CONTRAIRE: Wastewater Treatment Plant Testing & Aeration Control Services

Business Plan

November 23, 2018

Prepared for: Baylor New Venture Competition
# Table of Contents

- Executive Summary: ................................................................. 1
- Problem: ............................................................................... 1
- Business Mission and Vision: .................................................. 1
- Business Description: .............................................................. 2
- Market Analysis: ...................................................................... 2
- Description of Products & Services: .......................................... 3
- Organization & Management: .................................................. 5
- Competitive Environment: ....................................................... 5
- Marketing & Sales Strategy: ..................................................... 5
- Potential Energy Savings: ....................................................... 6
- Product Development Plan: ...................................................... 7
- Oklahoma State University Licensing Agreement ..................... 7
- Grant Funding: ......................................................................... 8
- Financials: ............................................................................... 8
- Exit Strategy ............................................................................. 10
- Appendices .............................................................................. 11
  - A. Financial Modeling ................................................................. 11
  - B. Capitalization Table ............................................................... 15
  - C. Economic Buyer / Economic User Support Letter .................. 16
  - D. Accredited Investor Group Support Letter ............................. 17
  - E. Preliminary Indication of Investment Interest ......................... 18
  - F. Technology Development Center Support ............................. 19
Executive Summary:
Contraire deploys a retrofit “control system” to manage the aeration process within mid-sized municipal wastewater treatment plants (WWTPs) through utilization of proprietary non-biological surrogate real-time testing techniques. The proactive predictive analysis system has the ability to decrease total energy use by up to 45%, attributable to current Municipal Plant Operators over-aerating the wastewater as a safety precaution to ensure federal and state regulatory water compliance. An empty aeration basin is shown below. This unnecessary additional aeration is estimated to average up to $300,000 annually in electricity cost savings, dependent on WWTP size and electric demand prices. The control system, which will be owned and maintained by Contraire, will be provided as a recurring service to municipalities at an average $4,000 per month, yielding an average $21,000 per month in “net savings” for the municipality.

Problem:
The current water quality test used by WWTPs to determine the required aeration for wastewater to sufficiently degrade contaminants requires a lengthy five-day testing time for the biological oxygen demand (BOD), the relevant parameter in the effluent regulated by government agencies throughout the world. As a direct impact, WWTP operators are compelled to over-aerate, ensuring they meet environmental permit limits. This current significant time delay in testing results, paired with severe repercussions if water quality is non-compliant, results in unnecessarily high air uptake rates. Moreover, WWTPs are typically funded by the municipalities they serve, and although there is a need in many cities to find ways to cut down on costs, at WWTPs there is often a lack of knowledge of, or capital to implement, an optimization method. Surveying over 30 WWTPs through NSF’s I-Corps program, we found they are not aware of the amount of energy they are wasting during the aeration process, but are concerned because they know these inefficiencies exist. The result is WWTPs, such as the one in Stillwater, OK are spending up to $300,000 per year, unnecessarily, on electricity.

Business Mission and Vision:
Our mission is decreasing overall wastewater treatment costs by providing real time surrogate testing results, enabling energy cost optimization while continuing to ensure full regulatory discharge compliance. Our green technology is offered on a subscription base, making it more accessible to budget constrained communities. Aeration is the most costly process within a WWTP, and by reducing these costs at all mid-size plants that use activated sludge processes and fine bubble aeration, municipalities will on average realize a net $252,000 in annual budgetary benefits.
Our vision is simple: make treating wastewater less costly in order to save their municipalities, and therefore community, money. We seek to implement our testing services at all WWTPs in financial need of a system to optimize their wastewater process that fall within our target market. Although our initial launch market is mid-sized Oklahoma municipalities, our product is marketable worldwide. Furthermore, the combined monetary benefits to municipalities as well as the reduction of carbon emissions as a result of reduced electricity demands truly make our services stand apart from others.

**Business Description:**

Contraire’s “near real time” predictive analysis technology will enable an innovative alternative testing approach to the typical five-day testing method currently used at WWTPs by providing real-time feedback based off of key real-time measurable wastewater quality parameters and specialized algorithms. Our sensors record real-time key water quality parameters and environmental conditions, process these parameters through our core algorithms, then output the vital BOD data directly to the provided interface. This revolutionary solution allows operators to treat their water utilizing vital current data that has never been available before. This innovative and unique control system will transform how plant operators determine the aeration required for adequate biological degradation of contaminants in the wastewater, and will simplify the process even more through automated adjustment of the air pumps that provide the aeration treatment process. The test to determine required aeration will now be almost instantaneous instead of a drawn out over five-days, greatly enhancing the energy optimization in the aeration process of these plants.

**Market Analysis:**

About 16,400 WWTPs exist in the United States. Our initial market niche will be the estimated 12,000 mid-size WWTPs that serve cities with populations between 10,000 and 100,000 people. Within these, Contraire targets plants that utilize activated sludge treatment. Unlike lagoons or trickling filters, activated sludge treatment systems use bubble aeration, which is the focus of our predictive analysis. Moreover, WWTPs can utilize either fixed or variable frequency drive (VFD) blowers to supply aeration. Plants utilizing VFDs will be our beachhead market because not only are VFDs easier to optimize, the life of the blower can be extended by running below full capacity providing additional customer economic value.
Our final beachhead market inside the U.S. is about 7,700 WWTPs. Contraire’s average pricing model of $48,000 a year represents an annually-recurring addressable beachhead market in the U.S. equal to $350 million. Further environmental engineering and legal research is being held to investigate the potential of entering foreign markets.

**Description of Products & Services:**

Contraire’s product/service is an automated testing and control system that will adjust aeration inputs as water characteristics fluctuate. This system will be owned and maintained by Contraire. Our control system will continuously analyze other real-time measurable parameters, such as COD (chemical oxygen demand), dissolved oxygen (DO), ammonium, TOC (total organic carbon) concentrations, and others in order to create a mathematical relationship that accurately predicts BOD in “near real-time”. Once this algorithmic relationship is field validated, we will finalize our process control system that will be able to collect the applicable influent parameters, determine a pseudo-BOD concentration from those parameters, and then adjust the air blowers accordingly.

Blowers are normally ran full throttle at all times, which excessively lowers the organic content in the water. Our approach will optimize air delivery, and thereby enable the real-time control of the organic content while remaining under the regulatory environmental constraints. The WWTP aeration function can effectively be put on “autopilot”. The more data we collect, the more we will be able to refine this process and optimize the amount of energy wastewater plants can save.

Although many plants operate their aeration systems differently, through our conversations with the operators, we are confident that we will be able to adapt our predictive analysis process to all of the different systems we have researched.

Contraire will install and own the control system at each WWTP at an estimated initial capital equipment and installation cost of $30,500 per facility. Each aeration basin will require, on average, 8 sensors for each of
the average three aeration basins (24 total sensors). The corporate ownership of each proprietary control system will create an enormous competitive barrier because municipalities can implement our technology at no capital cost. To ensure repayment of all hardware and installation costs within a year, a monthly recurring base fee will be charged. In addition, the average flow, in the units of million gallons per day, will be multiplied by $250 and added to the base fee to guarantee pricing is fair across the entire market segment. This results in an average recurring yearly price of $48,000 which generates a corresponding net $252,000 in operating expense savings. This pricing strategy guarantees, on average, a nine-month corporate payback period for all implemented equipment. No capital investment is needed for the municipality, creating savings “month one”.

By paying a monthly recurring fee based on average wastewater flow rates, municipalities are entitled to both the implementation and upkeep of all sensors and electrical hardware, both of which remain Contraire’s property. Contraire individually assesses each aeration basin at every WWTP to determine both the plant’s energy savings potential and the extent to which the municipality would like their plant optimized. Contraire personalizes aeration to meet consumer preference for cost savings versus risk of regulatory compliance. Even at a plant’s full optimization potential, Contraire can ensure legal compliance within all wastewater effluent quality regulations.

After interviewing over 30 city council members and city managers, Contraire determined a strategic pricing method to mitigate the bureaucracy of selling to municipalities. Our monthly recurring fee is low enough for a city manager to approve contractual purchase agreement without consulting city council members or public forums thereby expediting the purchasing process.
Organization & Management:

The current management teams consist of two co-founders: Rabecca Wiseman, a current Master’s student in Environmental Engineering, and Brooks Robison, a current senior in Entrepreneurship. Rabecca, the engineering lead, has worked extensively with the technology for over a year and will continue to serve as the lead lab GA. The business lead, Brooks, has significant family entrepreneurial experience and will begin graduate school in the spring. The management team receives advice from David Thomison, an NSF I-Corp Mentor, experienced entrepreneur, and previous venture capital fund manager, and Dr. David Lampert, an Assistant Professor in the Civil and Environmental Engineering department, who also is the Principal Investigator on the four grants listed below. Leveraging this oversight, the co-founders’ focus will be leading the company through research, beta testing and immediate subsequent stages of commercialization, which should coincide with completion of graduate programs.

Looking forward, we plan to hire an experienced entrepreneur at the beginning of Year 3, upon commercial readiness, as the CEO, and a retired executive that had a career in the wastewater industry as the VP of Sales & Marketing. These hires will instantly add credibility to Contraire and assist during the commercial launch. Attempting to minimize initial payroll expenses, these positions will work utilizing sweat equity, receiving only 75% of planned salary for just this first year. Salaries will increase to the full rate in Year 4 and thereafter. A VP of Engineering will also be hired during Year 3 at full salary because of the positions long-term lower salary. Hiring a CFO will follow in Year 4, and will correspond with the timing of raising the Series B Preferred and rapid financial growth of the business. All Executives will have equity, via a Stock Option Pool, in the company (see Appendices B). Additionally, Contraire will seek Board members in Year 2, at the time of our first external equity capital, to create a Board of Directors.

Competitive Environment:

Innovation regarding predictive control systems for aeration in WWTPs is a fairly new avenue of research, and no potential direct competitors have been identified from local research. There are multiple companies that offer their own solution to aeration optimization, but none who utilize peak demand mitigation or multiparameter analysis. Hach offers an aeration optimization system based entirely on dissolved oxygen sensors with the potential savings of up to $100,000 per WWTP. They, along with YSI, offer a BOD prediction sensor, but it is single-parameter based with an algorithm formed with surface water. This causes their prediction to be too inaccurate for WWTP operators to rely on. Endress + Hauser offers sensors that provide real-time characteristics of the water, however Siemens focuses on major cities to install their competitive product - the Turbocompressor STC-DO. This compressor has the ability to measure characteristics and adjust air flow rates accordingly, but it can only be installed in WWTPs designed by Siemens. None of these companies can claim both of our distinguishing factors: (1) a system that controls aeration levels based on predictive BOD concentrations and (2) the ability to retrofit systems into an existing WWTPs.

Marketing & Sales Strategy:

Initial awareness for this service will be created by marketing our service primarily at trade shows. In Stage 2 of marketing, an experienced technical sales team will directly target the
end user, the plant operator, with telemarketing campaigns. Once interest has been conveyed, that sales associate will personally meet with both the city manager (i.e. the Economic Buyer) and plant operator to discuss current plant operations, potential concerns, and initial pricing estimates. Each WWTP can be optimized to different extents, so the knowledgeable in-person sales strategy creates the opportunity to customize our service for every customer. Ultimately, the sales goal is to have the city manager sign a multi-year contract with the above stated recurring fees.

Our sales force will utilize a geographic organization structure, eventually expanding with representatives around the United States. To create an incentive to generate new sales, as well as maintain relationships with existing users the technical sales professionals will be paid a 7.5% sales commission for new accounts for the “first twelve months” and a 2.5% commission thereafter on existing accounts to incentivize on-going strong customer service. We are forecasting the sales associates to close 2 sales per month.

Customer service technicians will be available for customers to contact and request service. A description of the necessary service will be expected by the service technician to identity appropriate solutions, and an appointment will be decided upon by both parties. In the event of more appointments booked than service technicians available, appointments will be prioritized in order of immediacy for plant operation and environmental compliance.

**Potential Energy Savings:**

Treating municipal wastewater produces 130g CO2/gallon. Implementing our technology throughout our beachhead market can annually save 57 million metric tons of CO2 from being released into the atmosphere. This is equivalent to the emissions from 12 million cars every year, in the U.S. alone. Although some emissions come directly from the treatment processes, the majority of emissions come from the power generation needed to operate these facilities.

During on-peak hours, non-renewable resources account for 68% of the generation mix while renewable sources only account for 32%. However, during off-peak hours, non-renewable sources drop to 57% while renewable sources increase to 43%. Respective values reflect electricity production within the Southwest Power Pool. As a high-end estimate, using 100% off-peak electricity would reduce greenhouse gas emissions by 12.3%. Therefore, one key strategy to reduce WWTP energy consumption is to shift operations to run during off-peak hours where possible.
Product Development Plan:

All bench scale laboratory results and data has been positive thus far. The lab-scale WWTP is currently being enlarged from a 1 cubic foot reactor to 100 gallons. Completion of a full sensor system and hardware integration is critical for commercial success. After completing our lab upscale and system integration, field beta testing will be held at the Stillwater, Oklahoma WWTP. Funding will be provided by [BLANK]. Full hardware implementation in one of their three aeration basins is expected to begin in the summer 2020. The management team is in continuous contact with the Stillwater WWTP, and they have expressed vibrant enthusiasm both in person and on paper about the opportunity for their plant to be used for large scale beta testing (see Appendix C). Once conclusive data is available from the Stillwater plant, we will be able to begin full commercialization.

Oklahoma State University Licensing Agreement:

While no final decision has been made regarding patentability by the OSU Technology Development Center, at minimum the developed core proprietary algorithms will be maintained as a Trade Secret and associated software Copyrighted. All developed technology is owned by Oklahoma State University. Contraire is currently engaged with the senior licensing associate at the OSU Technology Development Center, Russ Hopper (see Appendix F). Currently, negotiations are in progress for an exclusive "option to license". Under this option Contraire has the exclusive right to license the technology for up to two years, with an option of a one-year extension, subject to achieving defined technological milestones. Based on current discussions, upon exercise of the option it is anticipated that the licensing structure would include upfront repayment of legal expenditures and a market rate royalty percentage forecasted to be in the 3-5% range.
Grant Funding:

To date, members of the Contraire team, through their roles at Oklahoma State University, have initiated, developed, and submitted all grant funding applications. 100% of grant applications have been awarded providing $213,000 in funding availability. This non-dilutive funding should be sufficient to advance the technology through a commercial field beta test, and execution of Contraire's right to license the core technology. Since the technology ownership and continued development resides within Oklahoma State University, all grant funding will flow through the university. These same key members, within their dual role, are personally executing the technology and commercialization development path.

<table>
<thead>
<tr>
<th>Funding Acquired (OSU)</th>
<th>Amount</th>
<th>Time</th>
<th>Use of Funds</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phase 1 EPA People, Prosperity, &amp; Planet (EPA P3)</td>
<td>$15,000</td>
<td>Aug '17</td>
<td>Initial Lab Set-Up</td>
</tr>
<tr>
<td>National Science Foundation (NSF)</td>
<td>$3,000</td>
<td>Feb '18</td>
<td>Travel for Market Discovery</td>
</tr>
<tr>
<td>OSU Technology Business Development</td>
<td>$25,000</td>
<td>May '18</td>
<td>Lab Equipment - Sensors</td>
</tr>
<tr>
<td>OK Center for Advancement of Science</td>
<td>$90,000</td>
<td>June '18</td>
<td>Upscale lab Set-Up</td>
</tr>
<tr>
<td>EPA P3 - Phase II</td>
<td>$75,000</td>
<td>Nov '18</td>
<td>Graduate &amp; Undergrad. Labor</td>
</tr>
<tr>
<td>Venture Well - Phase I</td>
<td>$5,000</td>
<td>Jan '19</td>
<td>Brand &amp; team development</td>
</tr>
</tbody>
</table>

TOTAL GRANTS AWARDED $213,000

Grants Targeted (Contraire/OSU)

<table>
<thead>
<tr>
<th>Amount</th>
<th>Time</th>
<th>Use of Funds</th>
</tr>
</thead>
<tbody>
<tr>
<td>NSF I- Corp National</td>
<td>$50,000</td>
<td>May '19</td>
</tr>
<tr>
<td>OK Center for Advancement of Science</td>
<td>$300,000</td>
<td>May '19</td>
</tr>
<tr>
<td>Venture Well - Phase II</td>
<td>$20,000</td>
<td>Aug '19</td>
</tr>
<tr>
<td>Future Business Plan Competitions</td>
<td>$75,000</td>
<td>2019-2020</td>
</tr>
<tr>
<td>OSU Pre-Seed Funding</td>
<td>$25,000</td>
<td>Feb '19</td>
</tr>
</tbody>
</table>

NEW GRANTS TARGETED $470,000

Co-Founder Rabecca Wiseman, initially hired in Aug. 2017 with the Phase 1 EPA People, Prosperity, & Planet (EPA P3) grant, has been promoted to Lead Researcher directing all science and lab experiments along with managing lab resources. In addition to leading the project’s technological development she is currently pursuing her Master’s degree in environmental engineering with a focus on the science behind municipal wastewater treatment, all of which is paid for by EPA P3 - Phase II funding.

Financials:

As depicted in the following summarized Forecasted Income Statements, during the first two years, Contraire in close collaboration with Oklahoma State University will continue to leverage non-dilutive funding, currently in the amount of $213,000, to advance the underlying technology to a commercialization stage. In Year 3, Contraire will lead the full transition into the
business launch phase. The focus will be the installation and development of a handful of municipal systems in order to create a small customer portfolio prior to full launch of marketing campaigns. Contraire will then immediately proceed to implement a full market launch. After this full market launch Contraire projects strong growth over the following three years leading to exit in Year 7. This aggressive marketing campaign launch will target beachhead municipalities with populations between 10,000 to 100,000, culminating in almost 500 WWTP municipality customers and approximately a 7% market share.

**Revenue Assumption:** Contraire’s unique scale pricing system allows for even the smallest communities in our segment to find value in our predictive analysis. Charging a monthly base fee of $4,000 plus $250 per units of million gallons treated per day, each customer is forecasted to produce a recurring annual revenue of $48,000.

**System Asset Deployment:** Since Contraire will design, install and own the control system at each WWTP, the total asset cost per system has a critical cash impact, as the company must fully fund this upfront capital deployment. The average “turnkey” cost per system installation, including all equipment and labor is $30,500. This upfront investment constitutes the primary influencer of future capital requirements as Contraire expands, as this investment precedes recurring revenues.

**Operational Financial Variables:** The remaining financial assumptions, including a detailed Staffing Plan is contained with the Financial Modeling within the Appendix A.
All the current and projected ownership details and forecasted or targeted capital returns are detailed within the Contraire Capitalization Table contained in Appendix B.

**Exit Strategy:**

We plan to exit in Year 7, with an EBITA of $\text{$_{14M}$}$ and revenue of $\text{$_{23M}$}$. Utilizing an EBITA Multiple of $\text{$_{6.5}$}$, our exit value will be $\text{$_{90M}$}$. This will produce an ROI of $\text{$_{21x}$}$ for Common Stock investors, $\text{$_{16x}$}$ for Series A investors, and $\text{$_{10x}$}$ for Series B investors (see Appendix B).

We anticipate being bought by a larger waste water company, such as Hach or SUEZ, for $\text{$_{90M}$}$ because they would greatly benefit from our proprietary technology to improve optimizing aeration basins. Offering something similar, Hach deploys dissolved oxygen (DO) sensors and thus already understands the market opportunity and immediate realize significant business synergies. Our savings potential is dramatically greater, multi-parameter based, algorithm in addition to the added value of optimizing with regards to peak electrical demand but will be extremely complimentary to their marketing/sales distribution channels.

GE Power & Water, Water & Process Technologies, now owned by SUEZ, offers the Sievers M5310 portable total organic carbon (TOC) analyzer, providing feedback twice as fast as previous models. Their dedication and investment towards real-time wastewater analysis would make them an ideal purchaser, provided Hach does not make an offer first.

Another avenue for potential buyers includes companies that currently operate wastewater plants for municipalities. While most municipal wastewater treatment plants are owned and operated by the city, certain municipalities will hire a third party for their wastewater services. Notable companies that operate wastewater plants in our region include Veolia and Inframark. Veolia is a large, international company that generated a total revenue of $\text{$_{29.8 billion}$}$ dollars worldwide, but they do have a presence in our target market, operating a total of 3 out of the 168 wastewater plants we targeted in Oklahoma.