2024 NORTH AMERICAN BIOCHAR CONFERENCE — USBI — CALIFORNIA, USA

ARTi

A decade of driving Climate Solutions

Dr. Bernardo del Campo
President

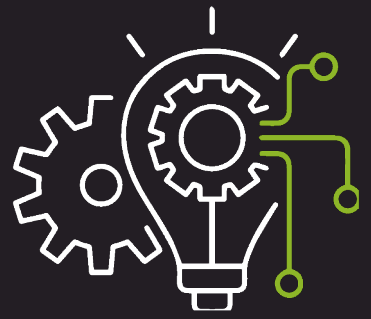
www.ARTi.com

ARTi

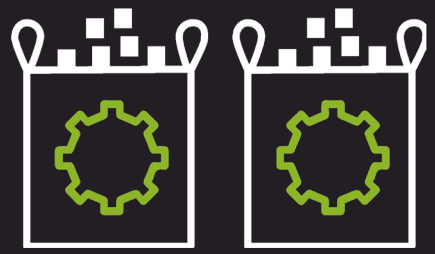
+ 10 years **experience**

End-to-End solutions for clients needs

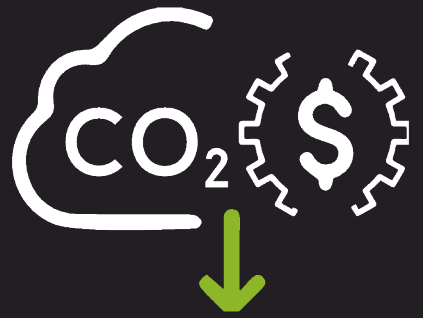
GREEN TECH.
MANUFACTURING
SOLUTIONS



RESEARCH
& DEVELOPMENT
for COMPANIES

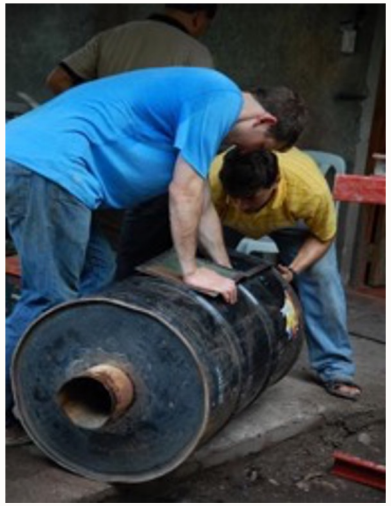


LARGE SCALE
BIOCHAR
PRODUCTION



CARBON DIOXIDE
REMOVAL
MARKET

From a **PROJECT** to a **COMPANY**



MARKET EVOLUTION

THE INDUSTRY KEEPS EVOLVING, AND SO IS ARTi

10 years ago…

CONTINUOUS SYSTEM

- Wood based Biochar
- For specific soil applications

PYROLYSIS REACTOR

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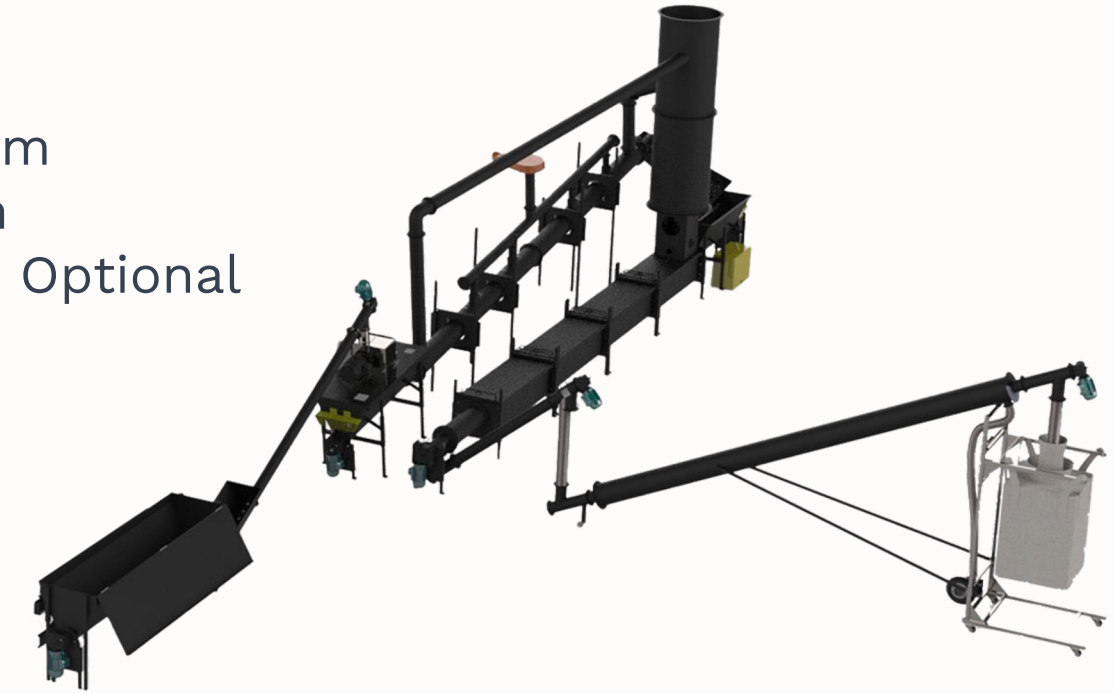
5 years ago…

SYSTEM INTEGRATION

- Multi Feedstock
- Large-scale production

Same Pyrolysis Reactor + integrations

- Grinder
- Dryer
- Cooling System
- Filling Station
- Afterburner > Optional



BPU > Integrated System

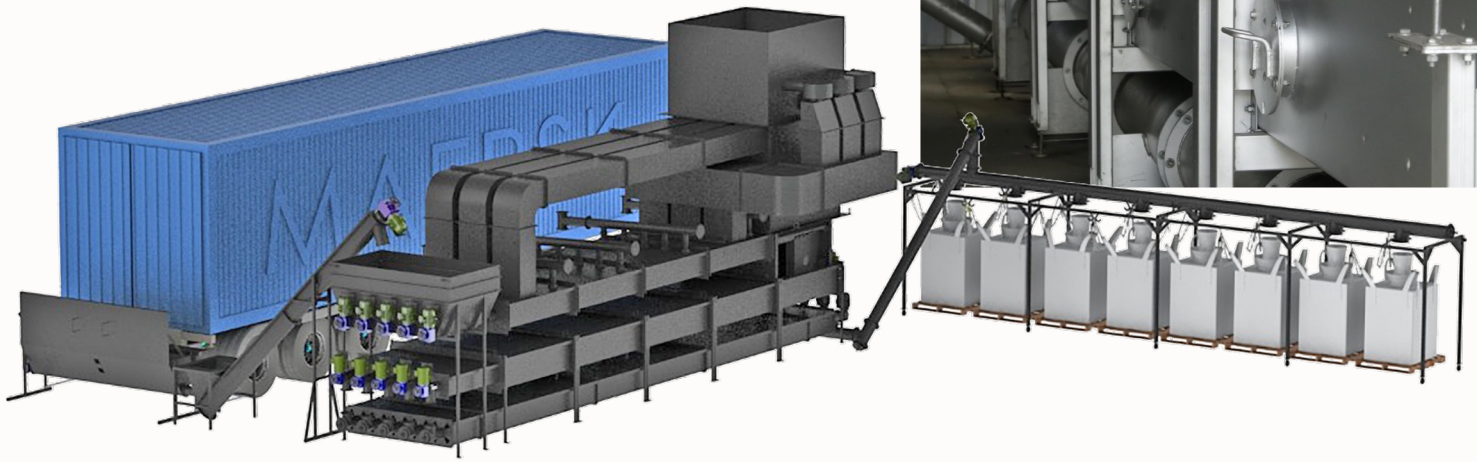
3 years ago…

CAPACITY + EMISSIONS

Climate change + Carbon Credits

- Multi Feedstock, waste reduction
- 24/7 maximize BC production
- Economic profitability: - costs, + efficiency
- Emissions restrictions

BPU > 1 to 5 trains



MOBILE BPU

Decentralize access to biomass

BIOMASS VARIABILITY

WHAT ARE THE KEYS TO SUCCEED?

THINGS TO CONSIDER

in order to have a successful project

DEFINE YOUR

GOALS

OPTIMIZE YOUR

FEEDSTOCK

OPTIMIZE YOUR

OPERATION

Everything matters, and everything depends

BIOMASS

CHEMICAL COMPOSITION

WOOD BIOMASS:

> What type of tree
> What part of the tree
> Homogeneous or mixed

*Same pyrolysis conditions

BIOMASS

CHEMICAL COMPOSITION

WOOD BIOMASS:

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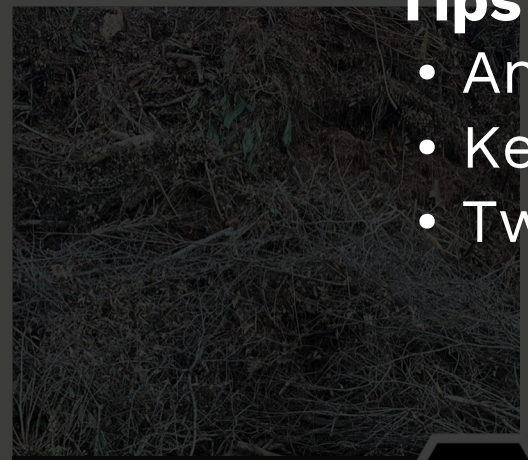
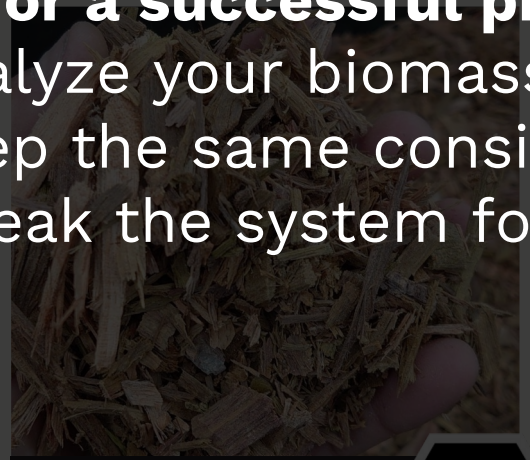
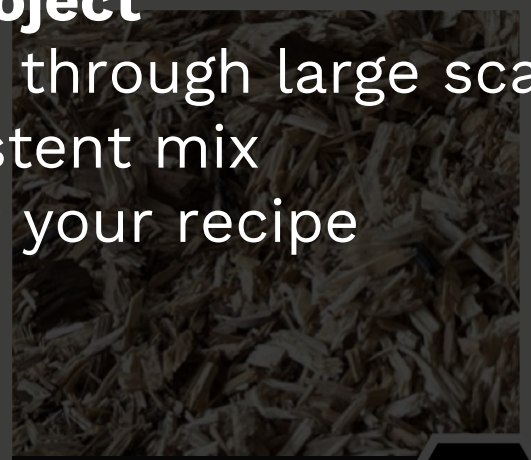
> Homogeneous or mixed

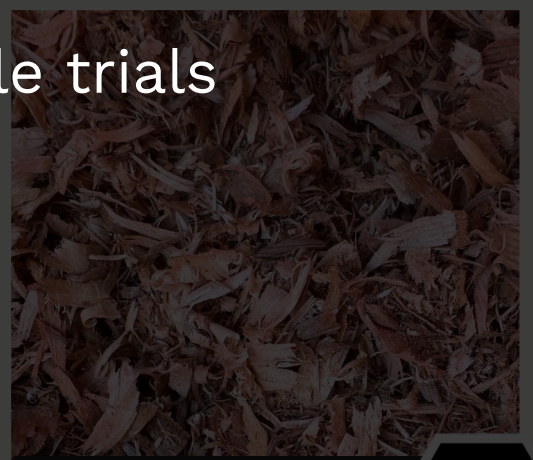
Tips for a successful project

- Analyze your biomass through large scale trials
- Keep the same consistent mix
- Tweak the system for your recipe









*Same pyrolysis conditions

BIOMASS

PHYSICAL COMPOSITION

PARTICLE SIZE
Fully cooked material
> Temperature + Residence time

H:C **0.7 - 0.3**
Speed **5 - 15 Hz**

DENSITY
> Daily Biomass Input
shred it, densify it

Throughput **± 50%**
Biochar Yield **12-35%**

CONSISTENCY
> Homogeneous or mixed biomass?

Moisture, Particle size
> **Consistent Biochar**

BIOMASS

PHYSICAL COMPOSITION

PARTICLE SIZE
Is It fully cooked? Ashes?
> Temperature + Residence time

DENSITY
> Daily Biomass Input
shred it, densify it

CONSISTENCY
> Homogeneous or mixed biomass?

Tips for a successful project

- Biomass pretreatment (Equipment)
- Consistency of the biomass (Supplier)

BIOMASS

MOISTURE CONTENT

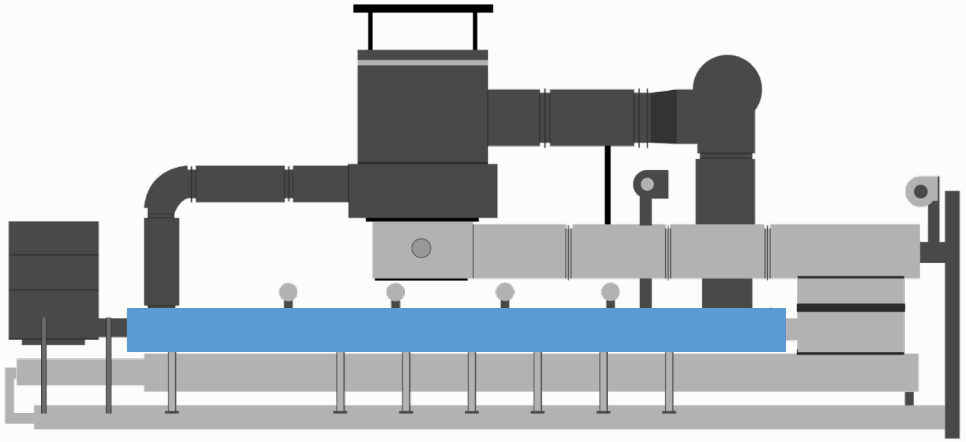
MECHANICAL CHALLENGES

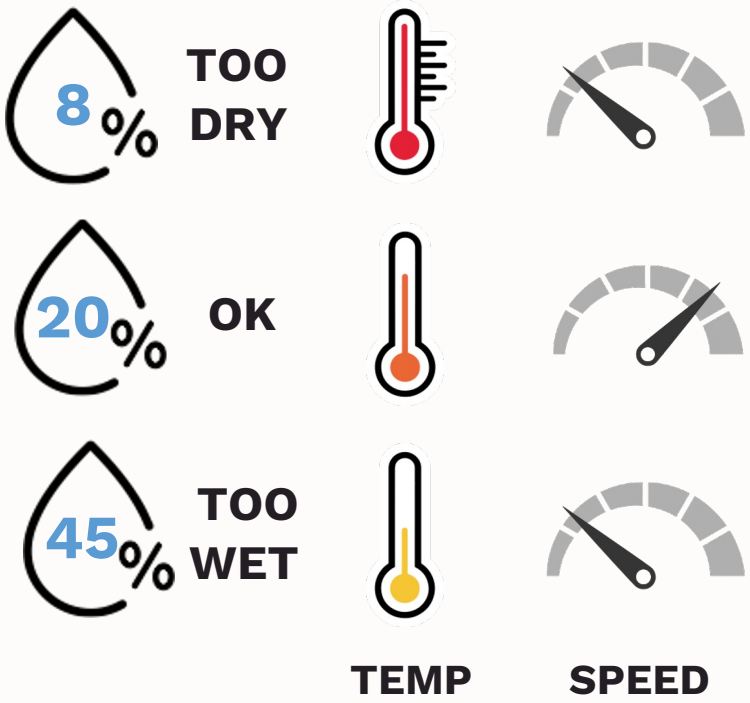
- Wet Biomass > Clogging, bridging, etc

ECONOMICAL CHALLENGES

- BPU Temp. variation > Propane Consumption
- Lower speed = Less Biochar production

Direct impact in **Biochar throughput**





BIOMASS

MOISTURE CONTENT

MECHANICAL CHALLENGES

- Wet Biomass > Clogging, bridging, etc

ECONOMICAL CHALLENGES

- BPU Temp. variation > Propane Consumption
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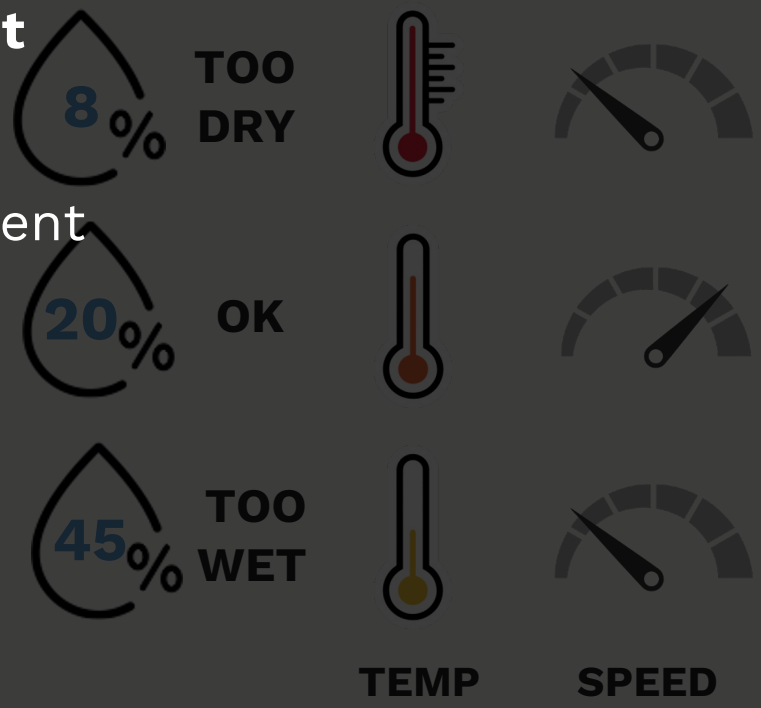
Direct impact in **Biochar throughput**

Tips for a successful project

- Biomass storage
- Need of external dryer?
- Consistent moisture content



OTHER SOLUTIONS for REDUCING MOISTURE

OPTIMIZE HEAT FOR DRYING BIOMASS

EXTERNAL SOLUTIONS

BIOMASS

TEMPERATURE

CHARRING INTENSITY

> Which temperature to get the BC you need?

as TEMPERATURE increases

	400 °C			550 °C			700 °C		
	Corg	**H:C**	**Yield**	**Corg**	**H:C**	**Yield**	**Corg**	**H:C**	**Yield**
Wood	67	0.63	**30**	73	0.51	**27**	82	0.40	**23**
Bagasse	63	0.68	**35**	68	0.55	**29**	75	0.49	**28**
Manure	46.0	0.77	**38**	45.1	0.63	**36**	45.4	0.47	**33**

Organic Carbon +

Biochar Persistance +

Biochar Yield -

BIOMASS

TEMPERATURE

CHARRING INTENSITY

> Which temperature to get the BC you need?

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	400 °C			550 °C			700 °C		
	Corg	H:C	Yield	Corg	H:C	Yield	Corg	H:C	Yield
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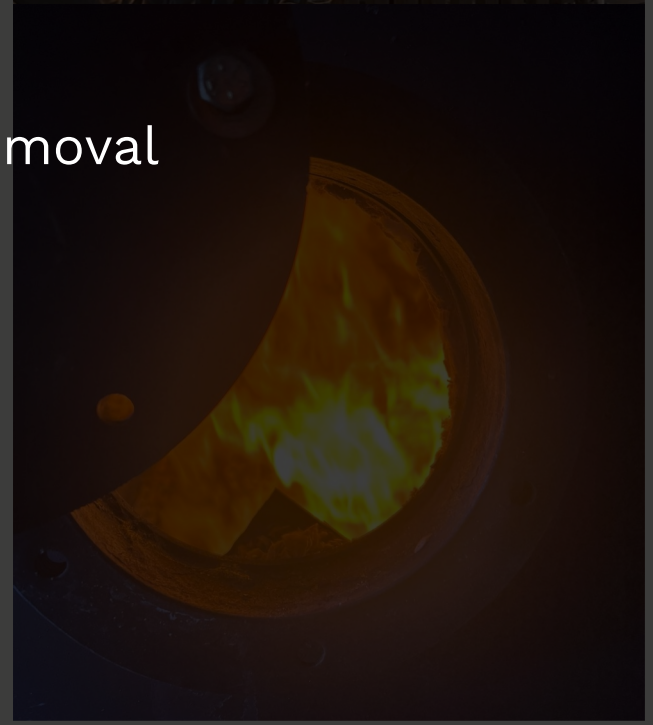
Organic Carbon +

Biochar Persistance +

Biochar Yield -

Tips for a successful project

- Define your goal: BC, CDR, Heat, Waste removal
- Test different temperatures



LOCAL CHALLENGES

EMISSIONS POLICIES

POLICY BARRIERS
EPA doesn't specify **Pyrolysis**
Local Authorities (CA vs ARK)
So many variables

Know the permits that you need

Emission Testing before

Afterburner are necessary
pollution control device

LOCAL CHALLENGES

FEEDSTOCK PRICE

Woodchips

€200 dry Ton

Spent Compost

$ Transport

Other types of Waste

Tipping fees

THINGS TO CONSIDER

in order to have a successful project

DEFINE YOUR

GOALS

Waste management
Large-scales Biochar
Specific Biochar
Heat production
Carbon credits

OPTIMIZE YOUR

FEEDSTOCK

Price
Quality
Availability
Moisture content
Consistency

OPTIMIZE YOUR

OPERATION

Biomass storage
Handling Equipment
Operators
Resources
Facility logistics

Everything matters, and everything depends

Consultation services are the cheapest advise.

THANK YOU