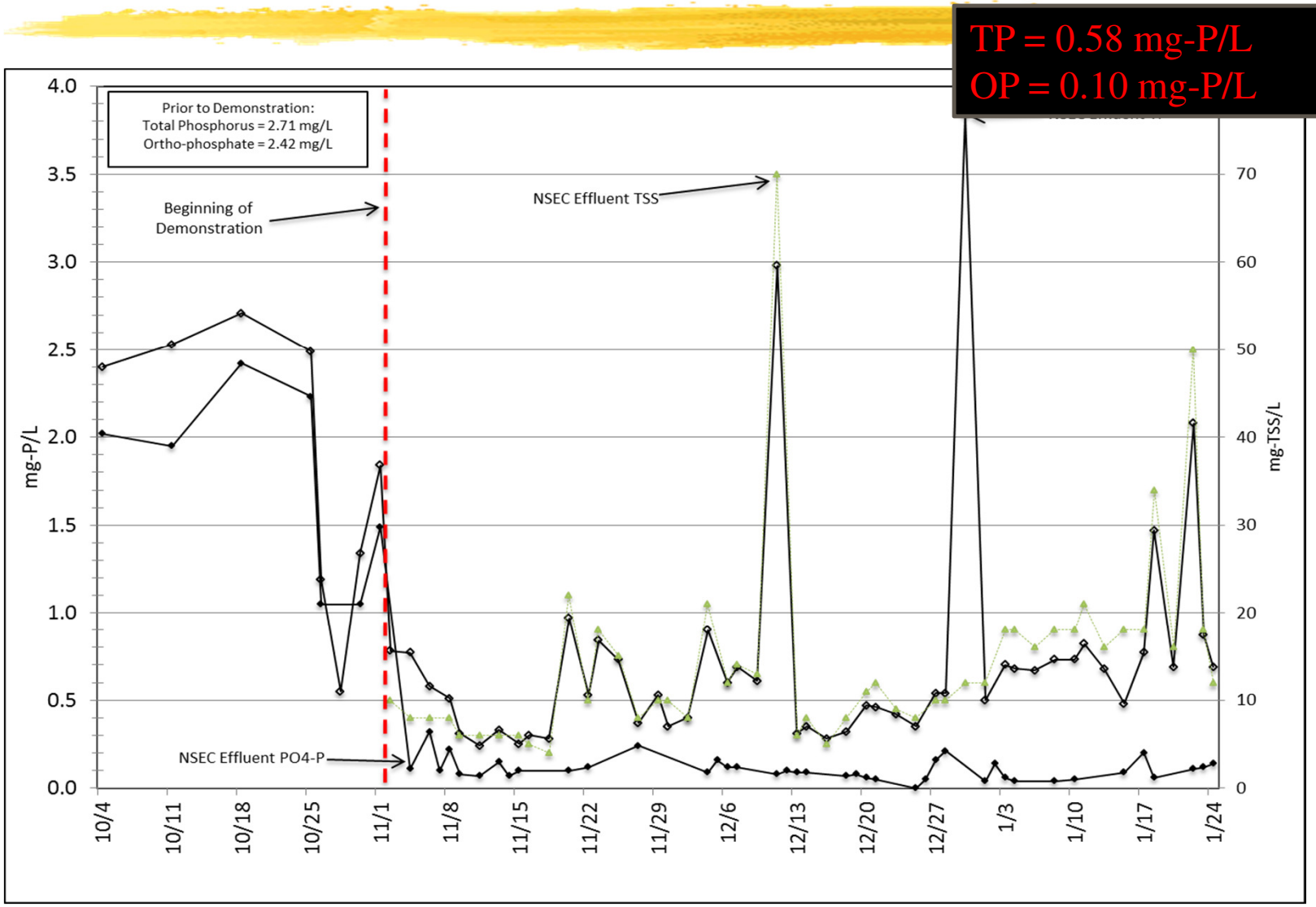
Conditions for unconventional P removal

- Pump a portion of the mixed liquor to an unstirred holding tank.
- Allow overflow back to anoxic or anaerobic zone
- Mix tank once or twice a day
- Cover tank if concern for odors
- Hold sludge in tank for 2 days
- Check on the ORP – best at -300 mV

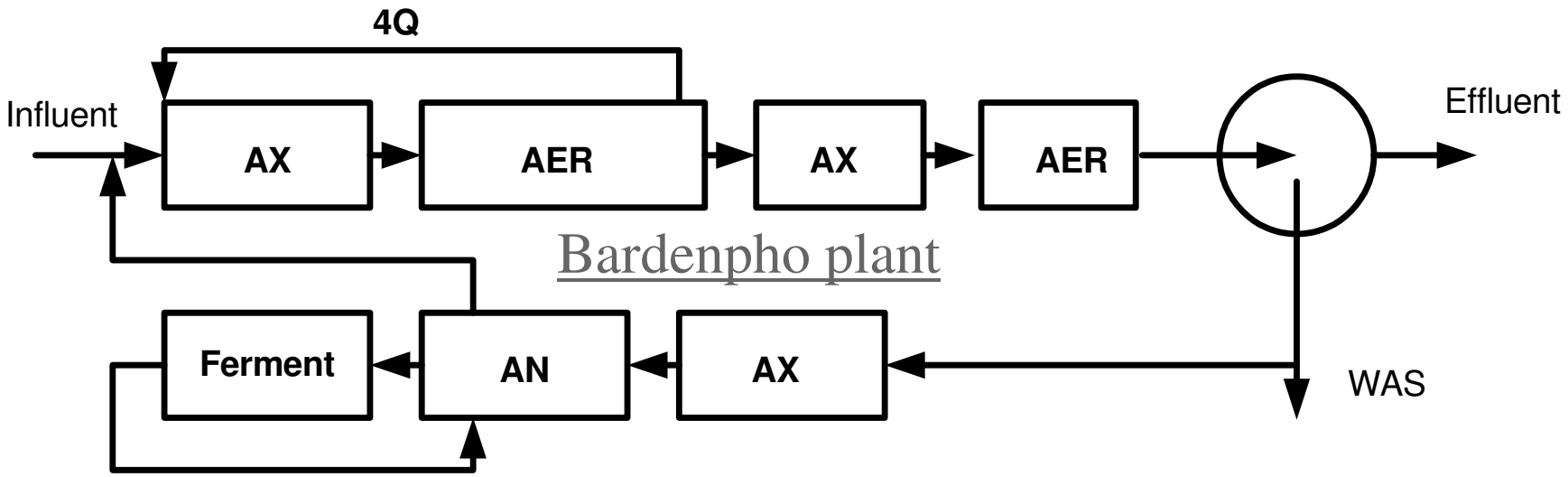
Process Schematic (Alternative)



Denver Metro Experiment
Effluent Phosphorus Concentrations

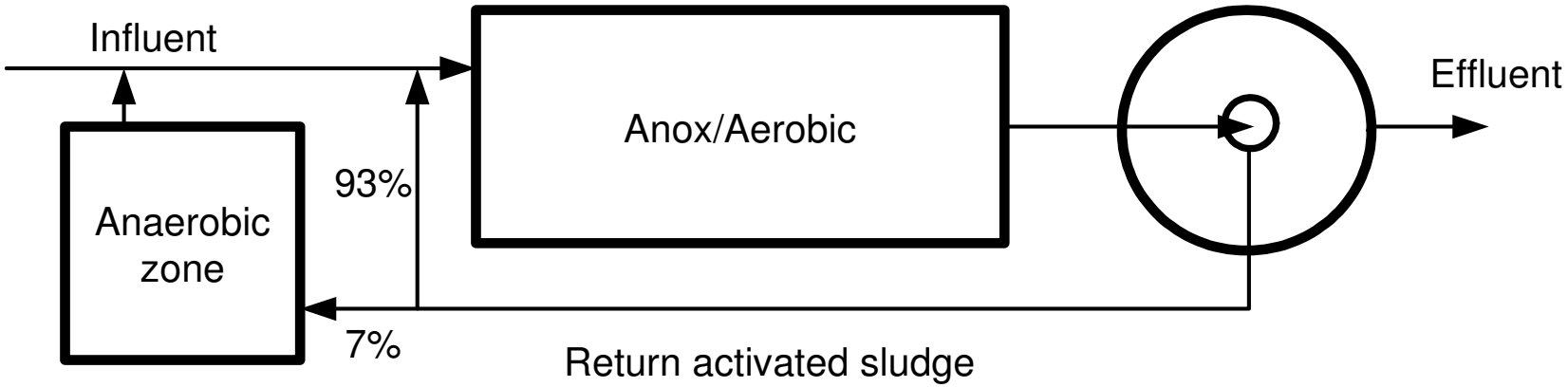


Configuration used by Stroud et al



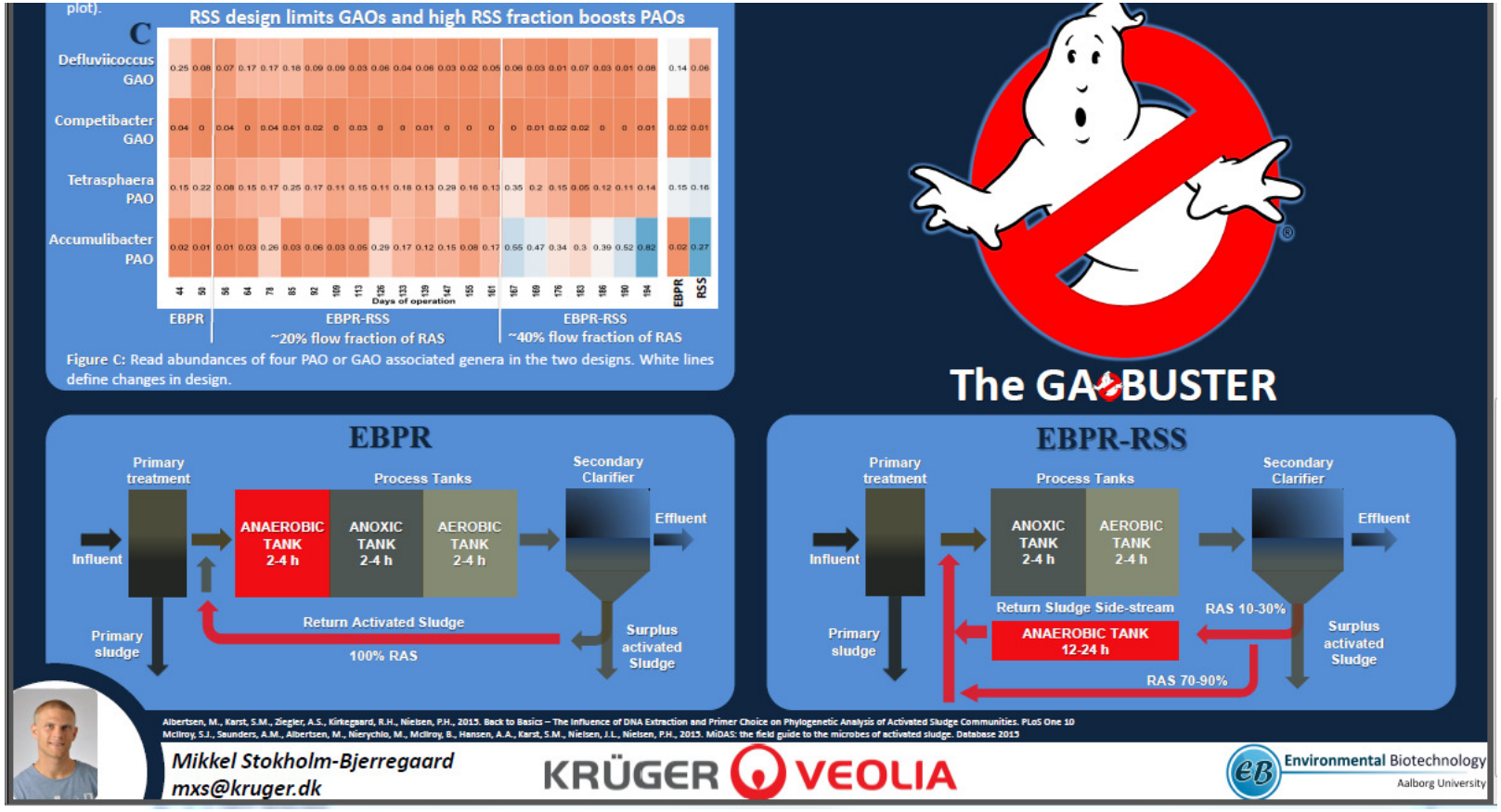
RAS Fermentation

Configuration used by Vollertsen for BPR

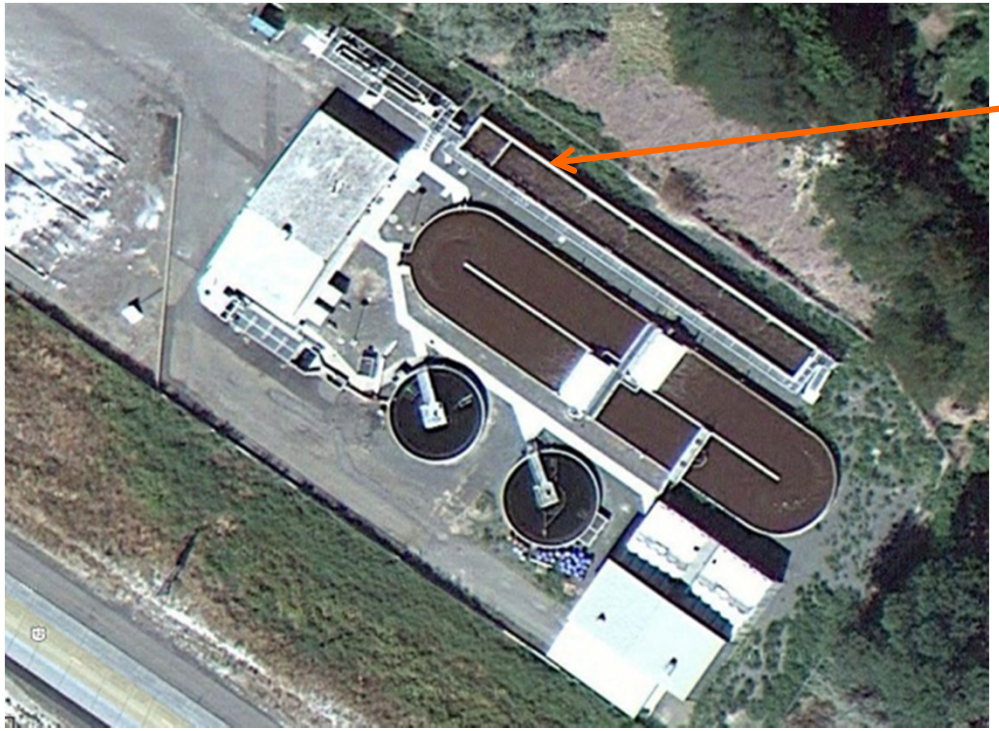


The main reactor consisted of channel systems for SND. 7% of the RAS was passed to a sidestream anaerobic zone with long retention. Note that VFA in the feed was lost for enhancing phosphorus removal

From Poster at Prague Conference



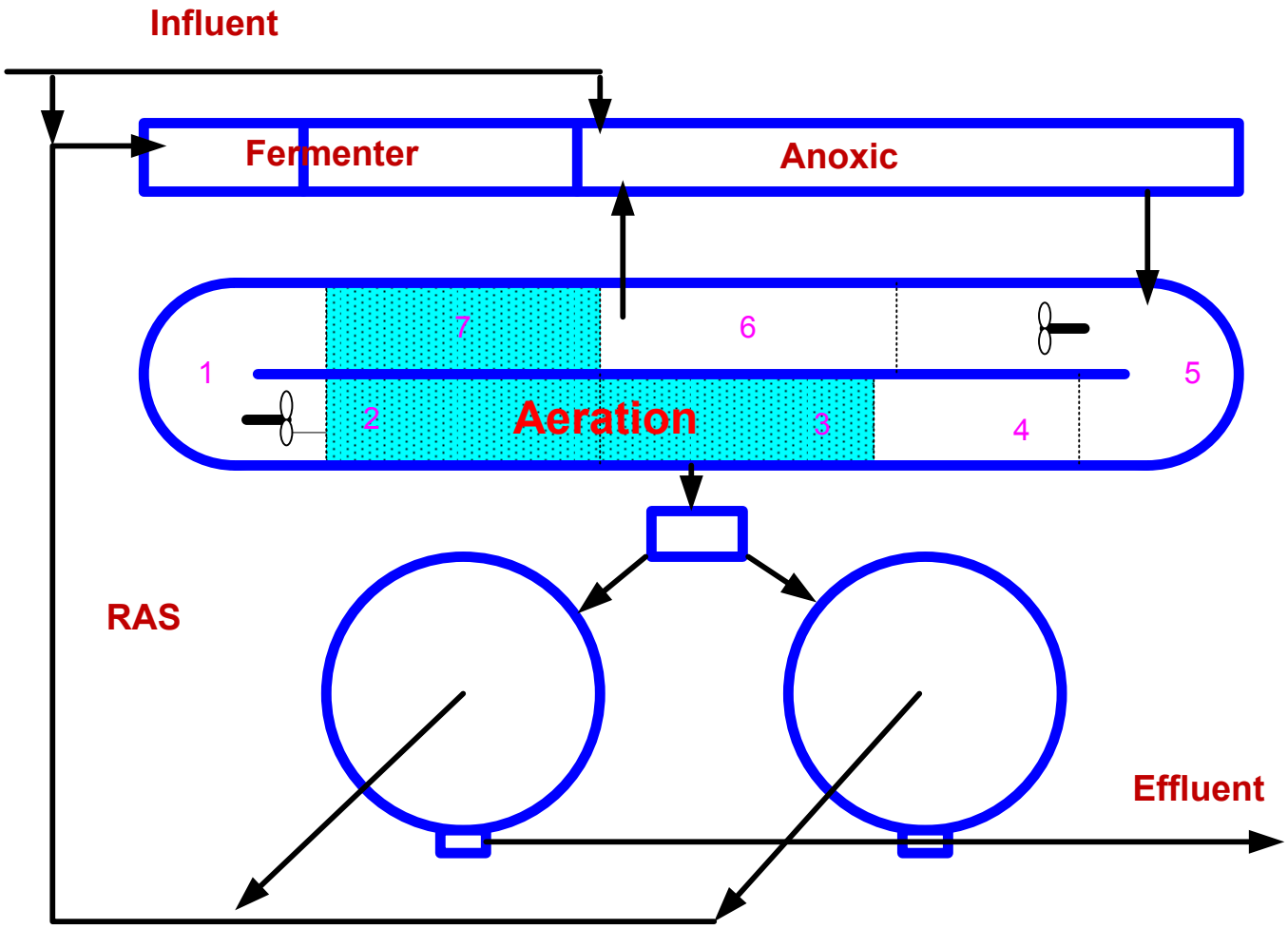
Apply to Zillah



Minimal change

- Switch off air at front end
- Only switch on shortly for mixing

More reliable



Questions ?