What next at Ynysarwed?

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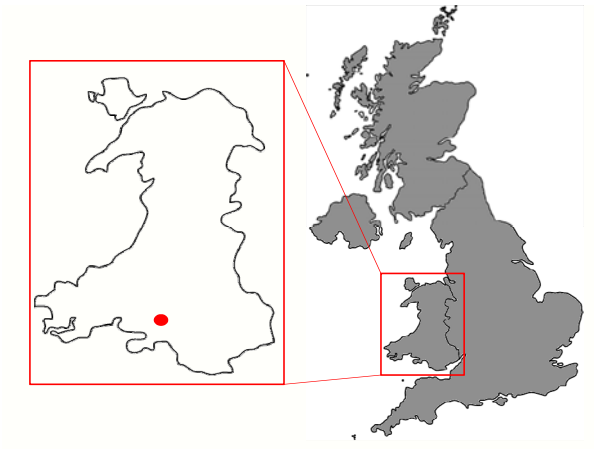


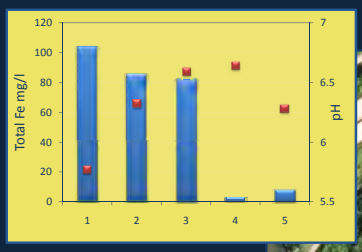
Summer 1994

- Peak flow 36 l/s
- 400mg/l Fe(II)
- pH 3.5 after oxidation
- 12km of nearby canal affected
- Active treatment plant installed
- Constructed wetlands for final polishing
- Fe(II) levels predicted to be 30mg/l in 10yrs

Summer 2010

- Active treatment plant closed
- Dosing with alkali and flocculent
- Reed beds nearly full
- Fe(II) ~100mg/l
- What to do next?

Current system performance



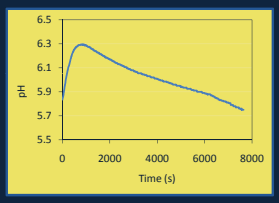
Is the water still net acidic?

Net acidity = Total permanent acidity – Total alkalinity

- Cold titrations
- Hot peroxide titration
- Aeration and degassing

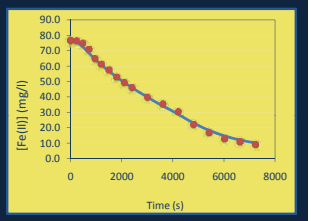
pH change on aeration

- Initial rise due to CO_2 degassing
- Oxidation reaction then lowers pH
- Final pH lower than initial pH
- Hot peroxide titration = net acid



Oxidation rate at Ynysarwed

- K = order of magnitude higher than expected
- Microbial contribution?
- Autocatalysis by HFO below pH 7?



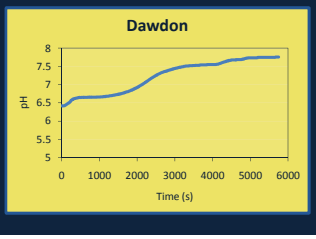
$$\frac{d[Fe(II)]}{dt} = K[Fe(II)][O_2][OH^-]^2$$

Active treatment still needed?

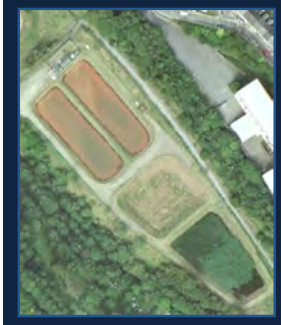
- Aeration/degassing brings Fe(II) within discharge consent
- Sludge recirculation to further increase oxidation rate
- Residence time in reed beds sufficient to settle all particulates

Aeration as a diagnostic tool

- Characteristic shape for net acid waters
- Simple first step in assessing a new discharge
- No need for titration



Example: 6 Bells



- 0.36 Tonne/day H_2O_2 (35%)
- pH > 8 in 15 minutes
- No need for peroxide

Implications for treatment

- Greatly reduced need for chemical dosing
- Reduced residence time requirement
- Cost saving on chemicals and land
- Health and safety benefits
- Reduced site traffic