



VIVA™ MFC

**Decarbonization, Digitization, and Decentralization
for Wastewater Treatment**

THE CHALLENGE:

WASTEWATER TREATMENT'S CORE PROCESS: AERATION

(BLOWING AIR INTO WATER...INVENTED IN 1914)



Essential and energy intensive

1600 kWh to treat 1M Gallons

US plants treat > 32 Billion Gal/day

Aeration Is an Energy Hog

15% - 20% of plant OpEx

57% of plant energy use

3% of US Electricity use

And

NO process intelligence

No alternatives...

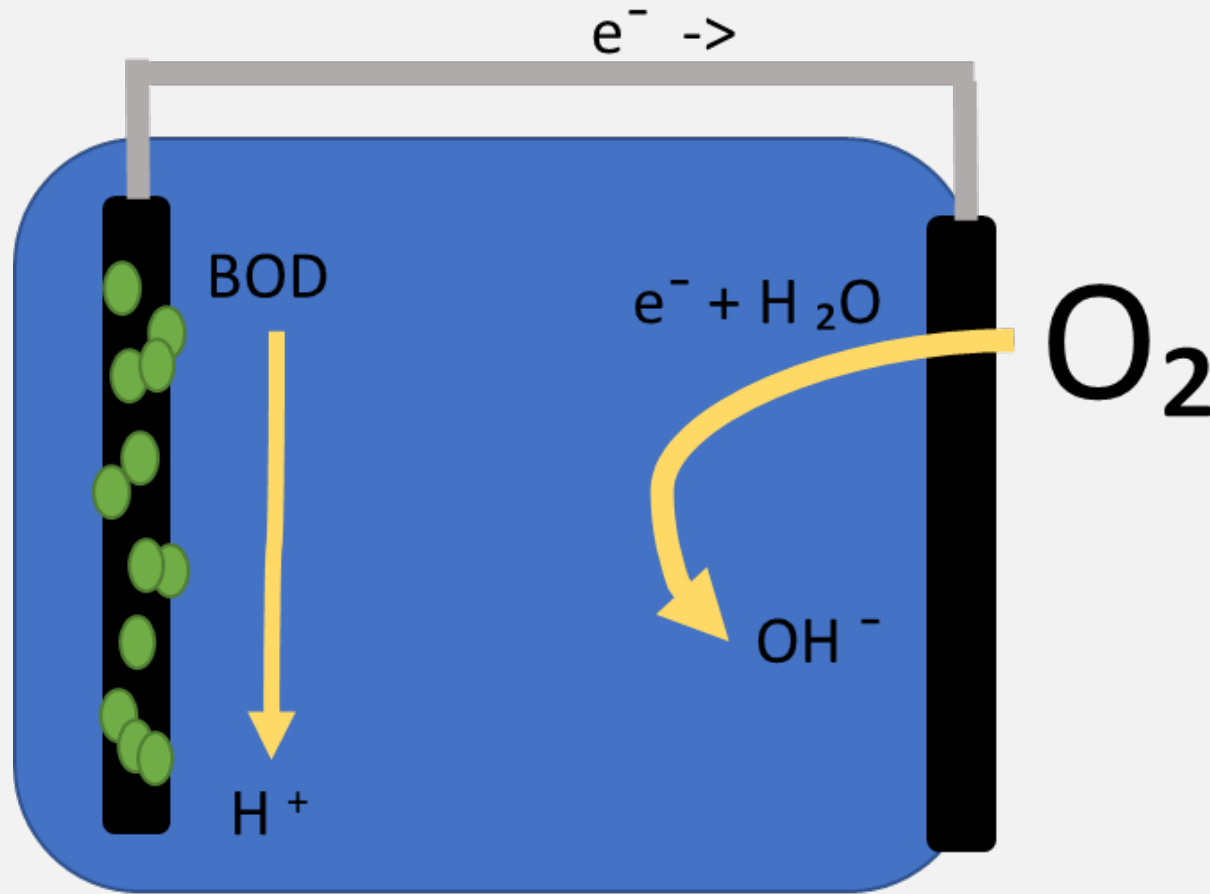
Until Now

**MEET VIVA MFC, A
SUSTAINABLE ALTERNATIVE TO
AERATION**

A LIVING BATTERY

BETTER TREATMENT

REDUCES AERATION COST 80-90%



Naturally electrogenic microbes grow a biofilm connected to a circuit

Microbes consume waste deposit electrons onto the circuit –“breathing” through a wire

Electron flow is DC Power and tracks real-time performance

Retrofits to nearly all systems for cost efficiency and less downtime.

US & EUROPE MARKET PRESSURES MAKE AERATION UNSUSTAINABLE

**Urban Growth + Aging
Infrastructure**



Stressed Municipal Plant Capacity



**Surcharges & fees for Industrial
customers**

AND/OR

**Pre-treatment equipment to
reduce municipal costs**





VIVA MFC

AN INDUSTRIAL SCALE SOLUTION

- Cost-efficient materials
- High performance
- High conductivity
- Manufacturing that scales
- Large Cathodes for large-scale system efficiency





**SCALED PILOT SYSTEM VALIDATION: 10,000
GAL/DAY**

**SPONSOR: MASSACHUSETTS CLEAN ENERGY
CENTER**



**Running
continuously for
16 months**

**All weather
conditions
(-20F to 95F)**

**Aeration Energy
reduction: 85%**

**Reduces
Nitrogen
by 35% - 40%**

**5% additional
power
generation**

**Designing
Commercial
prototype now.**

KEY WWT METRICS COMPARISONS – FINE BUBBLE AERATION VS. VIVA:

PILOT ENERGY RESULTS

Pilot results: key WWT metrics	Conventional “high-efficiency” Aeration	VIVA MFC Energy Efficiency
Aeration Energy Use	1770 MWh annually	1-2 MWh annually
Aeration Electricity Cost	> \$150K/year	< \$10K/year
Greenhouse Gas Emissions	1253 metric tons CO ₂	.8 – 1.6 metric tons CO ₂
CO ₂ Equivalents (miles driven, average passenger car)	3,100,000 miles	2,000 miles
DC Power Generation	\$0 – no energy generation	50-100 MWh annually

VIVA MFC OFFERS UNIQUE PROCESS INTELLIGENCE

VIVA MFC Smart Capabilities	Conventional Aeration Systems
Real-time treatment rate	Not possible
Diagnose biological process upsets	Not possible
Diagnose mechanical problems down to an individual electrode	Not possible
Send automatic alerts to Operator	Not possible
Integrates process intelligence with existing sensors (pH, Nitrate, Solids, Ammonia) – for comprehensive data and eventual AI applications.	Many sensors available, but not comprehensive biological treatment

MANUFACTURING READINESS

Purchased equipment in 2019 for in-house Electrode Fabrication

Established Repetitive Manufacturing protocols and materials for manufacturing efficiency

Early fabrication costs are responsive to small scaling & efficiency improvements

Engineering a new, modular unit design with standard size, known treatment capacity, and efficient, standardized Assembly fabrication.

COMMERCIAL & TECHNICAL TRACTION

First Customer (Industrial Plant/Brewer after earlier pilot)

- Next step – deploy commercial prototype for sizing validation
- Received \$100K grant from NYSERDA to build commercial prototype

Developing paid pilots with two international WWT Equipment Companies

- **energy-energy-efficiency is the key driver**
- Municipal pilot (under NDA)
- SSI International

INTELLECTUAL PROPERTY

Patents:

Electroactive Cultures and Apparatuses Therefore: Issued 2017

Cultivating and preserving Biofilms for quick system startup

Multi-Strand Electrode and Method of Making: Issued 2017

Applications for Hydrogen generation

Microbial Fuel Cell Cathode and Method of Making: Pending

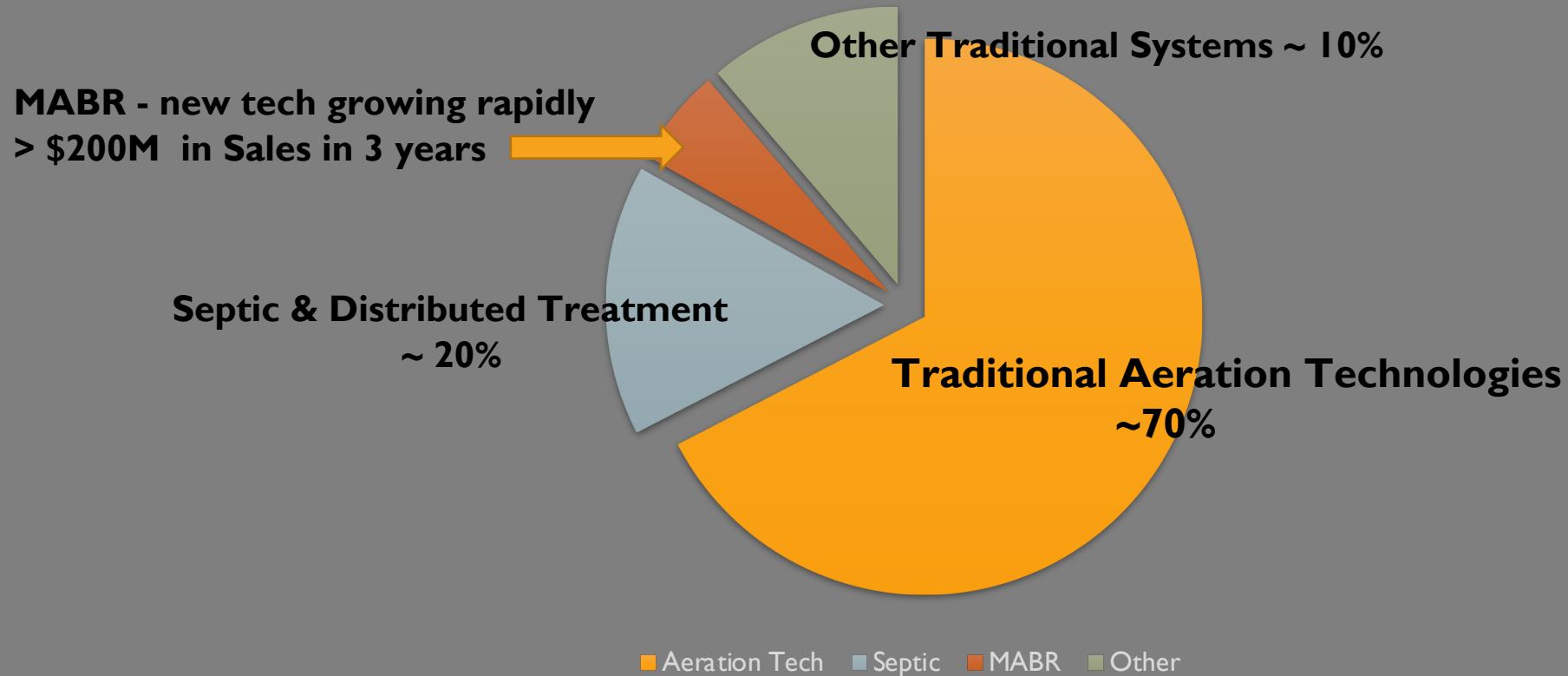
Manufacturing, configuration and characteristics of MFC Cathode

Trade Secrets:

Proprietary, tested, and validated materials for high-conductivity Cathodes

Repeatable, high quality, for large-size, scalable, repeatable quality and performance

THE WWT MARKET

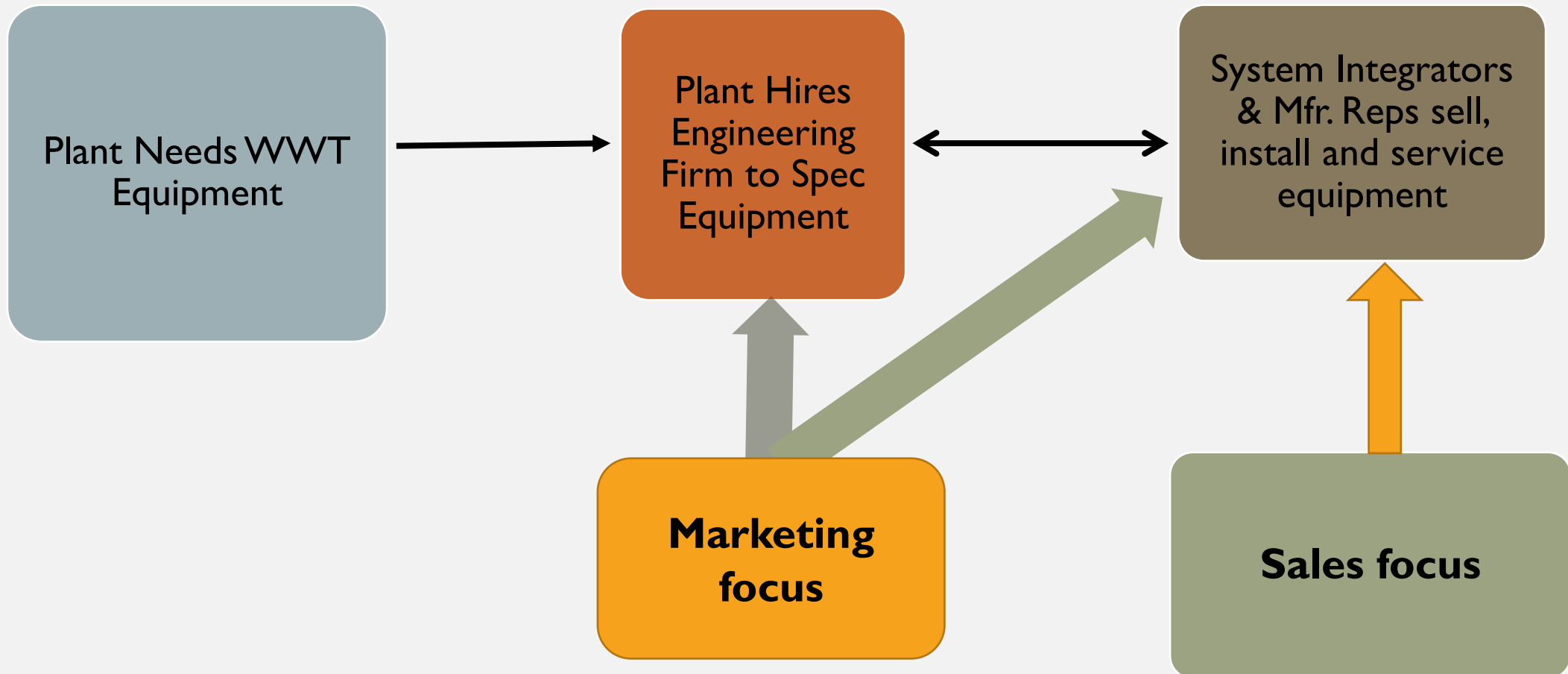


US Aeration Market: \$15-20B. Global growth rates high in all continents

MABR (in market ~4 years) Higher aeration efficiency than other options.

MFC Market (MICROrganic + 1 competitor (Aquacycl):

BUSINESS MODEL: ESTABLISHED B2B SALES & SERVICE FOR FASTER TRACTION



GO-TO-MARKET & EARLY GROWTH

Marketing Strategy Focus

- Outbound Marketing
- Continued customer piloting
- In-person meetings & introductions with Engineering Firms, Integrators, and Rep Firms – relationship building & feedback
- Trade Shows
- Industry Ad Testing & Refinement (sub-sector analysis)
- Testing marketing approaches (multiple sectors)

Product Development

- Learning from pilots and potential customers, identifying areas for product optimization
- Introduce Advanced AI Software & DC Power Storage
- Addition of second VIVA module size

USE OF FUNDS: \$875K CONVERTIBLE DEBT ROUND

Personnel	\$232,324
Ops/Legal/Ins/Acct.	\$168,640
R&D	\$32,200
Mobile Site Evaluation Unit/Development and Deployment	\$140,836
VIVA Module Manufacturing	\$301,000
Total	\$875,000

Current Status: Recently opened, 1 investor (\$25K) – Chet Opalka (shareholder)

TEAM

Brent Solina, CTO, Co-Founder

Biochemist, Disruptor – first and only to create scaled manufacturing for MFC tech, deep WW Sector knowledge (including working at WWT plant.)

Carol Maxwell, CEO, Co-Founder

Biologist, 30+ year career in Product Dev, Sales, Marketing & Mkt. Research (senior leadership, technical & regulated sectors), RPI Innovation Mentor

3rd startup

4 Active External Directors:

Chemist, Mechanical Engineer/Water Infrastructure, Management Software, & Clean-Energy financing experts.



APPENDIX

RETROFIT IS A MAJOR OPPORTUNITY

Existing WWT Plants (Industrial and Municipal)

US: 45,000, EU: 71,000

70% of plants are <2M Gal/Day:

Many Older plants (older equipment, fewer resources, and less capital)

Materials innovation

Flexible assembly design

Retrofits to most existing WWT

Retrofit Benefits:

15-20% OpEx Reduction

Less engineering

Less plant disruption

Pre-inoculated for quicker start-up

Real-time process intel

Water Issues are a Global Problem:

1.8B people lack sanitation
(25% of the global population)

2.2B people lack safe drinking water
(33% of the global population)

Climate-change is increasing the number and severity of hurricanes, floods, and droughts.

VIVA MFC is uniquely prepared to address the needs emerging economies and emergency sanitation.

Wastewater Treatment Challenges:

Inadequate WWT and Power Infrastructure

Fragile or non-existent Power Grids

80% of discharged wastewater is ***untreated***

Lack of trained WWT professionals

Rapid urbanization

VIVA Offers:

Very low power requirements

DC Power Generation

Deployable in lagoons, ponds, cesspools, septic tanks,
and for Emergency/Disaster Sanitation.

WE MAKE MICROBIAL FUEL CELLS

...A BIT OF HISTORY

- The science behind our technology has been studied academically for over 50 years.
- BUT... scaling MFCs was difficult.
- There were multiple failures, at great expense.