

renewable energy - *StrawTherm*

Energy from Straw, Trash and Leaves

The brilliant Solution

StrawTherm Straw Bale Gasifier

Alfred Schulze

Dipl. Ing.

StrawTherm

Im Gröber 8

D-88662 Überlingen

+49 7551 66764

alfred.schulze@strawtherm.com

<https://strawtherm.com/>



AHK

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

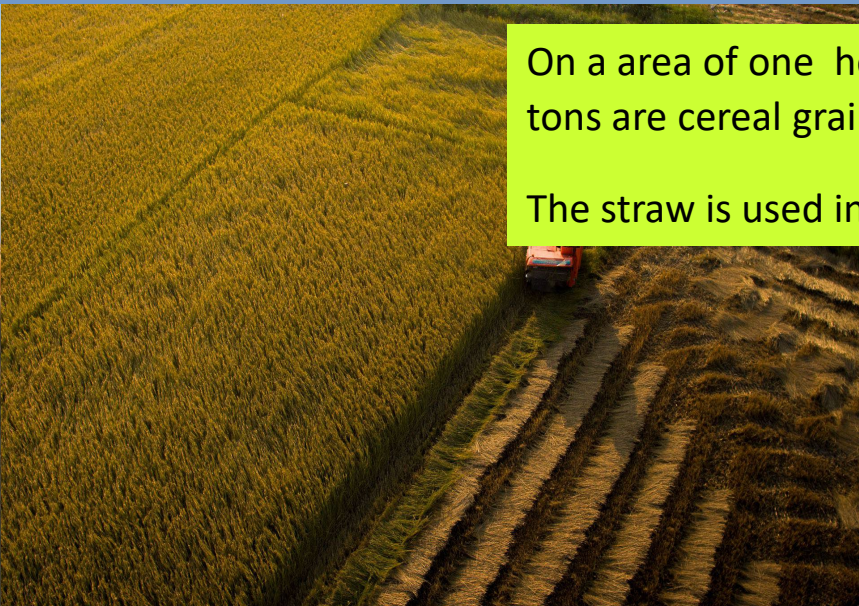
Virtual Energy Delegation Trip to Cambodia 2022

4th Cambodian-German Energy Symposium

Yangon

11th October 2022

renewable energy - *StrawTherm*





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.

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

A farmland
in Germany



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.

renewable energy - *StrawTherm*

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

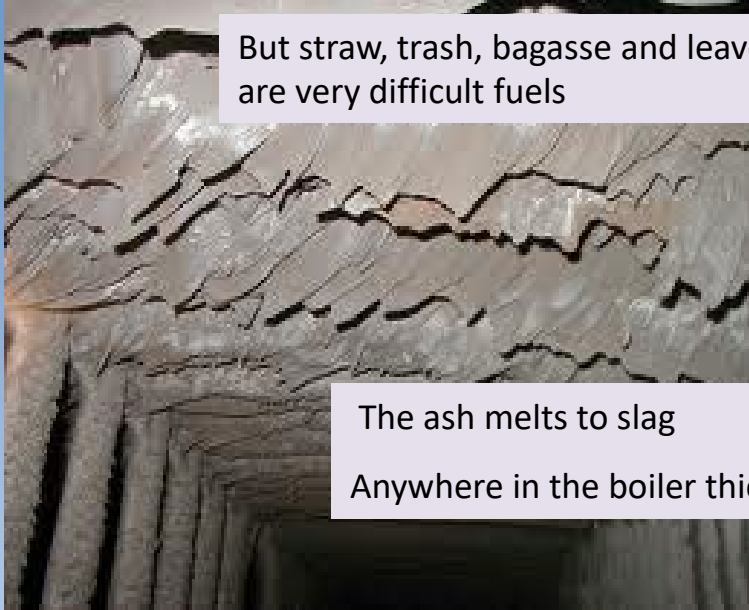
Heating values in the anhydrous state	(Factor 1/3,6)	H u(wf)
	[kW/kg]	[MJ/kg]
Spruce wood	5,22	18,80
Beech wood	5,09	18,34
Wheat straw	4,78	17,20
Bagasse	4,56	16,40
Sugarcane trash	4,92	17,70
Leaves other plants	4,92	17,70
Hard coal	8,16	29,37
Heating oil / liter	10,00	36,00
Converting MJ/kg to kWh/kg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

Straw and other grasslikes have nearly the same heating values as wood



renewable energy - *StrawTherm*

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**

renewable energy - *StrawTherm*



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.

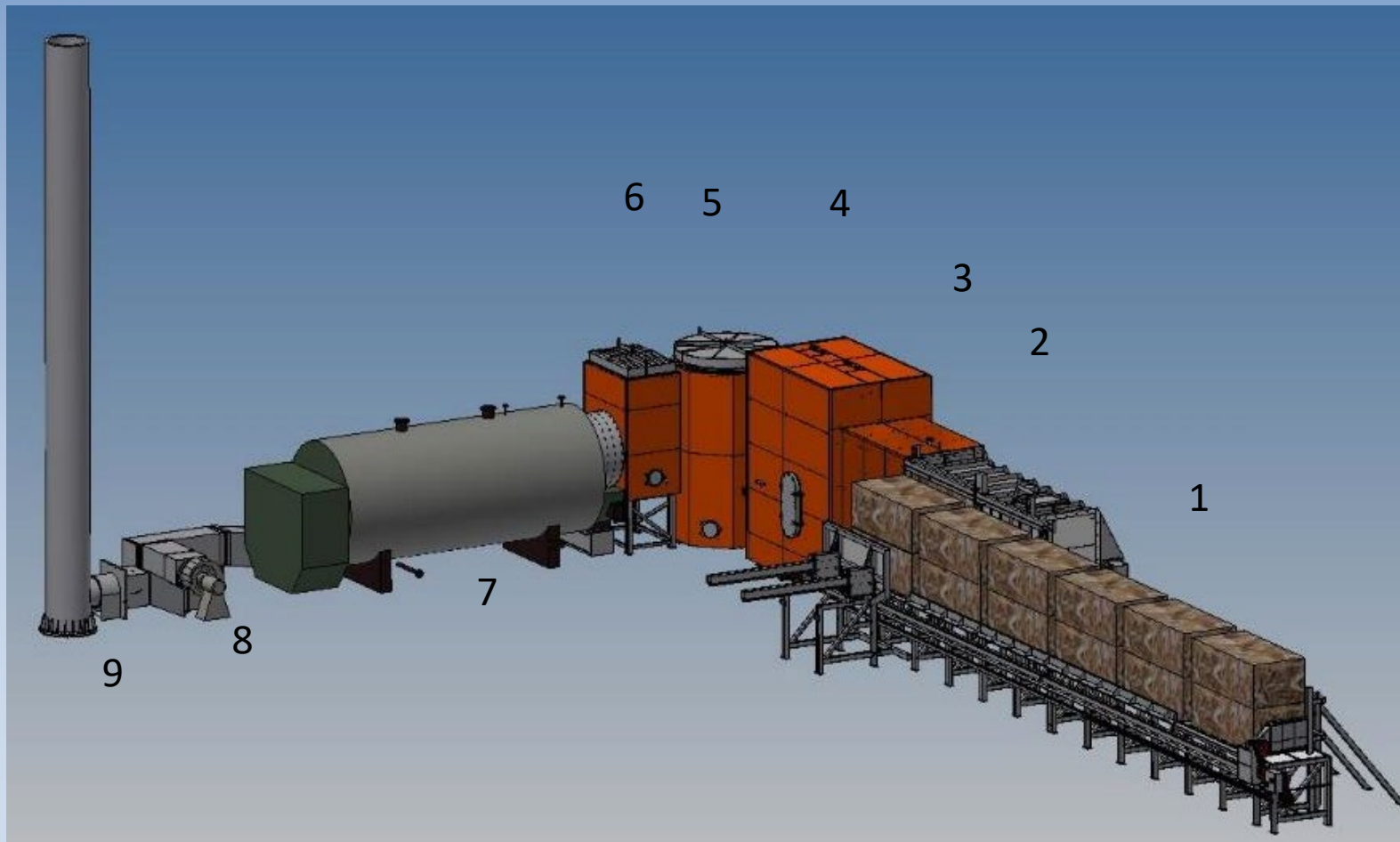
No visible smoke from the chimney.

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

It is a valuable fertilizer for the field.

renewable energy - *StrawTherm*

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)

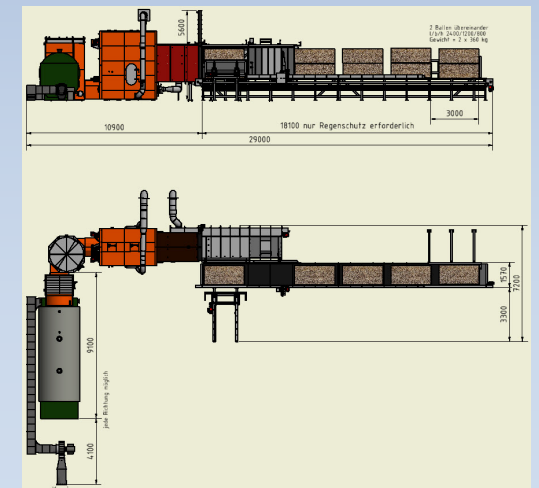
5 Afterburner

6 Connector

7 Heat exchanger

8 Fume extraction fan

9 Chimney



renewable energy - *StrawTherm*



Steam generator

Working for a factory producing animal feed pellets.

Heated with StrawTherm gasification boiler

Heating capacity 300 kW, 24 hour operation

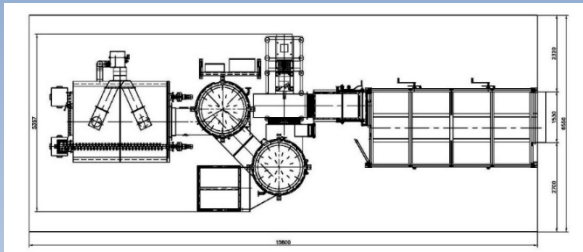
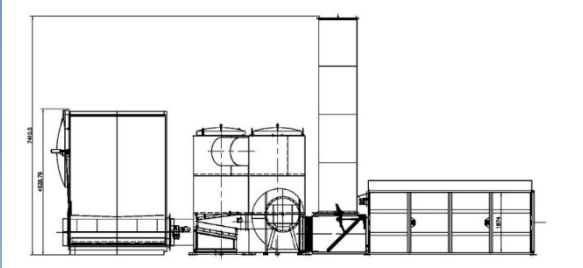
Lower or higher capacity possible



The ash is white
and fine how
powder
Best exhaust smoke



renewable energy – *StrawTherm*



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

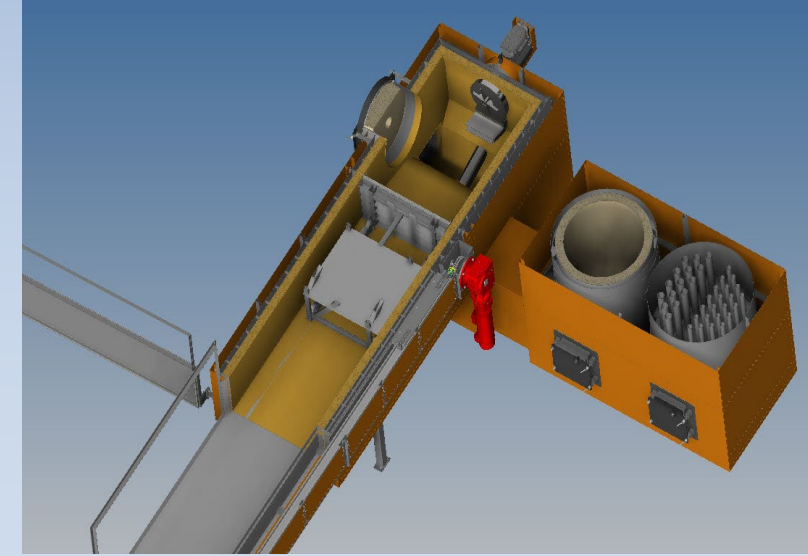
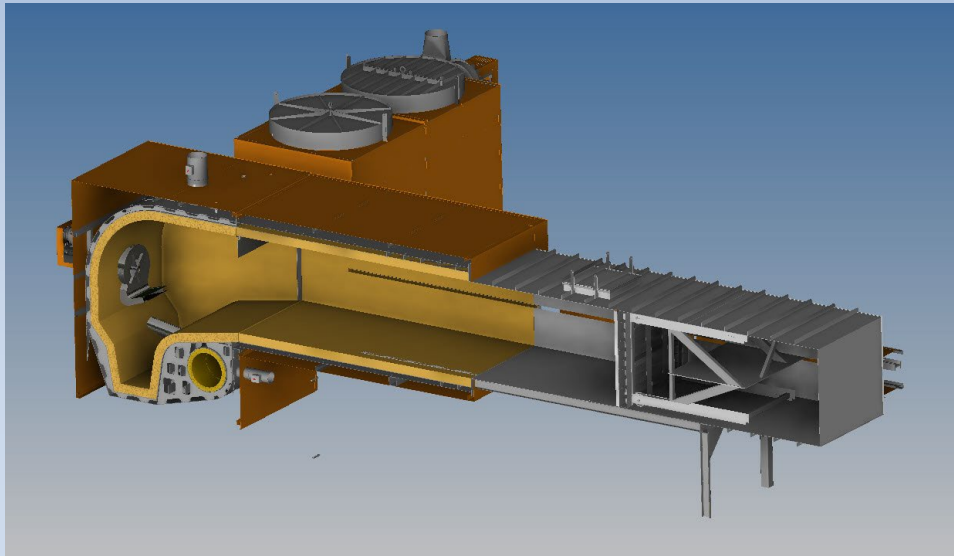
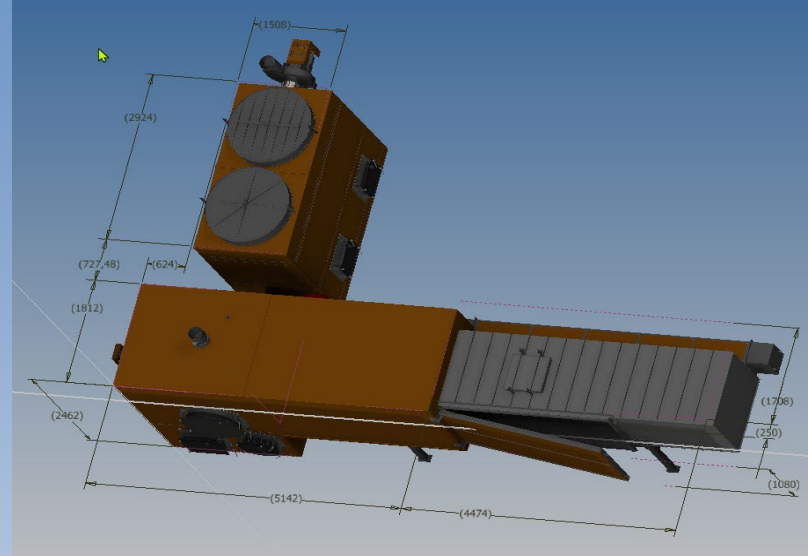
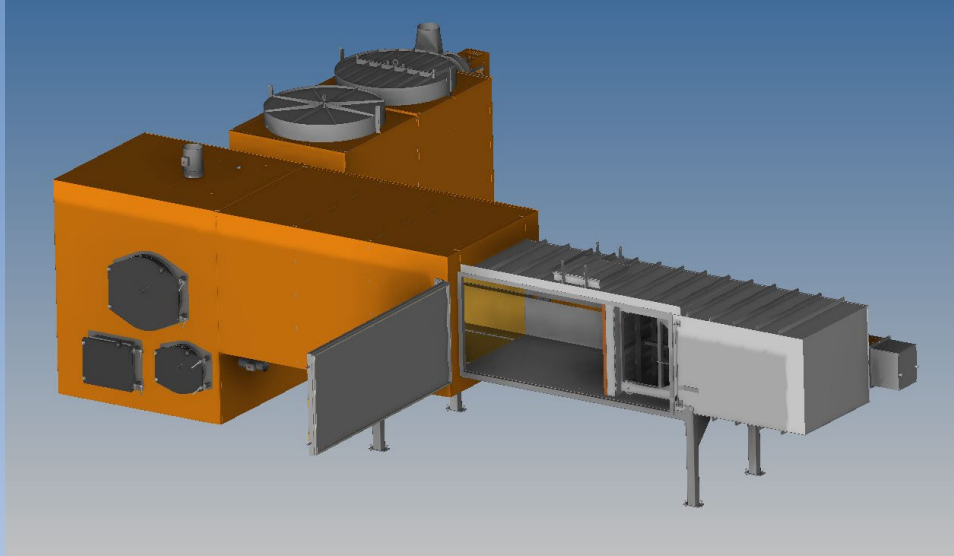
The clean combustion gas is lowered to the desired temperature by adding fresh air.

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 .

renewable energy – *StrawTherm*



**With new design
Thermal output 200 - 2000 kW**

For rectangular bales

1. Gasification
 2. combustion
 3. heat recovery
- Physically and thermally strictly separated

Fuall storage possible for 12 hours of operation

Ash removal by hand or automatic

Easy operation

renewable energy - *StrawTherm*

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
			Saving through straw as a fuel	304000 EUR / year
Investment including remodeling	670000	Euro	Return on investment	46%

This is only an example. You must use the values that apply to you.

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

renewable energy - *StrawTherm*

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)

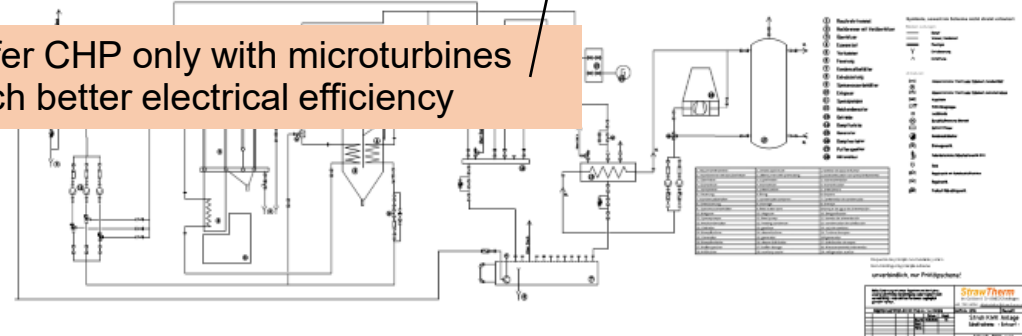
You surely know more



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



renewable energy - *StrawTherm*

Energy from Straw, Trash and Others

The brilliant Solution

StrawTherm Straw Bale Gasifier

Alfred Schulze

Dipl. Ing.

StrawTherm

Im Gröber 8

D-88662 Überlingen

+49 7551 66764

alfred.schulze@strawtherm.com

<https://strawtherm.com/>



AHK

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

Thanks for listening