

renewable energy - *StrawTherm*

Energy from Straw, Trash and Bagasse

The brilliant Solution

StrawTherm Straw Bale Gasifier

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AHK

Delegation der Deutschen
Wirtschaft in Myanmar
Delegation of German Industry
and Commerce in Myanmar

Virtual Business Trip Cambodia

„Energiespeicher und erneuerbare Energien“

Phnom Penh - Cambodia

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On a area of one hectare grow 13 tons of biomass per year. Of these, 6 to 7 tons are cereal grains and about 5 tons are straw.

The straw is used in livestock for animals or is plowed under.

A farmland
in Germany



There are plants that grow up to 30 tonnes of biomass per year.

Miscanthus is one of them. It is perennial, that is, 20 years only harvesting without any further work



In some countries straw is burnt in the field. This wastes as much energy per hectare as is contained in 2,000 litres of heating oil or 2,000 m³ of natural gas.



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In your country there is better and much more:

Sugarcane, Bagasse, Trash

Banana leaves, coffee bushes

You can produce heat from anything green

With little or no additional effort.

It only has to be dry, then they are wonderful fuels

Heating values in the anhydrous state	(Factor 1/3,6)	H u(wf)
	[kW/kg]	[MJ/kg]
Spruce wood	5,22	18,80
Beech wood	5,09	18,34
Wheat straw	4,78	17,20
Bagasse	4,56	16,40
Sugarcane trash	4,92	17,70
Leaves other plants	4,92	17,70
Hard coal	8,16	29,37
Heating oil / liter	10,00	36,00
Converting MJ/kg to kWh/kg	$1/(60*60)*1000 = \text{Factor } 1/3,6$	

Straw an other graslikes have nearly the same heating values as wood



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But straw, trash, bagasse and leaves of other plants are very difficult fuels

The ash melts to slag

Anywhere in the boiler thick coverings - like extreme hard rubber

The ashes contain valuable minerals.

It is brought back to the field as fertilizer.

In a bad boiler the ashes melt. It is then like a stone. The valuable minerals are inaccessible for the plants.

Only a special boiler as StrawTherm is suitable

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You have to put a lot of effort into building the boiler

Gasification at lower temperature
and afterburning at higher temperature in strictly
separated areas of the boiler.

The result

Only the condensate from the 15% moisture of the
straw is visible.

No visible smoke from the chimney.

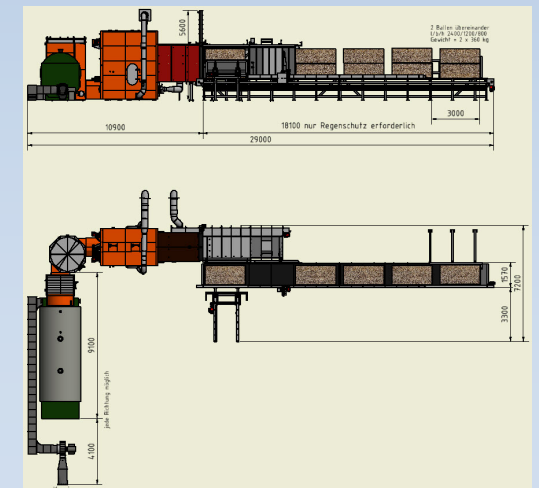
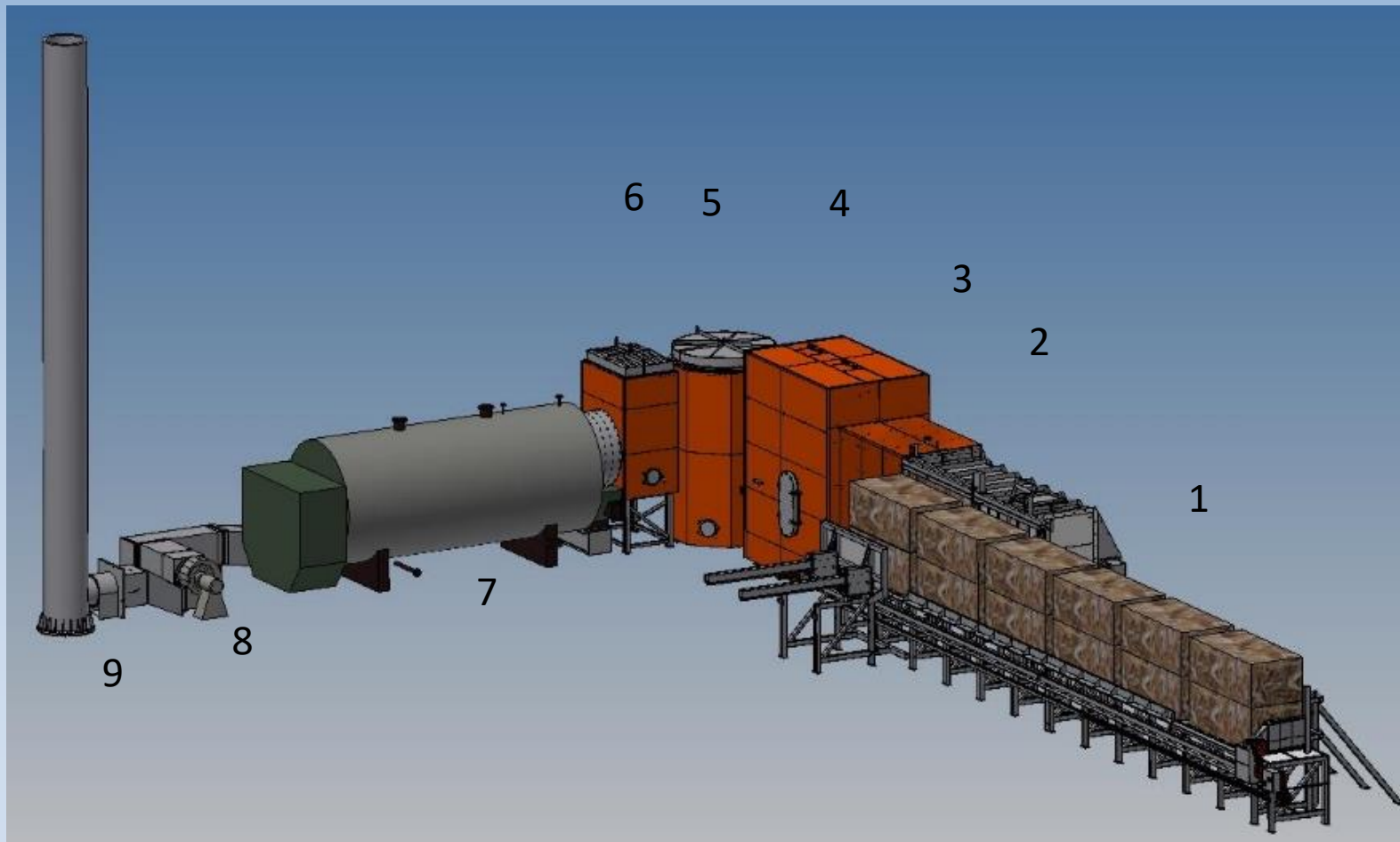
The ash is white - grey, like a powder, without any
slag.

It is a valuable fertilizer for the field.

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Boiler for hot water 2 MW, automatic bale feeder, supply for 12 hours burning time

- 1 Storage table
- 2 Sluice gate
- 3 Filling chamber
- 4 Carburettor with combustion chamber. (see picture before)
- 5 Afterburner
- 6 Connector
- 7 Heat exchanger
- 8 Fume extraction fan
- 9 Chimney



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Steam generator

Working for a factory producing animal feed pellets.

Heated with StrawTherm gasification boiler

Heating capacity 300 kW, 24 hour operation

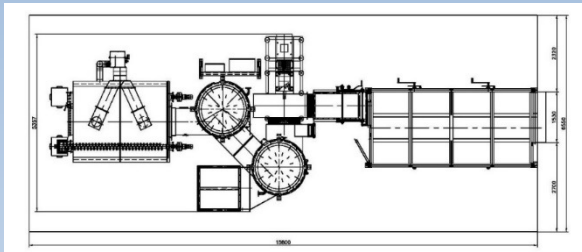
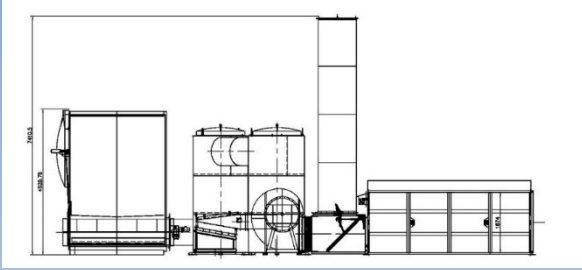
Lower or higher capacity possible



The ash is white
and fine how
powder
Best exhaust smoke



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Straw gasification boilers for the production of hot gas for drying plants

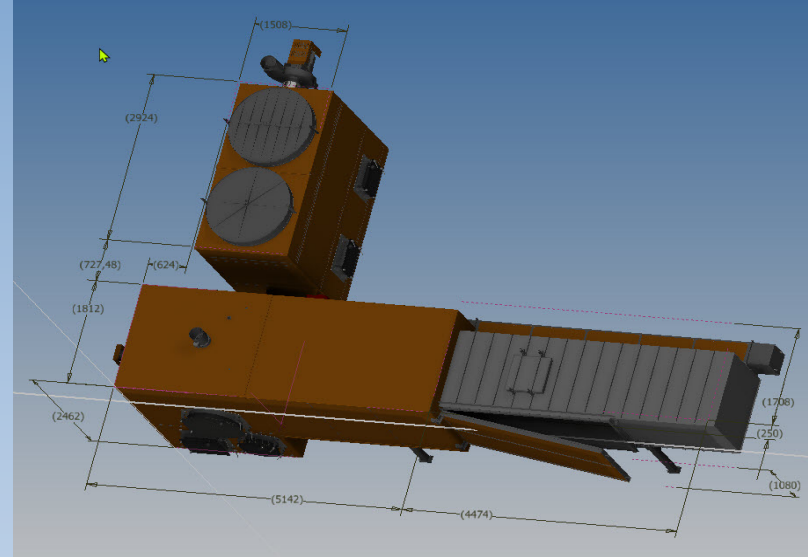
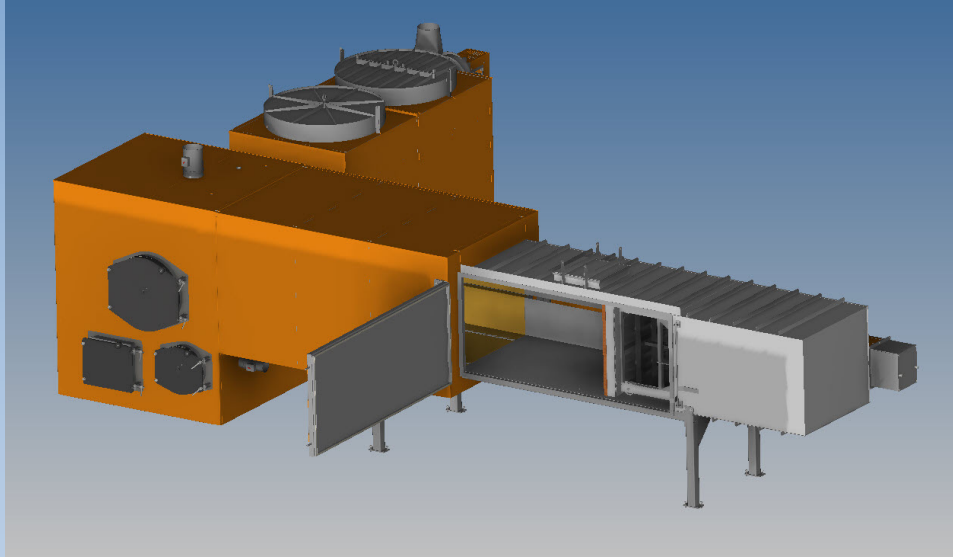
The clean combustion gas is lowered to the desired temperature by adding fresh air.

Spark protection by sieves with turning device.

The generated air-gas mixture is free of pollutants. It can be used for direct drying of grain.

Thermal power up to 3 MW .

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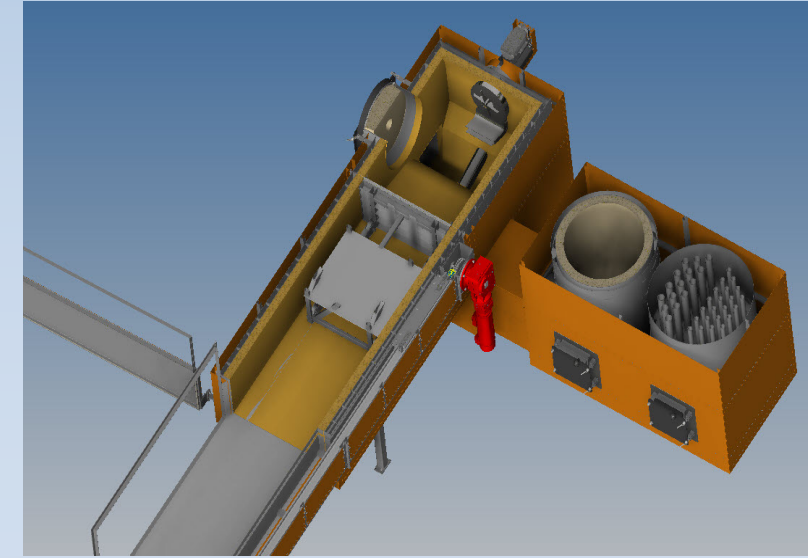
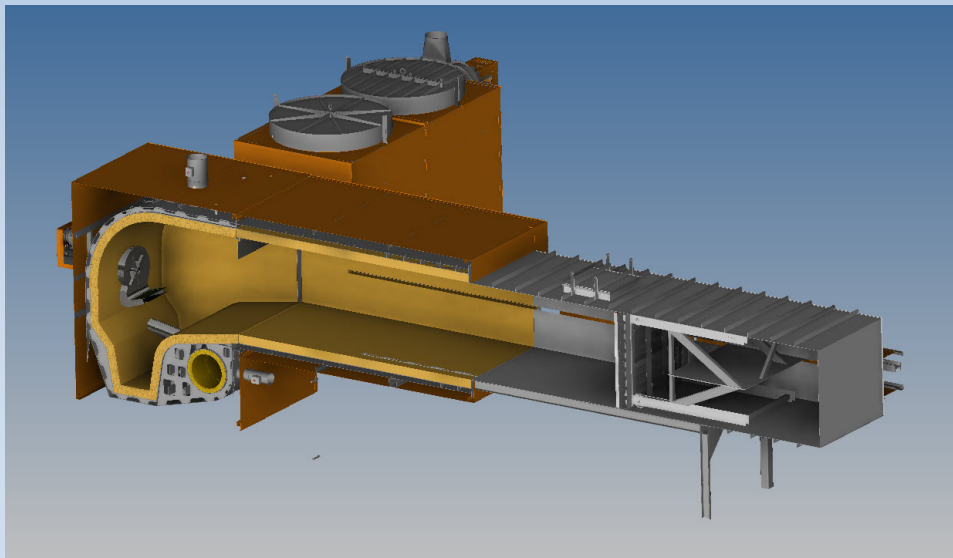


Thermal output 200 - 500 kW

For rectangular bales

1. Gasification
2. combustion
3. heat recovery

Physically and thermally strictly separated



Storage enough for 12 hours of operation

Ash removal by hand or automatic

Easy operation

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The customer has an annual income of **>300,000 €** when operating with StrawTherm

Heat output	2.0	MW		
Operating hours per year	4000	H		
OIL consumption per hour	220	l / h	Straw consumption per hour	0.55 t / h
Oil consumption per year	880000	l	Straw consumption annually	2200 to
oil price	0.60	EUR / l	straw Price	70,00 Euro / t
Oil costs annually	528000	Euro	Straw costs annually	154000 Euro / t
Operation and maintenance	30000	Euro	Operation and maintenance	90000 Euro
Oil Total expenses annually	558000	Euro	Straw total expenditure annually	254000 Euro
				EUR / year
			Saving through straw as a fuel	304000
Investment including remodeling	670000	Euro	Return on investment	46%

The promotion of EU or others is not included in this table

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Wherever inexpensive heat is needed

Hot water - Steam - Hot gas

Drying of berries, vegetables, grains, fruits

Heating or cooling networks

Canning industry, Slaughterhouses

Residences, hotels, offices

Fattening farms

Pellet production plants

Steam for Industry

Combined heat and power (CHP)

You surely know more

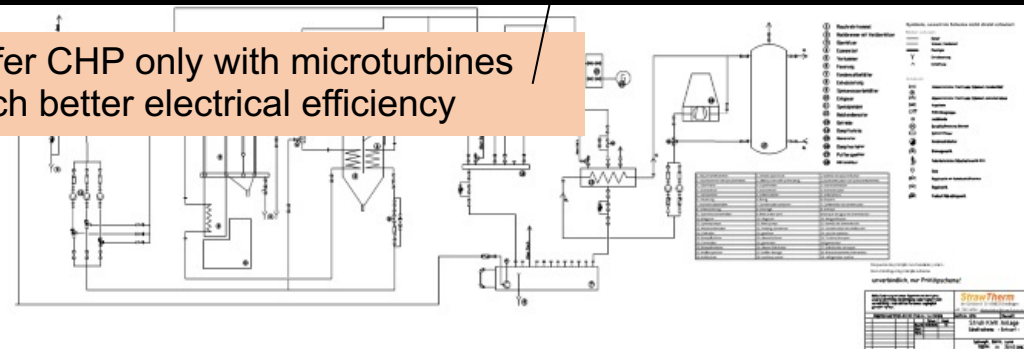
Financing by KfW possible
Equity up to zero for local municipalities
up to 10 percent equity for others



Heat, cold and electric energy from trash

Fuel requirement	1,31	t/h
Calorific value of fuel	4,2	kW
Firing capacity	5.455	kW
Efficiency	0,86	eta
Steam output 4,716 kW	4.716	kW
Turbine Coupling 645 kVA	645	KVA
Mechanical efficiency 0,98	0,98	U
Generator efficiency 0,96	0,96	eta
Electrical efficiency 0,11	0,11 0,21	eta
Useful heat for warm water and absorbercooling	4077	KW

In the future, we will offer CHP only with microturbines
-simpler, cheaper, much better electrical efficiency



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**Thank for letting me speak.
You have indeed listened attentively.**