DE BORTOLI WINES

Re-Engineering a Wastewater Treatment System:

A Case Study

De Bortoli Wines, NSW

Dr Simon Lott
Principal Engineer
E.A. Systems Pty Ltd

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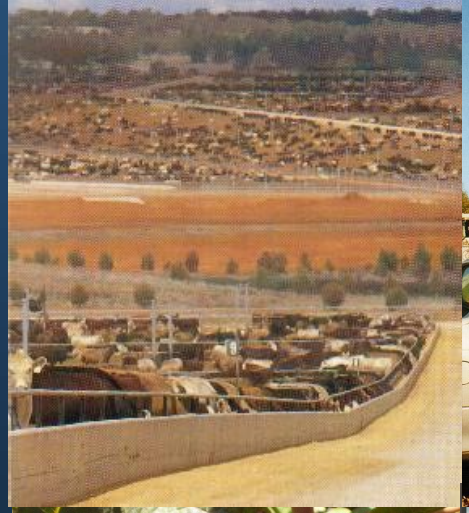
E.A. Systems ?

- Agriculture
- Energy (Renewable)
- Government
- Intensive Livestock
- Junior Mines and Quarries
- Food and Fibre Processing
- Water
- Land Re / Development



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Partnering You

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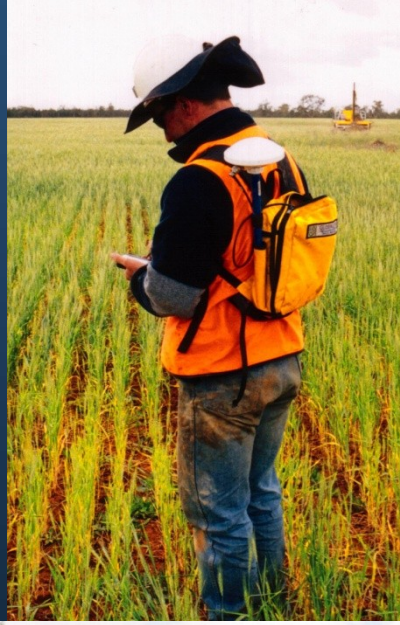
What Do We Do ?

- Scientific Investigation and Analysis for:
  - Contaminated Lands;
  - Agricultural systems (intensive / extensive);
  - Environmental Assessments;
  - Energy and mining sector;
  - Government policy development;
- Approvals
- Engineering design (Civil, Env)
- EPA Licensing - monitoring and reporting
- Project Management
- Integrated Systems Development, and Auditing (ISO 9000 thru to 14000)



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Introduction

- Winery wastewater treatment systems vary from
  - the most simple; eg direct discharge to sewer,
  - to complex, capital and labour intensive systems.
- Re-engineering the de Bortoli Winery at Bilbul, NSW
  - production improvements, and,
  - environmental benefit for.
- Aims for presentation is to discuss the engineering principles applied:
  - Within the winery
  - In the treatment system upgrade

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Cleaner Production

- Waste Minimisation / Cleaner Production Principles
  - Recycle
  - Reuse
  - Reduce
- ‘End of pipe’ rehabilitation requires friendly by products (ie cleaning agents ?).
- Winery cleaning agents and ph correction - caustic soda commonly used.
- Sodium
  - Soluble
  - Note remove in treatment process
  - Adds to salinity
  - Impacts on land well documented
  - Not a plant nutrient.
- Land disposal / utilisation of waste water – sodium application is a key constraint
- Offset the impacts of sodium = effective leaching and shandying = clean water.
- Avoid sodium based cleaners

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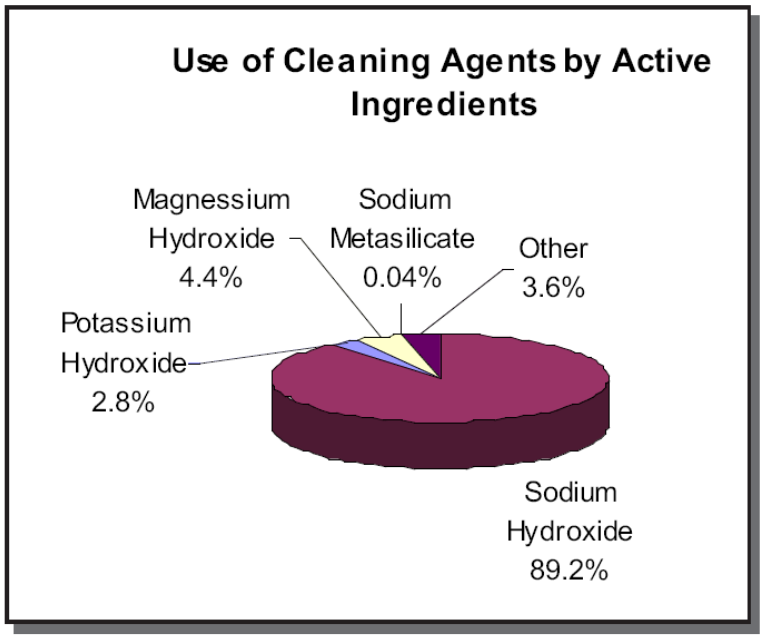

Cleaner Production

- Clean down of equipment
  - fermentation tanks
  - transfer lines
  - General cleaning / sanitising.
- By-product ends up in the wastewater treatment system
- Alternatives ?

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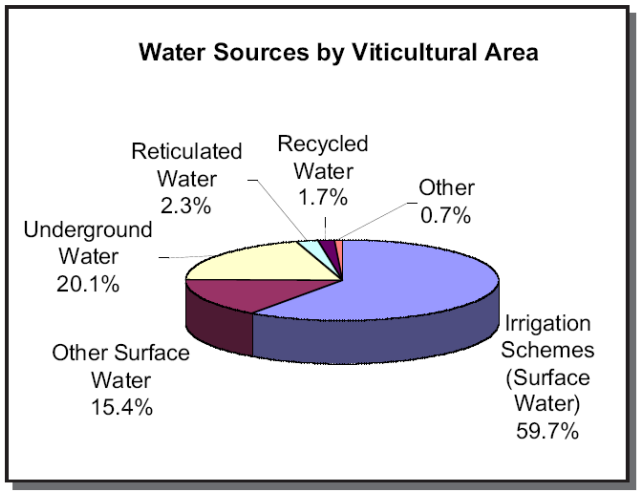
De Bortoli Winery – Day 1



- Odour from unstable waste waters.
- Fresh water use – town and irrigation
- Wastewaters evaporated
- Increasing stored volume with increased crush
- Huge $ and energy requirement
- High salinity in earthen structures
  - Failure
  - Contaminating land use
- Sodium used through out
- Dead End Situation

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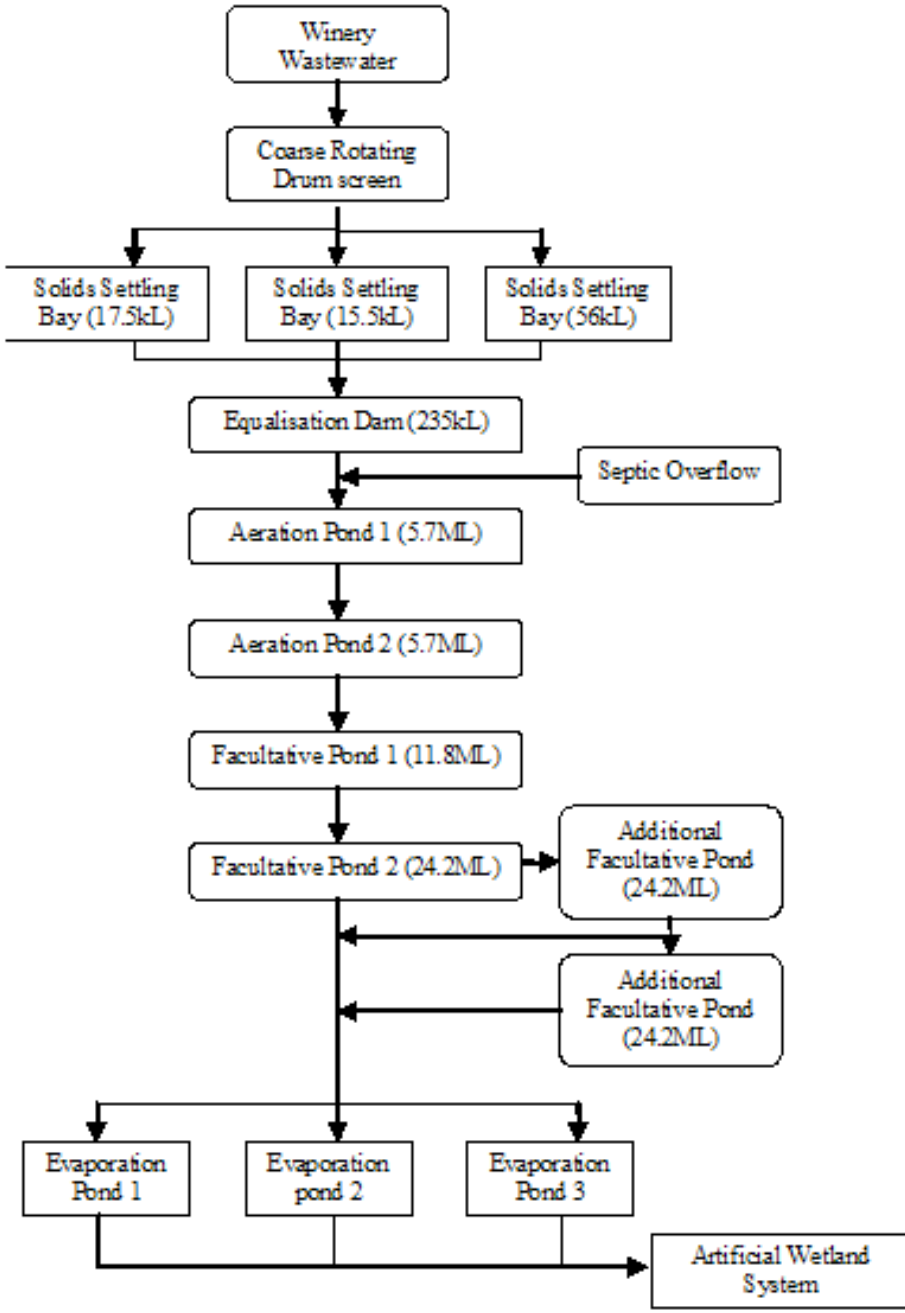
Wastewater Treatment System – Day 1



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Solutions

- Stabilize waste waters
- Reduce / remove sodium inputs
- Reduce fresh water consumption
- Re-Use = Irrigation of Waste Waters
- Maximise nutrient uptake

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Cleaning agents – Sodium replacement

- Product of choice was potassium hydroxide (KOH).
- Potassium = plant macro-nutrient = 100 x K over Na taken up
- Potential for soil degradation dramatically reduced
- Clean water for leaching reduced.
- KOH potentially more expensive – cost of supply reduced by bulk supply and buying power
- Net cost = reduced.

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Stabilization of waste water

- MgOH and NaOH used to adjust pH.
- Characterisation of waste stream – contains sugars, N, P and S
- Odour – N and S derivatives are offensive
- PH adjustment needs to focus on buffering and locing up P and S
- Lime (CaCO3) selected for pH adjustment.
- Advantages:
  - when mixed with the sulphuric acid based wastewater gypsum (CaSO4) generated. This provided the added benefit of soil amelioration.
  - Lime is not considered a hazardous substance – less OH&S risk
  - Not messy, automated systems used in other industries adapted
  - Sedimentation systems used to collect residues

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Wastewater Dynamics

- Wastewater generation is:
  - highly variable; and
  - concentrated with the majority of the discharge occurring during vintage.
- A buffer storage was implemented to dampen peaks.
  - assists the pH adjustment system by providing a continuous stream for dosing and contact time
  - consistent discharges sustain stable micro-organism populations/communities within pond systems.
- The ion exchange column separated from the wastewater stream.
  - storage in a designated tank within the wastewater treatment section of the facilities.
  - discharge will be under controlled conditions to ensure that the pH balance is not disrupted significantly.

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Wastewater Dynamics

- pH adjusted through use of lime
  - Mixed within ‘reaction tank’ through a hydro-shear mixer,
  - A recirculation allows re-adjustment of wastewaters where required. This system is essentially an automated system reducing the need for labour.
- Wastewater is then either:
  - stored in aerated based wastewater treatment ponds; or
    - De Bortoli Wines have installed aerators, which rely on a blower to provide effective aeration rather than a compressor reducing operating costs;
  - Discharged directly to the wastewater utilisation area.

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Comparison - Treatment Systems

	De Bortoli Wines WWTP	Packaged Plant
In plant waste water storage	Acid storage tank	
Solids removal	Rotating drum screen	Wastewater screen
		Decanter
pH Adjustment	Lime hopper, hydro shear mixer	pH adjustment system
	Reaction tank and recirc system	
	Sump for discharging adjusted WW	
Treatment system	Serpentine	Systems control
		Temperature control
	250 kL supply sump	Primary clarifier
	Discharge pumps	Supply pumps
		Aeration system
	Aerators	Tank/s
	Aeration ponds	Discharge pumps

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Comparison of Capital costs

- De Bortoli Wines system including, system, pipe work farm– Approx $2.5M
- Treatment Plant – Costs for SBR unit vary between $1M and $6M - depending on flow rate
- Treatment Plant + farm system size for Be Bortoli winery is $4M+

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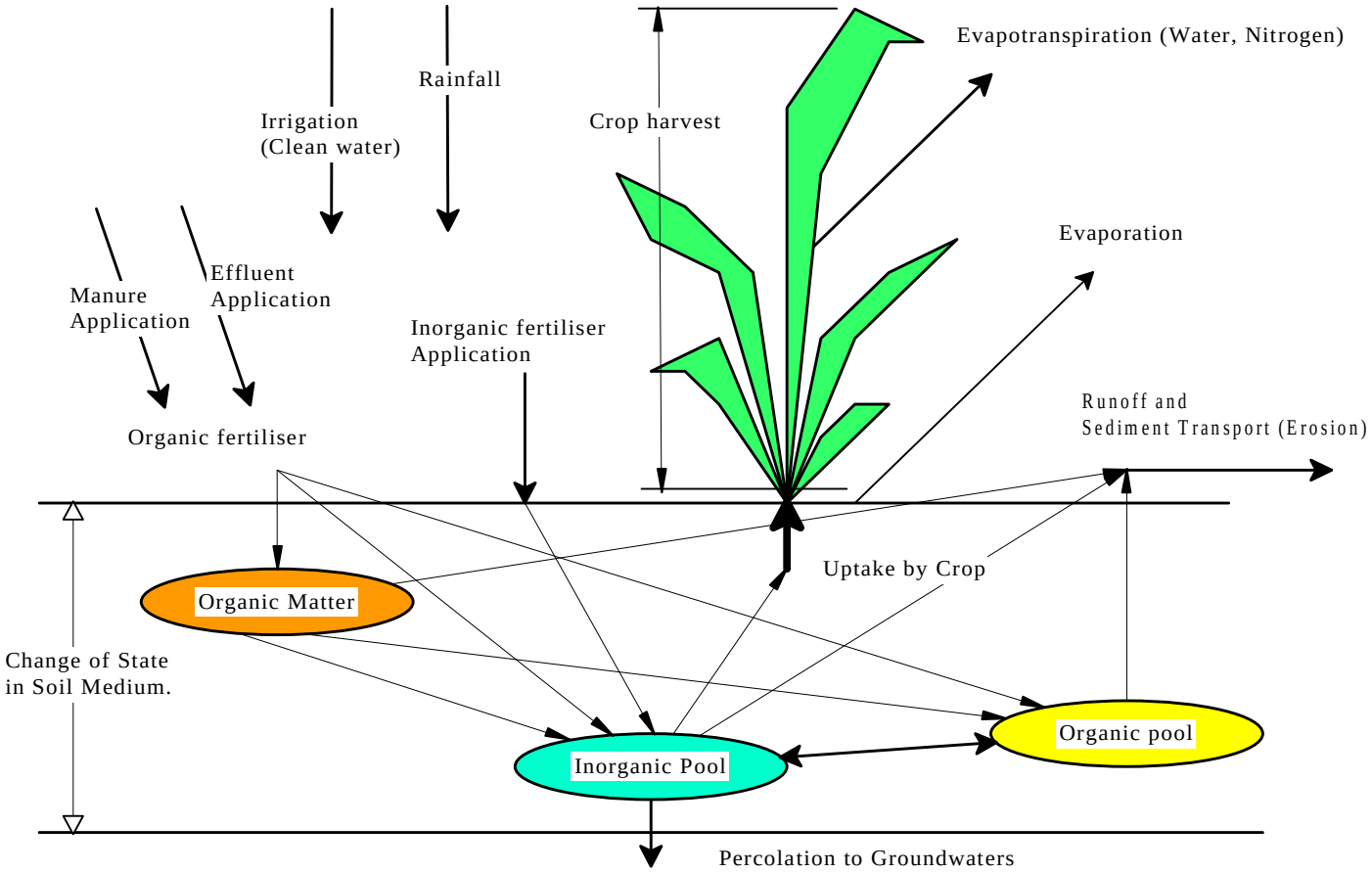
Plant to Plant



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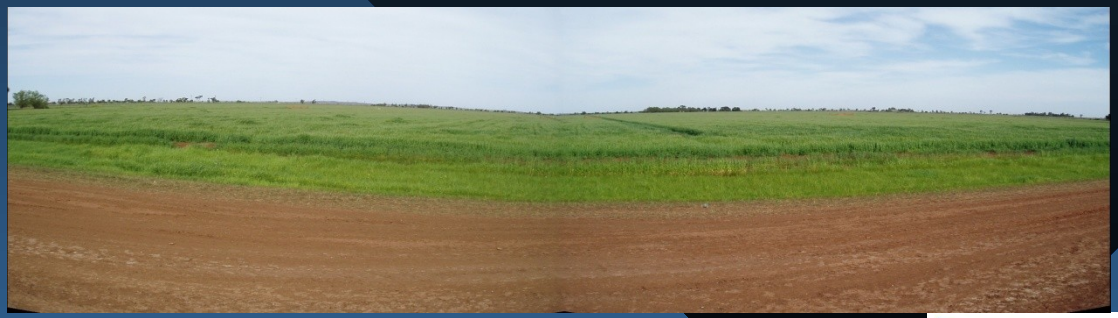
Cost Benefits

- How does this equate: Harvesting approximately 5 T/ha from 20ha – Net profit $200 / T = Result - $20 000 profit.
- Under good conditions: Possible profit of $60,000-100,000 per annum
- Profit used to offset operational costs of treatment system – creating more economically viable alternative



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Concluding Remarks

Application of;

- Cleaner production in the winery,
- pH control by active lime recirculation systems and
- Creation of a downstream water demand by crops has allowed:
  - The removal of energy intensive aeration systems,
  - A reduction in the required storage volume for waste waters,
  - Income from crops grown by irrigation of shandy of treated wastewater and fresh water.
- Re-engineering the production systems in a winery together with returning its waste water system design to basic principals of treatment has had a significant production and environmental benefit to the De Bortoli Winery

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