



# SÜLZLE KOPF

**SynGas**  
**Sewage sludge utilization**  
**Environmentally friendly.**  
**Economical.**  
**Future-orientated.**





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# FOR A CLEAN ENVIRONMENT



Heinrich Sülzle  
Owner of SÜLZLE Group

On the one hand, the protection of natural resources requires in-depth knowledge of ecological and technological processes to be target-oriented and effective – on the other hand, it calls for economic investments now for a clean future.



Andreas Sülzle  
Owner of SÜLZLE Group

Due to numerous problematic substances, sewage sludge presents a great challenge to the environment that municipalities have to face.



Frank Gansloser  
Owner of AVAT Automation

KOPF SynGas – a joint venture between the two mid-size corporate groups SÜLZLE and AVAT Automation – offers the most economic, environmentally friendly solution for sewage sludge utilization.

The KOPF SynGas Process: Gasification utilizing the gas in a combined heat and power plant. The carbon present in the sewage sludge is completely converted into energy. All organic toxins are destroyed. Gasifier ash, a fraction of the dewatered sewage sludge, can be utilized directly for fertilization or processed further to extract phosphorous.

# RESIDUE WITH POTENTIAL



## SEWAGE SLUDGE AS A RESOURCE

The purification of waste water in mechanical-biological sewage treatment plants generates large amounts of residual sewage sludge. Germany has to dispose of approx. 2 million tons of dried sewage sludge matter (TS) annually.

Since sewage facilities represent the largest energy consumers in the communal energy sector, energy self-sufficient sewage treatment plants are key. Sewage sludge contains energy that, once recovered through digestion and gasification, can cover the heat and power demand of a waste water treatment plant.

### CHALLENGES

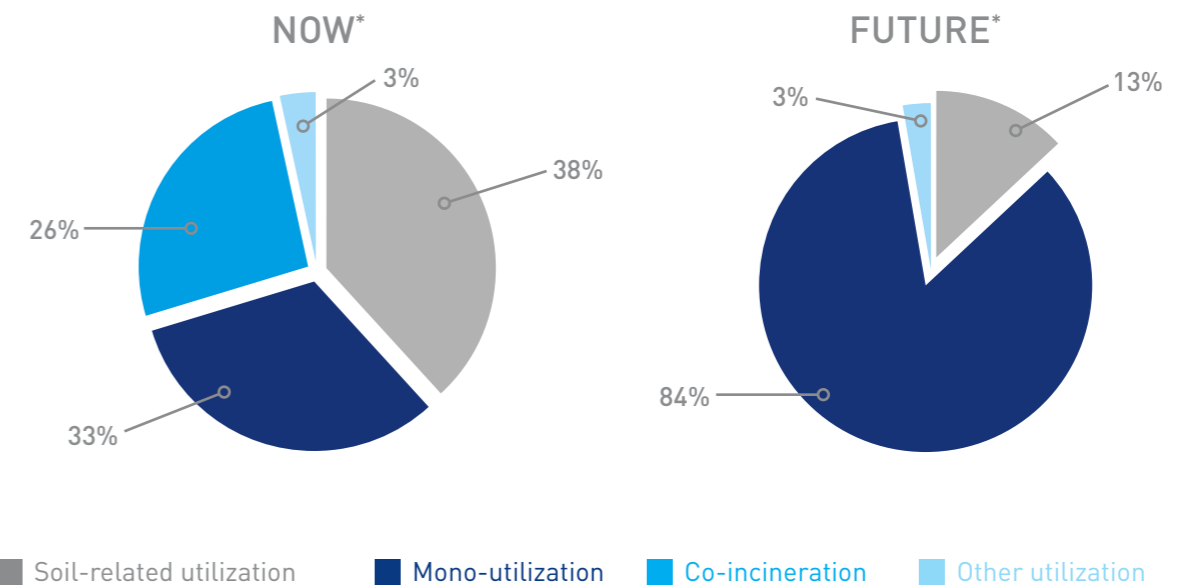
Sewage sludge contains harmful residues such as bacteria, parasitic worm eggs, viruses, hormones, and medication, as well as environmental pollutants such as sulphur and mercury. With the KOPF SynGas Process, harmful substances are thermally destroyed; inorganic toxins are eliminated during the purification stages.

### RESOURCES MADE AVAILABLE

In addition to poisonous substances, sewage sludge also contains substances, primarily phosphorous,

## SEWAGE SLUDGE DISPOSAL IN GERMANY

2 mil. t sewage sludge dry substance annually



NOW\* = 2013 / FUTURE\* = from 2026

that serve as the basis for fertilizer. Germany completely relies on the import of phosphorous. Ensuring supply reliability requires recovery of this recyclable material. In the KOPF SynGas Process a phosphorous-rich ash is generated, which is free of toxins and heavy metals, thus ideal for phosphorous recovery.

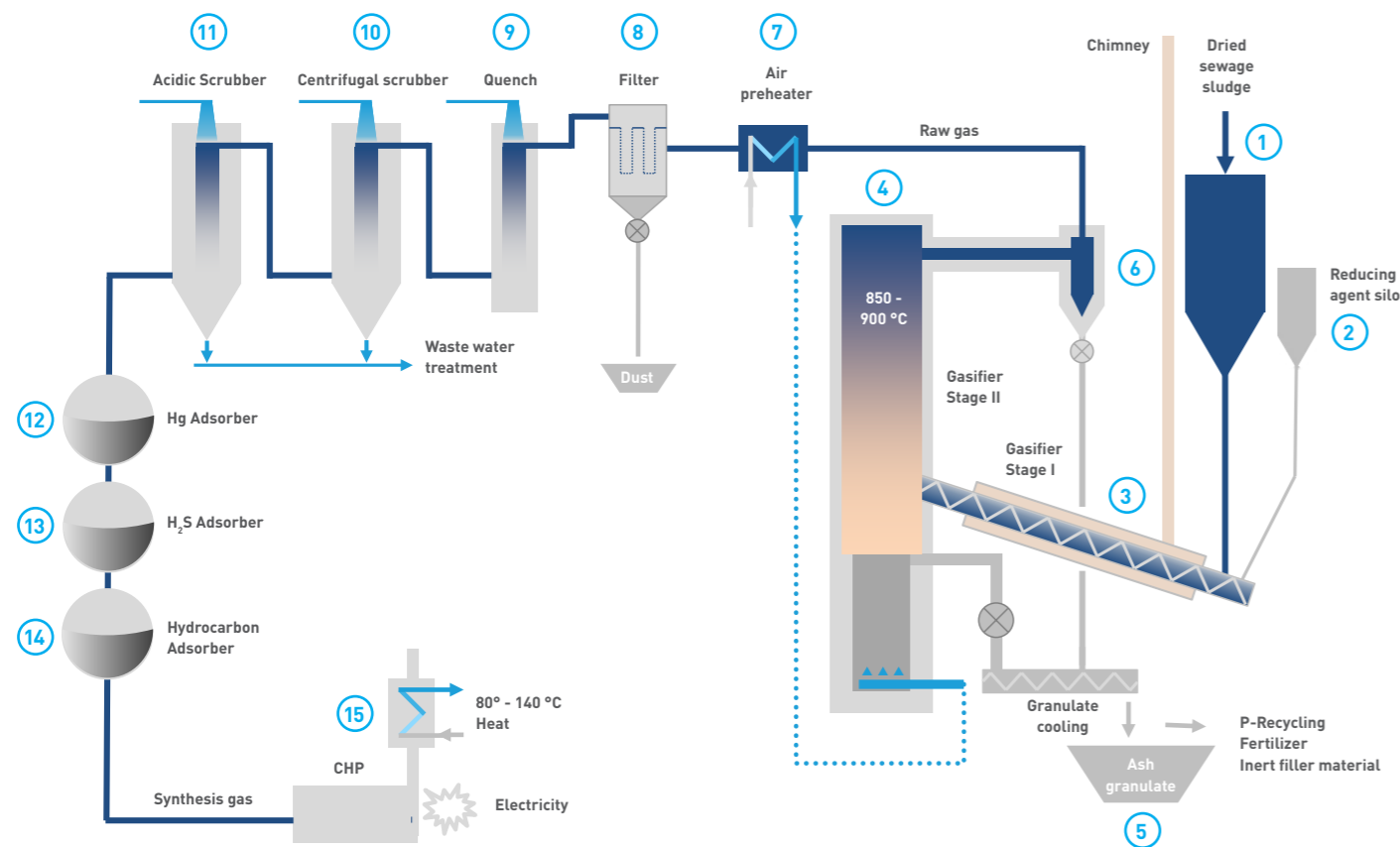
### NEW GENERAL REGULATIONS

In the amendment of the German sewage sludge regulations, the deployment of sewage sludge for fertilization purposes has been widely prohibited. At the same time, phosphorous recovery must be ensured.

This requires pure ash from mono-utilization processes. In Germany, there is a demand for sewage sludge mono-utilization systems with a capacity of one million tons of dry substance by 2026. The KOPF SynGas Process offers thermal, onsite sewage sludge utilization that optimally meets the requirements of sewage sludge detoxification, energy recovery and material recycling – without environmentally burdening transport, and at a predictable price.

# A PROMISING TECHNOLOGY

## DESCRIPTION OF THE KOPF SYNGAS PROCESS



### THE SYNGAS 5,000 MODULE

5,000 t dried sewage sludge per year  
 4,200 MWh electricity per year  
 5,500 MWh heat per year

### SCALABILITY OF THE KOPF SYNGAS PROCESS

|  |                            |
|--|----------------------------|
| < 2,000 t dried sludge per year:       | Heat Module                |
| 2,000 - 6,000 t dried sludge per year: | CHP-Module, single line    |
| > 6,000 t dried sludge per year:       | CHP-Module, multiple lines |

### TECHNOLOGY

Due to the many difficult substances such as bacteria, medication, sulphur, heavy metals – the Kopf SynGas Process is based on a two-stage thermal treatment. In combination with multi-stage, downstream purification, this results in clear synthesis gas for use in a combined heat and power plant (CHP).

### TWO-STAGE THERMAL TREATMENT

Sewage sludge (dry content 85-95%) is conveyed from the silo ①, together with limestone ②, to a thermolysis screw feeder ③. The products, thermolysis gas, carbon and ash, generated during thermolysis, are conveyed to a fluidized-bed gasifier ④.

In the second stage of gasification, the carbon is converted under substoichiometric conditions into gas and the long-chain molecules (so-called tar) of the thermolysis gas are cracked. The granulated ash is discharged into an ash silo ⑤.

### GAS TREATMENT

In the cyclone ⑥, the raw gas is freed from dust in a coarse filter and cooled to 400°C in the recuperator ⑦. In the process, the air is preheated for the gasifier.

The fine dust is separated in a candle filter ⑧.

The quench ⑨ cools the gas to 35°C with treated waste water. The remaining dust and tar are separated. After recirculation in the centrifugal washer, the quench water is purified in a subsequent water treatment process.

In the centrifugal washer ⑩ the aerosols generated in the quench column are removed. The acidic washer ⑪ serves to remove the nitrogen compounds in the gas.

Three activated carbon filters follow. The first one ⑫ removes the mercury with iodized activated carbon and via adsorption. The second filter ⑬ removes any remaining H<sub>2</sub>S with special activated carbon. The “police filter” ⑭ removes the remaining aromatic hydrocarbons.

### ENERGY GENERATION

The synthesis gas is used in a combined heat and power plant (CHP) ⑮ to generate electricity and process heat, for example for sewage sludge drying.

#### MINERAL GRANULATE

The end product of the gasification is inert, grainy and rich in phosphorous. It has therefore many application options.

#### PHOSPHOROUS RECOVERY

The high phosphorous content enables the use of a local secondary raw material for the manufacture of fertilizers instead of phosphorous mined in remote areas.

- Substantial CO<sub>2</sub> savings
- Independence from raw material sources
- Lower heavy metal pollution than from phosphorous ore

This utilization of ash as a phosphorous feedstock currently receives a great deal of attention in Germany and Europe, as the introduction of phosphorous recovery is a stated political aim in coming years.



Figure: Sewage sludge gasification at Mannheim municipal waste water treatment plant



**ECONOMICS OF THE KOPF SYNGAS PROCESS**

Capacity dry sludge: 4,000 to 6,000 t/a  
 Capital investment incl. dryer: 6 to 12 Mio €  
 Operating earnings: 300,000 to 700,000 €/a  
 Return: 15 to 25 %/a  
 Payback period: 4 to 7 years

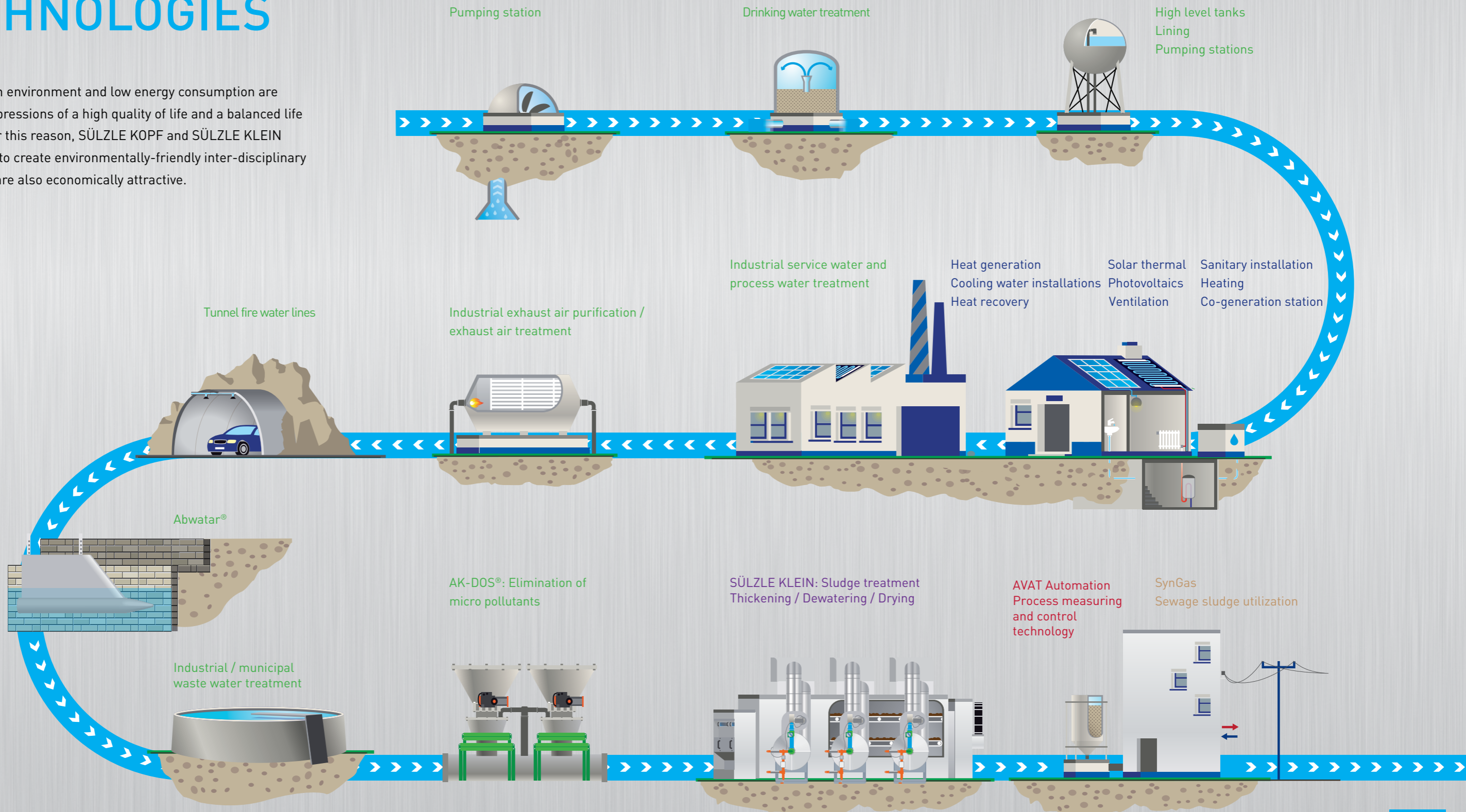


|                          | <b>GASIFICATION PLANT KOBLENZ</b> | <b>GASIFICATION PLANT MANNHEIM</b> | <b>GASIFICATION PLANT BALINGEN</b> |
|--------------------------|-----------------------------------|------------------------------------|------------------------------------|
| Capacity                 | 4000 t/a TS                       | 5000 t/a TS                        | 2000 t/a TS                        |
| Gasification medium      | Air                               | Air                                | Air                                |
| Gasification temperature | 850 °C-900 °C                     | 850 °C-900 °C                      | 850 °C                             |
| Installed capacity       | 1,8 MWth                          | 2,2 MWth                           | 720 kW                             |
| Electrical output        | 440 kW                            | -                                  | 75 kW                              |
| Dryer capacity           | 250 kW @ 90 °C                    | -                                  | -                                  |
| Dryer                    | Belt dryer                        | 1,5 MWth Drum dryer                | 250 kW Belt dryer                  |
| Plant floor area         | 350 m <sup>2</sup>                | 500 m <sup>2</sup>                 | 120 m <sup>2</sup>                 |
| Cold gas efficiency      | 70 %                              | 70 %                               | 66 %                               |

# FOR PEOPLE AND THE ENVIRONMENT: INNOVATIVE TECHNOLOGIES

An intact, clean environment and low energy consumption are elementary expressions of a high quality of life and a balanced life philosophy. For this reason, SÜLZLE KOPF and SÜLZLE KLEIN work together to create environmentally-friendly inter-disciplinary concepts that are also economically attractive.

- PLANT TECHNOLOGY
- SEWAGE SLUDGE UTILIZATION
- BUILDING SERVICES ENGINEERING
  - Heating
  - Air
  - Solar power
  - Air conditioning
  - Sanitary installation
  - Services
- ▶▶ MANUFACTURING WITH OWN WELDING ENGINEERING
- SLUDGE TREATMENT
- PROCESS MEASURING AND CONTROL TECHNOLOGY  
MEASUREMENT AND CONTROL TECHNOLOGY (MSR)  
PROCESS AND CONTROL TECHNOLOGY  
(IN COOPERATION WITH AVAT AUTOMATION)





# SÜLZLE

überzeugt.

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