THE PYROLYSIS-FLOX TECHNOLOGY
Clean heat and biochar from agricultural waste

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HIGH VOLUME OF BIOWASTE

Millions of tons of harvest residues are waiting to be treated!

But also:
Sawdust, wood chips, coconut shells etc.
PRODUCTION COSTS FOR FARMERS
the main production costs that farmers is paying

Expensive amounts of fertilizer
High costs for irrigation
Huge demand for “continuous“ thermal energy
Current burners …

→ cause heavy smoke emissions with negative effects both on the health of the local population and the quality of the product that is dried.

→ Leaves only ash as by-product, which is not easy to valorize.
THE PYROLYSIS AND THE FLOX TECHNOLOGIES

PYROLYSIS
Traditional combustion without O₂, producing Biochar and generating smoke, with no easy collection of heat

FLOX
Combustion at very high temperature, without flamme nor smoke, generating gaz with an easy collection of heat

PYROLYSIS-FLOX
Under a research from Ökozentrum (Switzerland), merging both processes creates a continuous generation of collectable heat, with biochar production and no smoke
Difference between normal combustion and Flox

Image of the normal combustion of gas in the combustion chamber with flame. In this situation, we use a lot of gas, resulting in poor performance and not the highest temperature especially for gas produced from agricultural waste or biomass.

Flox technology was an invention in the 1990s discovered by Dr. Joachim G. Wünning (Germany). It creates high temperature combustion at 1200°C and WITHOUT A FLAME.

Image of the unusual combustion with Flox principle. At very high temperature, which can burn anything, including smoke.
A NEW DESIGN FOR THE PYROLYSIS-FLOX TECHNOLOGY

- is designed to fit local context
- is affordable
- is compliant with international quality standards
- is scalable for big producers & small farmers
- can be integrated in existing drying systems

DOES NOT GENERATE SMOKE

BIOMASS WASTE

PRODUCES CLEAN HEAT CONTINUOUSLY

Flox Burner

Reactor

PRODUCES BIOCHAR, A NATURAL SOIL ENHANCER
BIOCHAR, A NATURAL SOIL ENHANCER WITH A “SPONGE” EFFECT

- Raising pH to an optimum level
- Reduce fertilizer needs
- Reduce waterlogging and increase drought resistance
- Improve soil structure, increase the reproduction of soil organisms
- Reduce erosion and nutrient loss
A CLIMATE POSITIVE TECHNOLOGY!

- Burning biomass is considered as carbon neutral
- With the pyrolysis technology applied e.g. to coffee, 0.5 kg of CO$_2$ is stored in the biochar for each kWh produced!
- This energy production can therefore be considered as “climate positive”
Thank you for your attention at our presentation
Back-up slides
Developing the prototype in Switzerland

- **Emission**

- **Biochar quality**

(European Biochar Certificate)
Swiss - Vietnamese knowledge transfer workshop in Switzerland (2015)
Sharing a vision: Combining the pyrolysis system with a Combined Heat and Power (CHP) Unit

50 kW electric power, 200 to 320 kW heat, 340 tons biochar per year
Technology Transfer to Vietnam
Pilot Implementation
Collaboration between

Viet Nien
Hanns R. Neumann Stiftung
Neumann Kaffee Gruppe

[Images of buildings and people working]
Technology Transfer and Testing at Viet Hien
International support for pilot implementation (2016-2017)
V. OPERATION PRINCIPAL OF PYROLYSIS AND FLOX

Under pyrolysis process, being transferred from burner to reactor, biomass will produce gas and resupply back to burner. Because of FLOX (flameless combustion) process, burner chamber will not have flame but only generate thermal radiation with high temperature and provide circularly to reactor. Because the combustion does not occur directly with material and burned carbon so oxygen doesn't have chance to make contact with carbon to form CO2. The gas combustion occurred with FLOX condition makes a complete burn, result in low CO and NOx concentration.