

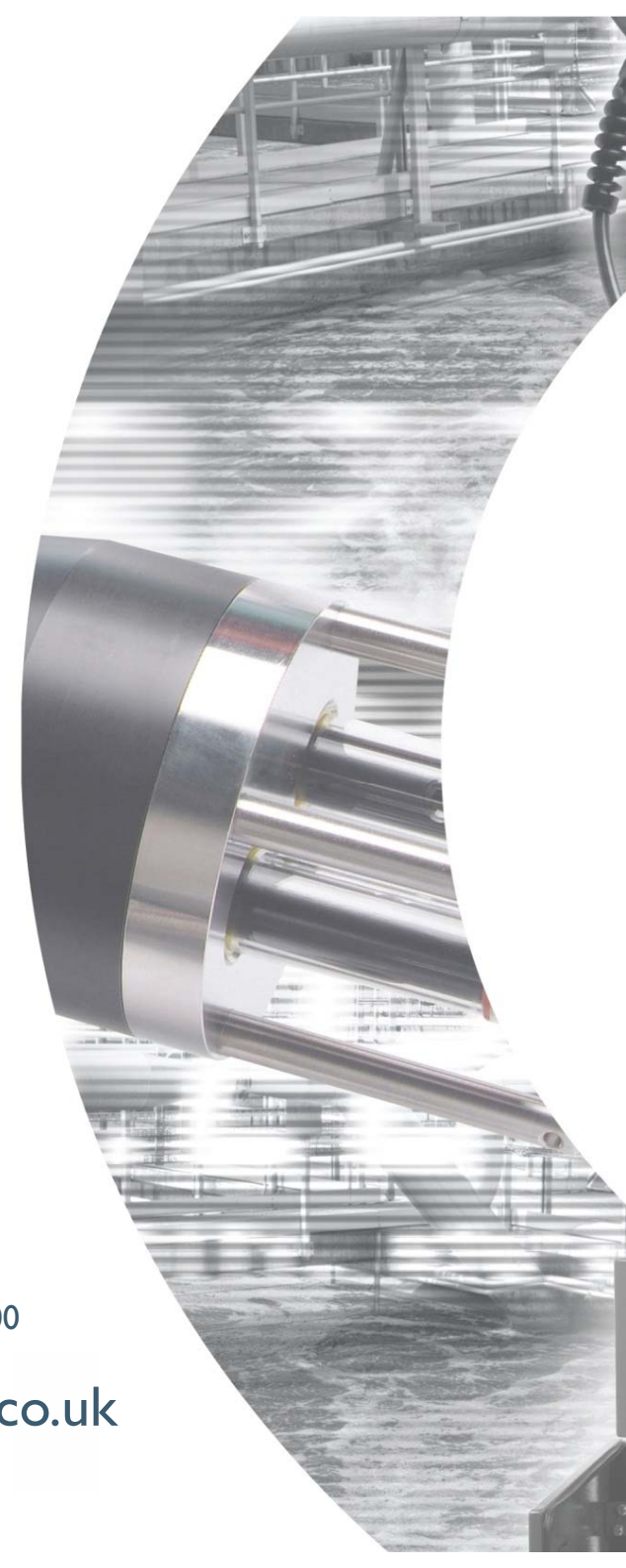
Activated Sludge Plant Control

Application & Product Data

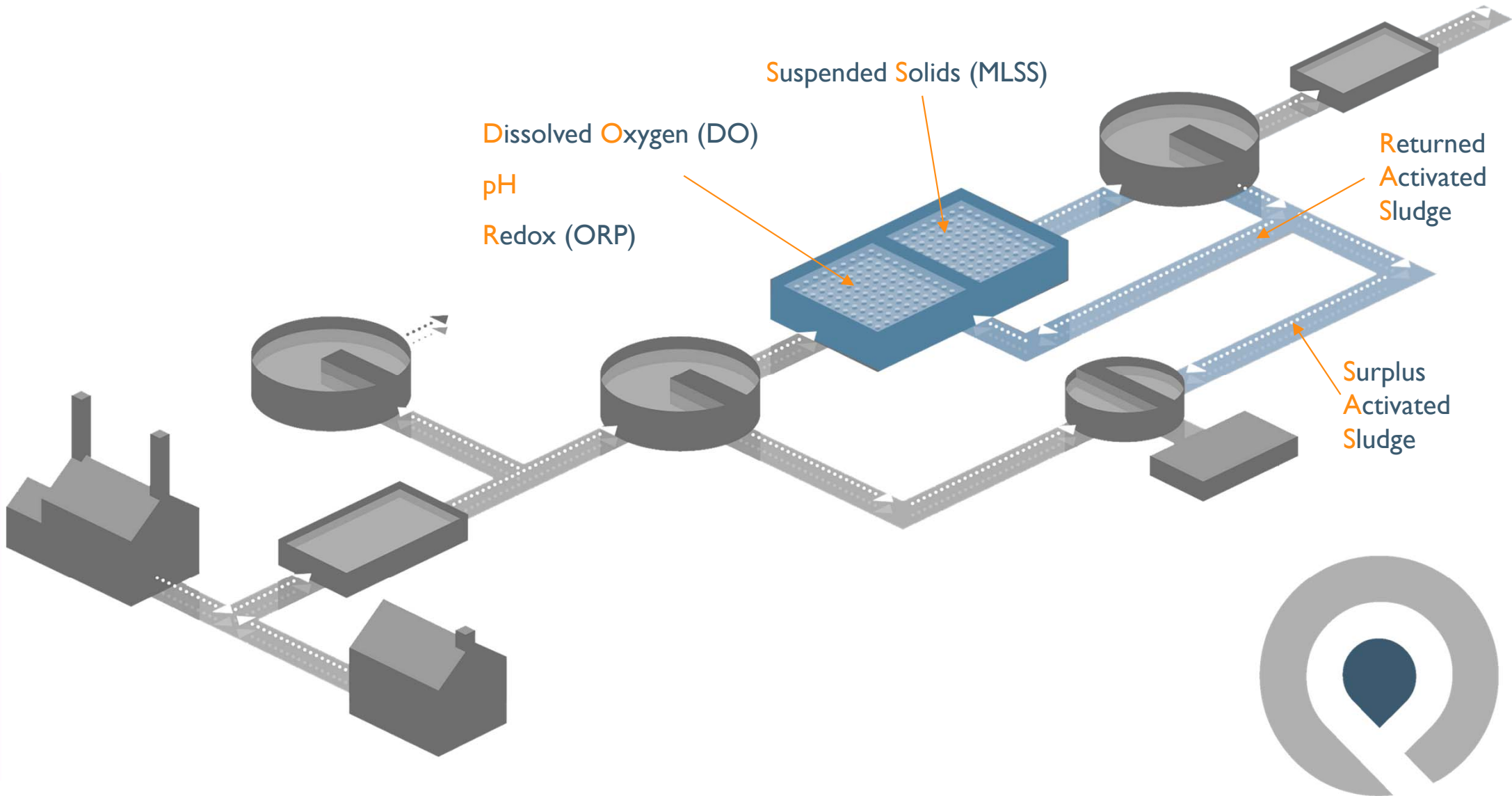


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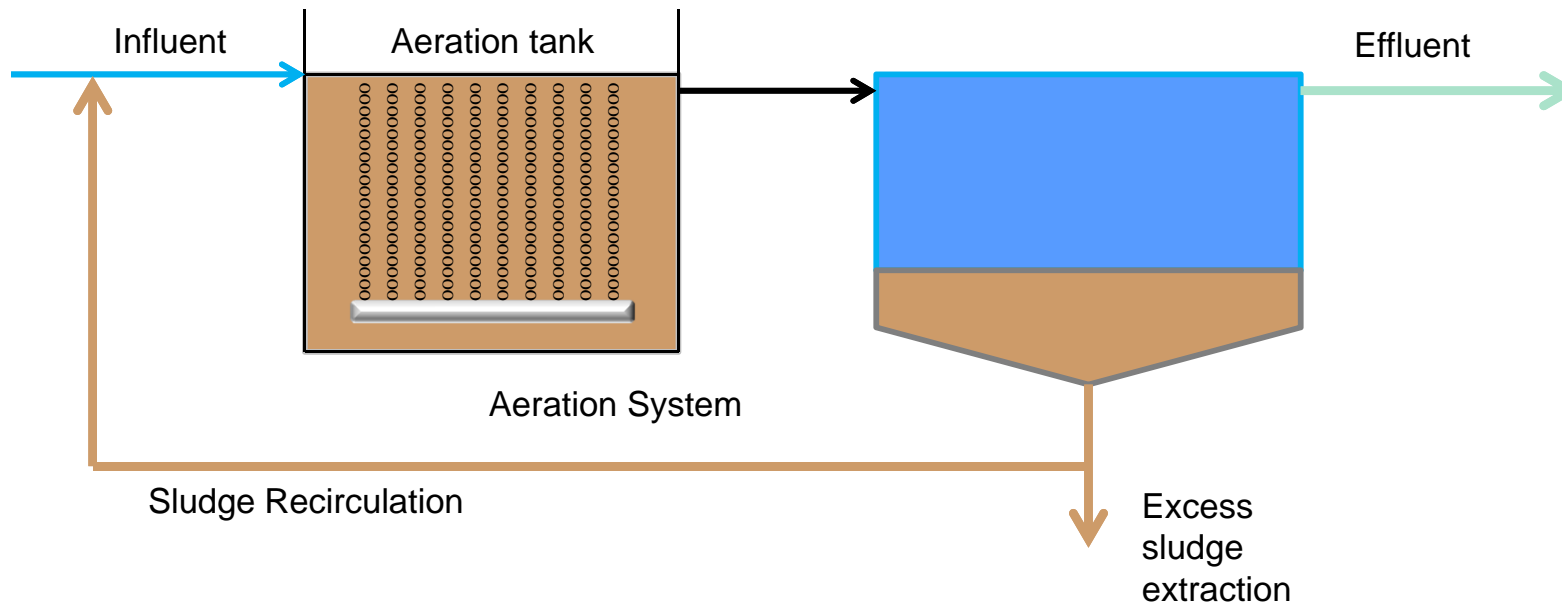
www.partech.co.uk



Typical Treatment Plant



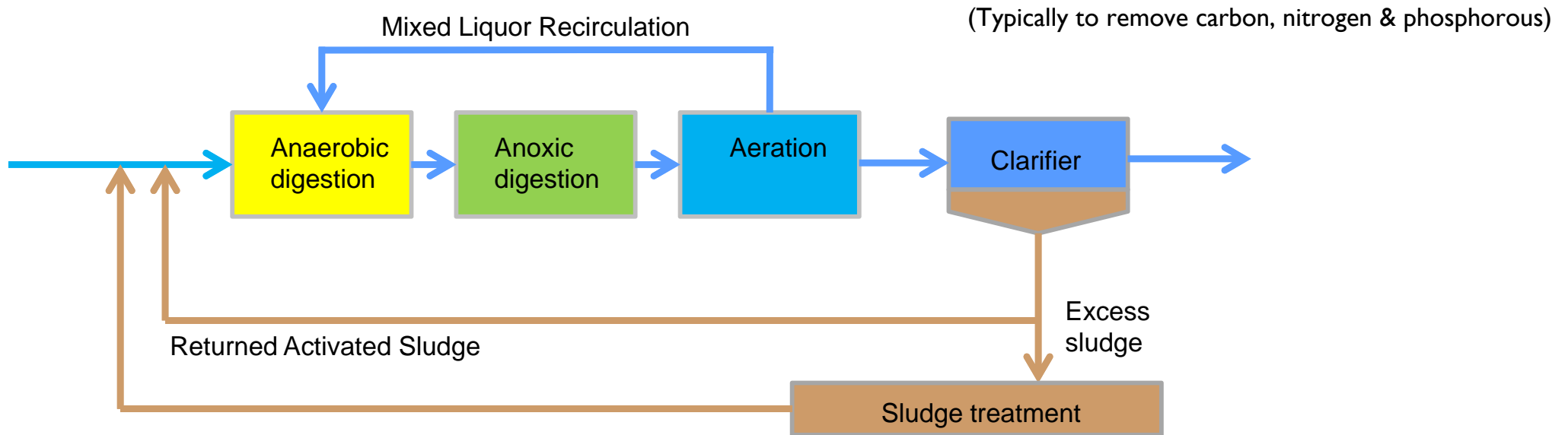
Simplified Diagram of an Activated Sludge System (ASP)



- Activated sludge is a biochemical process for treating sewage and industrial wastewater that uses air (or oxygen) and microorganisms to biologically oxidize organic pollutants, producing a waste sludge (or floc) containing the oxidized material
- Atmospheric air or pure oxygen is bubbled through primary treated sewage (or industrial wastewater) and combined with organisms to develop a biological floc which reduces the organic content of the sewage
- The combination of raw sewage and biological mass is commonly known as Mixed Liquor.



Schematic Diagram of a Complete Plant



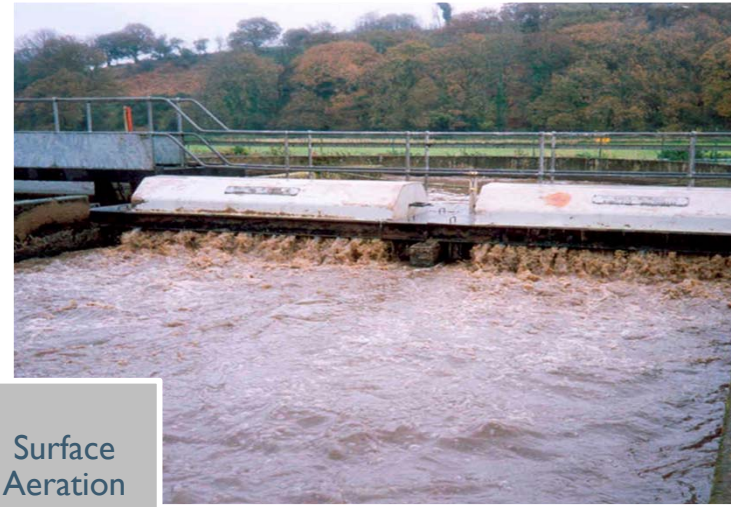
- Anoxic & Aeration configuration is appropriate for Carbon and Nitrogen treatment. Aeration for Carbon only treatment.
- In all activated sludge plants, once the sewage (or industrial wastewater) has received sufficient treatment, excess mixed liquor is discharged into settling tanks and the treated supernatant is run off to undergo further treatment before discharge.
- Part of the settled material, the sludge (RAS), is returned to the head of the aeration system to re-seed the new sewage entering the tank.
- Mixed Liquor is a mixture of raw or settled wastewater and activated sludge within an aeration tank in the activated sludge process
- Mixed Liquor Suspended Solids (MLSS) is the concentration of suspended solids in the mixed liquor, usually expressed in milligrams per litre (mg/l), often referred to as SS or TSS.



Aeration Process



Fine Bubble
Aeration



Surface
Aeration



Circular
Surface
Aerator



Packaged Treatment Plant



Packaged treatment plant have the same requirements for sensors.



Why Measure Dissolved Oxygen?

Air is forced into the aeration basins, it increases the activity of the micro organisms and helps keep the organic waste thoroughly mixed.

Dissolved Oxygen is added to the aeration basin to enhance the oxidation process by providing oxygen to aerobic micro organisms so they can turn organic waste into inorganic by products.

Micro organisms must have at least 0.1 to 0.3mg/l DO. Plants maintain the DO to 2 mg/l. If the DO is less than 2mg/l the bugs in the centre of the floc may die as the bugs on the outside of the floc use up the DO first. If this happens the floc breaks up.

When the DO comes too high it waste energy. The aeration process takes between 30-60% of the total electrical power in a WwTW. Automated aeration process using DO according to the USEPA may reduce energy costs by 50%.

Also adds benefit of mixing, bring the bugs, oxygen and nutrient together. This keeps the floc suspended and prevents it from settling.



Ensure Success – Pick your Location



Platform over aeration process



Inaccessible probes



Surface aeration

Find

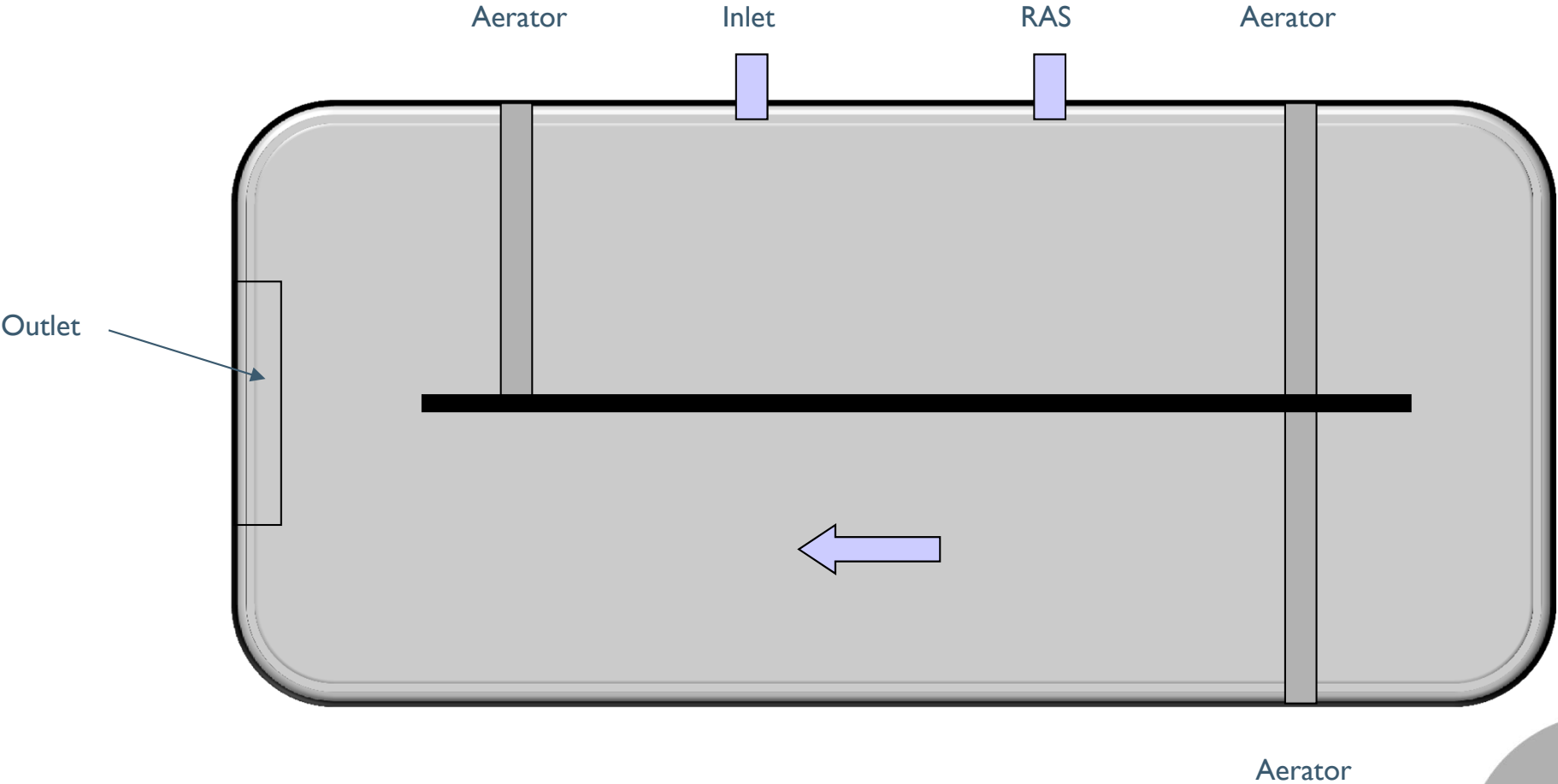
- Representative sample point of the process
- Well mixed sample
- Safe to reach sensors

Avoid

- Dead Zone
- Extreme Turbulence
- Area next to Aerator
- Hazardous access to sensor
- Reaching over handrails



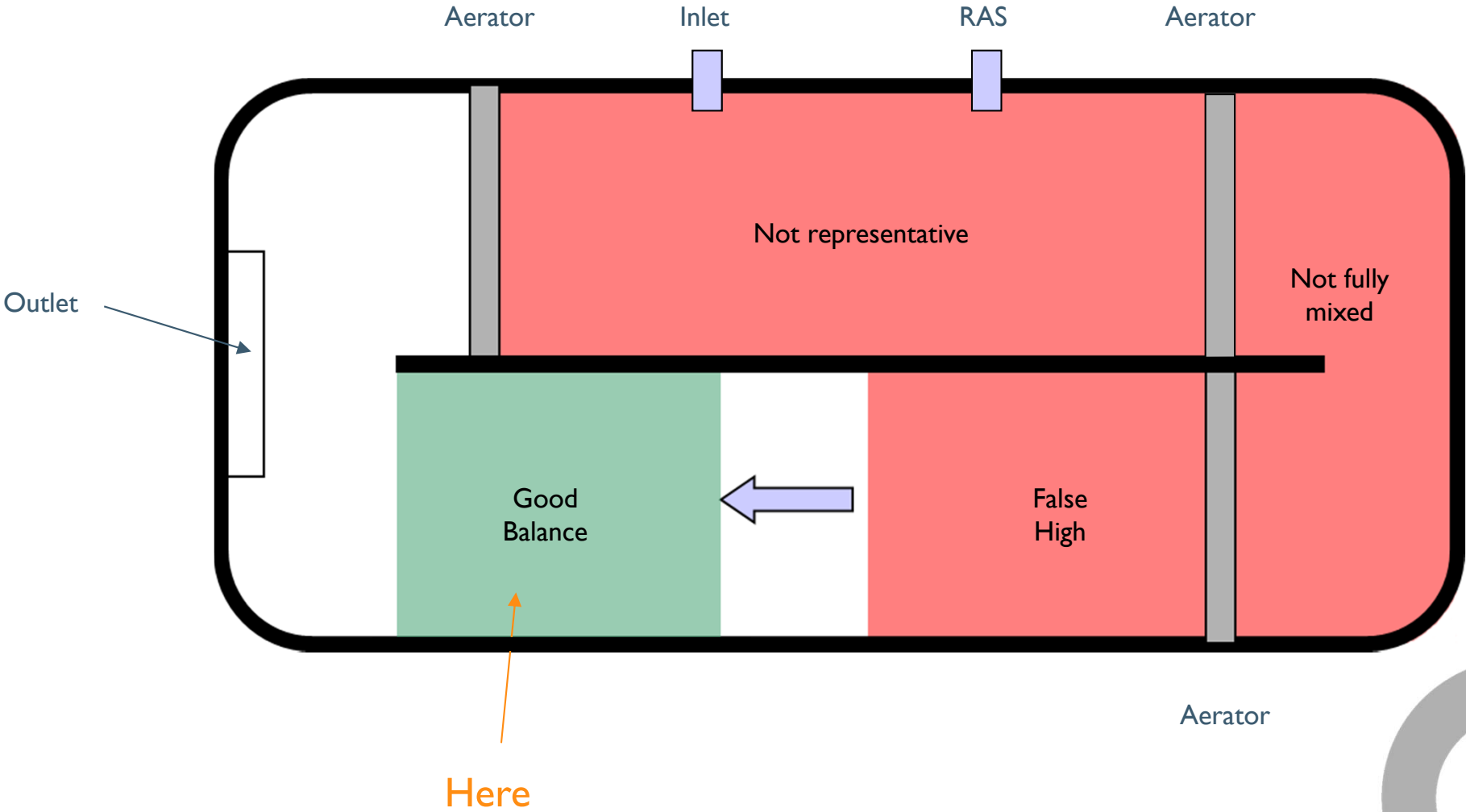
Oxidation Ditch



Where should the DO sensor go?



Oxidation Ditch



Why Measure Suspended Solids

Mixed Liquor Suspended Solids

- Mixed Liquor is a mixture of raw or settled wastewater and activated sludge contained in an aeration basin. Standard control band 1,000 to 4,000 mg/l. membrane batch reactor CMBR control 6-8k

If MLSS is too high

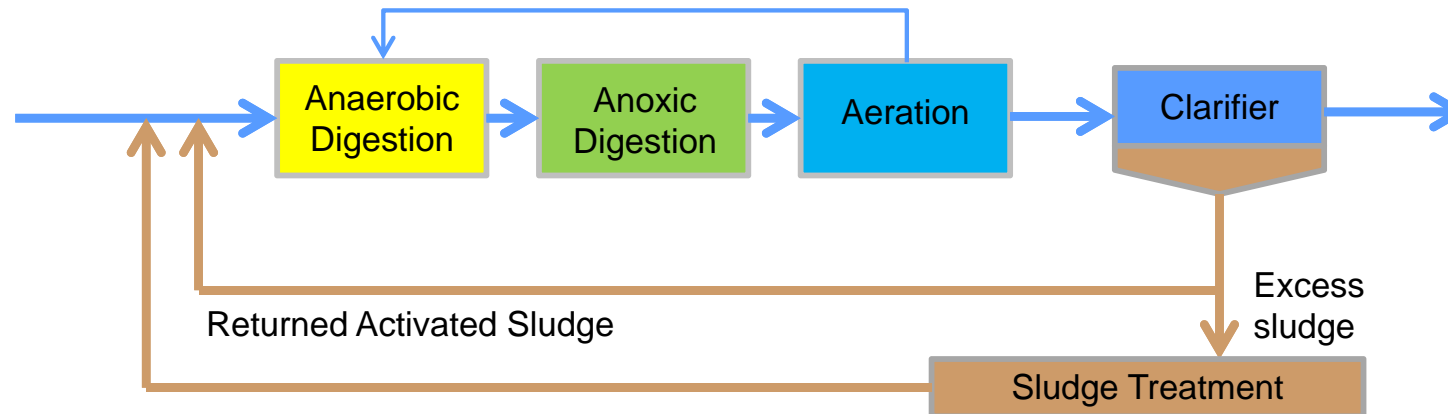
- The process is prone to bulking and treatment system becomes overloaded.
- Causes DO content to drop off with the effect that organic matters are not fully degraded and biological 'die off'.
- Excessive aeration wastes electricity.

If MLSS is too low

- The process will not operate efficiently and waste energy.
- The biological active 'bugs' are being lost and the system may need expensive re-seeding.



R.A.S & S.A.S



- A proportion of the floc is called Return Activated Sludge (R.A.S.) and is used to re-seed the process.
- Measuring the solids concentration of RAS allows the return volume to be adjusted to keep the solids level in the aeration basin within the control parameters
- Excess sludge which eventually accumulates beyond that returned is defined as Surplus or Waste Activated Sludge (SAS/WAS)
- This is removed from the treatment process to keep the ratio of biomass to food supplied (sewage or wastewater) in balance
- Typical Range
 - 4,000 to 6,000 mg/l



Measurement Options

Laboratory Tests

- Sample sent away
- Results not known until at least 24hrs after the event
- Sample degrades in transit

Site Settling Jars/Handheld Meter

- Very operator dependent
- Takes 30 minutes

Portable Monitor

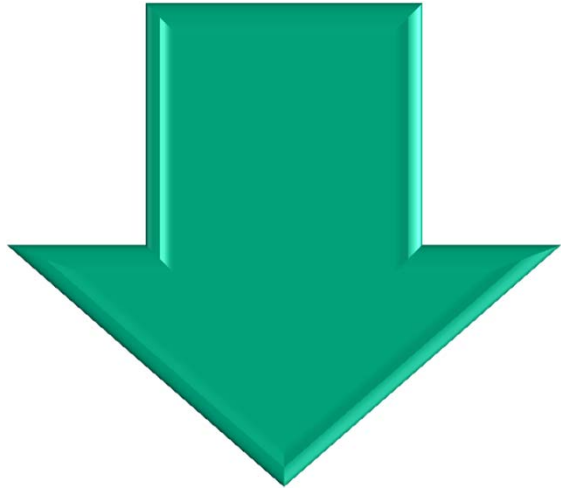
- Calibration can be made to same standard as fixed installation systems
- Available when operator is on site, manual adjustment possible

Fixed Installation Monitor

- 24/7 Monitoring
- Automated control possible

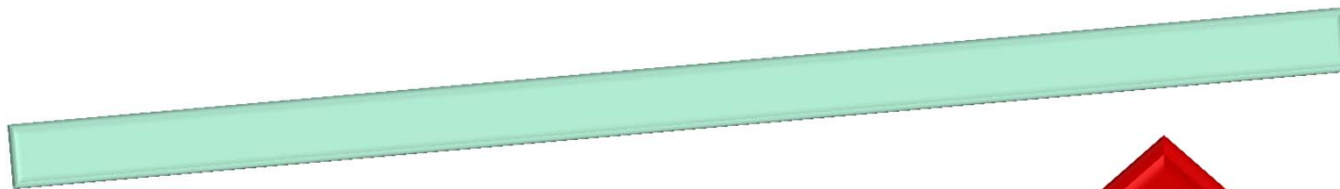


Benefits of Online Monitoring



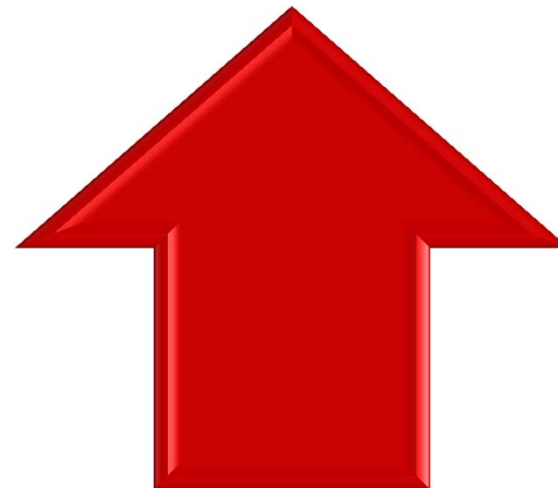
Pro's

- Continuous In-Line Monitoring reduces the need for time-consuming laboratory analysis
- Removes operator dependency from the measurement
- Real-time monitoring provides more accurate process control
- Improves plant efficiency by providing stability and continuity to the treatment process



Con's

- Capital costs
- Whole life costs



Products



Partech's Portable Products



Portable Suspended Solids

740 Monitor with Soli-Tech 10 Sensor



Portable Dissolved Oxygen

Handy Polaris



Portable Suspended Solids – 740 Monitor

- The Soli-Tech 10 Sensor uses
 - Infrared Light Attenuation
 - Wavelength = 880 nm
- The sensor has two ranges that are automatically selected by the 740 Monitor
- Wide application range
 - from 20-100 to 0-20,000 mg/l
- User selectable units
 - Can measure in FTU, mg/l g/l, ppm, %SS or your own defined units
- Multiple site setups
 - Uses pre-set profiles to suit application
 - Upto 10 different setups on one system



Supplementary Features

- Rechargeable battery
- Carry Bag included
- Protective Case includes hand strap for security
- Language Options
 - Currently Italian
 - French planned



Portable Dissolved Oxygen – Handy Polaris

- Galvanic Sensor
 - Self Polarising and Temperature Compensated
- No warm up time, short response time
 - 90% of end value in less than 20 seconds
- Automatic Calibration and self check
- 1400 hours from one 9V alkaline battery
 - Approximately 2 years with 1 hour use per day
- Large easy to read graphical LCD display



7300w² Monitor/Controller



Multiple Sensors

- 1 or 2 into the base unit
- Upto 8 using expansion boxes
- Any w² sensor is compatible with the monitor



Graphic Display with trending

- Easy to configure
- Multiple language ability



Flexible control and monitoring options

- Profibus output – anticipated late 2011
- Triple Validation option
- Dosing control and datalogging available on request



Sensors – Dissolved Oxygen



OxyTechw² RDO-X

- Dissolved Oxygen & Temperature Sensor
- Optical Luminescent Technology
- Applications
 - Activated Sludge Control
- Fast Response, Long Cap Life, Abrasion Resistant



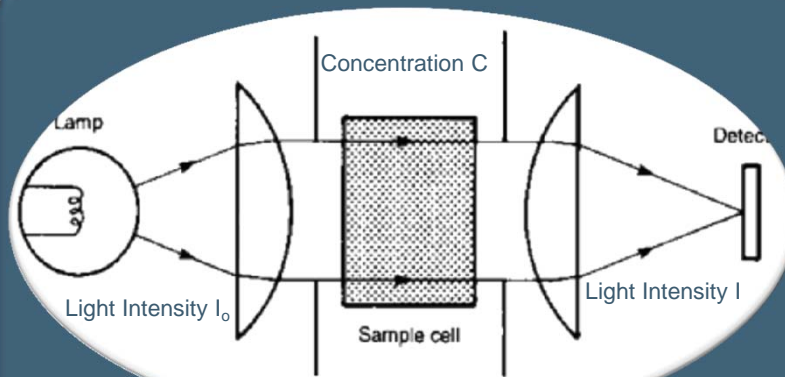
OxyTechw² GAL

- Dissolved Oxygen
- Galvanic principle.
- Applications.
 - Activated Sludge Control
- Exceptional resistance to damage. Long term stability of 3 years without need for sensor replacement or membrane replacement

Fast response – Minimal Maintenance



Sensors –Suspended Solids



TurbiTechw² LA

- Light Attenuation Principle.
- 860nm Wavelength
- Designed for use in the Aeration system of an activated sludge plant.
- Sensor can also measure Returned Activated Sludge (R.A.S), Surplus Activated Sludge (S.A.S)



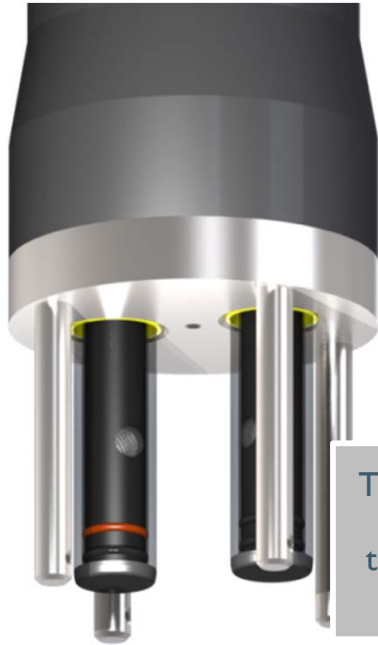
TurbiTechw² LA

- Large optical surface & sample volume ensures tolerant of fouling.
- Deposits of fats and grease on the sensor area do not prevent the sensors from measuring unlike smaller optical surfaces.
- Self Cleaning mechanism. Initiated by monitor at user determined frequency.
- Cleaning process only takes 90 seconds

Rugged & Robust sensor designed for the application



Fit for Purpose!



LA Light Attenuation optics



The cleaning action is thorough & effective



Designed for the application



DO Cleaning – no compressor, no wipers



Summary

Lower blower usage
– reduce energy

Reduce wear on plant
- Less maintenance.

Correct application of
instrumentation to
control ASP will:

Improve response to
process changes

Remove operator error
from process adjustment



What Good ASP Measurement can Achieve!

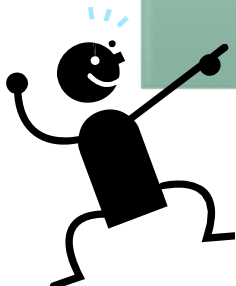


Done well

- Reduce energy usage
- Increase plant life
 - Blowers and Aerators working less
- Better Effluent Quality
- Improved Sludge Control
- Warning of process problems

Done Poorly

- Poor Effluent Quality
- Drain on ICA resources
 - Repairs
 - Calibration
- Wasted Energy
 - Over Aeration
- Bulking of Sludge
- False alarms



Happy Site
Manager





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