

## FARM AND LABORATORY SIZE BIOCHAR & HEAT COPRODUCTION IN REDUCING ATMOSPHERE COMPACT AUTO THERMAL PYROLYSIS REACTOR/BOILER

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Local production of the biochar (BC) at the farm level remains unresolved regarding technology and operation/business model. A new patented technical solution of coproduction BC and heat in a Reducing Atmosphere (BC&H-RA) [1] as a compact autothermal pyrolysis reactor/boiler enters the market. The device covers a niche market of smaller size (5-50 kg/h of BC) [2, 4] production units offering fully automatic all day (24 h) operation with all ecological features of flue/exhaust gases. Fully automatic operation provides BC acc. to EBC quality standard from standard wood chips (BS-EN-ISO 17225) of wide particle sizes up to 45 mm of diameter. Under presented conditions, farm size reactor/boiler use 20 kg/h of BM (wood chips) or 1.7 m<sup>3</sup> per day and produce 5 kg/h of BC or approx. 0.8 m<sup>3</sup> per day at 26 kW continuous thermal output.

A possible implementation of alternative biomasses (BM) needs to be tested to assure BC - EBC quality with some corrections of process parameters. Compact pyrolysis unit can be installed as a domestic boiler producing hot water (max 90/70 °C regime) and BC in big bags.

Laboratory compact BC&H-RA compact pyrolyzer exactly follows the process in a large unit but in smaller proportions. Continuous production of BC with integrated dryer and automatic operation targets 5 h of operation per day. With 1kg/h of BC capacity from 4 kg/h BM at input approx. 70 l of BM need to be provided per day. At output a 5 kg or approx. 33 l of BC can be produced. The unit generates 5.2 kW of heat output continuously and can be recorded and used as a heat source or blown to exhaust. Computer controlled process provides 24 h operation of the unit (drying 1 day before running test) and enables continuous data monitoring and logging

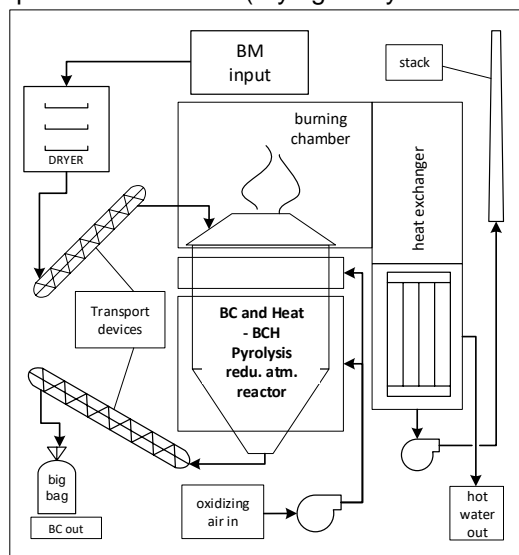


Figure 1 – Biochar & Heat (BCH) Reducing Atmosphere (RA) pyrolysis reactor/boiler

during the whole period of testing. One experiment last, according to the operation cycle, three days. The first day only drying, second-day pyrolysis and third day cooling down, mass balance and cleaning. Two experiments can be provided in a week.

Economic indicators regarding CAPEX and OPEX accordingly follow small production scale or only domestic applications of BC, heat is always a side product.

Basic CAPEX assumptions stick to provide investment price of the presented process unit in a range less than 15 k€ per 1 kg/h of BC plant capacity (<15 k€ / kg/h BC plant capacity). OPEX assume two to three cleanings and one general service per year in a range of domestic boiler maintenance costs.

A presented technological solution is comparable only with larger pyrolysis process units and not with simple batch stove technologies. Simple, manual stoves can produce batches of BC in an environmental controversial manner [3] and only for a limited quantity of BC. A modern automatic continuous production of BC and heat on demand in an environmentally friendly manner can rise BC application to a new level. Changes of business model to new “modus operandi” of BC production on small scale becomes possible.

Presented thematic cover the biochar reactor technologies area.

### References:

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