A Time for Change

Ending Marine Pollution: A necessary Climate Action

"Innovation stems from a need for social evolution yet is too often treated as a paradox until successfully brought to market by its enduring founders.

But it is invention which is the most purposeful product of the human brain - there is no greater benefit than that granted by innovation which yields eco-social betterment. The challenge is not whether we can innovate, but rather can we embrace innovation for greater good."

Yuri R. Obst

Baleen Filters Pty Limited

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Foreword

The natural world is dependent upon Earth's natural cycles. The Water Cycle, and in turn the Food Cycle, revolve through stages for which nutrients recycle within the natural environment.

Unless water and nutrients are recycled, the Food Cycle which is essential to natural ecosystems will not be complete. Contrastingly, humanity drains the land of these precious resources consequently depleting onshore ecosystems while conversely polluting marine habitats with spent nutrient-laden waters – only because of a 'literally' cemented linear "once use" mindset to water infrastructure.

As the human population grows, the need for safe water sources and sustainable farming (to keep soils fertile) without damaging the environment is becoming ever so critical. We depend on the balance of Nature for our survival, yet civilisation continues to exploit Earth's resources without demonstrable consideration for future populations.

For more details, please refer to Baleen's Advocacy at G7 2016 Japan http://touchline.digipage.net/g7/climatechange2016/66-1

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Our reckless, linear, polluting civilisation

More than 80% of waste waters (some 1,500 billion tons every year) flow untreated into rivers, lakes, and coastal zones, threatening health, food security, and access to safe drinking and bathing water. Interestingly, non-renewable power generation also consumes clean water (600 billion tons every year) at a rate of 2 gallons (8-litres) per kWh used and similarly compromises marine environments.

But this abuse of nature does not end there, the disposal of waste is of prolific occurrence worldwide. Today, around one third of food produced in the world for human consumption is wasted contributing to some 2 billion tons of garbage disposed annually.

Not surprisingly, two of the largest environmental problems facing the world today are improper waste management and an over reliance on non-renewable energy sources. And both problems are inextricably linked with water.

Food/garbage is rich in energy, while waste water is typically 99.9% water with less than 0.1% waste containing trace nutrients – yet we neglectfully dispose of these surplus resources as pollutants.

Einstein's famous equation $E=mc^2$ states that mass and energy are inter-convertible, so there is no plausible justification to waste any resource to ultimately compromise or destroy natural environs.

For more details, refer Baleen's speech at COP22 2016 Morocco http://touchline.s3-website-eu-west-1.amazonaws.com/cop/issue22/68-1

A much-needed circular economy for Water

The problem associated with Water management and conversely Ocean preservation centres upon disposal of 'sewerage from urban populations', which in turn influences Climate Change due to a disrupted Water Cycle; compromising health, food security, and access to safe drinking and bathing water worldwide.

Knowing that some 2 trillion tons of waste water is discharged annually to Ocean, carrying food-chain damaging micro-plastics, ecosystem destroying bacteria & chemicals, plus acidifying oxygen-depleting organic waste should pose enough reason to initiate a dramatic shift in mindset from today's negligent practice of waste disposal and (consequential) treatment to one of resource recovery and re-use.

A consequential dead zone has been doubling by the decade since the 1960s, with latest reports declaring the Ocean 10% dead due to hypoxia, largely because of waste water pollution. Short and simple, it is the declining health of the Ocean that must be abated to ensure future prosperity.

Over 30,000 sewer overflows discharge untreated sewage into UK rivers and beaches, many are unregulated and over used.
Surfers Against Sewage 2016

"… (waste water reclamation) is a great use of the waste and the nutrients it contains. The best answer is not to ban the practice, but to improve it. Even without expensive infrastructure, common sense measures can make wastewater irrigation safer."
Colin Chartres (IWMI) in interview with New Scientist reporter Fred Pearce August 2008

Refer to Baleen's advocacy on cleaner technology at G7 2017 Italy http://publications.climatechange-theneweconomy.com/g7-2017/84-1

Paradigm shifting process technology

It is the result of society's mismanagement of water that Baleen Filters (Australia) and VOsPS/UTOC (Canada) have come together to crown a unique Waste to Energy Infrastructure partnership to accept all manner of liquid and solid waste (well beyond biogas potential) to unveil a revolutionary "sustainable populations without waste" model centred upon a much-needed circular economy for water.

By way of introduction, Baleen is an engineered adaptation of the natural technique used by the class of filter-feeding whales of the same name, with novel counter clearing flow principles which sustain filtration without need for downtime, aptly recovering virtually all waste from waste water. UTOC is a simple 2 stage thermal process that, without requirement for supplemental fossil fuel or thermal energy, vaporizes and oxidises all organic fractions with a stoichiometric quantity of air without release of carbon monoxide or contentious ash.

Integrated UTOC-Baleen plants offer a transformative change in how population wastes are recycled. Baleen recovers the waste from water for conversion into energy, enabling fit-for-purpose water re-use (via inline oxidation/disinfection) in a sustainable manner to eliminate need for energy-consumable intensive biological treatment and sludge handling. With UTOC as key Partner Technology, a complete system approach delivers sufficient energy to power Baleen's entire infrastructure (refer next page) including ancillary water re-use distribution networks.

A 100,000-population case as example defines a modular, containerized Baleen-UTOC plant capable of reclaiming some 20,000 tons per day (tpd) of Water fit for horticulture, while converting 200 tpd of Garbage and 63 tpd of waste water Screenings (263 tpd Total) into 33 $MW_{thermal}$ energy per hour and 1 ton per hour of sterile, organic free ash. The resulting hot gas additionally producing steam for 10MW per hour electricity generation, in addition to supplying onsite heating.

The project's direct CO_2 equivalent emissions benefit compared to landfill disposal is around 167,500 tons CO_{2e} reduction per annum; plus, additional CO_{2e} benefits of not having to operate/maintain an equivalent capacity conventional biological sewage treatment plant (responsible for an additional 4% per capita of global emissions).

Accordingly, this transformative process technology presents a unique solution to shortcomings in mismanagement of solid and liquid waste aptly deployable to offset more than 8 of the Global (annual) 36 billion tons of CO_{2e} emissions, while producing sufficient energy to deliver 787 TWh; 3.6% of the 22 PWh Global electricity production.

In summary, the project alliance between Baleen Filters and VOsPS Inc. presents an immediate scalable opportunity to transform urban populations from a paradigm traditionally based upon resource wastage and pollution to one based on waste utilization and eco-social balance with direct opportunity to generate more than $1/30^{th}$ global electric power consumption and facilitate a $1/5^{th}$ reduction in emissions.

What better way to dramatically mitigate pollution and climate change than through conservation and restoration of marine and oceanic ecosystems by reforestation and sustainable agriculture. Participating communities will directly benefit by rural regeneration, improved food and water security, increased sanitation, and coastal resilience simply by implementing a circular economy on water.

"Nobody (referring to those without applied experience) really understands the influence the Baleen's have over water quality."

Andrew Westlake, Victoria - Australia, Baleen pioneer of 16yrs

Figure 1
Oxidised-Disinfected Baleen Filtrate (LHS cone)
Vs
Raw Waste Water (RHS cone)

Figure 2
Baleen separated waste from Waste Water (front centre view)

"…Toxic Sewage is turned into at least B-grade water after passing through the (Baleen and Disinfection) systems."

Tim Scholz, Mayor - Wudinna Council, South Australia, May 2009

Figure 3
Demonstration of fit-for-purpose water re-use for Agriculture – from reclaimed waste water.

RECOVERING LOSS FROM MUNICIPAL EFFLUENT

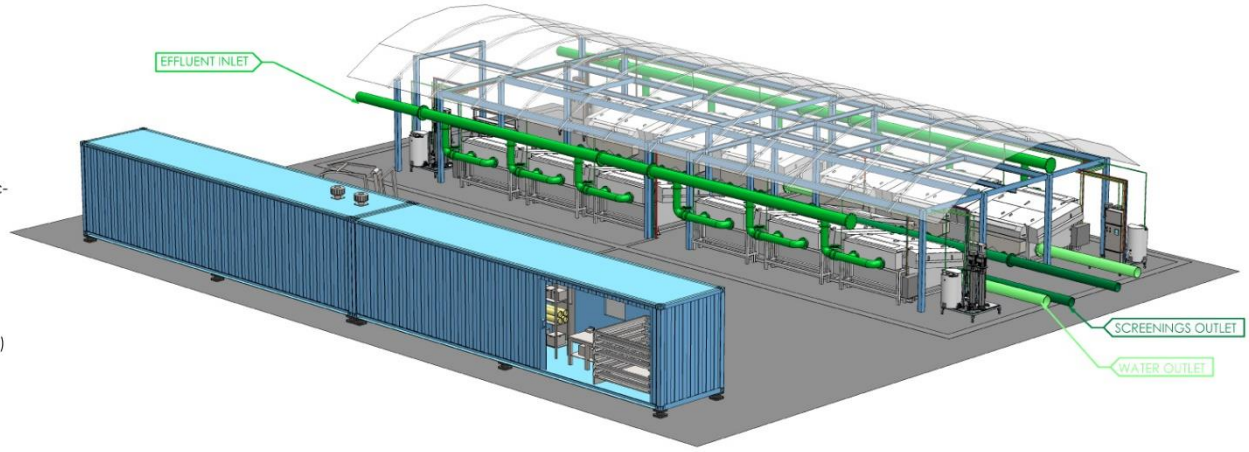
Use of clarifiers, decanter centrifuges, hydrocyclones and sedimentation tanks prior to marine discharge equals lost biomass & lost energy !

The Problem:
In treatment of municipal effluent it is not uncommon to discover as much as 500 ppm of biodigestable matter can be harvested; Lost to environment as BOD (marine pollution) and CO2 (greenhouse gas). Just 1-litre (1-Quart) kills flora/fauna in 100-litres (25-Gallons) of marine ecosystem, whilst 1,000-litres (250-Gallons) per day can produce 0.15-m3 methane (equivalent to 0.015-kW).

The Solution:
One Baleen '240-Series packaged plant can reclaim around 0.5 metric-tonne of biomass per hour from 40MLD (300,000 EP) of municipal outflow (subject to survey). At almost 1MW.hr (S$250) per Tonne and 8,750 operating hours (Per Year) it's not difficult to see that Baleen provides for a solid return on investment (measured in months).

Pre-requisites:
- 5mm (0.20") pre-screen or similar for protection against sharps
- Anaerobic Digestion Plant (for Biogas conversion)
- Concrete foundation and Utility requirements (subject to site survey)

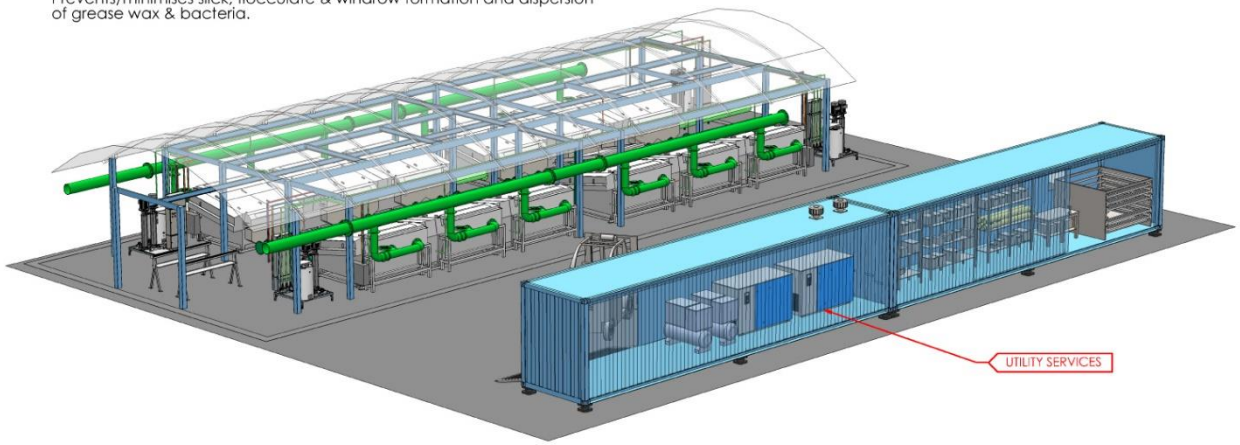
Nota Bene:
ppm = mg/L = kg/ML, 40MLD =10.5MGD, 1MW = 1,340HP, S$250 = US$175 (Sept '15)



PERSPECTIVE VIEW 1
CANOPY ITEM GHOSTED FOR CLARITY

Industry Benefit:
Biomass recovery for Biogas (Stage 1 - Resource Separation, as shown);
'Fit-for-Purpose' Water reclamation opportunity (Stage 2 - Barrier Filtration);
Rapid Return On Investment (Basis: S$250/Tonne);

Environmental Benefit
Baleen alleviates impacts upon marine environs in a number of ways:
Prevents/minimises bioaccumulation of toxins & sedimentation of sludge;
Prevents/minimises agglomeration of particles, grease & micro-plastics;
Prevents/minimises slick, flocculate & windrow formation and dispersion of grease wax & bacteria.



PERSPECTIVE VIEW 2
SOME ITEMS GHOSTED FOR CLARITY

baleen
engineered by nature

Functional Description:
Baleen is readily integrated into existing operations using gravity pipework with thickened biomass reclaimed for Anaerobic Digestion. Industry experience has confirmed that Baleen can consistently yield a mixed-biomass consistency of 8-12% percent solids content for optimum Biogas production.

Product Features:
- Major part change-out in 15 -30 minutes
- 'Hot-Swap' automation to alleviate operational downtime
- Exceptionally low service requirement per annum

Technology Features:
- FAT certified, ready-to-install plant
- Packaged in customised 40-ft (12.5m) shipping containers
- 'Connect and Use' within 20-days from delivery
- Complete pipework, framework and utility provisions
- Locked-in process-performance monitoring
- Instrumentation and remote-monitoring for full auto-operation
- Detailed design (PFD, P&ID and 3D CAD) for optimum durability
- No chemical or potable water requirement for operation
- Online density/flow log of recovered biomass volume
- Compliant to International safety, electrical & building codes

DESIGN FOR MANUFACTURE

DISCLAIMER	DRAWN: SEB	BALEEN FILTERS PTY LTD	DESCRIPTION: MUNICIPAL RESOURCE RECOVERY	
DETAILS ACCURATE AT TIME OF PRINTING. BALEEN FILTERS PTY LTD RESERVES THE RIGHT TO CHANGE ANY DETAILS.	DATE: 21/10/2015		PROJECT: BIOMASS	
	CHECKED: YBO	PO BOX 1181, NORTH ADELAIDE SA 5006, AUSTRALIA Tel: +61 8 8334 4571 Fax: +61 8 8334 4522 email: info@baleenfilters.com	SCALE: NTS	DRG No: P143-240-001P SHEET No: 1 of 3 REV:
ALL DIMENSIONS IN mm UNLESS OTHERWISE INDICATED	DATE: 21/10/2015			

To whom it may concern,

I herein introduce our company's disruptive / transformative UTOC technology and affiliations.

Fifteen years Research & Development, five prototypes, more than $20 million cash / in kind investment, and numerous third-party tests / validations / due diligence assessments have certified that the VOsPS Inc's UTOC Energy from Waste technology has global transformative potential.

The self-sustaining, unprecedented low emissions, universal organics feedstock UTOC is a next generation contributor to a healthy planet. A clean energy source, the UTOC operates solely on waste and residual organics (solid/slurry/liquid/gaseous forms of biomass / manufactured organics waste, hazardous materials, food processing wastes, diseased biomass, plastics, and like). No fossil fuel or supplemental thermal energy of any kind is required after UTOC start up. UTOC applications range from livestock-agri food operations/hospitals/industries thru small towns/remote settlements to largest cities.

The UTOC is a simple, quiescent, high temperature, continuous operation, 2 stage process. Stage 1 radiant energy vaporizes feedstock organics (like "stuck toasters" turn bread slices into smoke) wherein a portion of vapours (smoke) are burned to maintain optimal temperatures. Remaining vapours are completely burned in the 1,250C (2.5 times self-cleaning oven temperatures) stage 2 chamber, destroying BSE prions, pathogens, tars, furans, dioxins, raw sewage, landfill leachate, pesticides/herbicides, solvents, paints and like. The clean UTOC hot gas stream can be used for generating electricity, purifying water, and the complete range of industrial/institutional/commercial heating requirements. UTOC ash can be an agricultural land nutrient or asphalt/concrete aggregate.

Unlike incinerators, small footprint/quiet/ultra-low emissions UTOC Energy from Waste electric power generation plants are unobtrusive. Distributed electric power generating plants within tens of kilometres instead of one or two large generating stations within hundreds of kilometres significantly reduce garbage haul distances and electric power distribution infrastructure while increasing electric power reliability.

UTOC CO_2 equivalent emissions when processing Municipal Solid Waste received from collection vehicles are less than 50% landfill emissions. In addition to replacing landfills by directly converting planet organic waste into clean, low particulate, 1,250°C gas streams, the UTOC can process existing landfill contents; reallocating existing landfill sites for agricultural/commercial/green space/recreational purposes.

UTOC was developed for compliance with current and pending environmental regulations and Canadian Food Inspection Agency requirements. The rugged, simplistic UTOC is automated for unattended operation and fail safe shut down in less than 30 minutes of problem detection. A 30-year UTOC project life has simple payback intervals ranging between 1 year for northern communities to 5 years for 75 MegaWatt / hour electric output for modern cities.

In December 2017, VOsPS Inc. joined forces with Baleen Filters Pty Limited to extend UTOC's capability beyond a disruptive self-sustaining Energy from Waste technology to enable a transformative "*sustainable populations without waste*" solution.

VOsPS Inc.'s UTOC affiliations comprise: Sperling Industries (http://sperlingind.com/ *Manitoba company, equipment manufacturing*); Baleen Filters (http://www.baleen.com/ (Australia company, waste water reclamation); Refic Solutions [http://www.reficsolutions.com/ *Ontario company*, Build/Own/Operate/Transfer], and; WNL Development Solutions (http://wnlds.com/about-wnl.php Manitoba company, *international project management*).

Rugged, simple, UTOC-Baleen Energy from Waste plants accomplish "sustainable populations without waste" at much less cost than alternative "total solution" landfill / biological sewage treatment options.

Thank You for your interest,

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