



Algae-Based Wastewater Treatment

Using Nature to Treat Waste

***5% of US national
electrical requirements
are dedicated toward
wastewater treatment.***



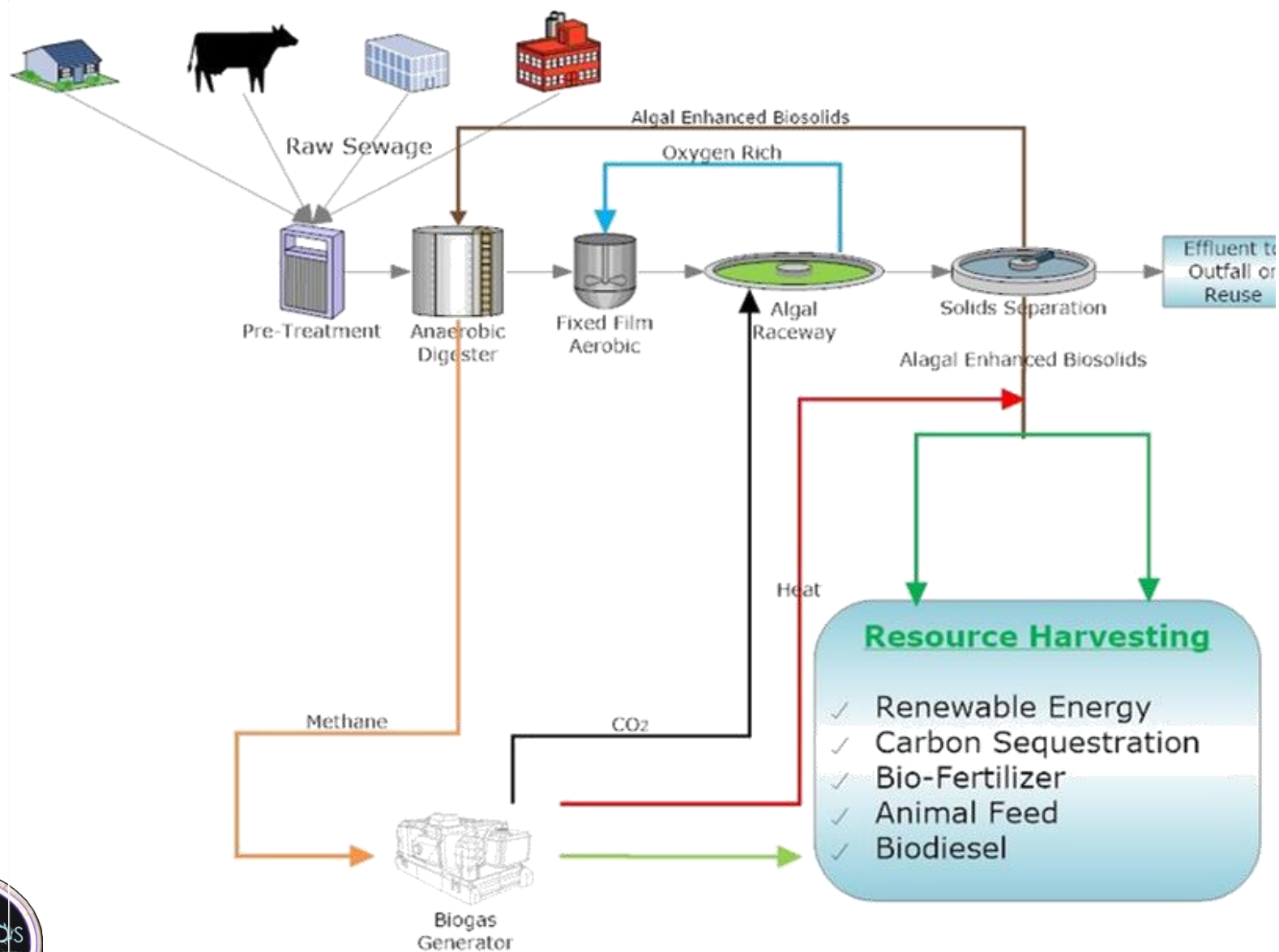
The Aquanos Process

Advantages



The Aquanos Process

Typical Flow Diagram



Sample Project



Traditional Activated Sludge Technology vs. Aquanos

	Traditional	Aquanos
Energy Use	0.5 kWh / m ³ of wastewater	0.05 - 0.1 kWh / m ³ of wastewater
Surplus Energy Production	None	0.3 kg of Biogas / 1 kg of Chemical Oxygen Demand (COD)
Byproducts	1 kg of Sludge* / 1 kg of Biochemical Oxygen Demand (BOD)	150 g of Biomass** / 1 kg of BOD
Cost Reduction	None	30-50% capex/opex reduction
Carbon Sequestering	None	2.2 g of CO ₂ Consumed / 1 g of algae in system

* Sludge handling/disposal is the second biggest cost in wastewater treatment.

** Biomass is a revenue stream that yields the products mentioned on the following slide.



The Aquanos Process

Resource Harvesting



Clean water
(reuse)



Low energy
requirement



Resource
Recovery



Sustainable





In developing countries, 80-90% of WW generated is discharged untreated directly into surface water bodies.



Shafdan – operation of one of the world largest reuse plants

- Process operations
- 350,000 m³/day, 2 million PE
- 100% reuse
- Technology – Activated sludge
- with tertiary treatment through Soil Aquifer Treatment

Jerusalem WWTP

- Execution and operations
- 82,000 m³/day
- Technology – Activated sludge





Haifa WWTP

- Consulting - operation and upgrade
- 120,000 m³/day
- Technology – Activated sludge with energy recovery from sludge digestion

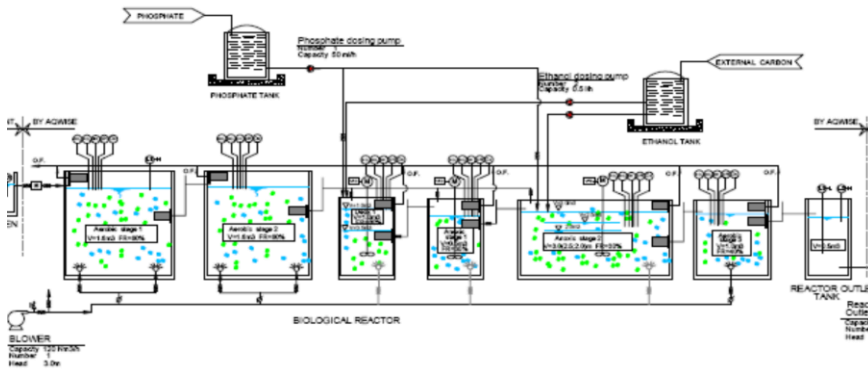
Monclova Mexico WWTP

- Process design and project management
- Expansion from 35,000 to 58,000 m³/day and upgrade to full reuse
- Technology – Integrated fixed Film Activated Sludge



Yamuna India WWTP

- Process design piloting, and supervision
- Treatment of 150,000 m³/day river water to drinking water
- Technology – Moving Bed Biofilm Reactor (MBBR) + Ultra Filtration membranes



Other projects:

- Israel Airport - 3,500 m³/day Membrane Bio Reactor (MBR) – Design, Upgrade , Operation Supervision
- Shoket WWTP – 9,000 m³/day activated sludge – Design, Upgrade
- Beer Sheva WWTP – 54,000 m³/day – Operation Supervision
- AMS paper tissue and converting (Portugal) – 1,000 m³/day paper production – Design, Operation Supervision



- 400 m³/day plant. Approximately 100 m³/day dairy farm waste, remainder is municipal wastewater
- Currently in the Commissioning and Construction phase
- Extensive WWTP, upgrading existing plant using Aquanos system in order to improve nutrient removal



- Water is utilized for irrigation, namely for apple orchards, making nutrient removal paramount. Too much nitrogen and phosphorous yields low quality apples with affected color, shelf-life, etc.
- The location also does not have a sufficient electricity supply so biogas from the Aquanos system will be utilized.

Beit Hillel Dairy Farm

- Two-stage Upflow Anaerobic Sludge Blanket (UASB) processing 15 m³/day of wastewater
- Deployed and operating, helping farm meet stricter Israeli effluent standards for discharge to municipal WWTP
- Generating biogas for heat/electricity use

Ototo Dairy Farm

- Two-stage UASB processing 35 m³/day of wastewater
- Commissioning and Construction phase
- **If piloted successfully, the Aquanos solution will be recommended by the Israeli Ministry of Agriculture for use in all dairy farms to help meet stricter effluent standards and avoid penalties.**



- Aquaclear Project – Partnership between Aquanos and Aquagen ISI, where approximately \$2M in funding has been secured from the Bird Energy Foundation.
- Problem is excess nitrogen pollution stemming from household septic systems in communities resistant to traditional sewerage. Goal is to reduce West Yarmouth, MA's septic nitrogen pollution footprint to zero.
- Aquanos algae-based wastewater treatment system, and Aquagen vacuum sewer collection system and solar greenhouse systems will be utilized.
- Clients include the Swan Pond Village Center, Lewis Bay Research Center, Dennis Yarmouth School Campus where plants will start at 100,000 Gallons Per Day (GPD) and are expected to grow to between 500K-1M GPD in capacity.
- Pilot system at Lewis Bay Research Center currently under construction



Project Pipeline

Project location	Country	Type of WW	Scope	Population (Current) or Flow	BOT/Concessional/Cash	Price Quoted (USD)
Bahir Dar	Ethiopia	Municipal	WWTP, landfill and electricity production	216,000 ppl	BOT	\$1/m3
Mojdo	Ethiopia	Industrial (Leather Tannery)	WWTP, landfill and electricity production	16,320 m3/day	Concessional	\$48.26M
Diredawa	Ethiopia	Municipal	WWTP, landfill and electricity production	400,000 ppl	Concessional/BOT	\$49.726M or \$1/m3
Haramaya University	Ethiopia	Municipal	WWTP	30,000 ppl	Cash/BOT	\$2.72M or \$1/m3
Jigjiga City	Ethiopia	Municipal	WWTP, landfill and sewer trucks	200,000 ppl	Concessional	\$29.630M
Harar + Haramaya Hospital	Ethiopia	Municipal	WWTP	167,000 ppl + 1000 beds	Concessional	\$21M



Project Pipeline

Project location	Country	Type of WW	Scope	Population (Current) or Flow	BOT/Concessional/Cash	Price Quoted (USD)
Addis Ababa Jeans Factory	Ethiopia	Industrial (Textile Wastewater)	WWTP	100 m3/day (flow)	Cash	\$857K
Mekele Industrial Park	Ethiopia	Industrial (textile) + Sanitary	WWTP for sanitary water (workers) and ZLD for industrial zone	6000 m3/day + 2500 m3/day (flow)	Cash	\$31.42M
Kombolcha	Ethiopia	Industrial (textile) + Sanitary	WWTP for sanitary water (workers) and ZLD for industrial zone	5000 m3/day + 2500 m3/day (flow)	Cash	\$26.24M
Adama	Ethiopia	Municipal	WWTP	350,000 ppl	Concessional/ BOT	\$29.6166M or \$1/m3
Yamoussoukro	Ivory Coast	Municipal	WWTP	260,000 ppl	BOT	\$1/m3



Team



HAGIHON COMPANY Ltd.
Jerusalem's wastewater & water corporation



Experienced Industry Veterans



SIEMENS



HAZEN AND SAWYER
Environmental Engineers & Scientists

Global Recognition



Why Aquanos?

- Rearranged existing technology, eliminating risk, smooth adoption. ✓
- Significantly reduced costs, simple operation. ✓
- Excellent project economics, growing pipeline in developed and developing countries. ✓
- Experienced team with strong track record in the industry. ✓
- Recognized on the world stage as the future of wastewater treatment. ✓





Thank you

www.aquanos.net