Brown coal to Energy Systems

COINVOLTA
Aktiengesellschaft

Climate-neutral energy generation from materials with high calorific value
With the help of

DuplexTEC-Process®

Electricity / Heat / Hydrogen

About us

„Paths are created by walking them.“ (Franz Kafka)

- COINVOLTA AG (CAG) with its headquarters in 6343 Rotkreuz / Switzerland is a company that open branches in Germany and other EU countries in the next few months. The entire project engineering and project management is carried out from Germany. We only work with selected suppliers who meet our high standards of quality and reliability.
- The target group of the CAG are waste management companies, recycling companies, municipalities, cities and companies that not only generate a lot of waste or coal deposits, but also have a large demand for energy in the form of electricity or heat for supply.
- CAG deals with the efficient processing of organic waste and also brown coal as input material.
- The energy generated during processing in the form of electricity, heat and, if desired, hydrogen can be used in a variety of ways.
- We have acquired our versatile know-how in the field of waste treatment in connection with high-temperature plants over the last 12 years.
- We now bring this background knowledge to CAG with a new and very capable main partner (Made in Germany). The technology used (WGL 2-50 to WGL 12-300) achieved significantly better results in efficiency and emissions than comparable technologies on the market, but at significantly lower total investment, operating, maintenance and follow-up costs.
- The customer can choose between purchasing the core system without peripheral devices or purchasing the entire system as part of a general contractor agreement. In this case, CAG delivers complete turnkey systems according to customer requirements.

OUR MISSION AND VISION

We strive to provide clean forms of energy and introduce a technology that has a positive impact on creating a cleaner environment globally.

Our **Vision** for a cleaner environment:

- ✓ Converting brown coal into clean energy
- ✓ Conversion of waste into clean energy
- ✓ Production of green hydrogen
- ✓ Reduction of greenhouse gas emissions
- ✓ Conservation of natural resources

Additional value creation through thermal conversion

This patented process is emission-free when processing brown coal or organic waste, is low-noise and offers maximum flexibility in input and output applications.

The variety of different types of waste that our systems can handle includes almost all fossil and organic materials, including toxic, non-toxic, infectious and hazardous materials. From brown coal to hospital waste.

We focus on brown coal and the plastics that are not recyclable.
Also industrial waste, sorted household waste,
sewage sludge, electronic waste.

The material specifications are very simple and can be easily achieved with standard shredders.

CAG systems can process organic materials with a moisture content of 15-30% and a fraction size up to 2.5 cm^3.

About the system from our Main Partner TPC Energies

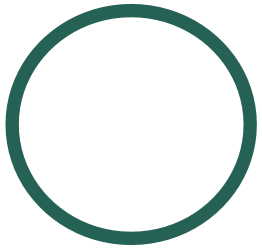
Duplex TEC Process®

Transformation of the residual materials through staged gasification

No formation of dioxins and furans

no residues such as oil, tar, Coke or similar ones

CO_2 neutral fuel gas production



Ecological advantages

Compliance with applicable emission protection directives

No combustion
No pyrolysis

Gas production in a closed system

No supply of external energy supply required, as it is an autothermal process

Duplex TEC Process®

More advantages

State-of-the-art technology ***Made in Germany***

Very low electricity generation costs per kWh

Plant operation in Germany is approved by the authorities

High return for the respective energy plant

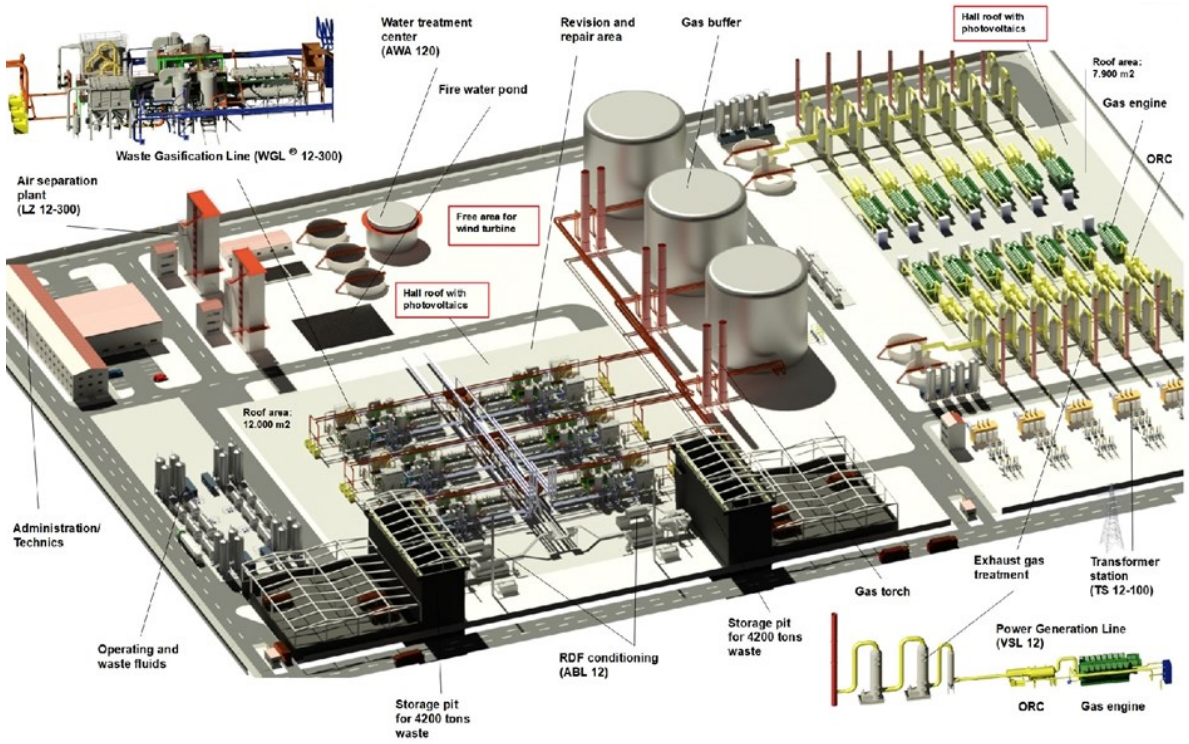
WGL Lines - SIZE AND CAPACITY

Capacity: from 80-950 **tonnes/day** – one plant processes 26.400 - 330.000 **tonnes** of input per production year

Possible to combine modules to achieve a higher capacity per day respectively

Once the plant is up and running, it runs **24/7, 330 days** per year

Regular maintenance of the system requires up to 4 **weeks** per year

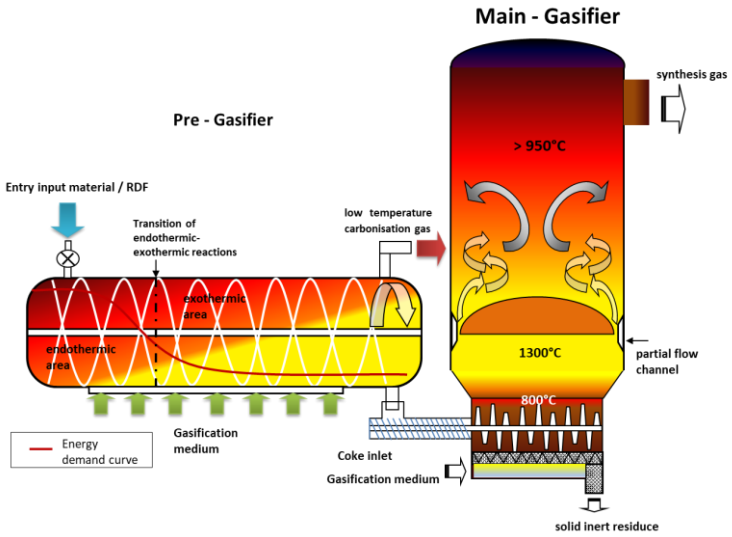


Our modular design of 2 lines (WGL-2/4/6/8/12) each of the WGL system gives the buyer the ability to expand the system as needed and ensure continuous production of energy without downtime.

DuplexTEC-Process®

New approach

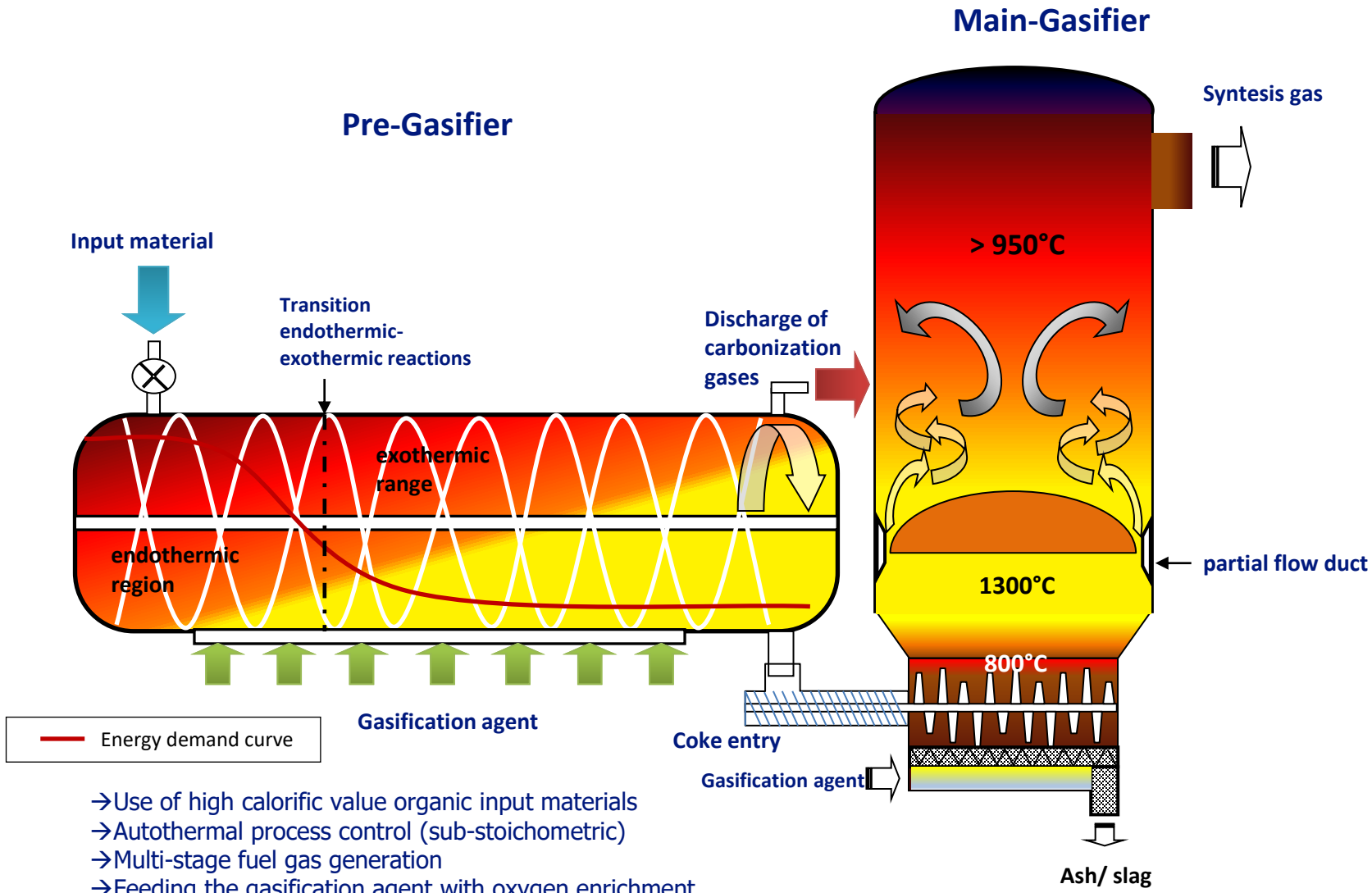
- No combustion
- No partial gasification
- No pyrolysis
- No scaling risk
- No supply of external energy



- ✓ Development on a 1:1 scale (2000-2011)
- ✓ Technical separation of the individual main processes for optimum conditions during operation
- ✓ High efficiencies
- ✓ Partial oxidation and reduction processes

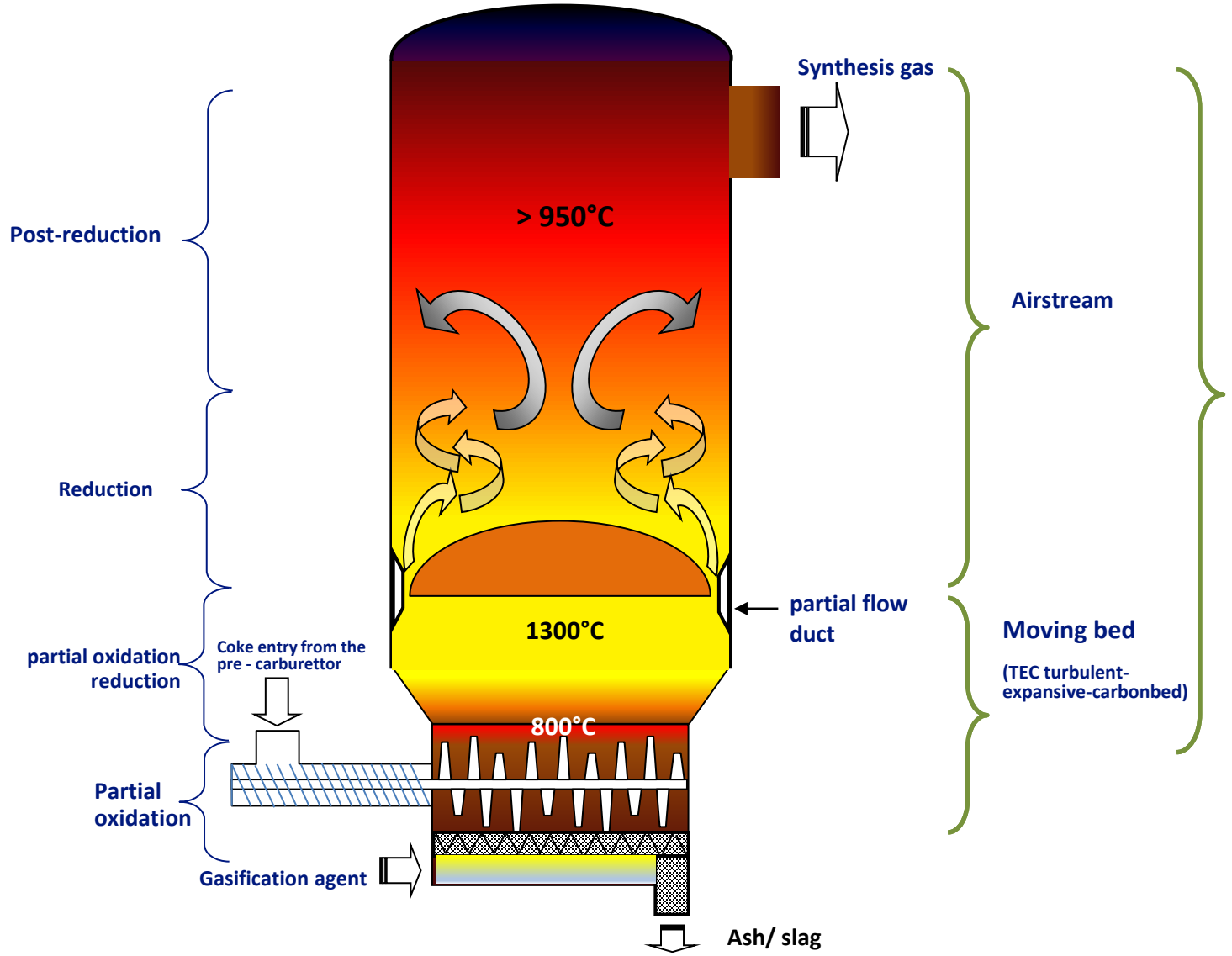
Multi-Stage-Gasifier

Duplex TEC-MSG®



→Use of high calorific value organic input materials
→Autothermal process control (sub-stoichometric)
→Multi-stage fuel gas generation
→Feeding the gasification agent with oxygen enrichment
→High utilisation yield
→High efficiency of carbon conversion >99 %

Main-Gasifier



- Fluidised moving bed
- Gas residence time > 2-3 s
- Multi-stage gasifier
- Gravimetric separation of the inert substances
- Destruction of complex contaminant compounds
- No formation of dioxins and furans

Highlights: Duplex TEC Process

Generation of energy *from brown coal and non-recyclable waste in a completely closed*, emission-free conversion system. (TEC process)

Latest technical generation *for highly efficient autothermal input treatment & transformation into energy.*

Generating 2.8 MW* *of* electricity *from one tonne of high-calorific Input materials. (Energy content of the raw materials on average approx. 18-22 MJ/kg).*

Worldwide patent protection: four main German patents, seven international patent applications. (EN/EP/US/JP/CN/HK/CA/RU)

A decade of research & development in a pilot and pre-series plant. Certified and approved as an industrially usable series plant.

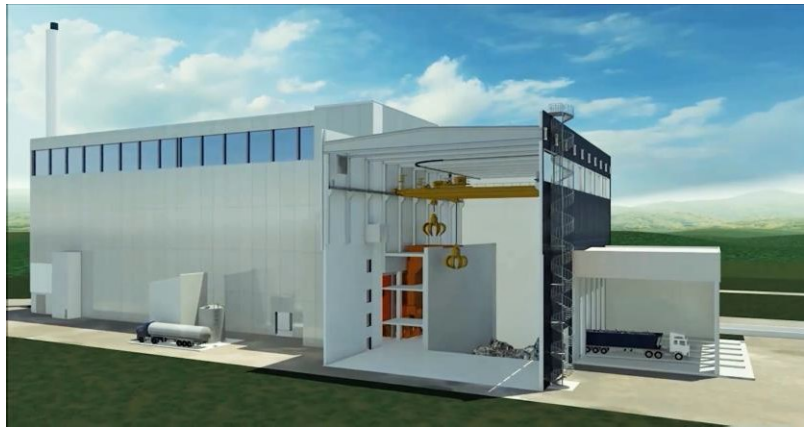
The TCP technology is base-load capable - (power feed-in 24h. for grid stability).

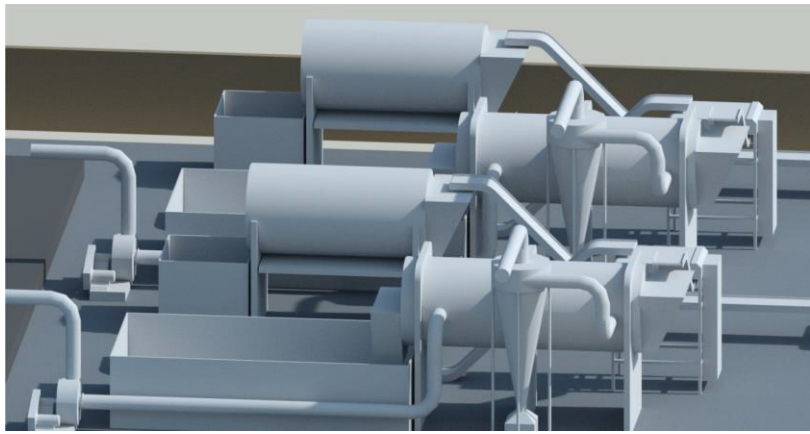
1megawatt [MW] = 1,000 kW*
8 MW - Drive power of the high-speed train ICE 3

COINVOLTA Aktiengesellschaft

Procedural steps

The technology does *not* use *pyrolysis*!





Unloading hall for example, a WGL 2-50 system. This is of course always adapted to the customer.

Approx. 6 -8 trucks/day transport high-calorific input in closed trailers and unload it.

Input bunker

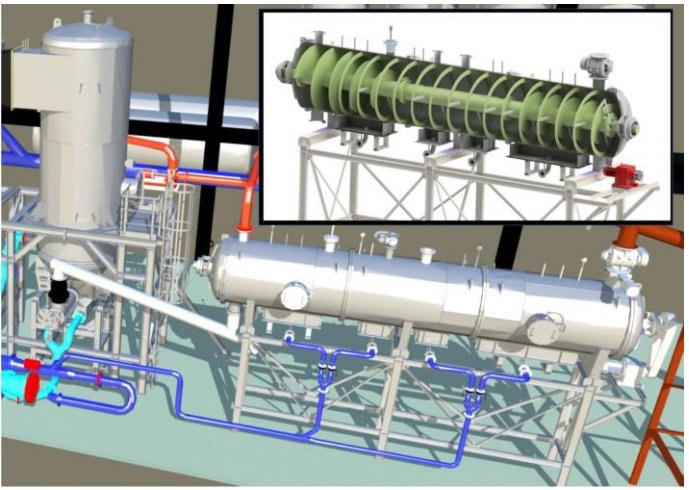
The Input is temporarily stored in the collection bunker before it is further processed into a high calorific value substitute fuel.

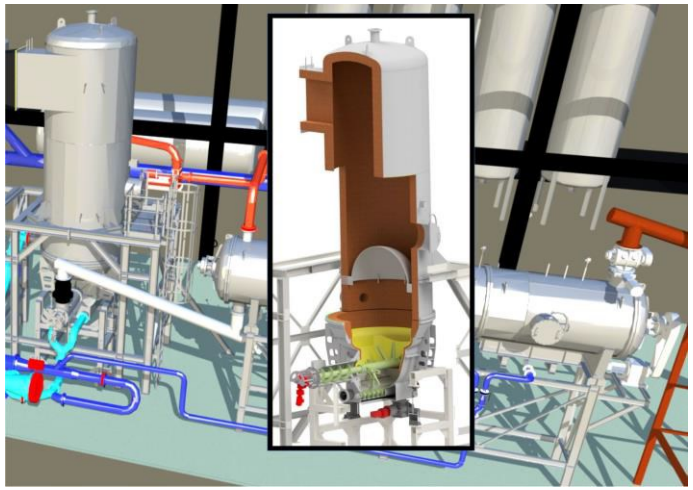
Conditioning of the Coal/Waste/EBSs

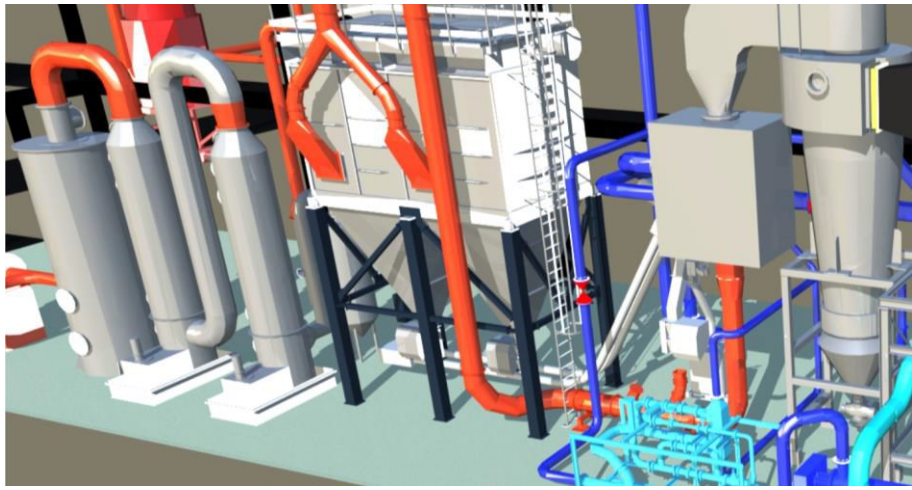
Mechanical shredding, pre-drying and filling of the pre-gasifier.
Minerals, stones, glass, metals, etc. are sorted out.

Procedural steps

The transformation of *the energy-rich materials takes place solely through conversion into a gaseous aggregate state.*







Pre-gasifier (autothermal)

Thermal conditioning *to carbon coke. Transfer without interruption into the main gasifier.*

Main gasifier (autothermal)

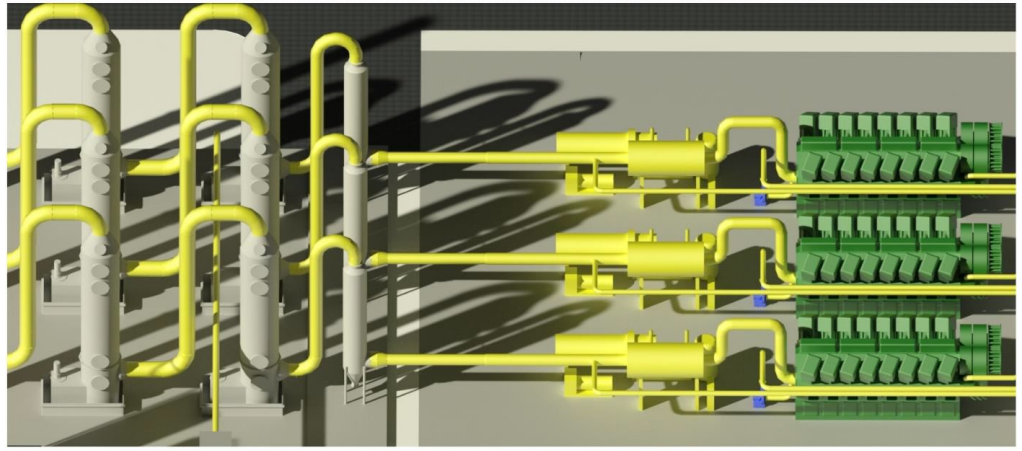
Multi-stage gasification to produce a synthesis gas with a high calorific value that is free of contaminants and tar. *Discharge of the residues. (eluate-free slag)*

Gas treatment

Cooling and fine filtering of the syngas => Utilization of waste heat for autothermal process control.

Procedural steps

It is therefore the most efficient form of energy conversion in thermal organic material utilization!



Recycling of residual materials

The discharged compacted residues (detached (vitrified) slags) are separated and further processed by a specialized company.

POWER GENERATION with CHP gas engine

The tar-free synthesis gas produced by the DUPLEX process *is fed to gas engines or gas turbines and serves as an energy source* to generate electricity.

Performance data of Power plants

Plant designation	WGL 1-25	WGL 2-50	WGL 4-100	WGL 6-150	WGL 8-200	WGL 12-300
Material	*Homogeneous, high-calorific, shreddable or miscible*					
Input stream TCP technology in tonnes per year	*27,000*	*56,000*	*112,000*	*163,000*	*224,000*	*335,000*
Product after sorting (tonnes per hour)	RDF 3.3 t/h	RDF 6.6 t/h	RDF 13.2 t/h	RDF 19.2 t/h	RDF 26.4 t/h	RDF 39.6 t/h
Water content	*10 Ma%*	*10 Ma%*	*10 Ma%*	*10 Ma%*	*10 Ma%*	*10 Ma%*
Calorific value of the input material approx.	22.8 MJ/kg	22.8 MJ/kg	22.8 MJ/kg	22.8 MJ/kg	22.8 MJ/kg	22.8 MJ/kg
Pure gas supply	*7,000 Nm³/h*	*14,000 Nm³/h*	*28,000 Nm³/h*	*42,000 Nm³/h*	*56,000 Nm³/h*	*84,000 Nm³/h*
System designation	VSL 1	VSL 2	VSL 4	VSL 6	VSL 8	VSL 12
Power generation *(gas engine and ORC)*	9.13 MWh/h	18.26 MWh/h	36.52 MWh/h	54.78 MWh/h	73.04 MWh/h	**109.56 MWh/h**

6 x WGL 12-300 and 1x WGL 6-150 Plants = 660 MWh/h Electricity production

Example: Consideration of a WGL 2-50 (2 lines, 50,000 t/a) Power plant

Two thermal lines (WGL 2-50) convert an annual capacity of < approx. 50,000 t of processed high calorific organic input into energy using the Duplex-TEC-Process®; with an electrical efficiency for power generation of >50%.

Illustration/impression: WGL 2-50

Consideration of a WGL 12-300 (12 lines, 335,000 t/a)

The UpCyclingKraftwerk®

(modular & variable from one to > twelve lines*).*
can be erected)

Generated incl. ORC (= Organic Rankine Cycle / power generation from waste heat by ORC plant technology)

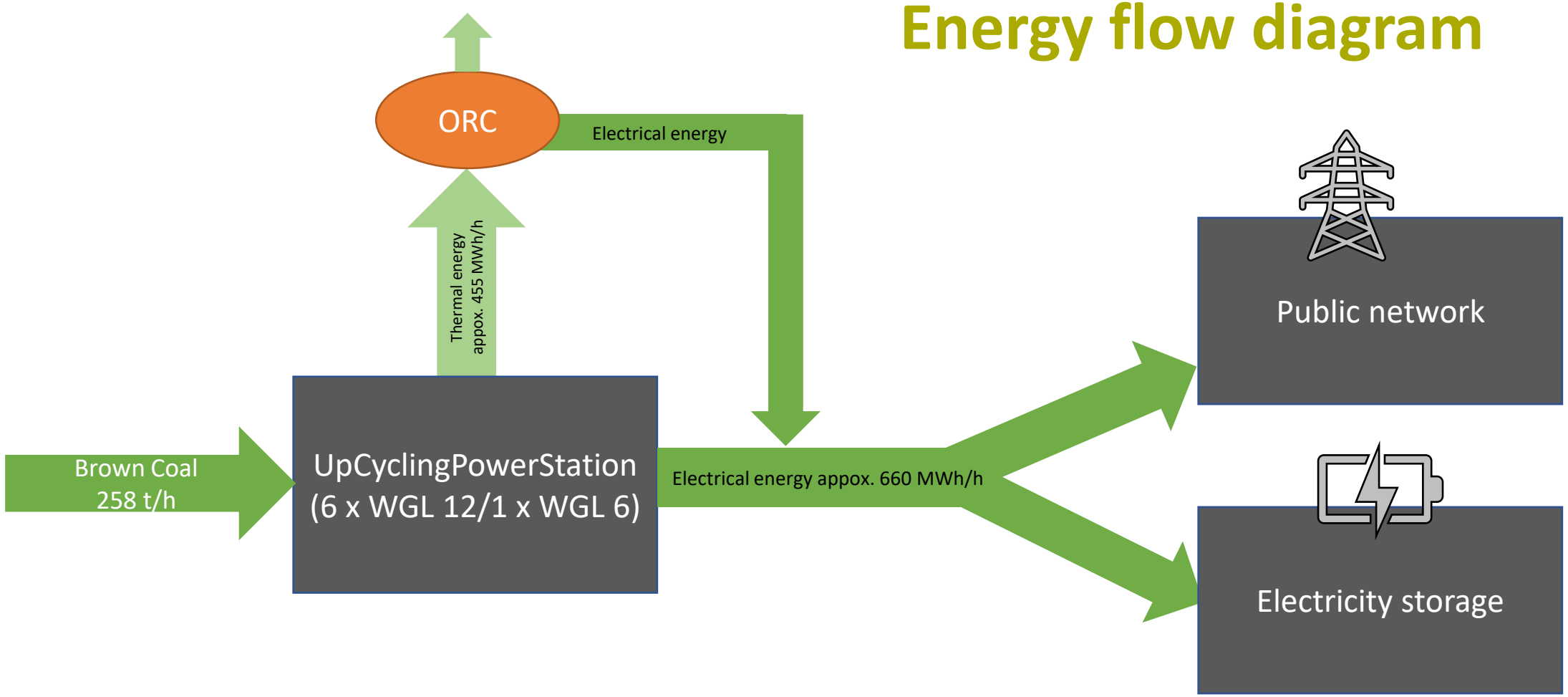
109,56 MWh/h

electricity produced in an environmentally friendly manner.

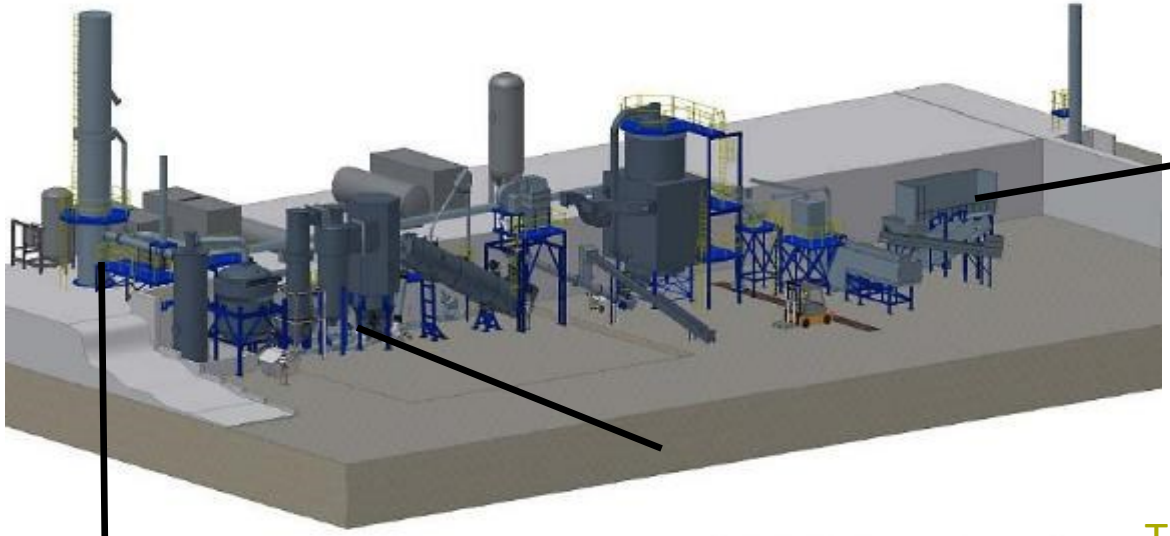
The CO_2 saving compared to the fossil fuel electricity mix in Germany for a WGL is 12-300

314,700 t/a

Energy flow diagram



Pilot plant (2000-2011) (1:1 scale)



Preparation and drying

Emergency flare and fuel supply

Thermal sector

Post-drying

Unique selling propositions:

The most important parameters of an UpCyclingKraftwerk®

- No comparable technology.
- Modular structure of *the technical system. 1to 12 lines (WGL 1/to WGL 12)*
- Closed multi-stage plant technology in *the thermal area (autothermal process control)*
- *No external energy for process stability (only for start-up and shut-down)*
- *No process-related flue gases, no dioxins and furans, tar- and dust-free synthesis gas*
- *High overall efficiency (of the plant) at ≥ 88%, carbon conversion > 99%.*
- *High electrical efficiency,* $\eta_{electr.} \geq$ *50-52%.*
- *High-energy fuel gas approx. 18 MWh/h per transformation line (WGL)*
- *Thermal residue throughput: 3.30 t/h per line -continuous*
- *approx. > 9.00 MWh/h energy supply (electricity) per transformation line*
- ***no pyrolysis!***

Conversion of high-calorific input materials by means of the patented DUPLEX TEC-Process® technology in ENERGY, without polluting emissions.

What is the special feature of the TCP procedure?

The TCP innovation based on a pure emission-free multi-stage conversion of solids into a gaseous state, without the use of process-related external energy (pure technology),

offers the prerequisites for economic, ecological, climate-neutral & base-load capable energy production!

The Future of Energy

Coinvolta AG, as general contractor, creates the entire project for the client as a turnkey project with our cooperation partners (see below). And takes care of the construction financing with its Swiss trust partner.

TCP Energies GmbH & Co. KG

Linde – Making our world more productive

MAHLER ADVANCED GAS SYSTEMS

MOCO SHREDDER

MAINTECH SYSTEMS

WIPA

BayoTech

R SCHMITT ENERTEC – Committed to Performance

WOLFTANK GROUP

WE-KR

HUBER TECHNOLOGY – WASTE WATER Solutions

FIROK – we rock industries

SI-TEC

SIEMENS energy

MWM – Energy. Efficiency. Environment.

HEXAGON PURUS | Wystrach

Alpensped – Internationale Logistik

fen research

COINVOLTA AG
Birkenstrasse 49
CH-6343 Rotkreuz
info@coinvolta.ch

COINVOLTA AG – General Contractor

- Consulting
- Engineering
- Project Management
- Turn Key Projects

- Clean
- Economically
- Ecologically
- Efficient