KARR GROUP OF COMPANIES

SUSTAINING HUMAN LIFE WITH BIOCHAR

info@karrgroupco.com
805-340-2484/818-929-6332

ONALASKA, WA (ENERGY MILL)

PANORAMA CITY, CA (CORPORATE OFFICE)

BASIC NEEDS FOR SUSTAINING HUMAN LIFE

- Air
  - Global warming. 5 million acres of forest fires in 2015 emitted as much air pollutants in the air as all industrial pollution combined
  - Toxic air contaminants from chemical fertilizer usage
- Food (agriculture)
  - Use of prolonged chemical fertilizers resulted in loss of soil carbon
  - Life underneath the soil is all but dead (yes, there is life below the soil, worms, microbes, fungi)
  - Nitrates and phosphates run offs, inefficient absorption of fertilizers
  - Compromise of plant immune system, plants more prone to disease and pests attack
  - Toxic chemicals being absorbed into our fruits and vegetables
- Water
  - Loss of soil carbon results in water run off, water not being absorbed to charge the aquafers
  - Loss of underground water supply
  - Chemical contamination from excessive chemical fertilizer usage
  - Nitrates and phosphates run offs have created large dead zone water bodies in Mississippi –Delta region and around the world
  - Cancer trains in India – contaminated underground water supply

KARR ECO-FRIENDLY SOLUTIONS

DO WE HAVE A SOLUTION IN HAND?

- Yes, we do have a very low cost and workable solution in hand….Large scale cost-effective biochar production and agriculture application
- Nature produced biochar (carbon) over thousands of year of processing, we produce it in 40 minutes through our patented process
- Karr has an operating plant in Onalaska, WA operating 24/7 producing 10,000 tons/yr biochar from green waste derived from sustainable forest residuals/waste wood

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ECO-FRIENDLY SOLUTIONS

HOW BIOCHAR ADDRESSES HUMAN EXISTANCE PROBLEM OF AIR, FOOD, AND WATER?

- Air
  - Biochar use in agriculture is carbon negative, each lb of biochar applied to soil results in 3.67 tons of reduction in green house gases (GHG), (almost equal to GHG emissions from one car) which cause global warming
  - Biochar reduces chemical fertilizer intake by 50% initially and ultimately eliminating it. Significant reduction in toxic air contaminants caused by chemicals spray
  - Reduction in pesticides use, results in reduction in air borne pesticide chemicals
  - Better quality of life for people around agriculture fields

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HOW BIOCHAR ADDRESSES HUMAN EXISTANCE PROBLEM OF AIR, FOOD, AND WATER?

- Food (data based on company trials with soybean, milo, vegetables, herbs)
  - Biochar increases crop yield up to 30%
  - Biochar increases plant immunity to fight diseases…healthier plants
  - Biochar results in reduced fertilizer and pesticides usage, less toxins n the fruits and vegetables
  - Biochar builds carbon and life back in the soil causing crop residue to break down in to usable and digestible carbon (food) for plants (we all intake carbon in our food for energy and growth, plants do too)
  - Biochar provides readily available food and water to plants near its root on 24/7 basis, minimal run off

KARR ECO-FRIENDLY SOLUTIONS

HOW BIOCHAR ADDRESSES HUMAN EXISTANCE PROBLEM OF AIR, FOOD, AND WATER?

- Water
  - Biochar application results in 30-40% reduction in irrigation water usage…..60% of water used in CA goes to agriculture irrigation
  - Biochar application results in substantially reduced water run off and builds the aquafer level back up, providing long term water supply and storage for agriculture and humans (loss of carbon in soil results in water run off and depletion of water underground)

WHERE DO WE GO FROM HERE?

- It is abundantly clear that we have an immediately available, cost-effective solution in hand to sustain human life on a long term basis
- 290 million acres of U.S. Crop Land
- 21.6 million tons/yr fertilizer usage
- We have enough biomass to meet the demand and forever change the way we as humans live
- Government and industry must get in sync and understand this viable solution and put enough resources to make it happen as soon as possible
- To utilize all biomass, 10,000 Karrbonizers will be needed nation wide, at a total cost of $30 billion (0.8% of U.S. annual budget)

KARR ECO-FRIENDLY SOLUTIONS

IS IT ECONOMICALLY STABLE?

- Absolutely yes. Here is how the economic model works….
- Results:
  - cut the fertilizer usage by 50% (NPK) resulting in savings of $100/acre,
  - Increased crop yield by 20%, Additional Profit = $2,000/acre
  - Decrease in pesticide use + decrease in water = $120/acre
  - Total additional income from biochar application = $2,200/year
  - Total expense = $2,400/acre
  - Payback – 1.00 year

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PROS AND CONS OF VARIOUS BIOCHAR – BUYER BEWARE

- Not all biochars are created equal
- Biochars from high temperature process like gasification, can have high levels of PAH compounds that can leach into the ground and be toxic to plants
- Biochars with high ash content – know what is in the ash (metals vs minerals)
- Biochar with very high moisture content – Application rates for biochar are based on high carbon, low moisture biochar. If buying high moisture biochar, you will have to put double or triple the amount to derive beneficial impact
- Pre inoculated vs non inoculated: Pre inoculated biochar at production level is better as the beneficial microbes and fungi have ample time to propagate between production and consumer application
- Phyto toxicity: High levels of volatiles in the biochar can create plant toxicity, make sure the IBI level II analysis is done on the biochar before you buy it
- Biochar with very high pH are very alkaline. Some biochars can have pH levels as high as 9. It can increase soil pH and have negative effect on liming. Cannot be applied to alkaline soils
- Water retention capacity
- Fines: high amount of fines can be detrimental to water retention and wind borne losses

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KARR'S BIOCHAR (TERRA-CHAR)

- pH maintained between 7 and 7.5
- Low ash, low moisture, high carbon
- Excellent water retention capability
- Pre inoculated at the factory assembly line before packaging
- Low volatiles, no PAH compounds, no leachable compounds
- Uniform sizing – excellent for application
- Low fines

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BIOCHAR SPEC SHEET

Control Laboratories
42 Hangar Way
Watsonville, CA 95076
www.biocharlab.com
Tel: 831 724-5422
Fax: 831 724-3188

Account No:
8658
Batch:
November 15 B
CODE:
BioChar IBI

Mahesh Talwar
Karr Group of Companies, LLC
321 N. Aviador St. #113
Camarillo, CA 93010

Date Received: 11/9/2015
Sample ID: Onalaska Wood Energy Biochar
Lab ID. Number: 5110275-01

International BioChar Initiative (IBI) Laboratory Tests for Certification Program

Dry Basis Unless Stated:		Range	Units	Method
Moisture (time of analysis)	6.4		% wet wt.	ASTM D1762-84 (105c)
Bulk Density	12.3		lb/cu ft	
Organic Carbon	80.6		% of total mass	Dry Combust-ASTM D 4373
Hydrogen/Carbon (H:C)	0.56	0.7 Max	Molar Ratio	H dry combustion/C(above)
Total Ash	3.92		% of total mass	ASTM D-1762-84
Total Nitrogen	0.72		% of total mass	Dry Combustion
pH value	6.85		units	4.11USCC:dil. Rajkovich
Electrical Conductivity (EC20 w/w)	0.072		dS/m	4.10USCC:dil. Rajkovich
Liming (neut. Value as-CaCO3)	1.9		%CaCO3	AOAC 955.01
Carbonates (as-CaCO3)	0.6		%CaCO3	ASTM D 4373
Butane Act.	1.9		g/100g dry	ASTM D 5742-95
Surface Area Correlation	194		m2/g dry	G

All units mg/kg dry unless stated:		Results	Range of Max. Levels	Reporting Limit (ppm)	Method
Arsenic	(As)	**ND**	13 to 100	0.47	J
Cadmium	(Cd)	**ND**	1.4 to 39	0.19	J
Chromium	(Cr)	7.5	93 to 1200	0.47	J
Cobalt	(Co)	0.5	34 to 100	0.47	J
Copper	(Cu)	5.9	143 to 6000	0.47	J
Lead	(Pb)	3.0	121 to 300	0.19	J
Molybdenum	(Mo)	1.3	5 to 75	0.47	J
Mercury	(Hg)	0.06	1 to 17	0.001	EPA 7471
Nickel	(Ni)	2.3	47 to 420	0.47	J
Selenium	(Se)	**ND**	2 to 200	0.94	J
Zinc	(Zn)	143	416 to 7400	0.94	J
Boron	(B)	6.2	Declaration	4.71	TMECC
Chlorine	(Cl)	**ND**	Declaration	20.0	TMECC
Sodium	(Na)	**ND**	Declaration	471.2	E
Iron	(Fe)	4495	Declaration	23.6	E
Manganese	(Mn)	77	Declaration	0.47	J

Particle Size Distribution	Results	Units	Method
< 0.5mm	42.4	percent	F
0.5-1mm	37.5	percent	F
1-2mm	15.9	percent	F
2-4mm	3.4	percent	F
4-8mm	0.8	percent	F
8-16mm	0.0	percent	F
16-25mm	0.0	percent	F
25-50mm	0.0	percent	F
>50mm	0.0	percent	F

Basic Soil Enhancement Properties			
Total (K)	2926	mg/kg	E
Total (P)	271	mg/kg	E
Ammonia (NH4-N)	6.2	mg/kg	A
Nitrate (NO3-N)	5.0	mg/kg	A
Organic (Org-N)	7184	mg/kg	Calc.
Volatile Matter	22.3	percent dw	D

* "ND" stands for "not detected" which means the result is below the reporting limit.

Method A Rayment & Higginson
B Enders & Lehmann
C Wang after Rajan
D ASTM D1762-84
E EPA3050B/EPA 6010
F ASTM D 2862 Granular
G Butane Activity Surface Area Correlation Based on McLaughlin, Shields, Jagiello, & Thiele's 2012 paper: Analytical Options for Biochar Adsorption and Surface Area
J EPA3050B/EPA 6020

Analyst: Nik Zumberge

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IBI CERTIFICATION

- International Biochar Initiative Certified (IBI)
  - Merit given to biochar producers who exceed rigorous quality standards
  - Karr is currently the only commercial producer with this certification

International Biochar Initiative

IBI Biochar Certification Program

Awards this certificate to

Karr Group of Companies, LLC
Panorama City, CA, USA
for
KGC Standard

as having met all the program requirements, according to the *IBI Biochar Standards.*

Status of this IBI certification may be verified at http://www.biochar-interntational.org/certification

Certificate No: 8429478
Issue Date: December 19, 2015
Renewal Date: December 19, 2016

Shiva Scotti
General Manager
International Biochar Initiative

International Biochar Initiative

The *International Biochar Initiative* grants the biochar manufacturer named on this certificate non-exclusive, non-transferable, non-licensable rights to display the *IBI Certified Biochar Seal* in conjunction with the sale or marketing of their *IBI Certified Biochar* and to use the *IBI Certified Biochar Seal* in promotional, advertising and informational material describing their *IBI Certified Biochar.*

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BIOMASS PROCESSED AT KARR TO DATE

APPLICATIOND DONE TO DATE

- Turf Rescue
- Golf Course
- Agricultural (grain and vegetable growing)
- Poultry barn
- Shrimp and crab waste disposal
- Composting
- Berry Growing in Greenhouses

PICTURES OF APPLICATIONS

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KARR TECHNOLOGY

- **Karrbonizer 6T System**
  - Karr Group has developed and is operating a unique and innovative closed loop patented technology to process raw biomass into biochar with high yields (Karrbonizer 6T System).
  - Karr's technology is the only of its kind that does not produce harmful byproducts and is safe for the environment. Karr's patent pending technology crack bio oil in its Karrbonizer and convert it into syngas through fractional hydro pyrolysis process (FHP)
  - Biochar in the soil remains for many years
  - Continuous process, 24/7 operation
  - High yields (40%) and process efficiencies
  - Zero discharge, closed loop. No waste bio oil production
  - Ability to handle moist material up to 55% moisture in input
  - Three products: Karrchar – IBI certified , Karr Vinegar (pesticide and microbial food, wood preservative), Karrgas (thermal or electrical use)

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KARR PRODUCTION PLANT (ONALASKA, WA)

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KARR CAPABILITIES

- Karr currently owns and operates a commercial 10,000 tons/yr biochar production facility in Onalaska, WA, utilizing biomass waste from timber mills as feed stock
- Karr funded the entire development utilizing its own funds (over $6 million to date), with no government grants for plant construction (Karr received $25K grant for a feasibility study from WADOC)
- Can handle all types of biomass waste
- Very low footprint of production process
- Continuous process, 24/7 operation
- No bio oil production
- Developed, designed, and built right here in the U.S.A.
- World wide application – can address palm plantation fires in Indonesia (some estimates put it as contributing a good portion of global green house gases emission), can end deforestation in many African countries by utilizing agriculture waste. Karr has received interest from eight countries so far.

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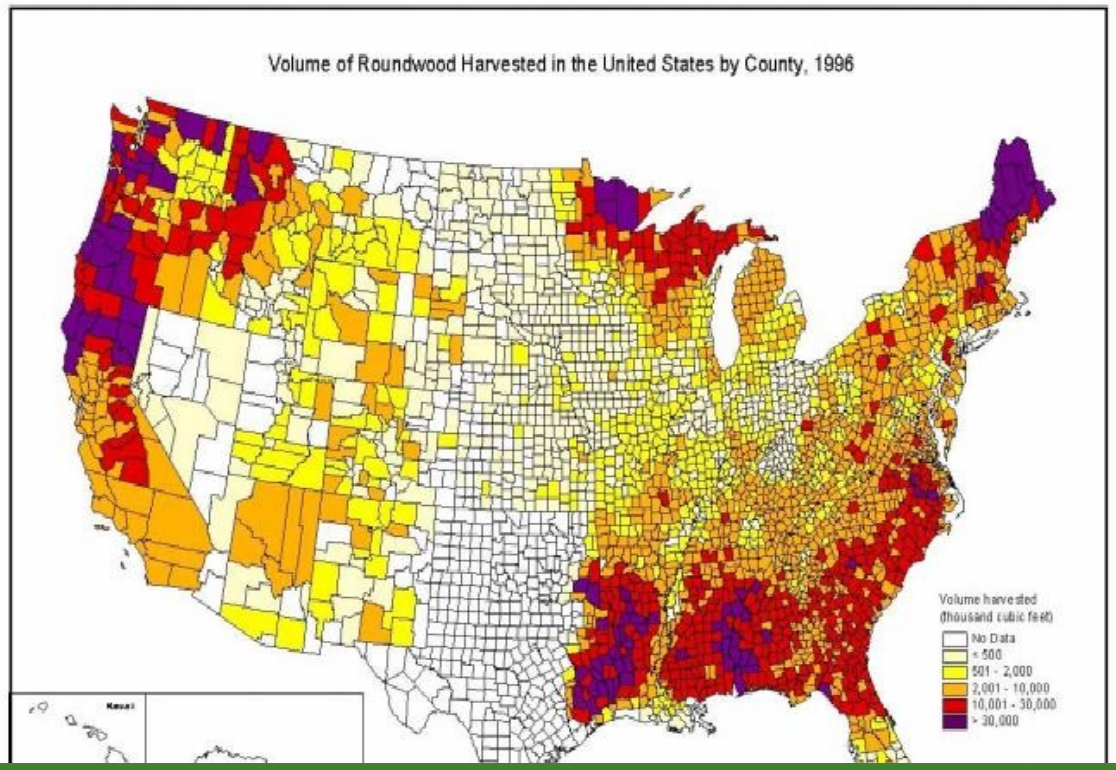
U.S. LOCATIONS FOR LARGE SCALE ROLL OUT OF KARRBONIZERS

Timber harvest by county



CURRENT U.S. FOREST DATA AND MAPS

Return

Timber harvests are concentrated in Maine, the Lake States, the lower South and Pacific Northwest regions.

The South is the largest timber producing region in the country accounting for nearly 62% of all U.S. timber harvest.

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SUMMARY

- We are headed in the wrong direction as a society
  - Nitrates and phosphates run off have created dead water zones of over 100 sq miles in Mississippi-Delta – Loss of SOM
  - Climate shifts, fires, and drought are real and measurable for our country
  - We need large scale commercial production of good quality biochar that is highly active, to reduce water usage, cut down chemical fertilizer usage, and build life in the soil for healthy agriculture and reduced run off
  - Karr solution provides this in a tested and proven model
  - Financial economic model prove that the operation can be self sustained
  - Large scale demonstrations through out the country will need Government-industry partnership initially
  - Need all agencies to work together to figure out the best way for a public private partnership

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ANNOUNCEMENT

- Karr Group announces the formation of a new non profit "Living Carbon Neutral (LCN)"
- Purpose: Funding pool creation from Government grants, Universities, industry, foundations, wealthy individuals, public at large to provide subsidized biochar for agricultural operations – make biochar affordable to farmers
- Social Benefits: Reduction in greenhouse gases (retirement of carbon credits for public good), better food chain for human consumption, drought management, bringing soils to life, reduction in chemicals usage (fertilizer, pesticides) in agriculture
- Each donor given a carbon currency for their contribution
- LCN will buy biochar from producers and act as a coop
- Potential Government partners: DOE, USDA, USFS, NRCS, Water Districts, State Energy and Resource Conservation, State and Federal Fire, foreign Governments

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- Contact: Mahesh Talwar 805-340-2484
  Ajay Keshap 818-929-6332
- Website: www.karrgroupco.com
- Email: mahesht@karrgroupco.com
  ajayk@karrgroupco.com

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