



BIOENERGIESYSTEME GmbH

Research, Development and Design of Plants
for Heat and Power Production from Biomass

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Key information and references about the company BIOS BIOENERGIESYSTEME GmbH

Basic data

The company was founded in 1995 as a Graz University of Technology spin-off in the form of a business partnership. In 2001 the legal status of the company was changed to a limited liability company due to the increasing annual turnover and the integration of senior staff members.

Prof. Ingwald Obernberger, who holds 51% of the shares, is the managing director and founder of the company. The remaining shares are held by 5 experienced staff members, providing a strong basis for the further enhancement of the company.

The present staff of BIOS BIOENERGIESYSTEME GmbH comprises 23 persons, 20 of them are university graduates (process, energy and environmental engineers). The turnover volume amounted to approximately 3.2 million Euros in 2008.

The company's registered office is located in Graz.

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Fields of activity

BIOS BIOENERGIESYSTEME GmbH is active in research, development, planning and optimisation of processes and plants designed to generate heat and power from biomass.

The BIOS team of engineers has many years of comprehensive experience in the design and operation of plants for energetic biomass utilisation and can refer to a wide range of project implementations and successful developments.

Cooperation contracts with Graz University of Technology and with the Austrian Bioenergy Competence Centre Bioenergy 2020+ GmbH ensure direct access to the latest developments and innovations in this area. Furthermore, BIOS has established close contacts to national and international scientific institutions and companies by participating in national and international R&D and demonstration projects.

Prof. Obernberger, the managing director of BIOS BIOENERGIESYSTEME GmbH, is head of the research group “Energetic Biomass Utilisation” at the Graz University of Technology, Austrian representative in the IEA Bioenergy Agreement, Task 32 “Biomass Combustion and Co-firing” and key researcher in the Austrian Bioenergy Competence Centre (Bioenergy 2020+ GmbH) for the areas “Biomass Combustion (medium- and large-scale plants)” and “Modelling and Simulation”.

BIOS BIOENERGIESYSTEME GmbH is a shareholder of the BIOSTROM Erzeugungs GmbH, a biomass CHP plant producing electricity, heat and cold in Fussach (A). This allows BIOS engineers to gain direct access to all plant data and gather comprehensive experience in the optimisation of biomass CHP plants. Moreover, BIOS BIOENERGIESYSTEME GmbH is an industrial partner and via the association of companies a shareholder of the Bioenergy 2020+ GmbH. The Bioenergy 2020+ GmbH is a centre of competence within the Austrian COMET-Programme, where R&D projects in the field of energetic biomass utilisation are performed in close cooperation between scientific and industrial partners. This secures direct access to relevant infrastructure and knowledge concerning R&D in the field of thermochemical biomass conversion (access to laboratory and pilot plant facilities for test runs, to comprehensive and modern analysis and measurement equipment as well as to latest results of R&D projects).

The experience gained in projects that have already been implemented, as well as detailed knowledge in the planning and design of thermal biomass conversion systems guarantee that solutions provided by BIOS are at the cutting edge of technology and meet the highest standards of cost effectiveness and environmental compatibility.

BIOS BIOENERGIESYSTEME GmbH is an experienced and reliable partner for all fields of energetic biomass and industrial waste heat utilisation. The solutions offered take account of all the latest developments and innovations in this sector and meet the most demanding requirements.

Working fields:

- Planning of heat generation, combined heat and power (CHP) generation and combined heat, cooling and power (CHCP) generation plants utilising solid, liquid and gaseous biomass fuels and substrates
- Planning of plants for industrial waste heat utilisation
- Energy engineering solutions for industry
- Planning of pellet production plants
- Planning and development of biomass gasification plants
- Planning of district heating networks
- Planning of biomass cooling plants and cooling supply systems
- Development, design and optimisation of biomass furnaces, boilers and flue gas cleaning systems by CFD simulation (Computational Fluid Dynamics)
- Energy concepts and energy efficiency
- Optimisation and refurbishment of existing biomass combustion and CHP plants
- Emission measurements and analyses of biomass fuels, ashes, aerosols and waste water
- Expert reports in the field of thermochemical biomass conversion
- Management of and participation in national and international R&D and demonstration projects
- Development of computer software and databases for the detailed calculation and design of single components of biomass combustion plants, including flue gas cleaning units
- Development of new combustion and flue gas technologies (low NO_x, dust separation) for biomass combustion plants
- Development, demonstration and optimisation of new combined heat and power (CHP) technologies for biomass combustion, gasification units, biogas plants and vegetable oil CHP plants (ORC process, screw-type steam engine cycle, Stirling engine process)
- Sustainable ash utilisation
- QM - biomass heating plants

Selected References

(Planning of heat generation, combined heat and power (CHP) generation and combined heat, cooling and power (CHCP) generation plants utilising biomass fuels)

Industrial waste heat utilisation

- Waste heat recovery for district heat utilisation and design of pipe network / BIOCHEMIE Kundl GmbH (Tyrol, Austria)
District heating capacity: 13.0 MWth; length of pipe network: 17,000 m; start of operation: 1996.
Energy master plan, feasibility study, emission forecast, technological assessment, detailed design of the waste heat recovery process and of the district heating network, supervision of construction.
- Waste heat recovery by flue gas condensation / Holzindustrie KAINDL (Salzburg, Austria)
District heating capacity: approx. 16.0 MWth; length of pipe network: 14,000 m; start of operation: 2000.
Energy master plan, feasibility study, emission forecast, environmental and technological assessment, detailed calculation of the flue gas condensation unit, preparation of the proposal for funding under the EU-THERMIE programme.
- Heat and power production by waste heat recovery of industrial flue gas streams based on an ORC cycle – RHI AG, Radenthein (Carinthia, Austria)
Nominal thermal capacity: 5.8 MW flue gas / thermal oil heat exchanger; nominal electric capacity: 1.0 MW ORC process; Start of operation: 2009.
Preliminary design of the overall plant, preparation of funding application, energetic and economic optimisation of the overall plant, preparation of permit applications, detailed design and supervision of construction and commissioning of the overall plant.
- Heat and power production by waste heat recovery of industrial flue gas streams of a cement plant based on an ORC cycle / Wietersdorf (Carinthia, Austria)
Preliminary design of the overall plant within the program "New Energy 2020" of the austrian climate and energy fund; Project title: "Waste heat utilisation: Utilisation possibilities of industrial waste heat for the production of hot water and power supply for industrial and municipal purposes".

Biomass district heating plants and process heat supply

- Biomass district heating plant / Tamsweg - EU-THERMIE demonstration project (Salzburg, Austria)
Nominal thermal capacities: 5.0 MW + 3.0 MW biomass pressurised hot water boiler + 1.6 MW flue gas condensation; length of pipe network: 22,000 m; start of operation: 1996.
Preliminary design and detailed design of the innovative plant components: biomass drying unit, newly designed biomass furnace with integrated fractionated heavy metal separation and NO_x reduction by primary measures, improved and computer-aided plant control and monitoring system, flue gas condensation unit with integrated sludge/condensate separation; monitoring and process optimisation including flue gas measurements and ash analyses over a two-year period, documentation of the whole project.
- Biomass district heating plant / Lech am Arlberg (Vorarlberg, Austria)
Nominal thermal capacities: 5.0 MW + 2.5 MW biomass pressurised hot water boiler + 1.5 MW flue gas condensation unit; length of pipe network: approx. 15,000 m; start of operation: 1999.
Preliminary design of the overall plant; detailed design and supervision of construction of the biomass furnace and boiler, flue gas cleaning system and the flue gas condensation unit.

- Biomass district heating plant / St. Pankraz in the Ulten Valley (South Tyrol, Italy)
Nominal thermal capacity: 0.6 MW biomass pressurised hot water boiler + 0.06 MW pressurised hot water economiser; length of pipe network: approx. 1,500 m; start of operation: 2000.
Preliminary design of the overall plant; preparation of funding application, technical and economic optimisation of the district heating network and plant, preparation of permit applications, detailed design, supervision of construction of the overall plant including the network of pipes; support of commissioning and acceptance, plant monitoring and process optimisation.
- Biomass district heating plant / Oberlech (Vorarlberg, Austria)
Nominal thermal capacity: 0.35 MW biomass pressurised hot water boiler; length of network: approx. 1,000 m; start of operation: 2002/2003.
Preliminary design of the overall plant; preparation of applications for funding; technical and economic optimisation of the district heating network and plant, preparation of permit applications; detailed design of the district heating network and biomass combustion plant, supervision of construction, support of commissioning and acceptance of the overall plant.
- Biomass district heating plant / St. Walburg im Ultental (South Tyrol, Italy)
Nominal thermal capacity: 1.4 MW biomass pressurised hot water boiler + 0.12 MW pressurised hot water economiser; length of pipe network: approx. 10,300 m; start of operation: 2000.
Preliminary design of the overall plant; preparation of funding application, technical and economic optimisation of the district heating network and plant, preparation of permit applications, detailed design, supervision of construction of the overall plant including the network of pipes; support of commissioning and acceptance, plant monitoring and process optimisation.
- Biomass district heating plant / Sulzberg (Vorarlberg, Austria)
Nominal thermal capacity: 0.6 MW biomass pressurised hot water boiler + 0.4 MW biomass pressurised hot water boiler + 0.1 MW pressurised hot water economiser; length of pipe network: approx. 4,800 m; start of operation: 2002; plant enlargement: 2007.
Preliminary design of the overall plant; preparation of funding application, preparation of permit applications, detailed design, supervision of construction, support of commissioning and acceptance of the overall plant.
- Biomass district heating plant / Lajen (South Tyrol, Italy)
Nominal thermal capacity: 1.4 MW biomass pressurised hot water boiler + 0.1 MW pressurised hot water economiser; length of pipe network: approx. 5,500 m; start of operation: 2004.
Preliminary design of the overall plant; preparation of funding application, technical and economic optimisation of the district heating network and the biomass heating plant, preparation of permit applications, detailed design, supervision of construction and commissioning of the district heating network and the biomass heating plant, project performed in cooperation with Ingenieurteam Bergmeister GmbH, South Tyrol.
- Biomass district heating plant / St. Nikolaus in the Ulten Valley (South Tyrol, Italy)
Nominal thermal capacity: 0.6 MW biomass pressurised hot water boiler + 0.06 MW pressurised hot water economiser; length of pipe network: approx. 2,200 m; start of operation: 2004.
Preliminary design of the overall plant; preparation of funding application, preparation of permit applications, detailed design, supervision of construction, support of commissioning and acceptance of the overall plant.
- Process steam supply based on a biomass steam boiler plant - Tirol Milch Wörgl (Tyrol, Austria)
Nominal fuel capacity: 7.2 MW ; steam capacity: 9.2 t/h ; start of operation: 2007.
Preliminary design of the overall plant; preparation of funding application, preparation of permit applications, detailed design, supervision of construction, support of commissioning and acceptance of the overall plant.

Biomass combined heat and power plants based on an ORC cycle

- Biomass CHP plant based on an ORC cycle / STIA Holzindustrie, Admont - EU-THERMIE demonstration project (Styria, Austria)
Nominal thermal capacities: 4.0 MW biomass pressurised hot water boiler + 3.2 MW biomass thermal oil boiler + 1.5 MW flue gas condensation unit; nominal electric capacity: 0.4 MW ORC process; start of operation: 1998/1999.
Preliminary design of the overall plant, preparation of applications for EU-THERMIE and national funding; technical and economic optimisation of the CHP unit, detailed design of the ORC process, the flue gas cleaning unit and the flue gas condensation unit, supervision of construction and support of commissioning and acceptance of the ORC unit.
- Biomass CHP plant based on an ORC cycle and a newly developed fuzzy logic control system / Stadtwärme Lienz - EU-THERMIE demonstration project (Tyrol, Austria)
Nominal thermal capacities: 7.0 MW biomass pressurised hot water boiler + 6.0 MW biomass thermal oil boiler + 1.5 MW flue gas condensation unit; nominal electric capacity: 1.0 MW ORC process; start of operation: 2001.
Preliminary design of the overall plant, preparation of applications for EU-THERMIE and national funding; technical and economic optimisation of the CHP unit, detailed design of the CHP plant, supervision of construction and support of commissioning and acceptance of the CHP plant.
- Waste wood-fired combined heat, cooling and power (CHCP) plant based on an ORC cycle and an absorption chiller / BIOSTROM, Fussach - national demonstration project (Vorarlberg, Austria)
Nominal thermal capacities: 6.2 MW biomass thermal oil boiler + 1.0 MW pressurised hot water economiser; nominal electric capacity: 1.1 MW ORC process; start of operation: 2002.
Preliminary design of the overall plant, preparation of applications for national funding; technical and economic optimisation of the CHP unit and the absorption chiller (combined heat, cooling and power plant); preparation of permit applications, detailed design, supervision of construction and support of commissioning and acceptance of the combined heat, cooling and power plant (ORC, absorption chiller) and hydronic installations.
- Biomass CHP plant based on an ORC cycle / Längenfeld (Tyrol, Austria)
Nominal thermal capacities: 4.0 MW biomass pressurised hot water boiler + 6.5 MW biomass thermal oil boiler + 1.2 MW flue gas condensation unit; nominal electric capacity: 1.1 MW ORC process; start of operation: 2003.
Preliminary design of the overall plant, preparation of applications for national funding; technical and economic optimisation of the CHP unit, preparation of permit applications, detailed design and supervision of construction of the overall CHP plant, detailed design and support concerning the supervision of coordination of the district heating network.
- Biomass CHP plant based on an ORC cycle / Dobbiaco (South Tyrol, Italy)
Nominal thermal capacity: 8.7 MW biomass thermal oil boiler + 0.5 MW pressurised hot water economiser + 2.4 MW flue gas condensation unit; nominal electric capacity: 1.5 MW ORC process; start of operation: autumn 2003.
Technical and economic optimisation of the CHP unit (ORC), detailed design of the ORC unit, support during supervision of construction and commissioning of the ORC unit; project performed in cooperation with SEEGEN/Salzburg.

- Biomass CHP plant based on an ORC cycle / Theurl sawmill (Tyrol, Austria)
Nominal thermal capacity: 6.5 MW biomass thermal oil boiler + 0.5 MW pressurised hot water economiser; nominal electric capacity: 1.0 MW ORC process; start of operation: 2004.
Preliminary design of the overall CHP plant, preparation of applications for national funding, preparation of permit applications, detailed design, supervision of construction and support of commissioning and acceptance of the overall CHP plant.
- Extension of the existing biomass district heating plant in Lofer with a biomass CHP plant based on an ORC cycle / Lofer (Salzburg, Austria)
Nominal thermal capacity: 4.2 MW biomass thermal oil boiler (3.75 MW for the ORC process) + 0.6 MW pressurised hot water economiser; nominal electric capacity: 0.6 MW ORC process; start of operation: 2004.
Preparation of applications for national funding; technical and economic optimisation of the CHP unit, preparation of permit applications, detailed design, supervision of construction and support of commissioning and acceptance of the overall CHP plant; project performed in cooperation with SEEGEN, Salzburg.
- Extension of the existing biomass district heating plant in Grossarl with a biomass CHP plant based on an ORC cycle / Grossarl (Salzburg, Austria)
Nominal thermal capacity: 3.2 MW biomass thermal oil boiler + 0.5 MW pressurised hot water economiser; nominal electric capacity: 0.5 MW ORC process; start of operation: 2005.
Preparation of applications for national funding; technical and economic optimisation of the CHP unit, preparation of permit applications, detailed design, supervision of construction and support of commissioning and acceptance of the overall CHP plant; project performed in cooperation with SEEGEN, Salzburg.
- Biomass CHP plant based on an ORC cycle – extension Stadtwärme Lienz (Tyrol, Austria)
Nominal thermal capacity: 8.7 MW biomass thermal oil boiler + 1.3 MW pressurised hot water economiser; nominal electric capacity: 1.5 MW ORC processes; start of operation: 2005.
Preliminary design of the overall CHP plant, preparation of applications for national funding, preparation of permit applications, detailed design and supervision of construction of the CHP plant, support of commissioning and acceptance of the overall CHP plant; project performed in cooperation with PLAN.T, Graz.
- Biomass CHP plant based on three ORC units / Biomasse-KWK-Leoben Betriebsgesellschaft m.b.H. (Styria, Austria)
Total nominal thermal capacities: 26.1 MW biomass thermal oil boilers + 2.1 MW pressurised hot water economisers; total nominal electric capacity: 4.5 MW ORC processes; start of operation: 2005.
Preparation of applications for national funding, preparation of permit applications, detailed design, support of supervision of construction, commissioning and acceptance of the overall CHP plant; project performed in cooperation with PLAN.T, Graz and EnerTec, Graz.
- Biomass CHP plant based on an ORC cycle / TILLY Holzindustrie Ges.m.b.H. (Carinthia, Austria)
Nominal thermal capacity: 10 MW biomass thermal oil boiler + 1.5 MW pressurised hot water economiser; nominal electric capacity: 1.5 MW ORC process; start of operation: 2005/2006.
Preliminary design of the overall CHP plant, preparation of applications for national funding, preparation of permit applications, detailed design, supervision of construction and support of commissioning and acceptance of the overall CHP plant.

- Extension of the existing biomass district heating plant in Tamsweg with a biomass CHP plant based on an ORC cycle / Tamsweg (Salzburg, Austria)
Nominal electric capacity: 3.2 MW biomass thermal oil boiler + 0.5 MW pressurised hot water economiser; nominal electric capacity: 0.5 MW ORC process; start of operation: 2006.
Preparation of applications for national funding, preparation of permit applications and detailed design of the overall CHP plant, supervision of construction, commissioning and acceptance of the CHP plant. Preparation of funding and permit applications in cooperation with SEEGEN, Salzburg.
- Extension of the existing biomass district heating plant St. Walburg in the Ulten Valley with a biomass CHP plant based on an ORC cycle / St. Walburg in the Ulten Valley (South Tyrol, Italy)
Nominal thermal capacity: 1.2 MW thermal oil boiler incl. thermal oil economiser + 0.13 MW pressurised hot water economiser; nominal electric capacity: 0.2 MW ORC process; start of operation: 2007.
Preliminary design of the overall plant; preparation of funding application, technical and economic optimisation of the plant, preparation of permit applications, detailed design, supervision of construction of the overall plant; support of commissioning and acceptance, plant monitoring and process optimisation.
- Biomass CHP plant based on an ORC cycle - enlargement of existing district heating plant / Olang (South Tyrol, Italy)
Nominal thermal capacity: 4.2 MW biomass thermal oil boiler + 0.15 MW pressurised hot water economiser; existing boiler: 2 x 4 MW biomass pressurised hot water boiler + 1.2 MW flue gas condensation unit; nominal electric capacity: 0.72 MW ORC process; start of operation: 2007.
Preliminary design of the overall CHP plant, preparation of applications for national funding, preparation of permit applications, detailed design, supervision of construction and support of commissioning and acceptance of the overall CHP plant.
- Biomass CHP plant based on an ORC cycle / Josko Fenster und Türen GmbH, Kopfing (Upper Austria, Austria)
Nominal thermal capacity: 1.1 MW biomass thermal oil boiler + 0.1 MW thermal oil economiser + 0.15 MW pressurised hot water economiser; nominal electric capacity: 0.2 MW ORC process; Start of operation: 2008.
Preliminary design of the overall CHP plant, preparation of applications for national funding, preparation of permit applications, detailed design, supervision of construction and support of commissioning and acceptance of the overall CHP plant, plant monitoring and process optimisation.
- Biomass CHP plant based on an ORC cycle / Allendorf (Hessen, Germany)
Nominal thermal capacity: 1.1 MW biomass thermal oil boiler + 0.1 MW thermal oil economiser + 0.11 MW pressurised hot water economiser; nominal electric capacity: 0.18 MW ORC process; Start of operation: 2008.
Preliminary design of the overall CHP plant, preparation of permit applications, detailed design, supervision of construction and support of commissioning and acceptance of the overall CHP plant, plant monitoring and process optimisation.

Biomass combined heat and power plants based on a steam turbine process

- Biomass CHP plant based on a steam turbine process / Kufstein (Tyrol, Austria)
Nominal thermal capacity: 24.5 MW biomass steam boiler; nominal electric capacity: 6.5 MW steam turbine; start of operation: 2003.
Preparation of applications for national funding; technical and economic optimisation of the CHP plant; preparation of permit applications, support of biomass furnace and steam boiler design using CFD simulation

- Biomass CHP plant based on a steam turbine process / LINZ STROM GmbH, Linz (Lower Austria, Austria)
Nominal thermal capacity: 26.0 MW biomass steam boiler; nominal electric capacity: 7.0 MW steam turbine; start of operation: 2005.
Preliminary design of the overall plant, preparation of applications for national funding; technical and economic optimisation of the CHP unit; preparation of permit applications, preparation of invitation to bid and evaluation of bids for the CHP plant, quality inspection of the unit after start-up
- Biomass CHP plant based on a steam turbine process / EVN AG, Baden (Lower Austria, Austria)
Nominal thermal capacity: 23.4 MW biomass steam boiler; nominal electric capacity: 5.0 MW steam turbine; start of operation: 2006.
Preliminary design of the overall plant, preparation of applications for national funding, preparation of permit applications, preparation of invitation to bid and evaluation of bids for the CHP plant; supervision of construction and support of commissioning and acceptance of the biomass furnace, steam boiler and flue gas cleaning system; project performed in cooperation with Verbundplan GmbH / Villach
- Biomass CHP plant based on a steam turbine process / EVN AG, Mödling (Lower Austria, Austria)
Nominal thermal capacity: 23.4 MW biomass steam boiler; nominal electric capacity: 5.0 MW steam turbine; start of operation: 2006.
Preliminary design of the overall plant, preparation of applications for national funding, preparation of permit applications, preparation of invitation to bid and evaluation of bids for the CHP plant; supervision of construction and support of commissioning and acceptance of the biomass furnace, steam boiler and flue gas cleaning system; project performed in cooperation with Verbundplan GmbH / Villach
- Biomass CHP plant based on a steam turbine process / Holzindustrie Stallinger, Frankenmarkt (Upper Austria, Austria)
Nominal thermal capacity: 18.7 MW biomass steam boiler; nominal electric capacity: 5.0 MW steam turbine.
Preliminary design of the overall plant, preparation of applications for national funding; preparation of permit applications and preparation of invitation to bid and evaluation of bids in cooperation with Energie AG O.Ö.
- CHP plant based on a steam turbine process using olive residues as fuel / New Energy Biomasse Hellas GmbH (Meligalas, Greece)
Nominal thermal capacity: 100.0 MW biomass steam boiler; nominal electric capacity: 26.3 MW steam turbine; fuel: olive residues.
Preparation of EU project application, coordination support for EU demonstration project, EU project partner, preparation of permit applications in cooperation with Infratec S.A. and Impetus S.A. (GR), preparation of invitation to bid and evaluation of bids and functional design specifications, assistance in the detailed design

Biomass combined heat and power plants based on a screw-type engine

- Biomass CHP plant based on a screw-type engine cycle / Fernwärmeversorgungsgenossenschaft Hartberg – EU demonstration project (Styria, Austria)
Nominal thermal capacity: 18.0 MW biomass steam boiler (5.6 MW for the screw-type engine process); nominal electric capacity: 0.71 MW screw-type engine; start of operation: 2003.
Preliminary design of the overall plant, preparation of applications for EU and national funding, technical and economic optimisation of the CHP plant, preparation of permit applications, detailed design, supervision of construction, support of commissioning and acceptance of the CHP unit.

Biomass combined heat and power plants based on Stirling engine technology

- Biomass CHP plant based on Stirling engine technology / TDZ Ennstal, Reichraming (Upper Austria, Austria)
Nominal thermal capacity: 0.25 MW biomass furnace (nominal thermal power output); nominal electric capacity: 0.035 MW Stirling engine; wood chips and log wood drying system; start of operation: 2005.
Preliminary design of the biomass CHP plant; preparation of applications for funding; preparation of permit applications; support of plant commissioning, plant monitoring.
- Biomass CHP plant based on Stirling engine technology / Allendorf (Hessen, Germany)
Nominal thermal capacity: 0.24 MW biomass furnace (nominal thermal power output); nominal electric capacity: 0.035 MW; start of operation 2008.
Preliminary design of the overall CHP plant, preparation of permit applications, detailed design, supervision of construction and support of commissioning and acceptance of the overall CHP plant.

Combined heat and power plants based on vegetable oil

- CHP plant based on vegetable oil-fired engines (combined heat and power units) and downstream ORC cycle / vegetable oil CHP New Energy (Germany)
Nominal electric capacity vegetable oil-fired engines: 4.7 MW per unit; nominal electric capacity ORC process: 0.3 MW per unit; 5 units per site are planned.
Preliminary design of the overall plant, preparation of permit applications; project performed in cooperation with concon GmbH.

Biogas plants

- Biogas CHP plant based on agricultural waste with gas engine / Zwettl (Lower Austria, Austria)
Nominal electric capacity: 0.5 MW gas engine, nominal thermal capacity: 0.57 MW gas engine waste heat.
Preliminary plant design, preparation of applications for national funding, preparation of permit applications.
- Biogas CHP plant based on agricultural waste with gas engine / Hídépitő (Hungary)
Nominal electric capacity: 0.25 MW gas engine; nominal thermal capacity: 0.30 MW gas engine waste heat.
Preliminary plant and conceptual design, technical and economic assessment.
- Biogas CHP plant based on agricultural waste with integrated gas treatment for biogas injection into an existing natural gas grid and utilisation in gas engines at the customer sites / Bad Tatzmannsdorf (Burgenland, Austria)
Nominal electric capacity: 2 x 0.25 MW gas engines, nominal thermal capacity: 2 x 0.4 MW gas engine waste heat.
Preliminary plant design, technical and economic assessment.
- Combination of an anaerobic waste water treatment plant and a biogas CHP plant for the energetic utilisation of organic residues with biogas utilisation in a gas engine and feed-in of biogas into the company-internal natural gas grid / Hermann Pfanner Getränke Ges.m.b.H., Enns (Upper Austria, Austria)
Anaerobic waste water treatment plant: 685 m³ waste water/day; 5,200 kgCOD/day; nominal electric capacity (gas engine): 0.5 MW; nominal thermal capacity (gas engine): 0.57 MW; thermal biogas utilisation (substitution of natural gas): 100 m³/h
Preliminary plant and conceptual design, technical and economic assessment, preparation of applications for funding.

- Preparation of an optimisation guideline for biogas plants based on a systematic optimisation of the biogas plant development by strategic studying of realised plants and projects
- Biogas CHP plant based on agricultural waste with fuel cell and integrated gas treatment
Nominal electric capacity: 0.25 MW fuel cell; nominal thermal capacity: 0.18 MW fuel cell waste heat (development phase)
Preliminary plant design and conceptual design, technical and economic assessment (in-house project).
- Biogas plant with integrated gas treatment for biogas injection into an existing natural gas grid
Biogas treatment capacity: 200 Nm³/h (development phase)
Preliminary plant and conceptual design, technical and economic assessment (in-house project).

Planning of Pellet Production Plants

- Pellet production plant for DIN+ wood pellets from log wood combined with a biomass CHP plant based on a steam turbine process (Caithness, Scotland)
Pellet production capacity: 60.000 tons per year; electric capacity of the steam turbine: 8 MW
Preliminary design and technical concept of the plant; technical and economic evaluation
- Pellet production plant for industrial wood pellets from log wood, sawdust and shavings in combination with a natural gas fired steam boiler (Karelia, Russia)
Pellet production capacity: 20.000 and 40.000 tons per year
Preliminary design and technical concept of the plant; technical and economic evaluation in cooperation with PROMANAGEMENT GmbH
- Pellet production plant for DIN+ wood pellets from saw dust combined with a gas fired boiler and a CHP plant based on a gas engine, Stainach (Styria, Austria)
Pellet production capacity: 40.000 tons per year; electric capacity of gas engine: 800 kW
Preliminary design and technical concept of the plant; preparation of permit applications, detailed design, supervision of construction and support of commissioning and acceptance of the pellet production and CHP plant

Biomass Gasification

- Biomass CHP plant based on a fluidised bed steam gasification process with the integration of an ORC cycle – Oberwart (Burgenland, Austria)
Nominal fuel capacity biomass gasifier: 8.31 MW; nominal electric capacities: 2.38 MW gas engines and 0.48 MW ORC
Preliminary design, preparation of permit applications, project performed in cooperation with REPOTEC - Renewable Power Technologies Umwelttechnik GmbH
- Methane production from biomass (Bio-SNG) based on a fluidised bed steam gasification process - Güssing (Burgenland, Austria);
Fuel capacity of the gas: 1.6 MW_{th}; production of synthetic natural gas (Bio-SNG): 140 Nm³/h
Detailed design of the thermal oil system, project performed in cooperation with REPOTEC - Renewable Power Technologies Umwelttechnik GmbH
- Gasification and pyrolysis of solid biomass fuels for power and heat production – state of development and techno-economic assessment
In-house project

Cooling Plants and Cooling Supply Systems

- Combined heat, cooling and power (CHCP) plant based on existing CHP plants and district heating systems as well as absorption and compression chillers / cooling plant Spittelau, Vienna (Austria)
 Nominal cooling capacity: 17 MW; re-cooling capacity using river water cooling 31.8 MW; heat supply for the absorption chillers by district heating network; planned start of operation 2009.
Technical assessment and preparation of request of proposals
- Combined heat, cooling and power (CHCP) plant based on existing CHP plants and district heating systems as well as absorption and compression chillers / cooling plant Vienna central railway station, Vienna (Austria)
 Nominal cooling capacity: 20 MW; re-cooling capacity using wet cooling towers 34.2 MW; heat supply for the absorption chillers by district heating network.
Technical assessment and preliminary design
- Waste wood-fired combined heat, cooling and power (CHCP) plant based on an ORC cycle and an absorption chiller / BIOSTROM, Fussach - national demonstration project (Vorarlberg, Austria)
 Nominal thermal capacities: 6.2 MW biomass thermal oil boiler + 1.0 MW pressurised hot water economiser; nominal electric capacity: 1.1 MW ORC process; start of operation: 2002.
Preliminary design of the overall plant, preparation of applications for national funding; technical and economic optimisation of the CHP unit and the absorption chiller (combined heat, cooling and power plant); preparation of permit applications, detailed design, supervision of construction and support of commissioning and acceptance of the combined heat, cooling and power plant (ORC, absorption chiller) and hydronic installations.
- Biomass combined heat, cooling and power (CHCP) plant based on an absorption chiller / VW plant, Salzgitter (Lower Saxony, Germany)
 Nominal cooling capacity: 4 MW; Re-cooling using wet cooling towers 10 MW; head supply for the absorption chillers by hot water.
Technical assessment and preliminary design

Energy Concepts and Energy Efficiency

- Development of technical and commercial concepts and strategies for a sustainable energy supply of super markets and neighbouring consumers (industry and trade, households) with heat, electricity and cooling based on the energy sources solar and biomass - SUPOSS (Sustainable Power Supply for Supermarkets and Surroundings)
Project within the programme "Energiesysteme der Zukunft"; project coordinator: IMG Innovation-Management-Group GmbH, Grambach
- Technical and economic assessment of the integration of biomass heating plants and biomass CHP plants into different types and concepts of biomass dryers
Project performed for ANDRITZ AG, Graz
- Energy concept for the heating, cooling and power supply based on gas engine CHP plants and absorption and compression chillers for the shopping center Buzin, Zagreb (Croatia)
 Nominal thermal capacity: gas engine 9 MW, ORC cycle 2.4 MW; nominal electric capacity: gas engine 13.4 MW, ORC cycle: 0.48 MW; nominal cooling capacity: 15 MW; re-cooling capacity using wet and dry cooling towers: 34.2 MW; head supply for the absorption chillers by hot water.
Technical assessment and preliminary design

Sustainable Ash Utilisation

- Preparation of an ash logistics and ash utilisation concept for a 13 MWth/1 MWe1 biomass CHP plant, Lienz (Tyrol, Austria)
- Preparation of a study regarding ash related problems in biomass combustion plants, as well as analysis and evaluation of selected plant manufacturers regarding the state-of-the-art of the minimisation of ash related problems in biomass fixed bed combustion plants for different biomass fuels (France)
- Preparation of a study covering the current state-of-the-art of the utilisation of wood ash from biomass combustions plants in Austria and Europe in regard of wood ash characteristics, possibilities of its utilisation as well as additional research required to further increase ash utilisation, Vienna (Austria)

Selected References

(CFD simulations for the design and optimisation of biomass furnaces, boilers and flue gas cleaning systems)

CFD-based design, refurbishment and optimisation of furnaces, boilers and flue gas cleaning systems for biomass, waste wood and sewage sludge combustion plants in order to reduce emissions and increase the availability and the efficiency of such systems:

- Simulation, further development and optimisation of electrostatic precipitators for biomass combustion plants; client: Scheuch GmbH, Aurolzmünster (Upper Austria, Austria).
Project period: 2001/2002
- Simulation and support of biomass furnace and boiler design for the CHP plant Grossaitingen (Bavaria, Germany) / Josef Bertsch Gesellschaft m.b.H. & Co, Bludenz (Vorarlberg, Austria).
Biomass grate furnace and water tube steam boiler; nominal thermal capacity: 16.5 MW biomass steam boiler; nominal electric capacity: 5.0 MW steam turbine; fuel: waste wood; project period: 2001-2003
- Simulation and support of biomass furnace and boiler design for the CHP plant of LINZ STROM GmbH, Linz (Upper Austria, Austria).
Biomass grate furnace and water tube steam boiler; nominal thermal capacity: 26.0 MW biomass steam boiler; nominal electric capacity: 7.0 MW steam turbine; fuel: untreated woody biomass including bark; project period: 2002/2003
- Simulation and support of the design and optimisation of the new wood log fired stoves "i-series" of the company HAAS + SOHN OFENTECHNIK GMBH, Puch (Salzburg, Austria) with a nominal thermal load of 8 kW
Wood log fired stoves; nominal thermal capacity: 8 kW stove; fuel: wood logs; project period: 2007/2008
- Simulation and support of the design and optimisation of the biomass grate furnace type series BIOTEC of the company Uniconfort srl., San Martino di Lupari (Italy)
Biomass grate furnace and fire tube boiler; nominal thermal capacity: 3.5 MW - 5.8 MW biomass hot water boiler; fuel: untreated woody biomass; project period: 2008/2009
- Simulation and support of the design and optimisation of a biomass grate furnace of the company VYNCKE ENERGIETECHNIEK N.V., Harelbeke (Belgium)
Biomass grate furnace and fire tube boiler; nominal thermal capacity: 6 MW biomass hot water boiler; fuel: woody biomass; project period: 2008/2009
- Simulation and support of the design and optimisation of a biomass grate furnace type series of the company POLYTECHNIK Luft- und Feuerungstechnik GmbH, Weissenbach (Lower Austria, Austria) in the medium size-range
Nominal thermal capacity: 1 MW - 15 MW biomass hot water / steam / thermal oil boilers; fuel: woody biomass; project period: 2009
- Simulation and support concerning the reduction of erosion tendencies of the lining of the cyclone evaporator of the biomass CFB furnace of the Strongoli power plant / Biomasse Italia S.p.A., Strongoli (Italy)
Biomass CFB furnace and water tube steam boiler including cyclone evaporator; fuel: woody and agricultural biomass; project period: 2008/2009

- Simulation and support of the design and optimisation of the prototype of a new pellet furnace of Fa. Windhager Zentralheizung GmbH, Seekirchen (Salzburg, Austria)
Biomass fixed bed furnace and fire tube boiler; nominal thermal capacity: 15 kW biomass hot water boiler; fuels: wood pellets; project period: 2007-2009
- CFD based design of the prototype of a new pellet and wood chip-fired furnace of KWB Kraft & Wärme aus Biomasse GmbH, St. Margarethen/R. (Austria); introduced into the market as KWB TDS Powerfire 150 boiler series, received the “Energie Genie 2004” award from the Austrian Ministry of Environment in co-operation with the regional energy agency “O.Oe. Energiesparverband” as well as the “Energy Globe Award 2004” (special category “most innovative product”)
Rotary grate furnace with a cyclone combustion chamber and fire tube boiler; nominal thermal capacity: 0.15 MW biomass hot water boiler; fuels: wood chips and wood pellets; project period: 2002/2003
- Simulation and support of biomass furnace and boiler design for the Kufstein CHP plant TIWAG-Tiroler Wasserkraft AG, Innsbruck (Tyrol, Austria)
Biomass grate furnace and water tube steam boiler; nominal thermal capacity: 24.5 MW biomass steam boiler; nominal electric capacity: 6.5 MW steam turbine; fuel: woody untreated biomass including bark; project period: 2002-2004
- Simulation and support of biomass furnace and boiler design and optimisation for the CHP plant New Energy Biomasse Hellas GmbH in Meligalas, Greece – Standardkessel GmbH, Duisburg (Germany)
Biomass travelling grate furnace with spreader stoker and water tube steam boiler; nominal thermal capacity: 100.0 MW biomass steam boiler; nominal electric capacity: 26.3 MW steam turbine; fuel: olive residues; project period: 2006/2007
- Simulation to support the analysis and optimisation of an existing sewage sludge combustion plant – Andritz AG, Graz (Styria, Austria)
Pulverised fuel furnace with rotary combustion chamber; nominal fuel power related to NCV: 3.7 MW; fuel: sewage sludge; project period: 2005-2006
- Simulation and support of the design of a mixed fuel furnace and boiler - Thermische Verwertungsanlage Schwarza (TVS) in Thuringia, Germany – Oschatz GmbH, Essen (Germany).
Water cooled moving grate furnace with water tube steam boiler; nominal fuel power related to NCV: 31.0 MW; fuel: mixed fuel with paper residues (rejects) as well as waste from mechanical/biological waste treatment; project period: 2006

Selected References (plant monitoring)

- Biomass CHP plant based on an ORC cycle / STIA Holzindustrie, Admont - EU-THERMIE demonstration project (Styria, Austria)
Nominal thermal capacities: 4.0 MW biomass pressurised hot water boiler + 3.2 MW biomass thermal oil boiler + 1.5 MW flue gas condensation unit; nominal electric capacity: 0.4 MW ORC process; start of operation: 1998/1999.
Plant monitoring based on a detailed evaluation of operating data and test runs with accompanying emission measurements and fuel and ash analyses, analysis of weak spots, assistance in plant optimisation during the first year of operation.
- Biomass CHP plant based on an ORC cycle and a newly developed fuzzy logic control system / Stadtwärme Lienz - EU-THERMIE demonstration project (Tyrol, Austria)
Nominal thermal capacities: 7.0 MW biomass pressurised hot water boiler + 6.0 MW biomass thermal oil boiler + 1.5 MW flue gas condensation unit; nominal electric capacity: 1.0 MW ORC process; start of operation: 2001.
Plant monitoring based on a detailed evaluation of operating data and test runs with accompanying emission measurements and fuel and ash analyses, analysis of weak spots, assistance in plant optimisation during the first year of operation.
- Waste wood-fired CHCP (combined heat, cooling and power) plant based on an ORC cycle and an absorption chiller / BIOSTROM, Fussach - national demonstration project (Vorarlberg, Austria)
Nominal thermal capacities: 6.2 MW biomass thermal oil boiler + 1.0 MW pressurised hot water economiser; nominal electric capacity: 1.1 MW ORC process; start of operation: 2002.
Plant monitoring based on a detailed evaluation of operating data and test runs with accompanying emission measurements and fuel and ash analyses, analysis of weak spots, ongoing assistance in plant optimisation.
- Waste wood-fired CHP plant based on a steam turbine process, Grossaitingen (Bavaria, Germany)
Nominal thermal capacity: 16.5 MW biomass steam boiler; nominal electric capacity: 5.0 MW steam turbine; fuel: waste wood; start of operation: 2003.
Plant monitoring based on a detailed evaluation of operating data and test runs with accompanying emission measurements, deposit probe measurements and fuel and ash analyses, analysis of weak spots, assistance in plant optimisation during the first year of operation.
- Biomass CHP plant based on a steam turbine process, Kufstein (Tyrol, Austria)
Nominal thermal capacity: 24.5 MW biomass steam boiler; nominal electric capacity: 6.5 MW steam turbine; start of operation: 2003.
Plant monitoring based on a targeted evaluation of operating data and test runs with accompanying emission measurements and fuel and ash analyses, analysis of weak spots, assistance in plant optimisation.
- Biomass CHP plant based on a screw-type engine cycle / Fernwärmeversorgungsgenossenschaft Hartberg – EU demonstration project (Styria, Austria)
Nominal thermal capacity: 18.0 MW biomass steam boiler (5.6 MW for the screw-type engine process); nominal electric capacity: 0.71 MW screw-type engine; start of operation: November 2003.
Plant monitoring based on a detailed evaluation of operating data and test runs with accompanying emission measurements and fuel and ash analyses, analysis of weak spots, assistance in plant optimisation of the CHP plant during the first year of operation.

- Agricultural biogas CHP plant based on a gas engine, Saaz (Styria, Austria)
 Nominal thermal capacity: 0.568 MW; nominal electric capacity: 0.5 MW; gas engine CHP; start of operation: 2004.
One-year monitoring, technical and economic optimisation, technical, economic and ecological evaluation.
- Biomass CHP plant based on an ORC cycle / Josko Fenster und Türen GmbH, Kopfing (Upper Austria, Austria)
 Nominal thermal capacity: 1.1 MW biomass thermal oil boiler + 0.1 MW thermal oil economiser + 0.15 MW pressurised hot water economiser; nominal electric capacity: 0.2 MW ORC process; Start of operation: 2008.
Preparation and performance of a plant monitoring for the evaluation and optimisation of the small scale ORC unit with special consideration of the operating performance newly developed components.