Unconventional Effluent treatment for profit

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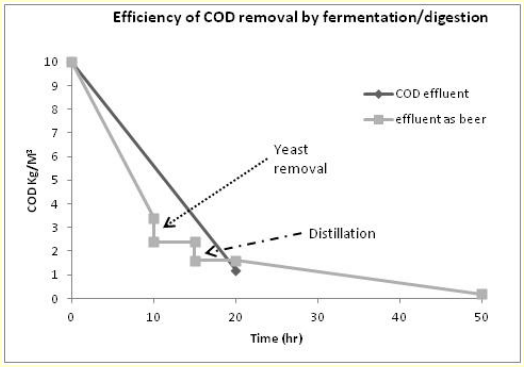
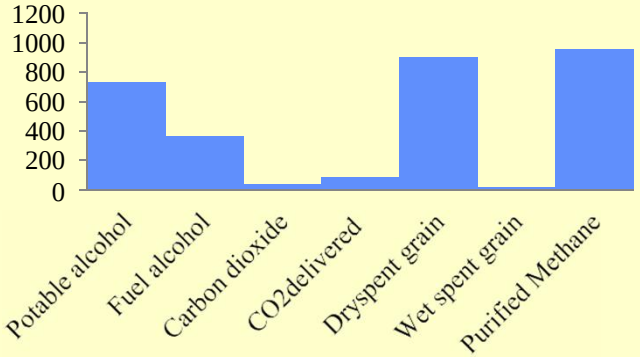
Introduction

All effluent is waste and the first principle of effluent treatment must be waste prevention. Levels of effluent at 0.6-3.5 Kg of COD per Hl represent 3-10% of the raw materials input bill. The methane from a 1M HL brewery theoretically generates 13 Mj /Hl beer or roughly10% of the brewery energy bill. Methane must go into suitable generators or steam boilers after desulphuration and CO_2 removal. The principals of effluent and waste reduction involving reduce, reuse, and recycle could not be better illustrated than in breweries. Interception and reuse of waste materials and energy (Table) before they reach a lower energy state or value gives an improved result. In practice the 80% efficiency of the effluent plant is ambitious because sulphur removal gives problems and the gas must be flared. Shock loads of caustic, sterilant and bottling line lubricant enter the waste system. Overload of sugar and carless release of live yeast combine to reduce efficiency. This poster looks at waste separation as an option for brewery wastes before disposal.

Waste	Application	Advantage	Constraint
Water at 70C	Distillation of alcohol from waste streams	Energy cost	Large heat exchangers needed because of low ΔH
Rainwater	Boiler feed and cooling towers	No deionization treatment needed, no bleed off wasted, so 30% more useful	Storage for dry season, efficient collection, separate drains are essential
Waste beer, decants brewhouse weakl worts & rinse water	Ferment using secondary yeast, collect carbon dioxide and distill off alcohol for fuel	Reduces BOD before effluent tank, recovers carbon dioxide & alcohol	Needs low grade waste heat to distill
Avoid residual beer on walls of vessels	Rinse down into beer with DAL as vessel empties	Reduces effluent saves 1-3% beer	Needs DAL supply at top of vessel
Reduce cleaning frequency	Every clean causes effluent	Possible continuous fermentation	Sterile operation, sterile gas
Recover carbon dioxide from methane plant	Separate carbon dioxide from methane by alkali/ monoethanolamine adsorption and heat off carbon dioxide using low grade heat	If carbon dioxide is purchased this augments supply	Existing Carbon Dioxide recovery system
Recover alcohol from fermentation carbon dioxide	Recirculation washing using a packed tower to increase alcohol content in wash water to 5% ABV and distill	Reduces COD and saves water but Union system uses liquid carbon dioxide to strip flavours instead of water.	Excise rules on distillation , needs low grade waste heat to distill
Ensure cooling towers use second use water	Supply from rain or recovered water tank	Abundant water in wet season	Connect directly to a waste outlet
Mashing in yeast	Add surplus yeast back at the mashing stage	Recovers valuable components	Flavour
Ferment autolysed yeast	Consume the yeast glycogen, distill alcohol	Recovers extract and reduces BOD	
Caustic recovery	Regenerates caustic for reuse	Recovers caustic and reduces pH of effluent	Sedimentation can be slow and needs tanks
Careful selection and perforation of labels to ensure intact removal	Good quality paper labels stay intact and are filtered in baskets	Makes caustic settling easier for faster recovery	Fibres contribute to BOD
Sun-dry label debris and combust as fuel	Calorific content realized	Avoids waste to landfill	
Feed Kieselguhr to poultry	Avoids landfill	Feed value of entrained yeast	Use simple transport - drums or small tanks
Feed Yeast to poultry	Avoids effluent	Feed value of yeast	Use simple transport
Sun-dry Brewer's Grain and combust as fuel	Calorific content realized	Alternative to animal feeding	Improvement in value when sun dried but needs covered store and insecticide



Product value €/ton



Conclusion

It is vital to separate very high BOD effluents from the waste stream as early as possible and send them as a semi solid waste to animal feed. One ton tanks on trailers or trucks (photo) facilitate smaller animal rearing units. A smaller septic tank or cess pit type digester for very high BOD wastes is a possibility. High BOD waste holding tanks volume reduces by about 50% every three weeks due to ammonia and CO_2 losses. Optimum configuration for effluent economies depends on generators for warm water, old or spare fermentation capacity. Super treatment may even allow release to a watercourse instead of a sewer.