BioFuran Materials LLC Business Summary

Executive Summary

BioFuran Materials LLC, herein BioFM, is taking a leadership role in changing the way chemicals are manufactured today. We're developing a truly sustainable process that is designed to chemically convert 100 ton/year of food wastes into short chain organic acid derivatives, such as esters, ionic liquids, and metal salts. Through our chemical manufacturing anchored on food waste feedstocks, we strive to make the world a better place, one product at a time. We believe that our food waste-derived products are safer to use since they are biodegradable and non-corrosive unlike the potentially harmful sulfate, nitrate, fluoride, chloride-based salts which we seek to displace. We expect that the utilization of 100 ton/year of food wastes for chemical manufacturing can create a sure path towards a zero-waste economy around our towns and cities. We have this far developed a process for manufacturing, scaled and commercialized potassium formate (KOOCH).

The Benefits of Our Chemical Approach

Once we become fully operational, municipalities will deal with reduced food waste tonnages (approx. 10% lower by end of 2021) at landfills. Cumulatively, our food waste-to-chemicals approach can solve serious issues associated with landfill-bound food waste tonnages including:

- Decreasing uncontrolled greenhouse gas (GHG) emissions from landfilled organic wastes,
- Reducing contamination of water supplies through leaching of toxins from decomposing organic matter and
- Limiting reliance on traditional incineration and composting of wasted foods.

Instead of landfilling, BioFM will repurpose food wastes to become a critical chemical manufacturing raw material used to produce potassium formate. Potassium formate is sold to customers as a:

deicer	heat transfer fluid	lubricant additive	foliar fertilizer
anti-freeze coolant	shale gas drilling fluid	paint additive	animal feed additive precursor
water harvesting desiccant	refrigerant	coating additive	reducing agent

Meet the Founder – About Us

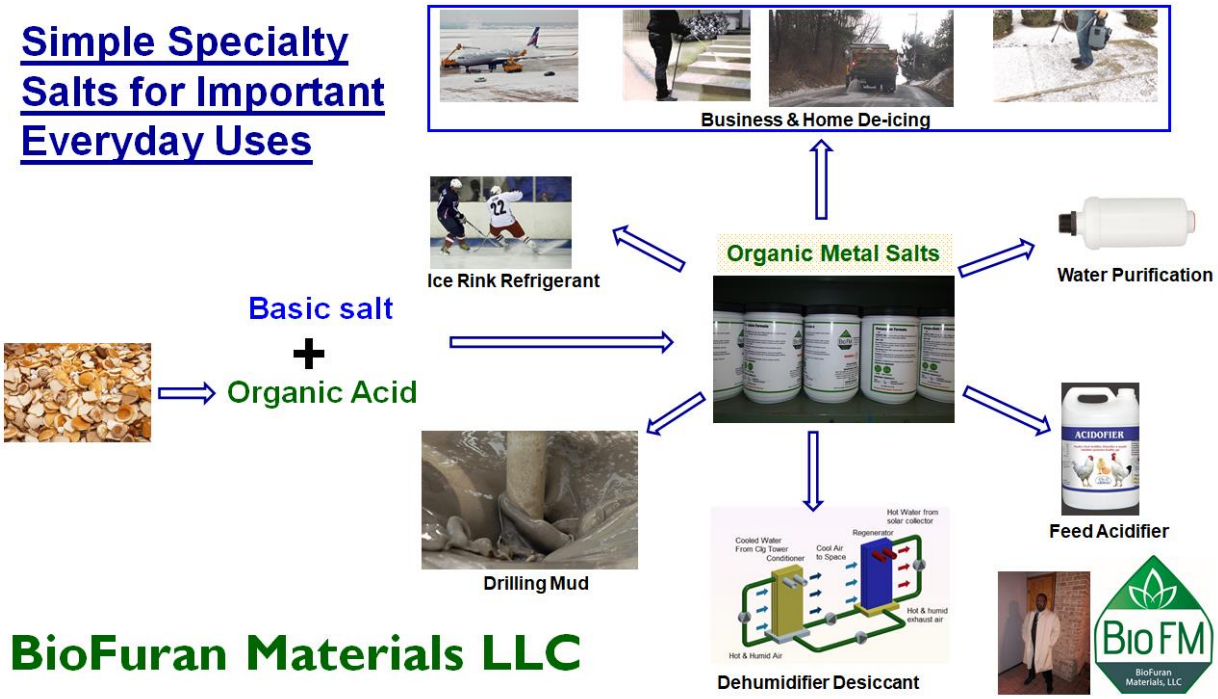
BioFM was started by Dr. Chengy Gwengo (CG), an Inorganic Chemist. CG grew up in an African village where intensive utilization of each resource was a life lesson. When CG came to Marquette University (Milwaukee, WI) in 2004 for his graduate studies, he was amazed by the abundance of resources, how easy it was to get day-to-day resources, and that it was OK to throw away excesses and leftovers. To fit into the new resource excesses norm, CG quickly assimilated the new culture but could not let go the concept of intensive utilization of resources. Fast forward to 2011, CG accepted a position as Visiting Assistant Professor at Claflin University, a position where he mentored students in developing methods for converting sugarcane processing wastes into renewable plastics building blocks. Today, CG is

revisiting the call to resource stewardship, this time by converting an old life lesson into a business and chemical manufacturing culture. Yes! Wasted foods are an important resource.

#Let's clean up our locality and create value

#Same-old wastes, transformative uses

#No food will be wasted in Pittsburgh and/or across the US.



Our Value Proposition

BioFM strives for higher quality, lower cost, and environmentally friendly products. We are passionate about our renewable chemical manufacturing process; we are committed to providing exceptional services and we are devoted to honest communication. We provide creative ideas and chemical solutions to customer needs. Our expertise includes, among other things, an excellent understanding of material design and synthetic chemistry, coupled to a strong emphasis on the quality and consistency of our products, as well as rapid response to customers' requests, and timely delivery. We supply environmentally friendly, green and sustainable products that minimize the impact of everyday chemicals on the environment to protect the future of our planet. By electing to use food wastes in chemical manufacturing, we promote

- greater eco-efficiency,
- resource productivity, and
- the commercialization of an emerging chemical manufacturing approach.

The Problem We Intend to Address

Food Waste is a major municipal management issue worldwide. Today, it is a growing component of landfill waste and is estimated to account for over 50-60% of the total municipal solid waste. Due to its putrescible nature, food waste is viewed as stinky mess that few people would want to deal with, even in their homes. However, the stinky mess contains significant quantities of chemical constituents which can be harnessed and reliably converted to a useable form. The McKinsey Global Institute announced that food waste is ranked third of the 15 identified resource productivity opportunities as part of its 2011 report entitled "Resource Revolution: Meeting the world's energy, material, food and water needs". Despite these statistics, many of these food waste residues still find no major uses apart from the first-generation recycling practices such as composting and/or feeding animals.

BioFM's Solution to High Food Waste Tonnages

The publicly available stats indicate that food wastes are abundant, readily available, under-utilized, and renewable (produced daily). In this context, BioFM is taking a role, at industrial level, by utilizing food waste as a truly sustainable industrial feedstock to produce biochemicals. We expect that the utilization of 100 ton/year of food wastes should positively influence chemical manufacturing revenues and create a sure path towards zero-waste economy in Pittsburgh and beyond. The development of a food wastes-to-chemicals platform will address the primary weakness of the food processing and supply industries, which currently undervalues the chemical content of rejected foods. Once we become fully operational, Pittsburgh municipalities will deal with reduced food waste tonnages at landfills (approx. 10% lower by end of 2021).

Food Waste Recovery Partners

BioFM is located at the University of Pittsburgh Applied Research Center. We've working with local food suppliers such as Walmart, Giant Eagle, Costco, Sheetz, Nickles Bakery Distribution Center, Shop-n-Save, ALDI, Save-a-Lot, Sam's Club, Sysco, Whole Foods, Panera, Pizza Hut, Papa Johns, McDonalds and others. Suppliers of food wastes may be paid a nominal incentive of about $0.19/kg of food wastes collected and delivered to BioFM. To supplement food waste feedstock, if necessary, BioFM has also reached out to food rescuers who, apparently, end up with loads of inedible or outdated baked goods. At this juncture, BioFM is already finalizing supply agreements with 412 Food Rescue, Food Waste Wrangler, Costco Cranberry, DeAngelis Donut Shop, and the Penn State Beaver Food Rescue team lead by Prof. Angela Fishman. We anticipate mobilizing at least 50 Allegheny County food waste generators towards a "no waste" culture by diverting of 100 tons/year of wastes from landfills.

Show me the Value of the Food Waste-to-Chemicals Concept

There is $value in converting wastes to chemicals. A 2017 book, **Biofuels from Food Waste Applications of Saccharification Using Fungal Solid State Fermentation**, summarized the monetary value in food wastes as follows: In 2007, the average value of bulk chemicals produced from waste biomass was estimated to be around $1000 per ton of biomass. Comparatively, the use of food waste for animal feed or generating electricity were estimated to be in the range of $70–200 and $60–150 per ton of biomass respectively, which in any case highlights high value addition brought about by converting biomass into chemical products. The numbers spoke then, the value has probably since multiplied, yet there is still little interest in food wastes. In Pennsylvania, fracking is hogging the limelight, all the attention is on finite fossil oil and gas. Well, Pennsylvania, we got refreshing news for you, BioFuran Materials is stepping in, we're bringing with us a resourceful approach to making everyday chemicals made from

good old food wastes that our food makers, restaurants, hotels, colleges, schools, homes, airports, etc., produce in large quantities daily.

Our Target Chemistries & Applications

Organic food wastes are energy dense, rich in starches, sugars, proteins, lipids, and traces of minerals, all begging to be converted into usable materials. At BioFM, we are developing processes for converting food wastes into esters, ionic liquids, and metal salts. So far, BioFM has launched and commercialized potassium formate. Potassium formate is used as a de-icer, heat transfer fluid, a drilling fluid, anti-freeze coolant, refrigerant, foliar fertilizer, lubricant additive, paint additive, coating additive, reducing agent, and animal feed additive. We produce potassium formate to custom specifications by request, in addition to custom compositions for commercial, research and proprietary applications. Typical and custom packaging is available. Contact us at https://www.biofuranchem.com/contact-us-5/ for information on lead time and pricing on quantities that are not listed on the website.

Exemplary Industrial Use Cases for Potassium Formate

Potassium formate can be used in a wide variety of industries including:

- As additive: drilling mud to improve drilling efficiency and extend working life of drilling bits.
- As a liquid deicing agent: to replace cheap but wasteful & corrosive rock salt
- As a reducing agent: in reaction chemistry, printing and dyeing.
- As an intermediate: in manufacturing of potassium diformate, a solid animal feed acidifier which is easier to handle than the liquid organic acids.
- As a fertilizer: in agriculture to improve growth of crops and produce yields (Check out AGROLIQUID, https://www.agroliquid.com/resources/blog/using-almond-tree-fertilizer-to-restore-potassium/.
- Production of green fire extinguishing composition
    - cleaner and more environmentally friendly alternative to dry chemicals, such as Purple K
- Rapid hardening of concrete
- Moisture buffering in building walls, ceilings, and floors as well as the furniture
- Metal stabilization in electroplating
- Low-temperature heat exchanger coolant

Show Me Why I Should Use Potassium Formate

A. Exemplary Performance Metrics of Potassium Formate – Vs. Traditional Snow Deicers

	Chloride Salt	Glycols		Organic Salt
	Calcium Chloride	Ethylene Glycol	Propylene Glycol	***Potassium Formate***
Active Ingredient Loading	28.3%	50%	54%	41%
Heat transfer	excellent	regular	poor	excellent
Viscosity	exceptionally low	high	extremely high	exceptionally low
Corrosivity	exceedingly high	low	low	moderate
Toxicity	food-safe	toxic	food-safe	food-safe
Costs	exceptionally low	low	high	low

B. Exemplary Performance Metrics of Potassium Formate – Vs. Traditional Refrigerants

Active Ingredient	Physical State	Chemical Formulation Concentration	Practical Temperature Limit
Potassium formate	Liquid	49%	-F (-52°C)
Potassium acetate	Liquid	44%	-°F (-53°C)
Ethylene Glycol	Liquid	40%	-°F (-51°C)
Propylene glycol	Liquid	60%	-°F (-50°C)
Rock salt brine (NaCl)	Liquid	22%	-°F (-21°C)
Calcium chloride	Liquid	30%	-°F (-50°C)
Magnesium chloride	Liquid	22%	-°F (-34°C)
Lithium chloride	Liquid	22%	-°F (-55°C)
Ammonia	Liquid	25%	-°F (-55°C)
Potassium formate matches leading refrigerants and is more user-friendly			
Melinder, 2007			

Why Potassium Formate is a Special Product?

Heat, snow and humidity are climatic factors that determine our outdoor and room comfort level. Effective control of these climatic conditions can enhance people's comfort, health, and savings. Apparently, the researchers at Lawrence Berkeley National Laboratory estimate the global stock of room air conditioners will rise by an additional 700 million by 2030, and 1.6 billion by 2059. Under such rising demand, society has always turned to chloride brines for traditional air conditioning. However, due to rapid corrosion of liquid transfer piping and high maintenance costs, chloride brines may be phased out in air conditioner installations for secondary coolant fluids that are more effective and environmentally friendly solutions such as organic salts like potassium formate. This pushes the demand for potassium formate, an easily biodegradable liquid desiccant with much less impact on the environment. Other potassium formate benefits include:

1. Toxicity rate which is significantly lower than that of chloride-based products.
2. Reduced corrosive attributes when compared with other aqueous salts.
3. Highly water solubility, 331g/100mL at 18°C, much greater solubility in hot water, 657 g/100mL at 80°C.
4. High density, high pH value, and low crystallization point.

Launching Residue-free, NOICE Deicer, in October 2020

NOICE deicer is a Potassium Formate ice-melt that is non-corrosive and not hazardous to the environment. It effectively and quickly melts ice to temperatures of -50F and continues to be effective to a dilution rate that corresponds with outside temperature. It can be used to pretreat roads or rigs to prevent freezing or icing and can also be used after icing on any equipment from drilling rigs to container ships to airplanes. NOICE deicer replaces other salts commonly used. #Let's make some NOICE in 2020!

Clientele

BioFuran Materials seeks customers who are searching for environmentally friendly chemical solutions in their process or product development. Typical customers maybe from the agrochemical, cosmetic, roads/pavement maintenance, pharmaceutical, petrochemical, refrigeration, coating, academic, adhesive, and textile industries. Locally, typical customers may include Valspar, Callery, Eastman Chemical Company, Interstate Chemical Company, Sanyo Chemical Industries, Covestro, Lanxess, Neville, Sherwin Williams, Nova Chemicals and BASF. BioFM may also leverage the wider network of chemical wholesalers such as ChemDirect, Brenntag, and Palmer-Holland Chemical Distributor, Knowde, Applied Industrial Technologies, and Right Patch Industries.

Competitors

BioFM will face KOOCH supply competition from incumbent suppliers such as Aldrich, HiMedia, American Elements, Midland Scientific, Santa Cruz, and FujiFilm. Most, if not all, of these suppliers get their raws from the formate by-products such methyl formate hydrolysis or hydrolysis of metal formates. Alternatively, some suppliers rely on finite petroleum hydrocarbons (butane or naphtha) oxidation. Some rely on third-party suppliers which characteristically complicates ordering and delivery process. In sharp contrast, BioFM manufactures their product in-house and their process is designed to avoid the use of finite petroleum raws but use abundantly available food residues as their main raw material. Food wastes are truly renewable and our food waste-derived formates should attract customers willing to 'green' their operations.

An added advantage for using discarded nuisances as chemical feedstocks is the magnitude of beautification added to our natural environs. The use of food wastes will reduce the magnitude of air pollution that emanates from the uncontrolled decomposition of landfilled food wastes. Using food wastes, BioFM manufacture 500g of KOOCH at a production cost of $35.50 and the selling price is set at $65.66, a price that sits right in the middle between a high of $100.49 for Midland Scientific and a low of $53.89 for HiMedia. Check out our product portfolio here, https://www.biofuranchem.com/products/

Business Model

BioFM sells their products directly to business customers. Customers can purchase our products online or through Amazon Web Services. BioFM will explore website-generated opportunities on case-by-case basis, prioritizing those customers where BioFM can deliver the most value and become profitable. BioFM is currently exploring some quick wins in the deicing, agrochemical, reagent chemistry, and animal feed markets.

Four scenarios (See **Table Below**) were considered for estimating the monthly breakeven for the BioFM operations. The first scenario shows that 27 units need to be sold at a price of $75, a fixed cost of $1,030, to generate an income of $2,000. This scenario is untenable due to the above-average selling price. The second scenario which assumes the lowest fixed costs and a lower selling price of $66 seems reasonable as it takes 30 units to generate $2,000. The fourth scenario affords the highest revenue of $7,000 from an ambitious 100 units. This scenario will only be achievable with an expanded production team which is well completed by savvy sales and marketing efforts.

Monthly Breakeven Scenarios				
Monetary Parameter	*Scenarios Based on 500g Units of KOOCH*			
	I	**II**	**III**	**IV**
Per Unit Costs	$36.38	$36.38	$36.38	$36.38
Fixed Costs	$1,029.87	$897.58	$1,200.00	$3,362.00
COGS	$1,066.25	$933.96	$1,236.38	$3,398.38
Markup	106.16%	81.41%	81.42%	92.41%
Per Unit Revenue	$75.00	$66.00	$66.00	$70.00
Margin	51.49%	44.88%	44.88%	48.03%
To Break Even				
Units required to sell	27	30	41	100
With Revenue of	$2,000.00	$2,000.00	$2,674.00	$7,000.00