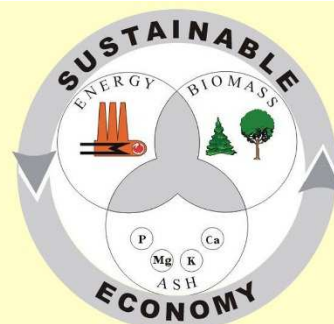




Research, Development and Design of Plants
for Energy Production from Biomass and Waste Heat Utilisation

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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 development of the company.

The present staff of BIOS BIOENERGIESYSTEME GmbH comprises 24 persons, 20 of them are university graduates (process, energy and environmental engineers). The turnover volume amounted to approximately 4.0 million Euros in 2014.

The company's registered office is located in Graz.

Contact address:

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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, cold and power from biomass as well as processes for biomass treatment (pelletising, torrefaction as well as with industrial waste heat recovery).

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 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 guarantees 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, comprehensive and modern analysis and measurement equipment as well as 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
- Development and simulation of biomass torrefaction processes
- Planning of district heating networks
- Planning of biomass cooling plants and cooling supply systems
- Development, design and optimisation of biomass gasifiers, 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
- Quality Management for 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

Customer	Abstract	Project start	Specifications / Scope overview
European Commission (Framework Programme 7, Project Nr. 314596)	PITAGORAS - "Sustainable urban Planning with Innovative and low energy Thermal And power Generation from Residual And renewable Sources"	2013	Heat recovery of exhaust gases in a steel foundry: 10 MW (saturated steam) nominal electric capacity: 2.0 MW ORC process; start of operation: planned 2016. energetic and economic optimisation of the overall plant; support of commissioning, acceptance and monitoring of the plant
Stadtwerke Wörgl GmbH, AT	Heat recovery from various waste heat sources of Tirol Milch Wörgl used for district heating of Wörgl (Tyrol, Austria)	2013	Nominal thermal capacity: compression heat pumps 2 x 1.5 MW, 1 x 1.1 MW; flue gas condensation unit 1.0 MW condenser and 0.35 MW ECO; heat recovery from the ice water cooling device 3.2 MW; 2 x 8.0 MW gas-fired boiler 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 energy centre
voestalpine Tubulars GmbH & Co KG, AT	Heat recovery of industrial flue gas streams of a steel works, Kindberg (Styria, Austria)	2011	Technical design of the plant concept of the overall plant within the program "New Energy 2020" of the Austrian climate and energy fund; Project title: "Storage-supported power generation from discontinuous waste heat streams with an ORC-plant at voestalpine Tubulars GmbH & Co KG"
Wopfinger Baustoffindustrie GmbH, AT	Heat recovery of industrial flue gas streams of a cement plant, Waldegg (Lower Austria, Austria)	2009	Preliminary design of the overall plant within the program "New Energy 2020" of the austrian climate and energy fund; Project title: "Innovative low temperature and waste heat utilisation in the cement manufacturing process using absorption pump technology"
Wietersdorfer & Peggauer Zementwerke GmbH, AT	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)	2008	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".
RHI AG, AT	Heat and power production by waste heat recovery of industrial flue gas streams based on an ORC cycle – RHI AG, Radenthein (Carinthia, Austria)	2007	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
M. Kaindl Holzindustrie, AT	Waste heat recovery by flue gas condensation – Holzindustrie KAINDL (Salzburg, Austria)	1997	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.

Customer	Abstract	Project start	Specifications / Scope overview
Biochemie GmbH, AT	Waste heat recovery for district heat utilisation and design of pipe network – BIOCHEMIE Kundl GmbH (Tyrol, Austria)	1995	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.

Biomass district heating plants and process heat supply

Customer	Abstract	Project start	Specifications / Scope overview
EVN Wärme GmbH, AT	Reconstruction of the biomass boiler, Aschbach (Lower Austria, Austria)	2014	Nominal thermal capacity: 5.0 MW biomass steam boiler; 8.0 MW gas fired boiler; planned start of operation: 2015. Detailed design, preparation of bids, supervision of construction, support of commissioning and acceptance of the plant.
Klaus Borne Türenfabrik GmbH & Co KG, DE	Replacement heating system Borne plant 1, Trierweiler (Rhineland-Palatinate, Germany)	2014	Nominal thermal capacity: 800 kW biomass steam boiler + 50 kW Eco; 300 kW oil fired boiler; start of operation: 2014. Detailed design, preparation of bids, supervision of construction, support of commissioning and acceptance of the plant.
EVN Wärme GmbH, AT	Reconstruction of the biomass boiler and construction of a gas fired boiler, Waidhofen/Ybbs (Lower Austria, Austria)	2013	Nominal thermal capacity: 5.0 MW biomass steam boiler; 8.0 MW gas fired boiler; start of operation: 2014. Detailed design, preparation of bids, supervision of construction, support of commissioning and acceptance of the plant.
Stadtwärme Lienz Produktions- und Vertriebs-GmbH, AT	Reconstruction CHP plant Lienz 1 and design of a decentralised heating plant for peak load coverage and stand-by unit (Tyrol, Austria)	2012	Nominal thermal capacity: 8.0 MW biomass steam boiler, 2 x 11.0 MW oil fired boiler; start of operation: 2013. 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.
Stadtwärme Lienz Produktions- und Vertriebs-GmbH, AT	Optimised utilisation of the district heating network and efficiency improvement by the use of decentralised heat storage - Local Heat Store (Tyrol, Austria)	2011	District heating capacity: approx. 50 MWth. To enable the connection of new customers and to increase the efficiency of the heat supply system, local heat storage solutions as well as an optimisation of the secondary heat supply systems at the customers were implemented using an integrated approach. Development of tools for monitoring and evaluation of the heat customers. Development of local heat storage solutions. Implementation, monitoring and evaluation of the measures.
WIBEBA-Holz Ges.m.b.H, AT	Process heat supply based on a biomass steam boiler plant - WIBEBA-Holz Ges.m.b.H (Lower Austria, Austria)	2011	Nominal thermal capacity: 2 MW biomass steam boiler. 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.
austria-microsystems AG, AT	Process heat supply based on a biomass steam boiler plant – austria-microsystems AG (Styria, Austria)	2011	Nominal thermal capacity: 3.5 MW biomass steam boiler. 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.

Customer	Abstract	Project start	Specifications / Scope overview
Holzindustrie Lenzing GmbH, AT	Process heat supply based on a biomass hot water boiler plant – Holzindustrie Lenzing (Upper Austria, Austria)	2010	Nominal thermal capacity: 3.0 MW biomass pressurised hot water boiler + 0.1 MW pressurised hot water economiser; start of operation: 2010. 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.
Fernwärme Weiz GmbH, AT	Biomass district heating plant Weiz – extension Fernwärme Weiz (Styria, Austria)	2009	Nominal thermal capacity: 6.0 MW biomass pressurised hot water boiler; start of operation: 2010. 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.
Tirol Milch reg.Gen.m.b.H., AT	Process steam supply based on a biomass steam boiler plant – Tirol Milch Wörgl (Tyrol, Austria)	2006	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.
Gemeinde Lajen, IT	Biomass district heating plant Lajen (South Tyrol, Italy)	2003	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.
Burg-Hotel Oberlech, AT	Biomass district heating plant Oberlech (Vorarlberg, Austria)	2002	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.
Förderungs-genossenschaft Ulten, IT	Biomass district heating plant St. Nikolaus in the Ulten Valley (South Tyrol, Italy)	2002	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.
Bäuerliche Genossenschaft Biomasse Fernwärme Sulzberg, AT	Biomass district heating plant Sulzberg (Vorarlberg, Austria)	2001 Plant extension 2006	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.

Customer	Abstract	Project start	Specifications / Scope overview
Vorarlberger Kraftwerke AG, AT	Biomass district heating plant Lech am Arlberg (Vorarlberg, Austria)	1998	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.
Förderungs-genossenschaft Ulten, IT	Biomass district heating plant St. Walburg im Ultental (South Tyrol, Italy)	1998	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.
Förderungs-genossenschaft Ulten, IT	Biomass district heating plant St. Pankraz im Ultental (South Tyrol, Italy)	1998	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.
Fernwärmeverorgungs GmbH, AT	Biomass district heating plant Tamsweg – EU-THERMIE demonstration project (Salzburg, Austria)	1995	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 NOx 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 combined heat and power plants based on an ORC cycle

Customer	Abstract	Project start	Specifications / Scope overview
Holy and Great Monastery of Vatopaidi, GR	Biomass CHP plant based on an ORC cycle, Karyes Mount Athos, Greece)	2012	Nominal thermal capacity: 1.6 MW biomass thermal oil boiler + 0.3 MW thermal oil economiser; nominal electric capacity: 300 kW ORC process; nominal chilling capacity: 1 MW start of operation: planned 2016. 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.

Customer	Abstract	Project start	Specifications / Scope overview
Klaus Borne Türenfabrik GmbH & Co KG, DE	Biomass CHP plant based on an ORC cycle, Trierweiler (Rheinland-Pfalz, Germany)	2012	Nominal thermal capacity: 4.8 MW biomass thermal oil boiler + 1.1 MW thermal oil economiser; nominal electric capacity: 1,0 MW ORC process; start of operation: planned 2015. 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.
AS Kuressaare Soojus, EE	Biomass CHP plant based on an ORC cycle, Kuressaare (Saare, Estonia)	2010	Nominal thermal capacity: 9.8 MW biomass thermal oil boiler + 2.2 MW thermal oil economiser; nominal electric capacity: 2.2 MW ORC process; start of operation: planned 2012. Detailed design, supervision of construction and support of commissioning and acceptance of the overall CHP plant, plant monitoring and process optimisation.
Marstal Fjernvarme a.m.b.a., DK	Next generation CHP plant with an ORC plant based on a hybrid system consisting of biomass combustion and solar energy, Marstal (Ærø, Denmark)	2010	Nominal thermal capacity: 3.24 MW biomass thermal oil boiler + 0.91 MW thermal oil economiser; nominal electric capacity: 750 kW ORC-Prozess; Start of operation: planned. detailed design of the biomass CHP plant; CFD-simulation of the biomass furnace and the thermal oil boiler, supervision of construction and support of commissioning and acceptance of the biomass CHP plant.
Viessmann Werke GmbH & Co KG, DE	Biomass CHP plant based on an ORC cycle, Allendorf (Hessen, Germany)	2006	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.
Fernheizwerk Olang GmbH, IT	Biomass CHP plant based on an ORC cycle – enlargement of the existing district heating plant Olang (South Tyrol, Italy)	2006	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.
Josko Fenster und Türen GmbH, AT	Biomass CHP plant based on an ORC cycle – Josko Fenster und Türen GmbH, Kopfing (Upper Austria, Austria)	2006	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.

Customer	Abstract	Project start	Specifications / Scope overview
Förderungs- genossenschaft Ulten, IT	Biomass CHP plant based on an ORC cycle – enlargement of the existing district heating plant St.Walburg in the Ulten Valley (South Tyrol, Italy)	2006	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.
Fernwärmever- sorgungs GmbH, AT	Biomass CHP plant based on an ORC cycle – enlargement of the existing district heating plant Tamsweg (Salzburg, Austria)	2005	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.
Tilly Holzindustrie Gesellschaft m.b.H., AT	Biomass CHP plant based on an ORC cycle – TILLY Holzindustrie Ges.m.b.H., Treibach/Althofen (Carinthia, Austria)	2004	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.
Tiroler Wasserkraft AG, AT	Biomass CHP plant based on an ORC cycle, Laengenfeld (Tyrol, Austria)	2003	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.
Stadtwärme Lienz Produktions- und Vertriebs-GmbH, AT	Biomass CHP plant based on an ORC cycle – extension Stadtwärme Lienz (Tyrol, Austria)	2003	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.

Customer	Abstract	Project start	Specifications / Scope overview
Brüder Theurl GmbH Sägewerk und Hobelwerk, AT	Biomass CHP plant based on an ORC cycle – Theurl sawmill, Assling (Tyrol, Austria)	2003	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.
Biomasse-KWK-Leoben Betriebsgesellschaft m.b.H., AT	Biomass CHP plant based on three ORC units – Biomasse-KWK-Leoben Betriebsgesellschaft m.b.H. (Styria, Austria)	2003	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.
Hackschnitzel und Heizgenossenschaft Reg. Gen.m.b.H. Lofer – St. Martin, AT	Extension of the existing biomass district heating plant in Lofer with a biomass CHP plant based on an ORC cycle (Salzburg, Austria)	2002	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.
Hackschnitzel und Heizgenossenschaft Reg. Gen.m.b.H. Großarl, AT	Extension of the existing biomass district heating plant in Grossarl with a biomass CHP plant based on an ORC cycle, Grossarl (Salzburg, Austria)	2002	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.
Fernheizwerk Toblach Gen.m.b.H., IT	Biomass CHP plant based on an ORC cycle, Dobbiaco (South Tyrol, Italy)	2002	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.

Customer	Abstract	Project start	Specifications / Scope overview
Biostrom Erzeugungs GmbH, AT	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)	2000	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.
Stadtwärme Lienz Produktions- und Vertriebs-GmbH, AT	Biomass CHP plant based on an ORC cycle and a newly developed fuzzy logic control system / Stadtwärme Lienz - EU-THERMIE demonstration project (Tyrol, Austria)	1998	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.
STIA-Holzindustrie GmbH, AT	Biomass CHP plant based on an ORC cycle / STIA Holzindustrie, Admont - EU-THERMIE demonstration project (Styria, Austria)	1998	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 combined heat and power plants based on a steam turbine process

Customer	Abstract	Project start	Specifications / Scope overview
Pfeifer Holz GmbH & Co KG, AT	Biomass CHP plant based on a steam turbine process, Kundl (Tyrol, Austria)	2015	Rebuilding of the existing steam boiler plant and low temperature heat recovery; planned realisation: 2015 / 2016. 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 combined heat, cooling and power plant.
Condino Energia Srl, IT	Biomass CHP plant based on a steam turbine process, Condino (Trent, Italy)	2013	Nominal thermal capacity: 14.8 MW biomass steam boiler; nominal electric capacity: 4.3 MW steam turbine; start of operation: planned 2015. Conception, preparation of permit application and preparation of bids of the biomass CHP plant.
Bioenergie Kufstein GmbH, AT	Biomass CHP plant based on a steam turbine process, Kufstein (Tyrol, Austria)	2012	Rebuilding of the existing steam boiler plant into a back-pressure turbine with a nominal electric capacity of 6.5 MW; realisation: 2014. 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 combined heat, cooling and power plant.

Customer	Abstract	Project start	Specifications / Scope overview
EVN Wärme GmbH, AT	Biomass CHP plant based on a steam turbine process, Vösendorf (Lower Austria, Austria)	2010	Optimisation steam cycle, preparation of permit applications
EVN Wärme GmbH, AT	Biomass CHP plant based on a steam turbine process, Ramingdorf (Lower Austria, Austria)	2009	Preparation of permit applications, consulting service regarding the plant concept and support of supervision of construction and commissioning
New Energy Biomasse Hellas GmbH, GR	CHP plant based on a steam turbine process using olive residues as fuel – New Energy Biomasse Hellas GmbH (Meligalas, Greece)	2004	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
EVN AG, AT	Biomass CHP plant based on a steam turbine process, Moedling (Lower Austria, Austria)	2004	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
EVN AG, AT	Biomass CHP plant based on a steam turbine process, Baden (Lower Austria, Austria)	2004	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
Holzindustrie Stallinger, AT	Biomass CHP plant based on a steam turbine process – Holzindustrie Stallinger (Frankenmarkt, Austria)	2003	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.
Tiroler Wasserkraft AG, AT	Biomass CHP plant based on a steam turbine process, Kufstein (Tyrol, Austria)	2002	Nominal thermal capacity: 18.7 MW biomass steam boiler; nominal electric capacity: 5.0 MW steam turbine. Preparation of funding application, preparation of permit applications and CFD simulation.
Linz Strom GmbH, AT	Biomass CHP plant based on a steam turbine process, Linz (Upper Austria, Austria)	2001	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 combined heat and power plants based on a screw-type engine

Customer	Abstract	Project start	Specifications / Scope overview
Fernwärmeverorgungs-genossenschaft Vitis, AT	Biomass CHP plant based on a screw-type engine cycle – Fernwärmeverorgungs-genossenschaft Hartberg – EU demonstration project (Styria, Austria)	2001	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

Customer	Abstract	Project start	Specifications / Scope overview
Viessmann Werke GmbH & Co KG, DE	Biomass CHP plant based on Stirling engine technology, Allendorf (Hessen, Germany)	2006	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.
TDZ Ennstal, AT	Biomass CHP plant based on Stirling engine technology, Reichraming (Upper Austria, Austria)	2005	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.

Combined heat and power plants based on vegetable oil

Customer	Abstract	Project start	Specifications / Scope overview
New Energy Hanover GmbH, DE	CHP plant based on vegetable oil-fired engines (combined heat and power units) and downstream ORC cycle – vegetable oil CHP New Energy (Germany)	2005	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

Customer	Abstract	Project start	Specifications / Scope overview
Lokale Energie Agentur Oststeiermark, AT	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	2008	

Customer	Abstract	Project start	Specifications / Scope overview
Best Energy VertriebsgmbH, AT	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)	2006	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.
Internal Project, AT	Biogas plant based with gas engine CHP plant and efficient waste heat recovery in a district heating network or in an ORC	2005	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).
Internal Project, AT	Biogas plant with integrated gas treatment for biogas injection into an existing natural gas grid	2005	Biogas treatment capacity: 200 Nm ³ /h (development phase) Preliminary plant design and conceptual design, technical and economic assessment (in-house project).
Hídépítő Rt., HU	Biogas CHP plant based on agricultural waste with gas engine, Hídépítő (Hungary)	2005	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.
Hermann Pfanner Getränke Ges.m.b.H., AT	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)	2005	Anaerobic waste water treatment plant: 685 m ³ 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 m ³ /h Preliminary plant and conceptual design, technical and economic assessment, preparation of applications for funding.
Fernwärme Waldviertel reg.Gen.m.b.H., AT	Biogas CHP plant based on agricultural waste with gas engine, Zwettl (Lower Austria, Austria)	2004	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.

Planning of Pellet Production Plants

Customer	Abstract	Project start	Specifications / Scope overview
Cycleenergy AG, AT	Pellet production plant for DIN+ wood pellets from wood chips and saw dust combined, Gresten (Upper Austria, Austria)	2010	Pellet production capacity: 37.000 tons per year support at the conception of the overall plant and the preparation of permit applications for the pellet plant. Project in cooperation with Cycleenergy AG (Vienna).
Cycleenergy Gaishorn GmbH, AT	Pellet production plant for DIN+ wood pellets from wood chips and saw dust combined, Gaishorn (Styria, Austria)	2010	Pellet production capacity: 40.000 tons per year support at the conception of the overall plant and the preparation of permit applications for the pellet plant. Project in cooperation with Cycleenergy AG (Vienna).
Methanco Energie Beratung und Beteiligung GmbH, H&H Pellets GmbH, AT	Reconstruction and extension of the pellets production plant and integration of a biomass CHP plant, Stainach (Styria, Austria)	2009	Pellet production capacity: 40.000 tons per year; electric nominal capacity of the gasengine: 800 kW Preliminary design and conception of the overall plant, preparation of permit applications, detailed design, supervision of construction, support of commissioning and acceptance of the pellet production plant and the CHP unit.

Customer	Abstract	Project start	Specifications / Scope overview
Summerlease Ltd., UK	Pellets production plant for DIN+ wood pellets (Caithness, Scotland)	2008	Pellet production capacity: 60,000 tons per year; nominal electric capacity of the steam turbine: 8 MW Preliminary design and conception of the overall plant, technical and economical evaluation.
Borodino Company, RU	Pellets production plant for DIN+ wood pellets, Petrozavodsk (Karelia, Russia)	2008	Pellet production capacity: 20.000 and 40.000 tons per year, respectively Preliminary design and conception of the overall plant, technical and economical evaluation in cooperation with PROMANAGEMENT GmbH.

Biomass Gasification

Customer	Abstract	Project start	Specifications / Scope overview
Konrad Lanz GmbH, IT	Biomass-CHP plant based on wood gasification - Mühlbach (South Tyrol, Italy)	2012	Technical and economic evaluation
Hartl Holz GmbH, AT	Biomass-CHP plant based on wood gasification - Leogang (Salzburg, Austria)	2011	Technical evaluation
Fernheizwerk Olang GmbH, IT	Biomass-CHP plant based on wood gasification, Olang (South Tyrol, Italy)	2011	Technical concept and economic evaluation
Internal Project, AT	Gasification and pyrolysis of solid biofuels for the production of heat and power – State of development and technical-economic evaluation	2008	State of development and technical and economic evaluation
REPOTEC Umwelttechnik GmbH - renewable power technologies, AT	Biomass methanisation plant (production of Bio-SNG) based on a CFB steam gasification process, Güssing (Burgenland, Austria)	2007	Product gas input: 1.6 MWth; production of synthetic natural gas (Bio-SNG): 140 Nm ³ /h Detailed design of the thermal oil system. Project in cooperation with REPOTEC - Renewable Power Technologies Umwelttechnik GmbH.
REPOTEC Umwelttechnik GmbH - renewable power technologies, AT	Biomass CHP plant based on the integration of an ORC-process into a CFB steam gasification process, Oberwart (Burgenland, Austria)	2004	Fuel input biomass gasification: 8.31 MW; nominal electric capacities: 2.38 MW gas engines and 0.48 MW ORC Preliminary design, preparation of permit applications. Project in cooperation with REPOTEC - Renewable Power Technologies Umwelttechnik GmbH.

Cold Production and Distribution

Customer	Abstract	Project start	Specifications / Scope overview
Holy and Great Monastery of Vatopaidi, GR	Biomass CHP plant based on an ORC cycle, Karyes Mount Athos, Greece)	2012	Nominal thermal capacity: 1.6 MW biomass thermal oil boiler + 0.3 MW thermal oil economiser; nominal electric capacity: 300 kW ORC process; nominal chilling capacity: 1 MW start of operation: planned 2016. 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.

Customer	Abstract	Project start	Specifications / Scope overview
Fernwärme Wien GmbH, AT	Optimised design of cooling plants under special consideration of waste heat utilization using the example of the City of Vienna (Austria)	2009	Conception of an energetically, technically, economically and ecologically optimised chilling plant within the program "Neue Energien 2020" of the Austrian Energy and Climate Fund; Project name: „Optimized design of chilling plants under special consideration of waste heat utilization using the example of the City of Vienna"
Fernwärme Wien GmbH, AT	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)	2008	Nominal chilling capacity: 20 MW; recooling by open cooling towers, nominal recooling capacity: 34.2 MW; heat supply for the absorption chillers by district heating. Preliminary design and plant conception.
Fernwärme Wien GmbH, AT	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)	2007	Nominal chilling capacity: 17 MW; recooling by river-water cooling, nominal cooling capacity recooling: 31.8 MW; heat supply for the absorption chillers by district heating; start of operation: 2009. Technical conception and preparation of requests for proposals.
HAWK Fakultät Ressourcenmanagement FH Hildesheim/Holz minden/ Göttingen, DE	Biomass combined heat, cooling and power (CHCP) plant based on an absorption chiller – VW plant Salzgitter (Lower Saxony, Germany)	2005	Nominal chilling capacity: 4 MW; recooling with open cooling towers, nominal cooling capacity of the cooling towers: 10 MW; heat supply for the adsorptions chillers by hot water. Preliminary design and plant conception.
Biostrom Erzeugungs GmbH, AT	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)	2000	Nominal heating capacity: 6.2 MW biomass thermal oil boiler + 1.0 MW hot water economiser; nominal electric capacity: 1.1 MW ORC unit; start of operation: 2002. Technical preliminary design of the overall plant, preparation of applications for national funding, energetic and economic optimisation of the combined heating cooling and power generation (combined process of an ORC and an adsorption chiller), preparation of permit applications, detailed design, supervision of construction and support of commissioning and acceptance of the overall CHCP plant. (ORC, adsorption chiller) and the hydronic system.

Energy Concepts and Energy Efficiency

Customer	Abstract	Project start	Specifications / Scope overview
Stadtwerke Wörgl GmbH, AT	Concept development of the first extension stage of existing district heating plant Wörgl (Tyrol, Austria)	2012	Development of a basic concept with gas turbine, different waste heat sources and gas boilers to cover peak loads and determine appropriate mass and energy balances and heat production costs of the energy centre.

Customer	Abstract	Project start	Specifications / Scope overview
Austrian Research Promotion Agency (FFG), AT	Optimisation of the utilisation from biomass systems and combined biomass-solar-heating systems for small-scale, medium and large-scale plants	2011	Long-term monitoring and data collection for selected biomass systems and combined biomass-solar-heating systems, system engineering and weak point analyses of the selected biomass and combined biomass-solar-heating systems based on the collected monitoring data, development of the basic concept of a model based regulation of small plant systems, development of standardised methods for a optimised control and plant concept of medium and large-scale biomass-heating-systems.
Austrian Research Promotion Agency (FFG), AT	Biomass flue gas condensation in combination with heat pumps	2011	Conception of energetically, economically and ecologically optimised biomass flue gas condensation units within the program "Neue Energien 2020" of the Austrian Energy and Climate Fund; Project name: "Innovative flue gas condensation with a high annual utilization rate by combination with heat pumps"
M2 Baumanagement GmbH, HR	Energy concept for the heating, cooling and power supply based on gas engine CHP plants and absorption and compression chillers for the shopping centre Buzin (Croatia)	2009	Nominal thermal capacity: gas engines 9 MW, ORC unit 2.4 MW; nominal electrical capacity: gas engines 13.4 MW, ORC unit: 0.48 MW; nominal chilling capacity: 15 MW; recooling with open and closed cooling towers, nominal cooling capacity: 34.2 MW; heat supply for the absorptions chillers by hot water. Preliminary design and plant conception.
Andritz AG, AT	Interconnection of biomass drying plants with biomass CHP and heating plants	2007	Technical and economic evaluation of the interconnection of different biomass drying technologies with biomass CHP and heating plants
Austrian Research Promotion Agency (FFG), AT	SUPOSS – Sustainable Power Supply for Supermarkets and Surroundings	2004	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

Sustainable Ash Utilisation

Customer	Project start	Specifications / Scope overview
Austrian Research Promotion Agency (FFG), AT	2010	Preparation of a study regarding the utilisation of wood ash as an additive to compost production - suggestions for technically and ecologically reasonable amounts of ash to be added to compost production. The study was performed within the FFG collective research project "Development of innovative processes for ash utilisation"

Customer	Project start	Specifications / Scope overview
Austrian Research Promotion Agency (FFG), AT	2009	Development of innovative processes for wood ash utilization. Project within the "Collective Research" program of the Austrian Research Promotion Agency (FFG) to evaluate and develop innovative processes for wood ash utilization. Main goals: <ul style="list-style-type: none"> • Development of environmentally friendly and ready-to-use recycling processes for wood ash under consideration of already available results from national and international research projects. • Evaluation of the complete process chain from combustion technology to treatment, logistics, transport and recycling of the ashes with the aim to close the mineral cycle while considering environmental and economic feasibility. • Comprehensive evaluation and assessment of technological, agricultural as well as pedological aspects under consideration of the legal framework conditions and the economic feasibility in order to provide the basis for the implementation of the project results in legal guidelines, ordinances or laws. • Focus on realistic and rather simple recycling processes.
EnBW Energie Baden-Württemberg AG, DE	2009	Research project regarding the reduction of the heavy metal contents in grate ashes from biomass combustion plants
EDF, FR	2008	Preparation of a study regarding ash related problems in biomass combustion plants as well as evaluation of selected plant manufacturers regarding the state-of-the-art concerning the reduction of ash related problems in fixed-bed biomass combustion systems
Kooperationsplattform Forst Holz Papier, AT	2008	Preparation of a study concerning the utilisation of wood ashes from biomass CHP and heating plants in Austria
Stadtwärme Lienz Produktions- und Vertriebs-GmbH, AT	2003	Preparation of an ash utilisation and logistics concept for the biomass district heating plant Lienz (Tyrol, 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:

Small-scale furnaces and stoves

Customer	Abstract	Project start	Specifications / Scope overview
Windhager Zentralheizung Technik GmbH, AT	CFD aided optimisation of the log wood boiler LogWIN LWP 300 of the company Windhager, Seekirchen (Salzburg, Austria)	2014	Log wood furnace with fire tube boiler; nominal thermal capacity: 30 kW biomass hot water boiler; fuel: log wood; project period: 2014
Windhager Zentralheizung GmbH, AT	Simulation and support of design and optimisation of a new wood chip furnace technology of the company Windhager Zentralheizung GmbH in the power range of 20 - 150 kW, Seekirchen (Salzburg, Austria)	2014	Biomass fixed bed furnace with fire tube boiler; thermal power: 20-150 kW biomass hot water boiler; fuel: wood chips; project duration 2014-2015
RIKA Innovative Ofentechnik GmbH, AT	CFD-based development and optimization of innovative pellet stoves of the company RIKA Innovative Ofentechnik GmbH, Micheldorf (Upper Austria, Austria)	2014	Pellet stoves; nominal thermal load 8 - 10 kW; fuel: wood pellets; project period 2014
ETA Heiztechnik GmbH, AT	Development of a high temperature boiler and high temperature cycle for the heat supply of the CraftEngine power generation unit; ETA Heiztechnik GmbH, Hofkirchen an der Trattnach (Upper Austria, Austria)	2013	Furnace and boiler development (50 kW pressure hot water boiler)
GUNTAMATIC Heiztechnik GmbH, AT	Development of high efficient heating systems with small-scale biomass combustion systems; GUNTAMATIC Heiztechnik GmbH, Peuerbach (Upper Austria, Austria)	2013	Furnace and boiler development (15 kW)
KWB Kraft & Wärme aus Biomasse GmbH, AT	Simulation and support of the design and optimisation of a new boiler technology for biomass small-scale furnaces; KWB Kraft & Wärme aus Biomasse GmbH, St. Margarethen/Raab (Styria, Austria)	2013	Secondary combustion chamber and boiler development (150 kW boiler capacity)
RIKA Innovative Ofentechnik GmbH, AT	Simulation and support of the design and optimisation of low-emission stoves of the company RIKA Innovative Ofentechnik GmbH, Micheldorf (Upper Austria, Austria)	2012	Wood log fired low-emission stove; fuel: wood logs

Customer	Abstract	Project start	Specifications / Scope overview
RIKA Innovative Ofentechnik GmbH, AT	Simulation and support of the design and optimisation of different stoves of the company RIKA Innovative Ofentechnik GmbH, Micheldorf (Upper Austria, Austria)	2010	Wood log fired or pellet fired stoves; fuel: wood logs or pellets
Fröling Heizkessel- und Behälterbau GmbH, AT	Simulation and support of the design and optimisation of the prototype of a new 100 kW pellet furnace of the company Fröling Heizkessel- und Behälterbau GmbH, Grieskirchen (Upper Austria, Austria)	2010	Biomass fixed bed furnace with fire tube boiler; nominal thermal capacity: 100 kW biomass hot water boiler; fuel: wood pellets; project period: 2010-2011
Windhager Zentralheizung GmbH, AT	Simulation and support of the design and optimisation of the prototype of a new pellet furnace for low-energy houses of the company Windhager Zentralheizung GmbH in the size-range from 1.7 to 6 kW, Seekirchen (Salzburg, Austria)	2009	Biomass fixed bed furnace with fire tube boiler; nominal thermal capacity: 1,7 to 6 kW biomass hot water boiler; fuel: wood pellets; project period: 2009-2010
KWB Kraft & Wärme aus Biomasse GmbH, AT	Simulation and support of the development of a new multifuel furnace for woody and herbaceous biomass fuels of the company KWB Kraft & Wärme aus Biomasse GmbH in the size-range from 8 to 120 kW, St. Margarethen/Raab (Styria, Austria)	2007	Biomass grate furnace with fire tube boiler; fuel: wood chips, wood pellets, olive residues, Miscanthus etc.); nominal thermal capacity: 8 to 120 kW biomass hot water boiler; project period: 2007-2009
HAAS + SOHN OFENTECHNIK GMBH, AT	Simulation and support of the design and optimisation of the new wood log fired stoves "i-series" of the company HAAS + SOHN OFENTECHNIK GMBH with a nominal thermal capacity of 8 kW, Puch (Salzburg, Austria)	2007	Wood log fired stove; nominal thermal capacity: 8 kW stove; fuel: wood logs; project period: 2007-2009
Windhager Zentralheizung GmbH, AT	Simulation and support of the design and optimisation of the prototype of a new pellet furnace of the company Windhager Zentralheizung GmbH, Seekirchen (Salzburg, Austria)	2007	Biomass fixed bed furnace with fire tube boiler; nominal thermal capacity: 15 kW biomass hot water boiler; fuel: wood pellets; project period: 2007-2009
Viessmann Werke GmbH & Co KG, DE	Simulation and support of the design and optimisation of different small-scale pellet furnaces of the company Viessmann Werke GmbH & Co KG (nominal thermal capacity < 150 kW) – Allendorf (Hessen, Germany)	2007	Biomass fixed bed furnace with fire tube boiler; nominal thermal capacity: 12 to 150 kW biomass hot water boiler; fuel: wood pellets; duration 2007-2009

Customer	Abstract	Project start	Specifications / Scope overview
Viessmann Werke GmbH & Co KG, DE	Simulation and support of the design and optimisation of different small-scale wood log furnaces of the company Viessmann Werke GmbH & Co KG (nominal thermal capacity < 80 kW) – Allendorf (Hessen, Germany)	2007	Wood log furnace with fire tube boiler; nominal thermal capacity: up to 80 kW; fuel: wood logs; duration 2007 - 2008
KWB Kraft & Wärme aus Biomasse GmbH, AT	CFD based design of the prototype of a new pellet and wood chip-fired furnace of KWB Kraft & Wärme aus Biomasse GmbH, St. Margarethen/Raab (Styria, Austria)	2002	Introduced into the market as KWB TDS Powerfire 150 boiler series, received the “Energie Genie 2004” award from the Austrian Ministry of the 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

Industrial combustion plants

Customer	Abstract	Project start	Specifications / Scope overview
Viessmann Holzfeuerungsanlagen GmbH, AT	CFD-based development of a combined dust-injection/grate-furnace for the combustion of wood fuels for the company Mawera Holzfeuerungsanlagen GmbH in the power range of 3 MW - 5 MW, Hard (Vorarlberg, Austria)	2014	Dust injection furnace combined with grate furnace and e.g. fire tube boiler; thermal nominal load: 3 MW - 5 MW; fuel: wastes from furniture industry; project duration 2014
Josef BINDER Maschinenbau- und Handelsges.m.b.H., AT	Development of a new low emission biomass grate furnace technology for fuels with very high moisture content; Josef BINDER Maschinenbau- und Handelsges.m.b.H., Bärnbach (Styria, Austria)	2013	Biomass grate furnace with hot water boiler (1 MW) and ceramic filter
POLYTECHNIK Luft- und Feuerungstechnik GmbH, AT	Conception of a wood chip-fired furnace based on extreme air staging for the company POLYTECHNIK Luft- und Feuerungstechnik GmbH, Weissenbach (Lower Austria, Austria)	2012	Grate furnace with special post-combustion chamber; nominal fuel capacity: 500 kW; fuel: wood chips
Standardkessel GmbH, DE	Development of a straw-wood co-firing; Standardkessel GmbH, Duisburg (North Rhine-Westphalia, Germany)	2012	Furnace development (50 MWth)
Mawera Holzfeuerungsanlagen Gesellschaft m.b.H, AT	Simulation and support of the development of a new biomass grate furnace technology for fuels with high water and ash contents in the size-range from 700 kW to 13 MW for the company Mawera Holzfeuerungsanlagen Gesellschaft m.b.H, Hard (Vorarlberg, Austria)	2011	Biomass grate furnace with hot water boiler / steam boiler / thermal oil boiler; nominal thermal capacity: 700 kW - 13 MW; fuel: biomass fuels with high water and ash contents (freshly harvested short rotation coppice, wood chips with high contents of bark, needles and mineral impurities, landscape preservation wood, stools); project period: 2011-2012

Customer	Abstract	Project start	Specifications / Scope overview
Marstal Fjernvarme a.m.b.a., DK	Simulation and support of the design and optimisation of the next generation CHP plant based on a hybrid biomass and solar system - EU project "Sunstore 4", Marstal (Ærø, Denmark)	2010	Biomass grate furnace with thermal oil boiler; nominal thermal capacity: 3.24 MW biomass thermal oil boiler + 0.91 MW thermal oil economiser; nominal electric capacity: 750 kW ORC process; fuel: short rotation coppice (willow); project period 2010-2011
Josef BINDER Maschinenbau- und Handelsges.m.b.H., AT	Simulation and support of the development of a Low-NOx furnace for „new“ biomass fuels in the medium size range of the company Josef BINDER Maschinenbau- und Handelsges.m.b.H., Bärnbach (Styria, Austria)	2010	Biomass grate furnace with hot water or steam boiler; nominal thermal capacity: 100 kW - 10 MW; fuel: short rotation coppice, agricultural residues (maize cobs; grass pellets); project period: 2010-2011
POLYTECHNIK Luft- und Feuerungstechnik GmbH, AT	Preliminary design of a grate fired combustion system for mixtures of wood chips and peat for the company POLYTECHNIK Luft- und Feuerungstechnik GmbH, Weissenbach (Lower Austria, Austria)	2010	Grate furnace with thermal oil boiler; nominal thermal capacity: 13 MW thermal oil boiler; fuel: wood chips, peat; project period: 2010
VYNCKE ENERGIETECHNIEK N.V., BE	Simulation and support of the design and optimisation of a biomass grate furnace of the company VYNCKE ENERGIETECHNIEK N.V. with a nominal thermal capacity of 6 MW (Harelbeke, Belgium)	2008	Biomass grate furnace and fire tube boiler; nominal thermal capacity: 6 MW biomass hot water boiler; fuel: woody biomass; project period: 2008-2009
Uniconfort srl, IT	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)	2008	Biomass grate furnace and fire tube boiler; nominal thermal capacity: 350 kW - 5.8 MW biomass hot water boiler; fuel: untreated woody biomass; project period: 2008-2009
BIOMASSE ITALIA S.p.A., IT	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 (Italy)	2008	Biomass CFB furnace and water tube steam boiler including cyclone evaporator; fuel: woody biomass and agricultural residues; project period: 2008-2009
Oschatz GmbH, DE	Simulation and support of the design of a mixed fuel furnace and boiler – Thermische Verwertungsanlage Schwarza (TVS) in Thuringia, Germany – Oschatz GmbH, Essen (Nordrhein-Westfalen, Germany)	2006	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
POLYTECHNIK Luft- und Feuerungstechnik GmbH, AT	Simulation and support of the design and optimisation different biomass grate furnaces of the company POLYTECHNIK Luft- und Feuerungstechnik GmbH in the medium and large size-range, Weissenbach (Lower Austria, Austria)	2005	Biomass grate furnace with hot water / steam / thermal oil boiler in the medium and large size range; fuel: woody biomass fuels

Customer	Abstract	Project start	Specifications / Scope overview
Andritz AG, AT	Simulation to support the analysis and optimisation of an existing sewage sludge combustion plant – Andritz AG, Graz (Styria, Austria)	2005	Pulverised fuel furnace with rotary combustion chamber; nominal fuel power related to NCV: 3.7 MW; fuel: sewage sludge; project period: 2005-2006
Tilly Holzindustrie Gesellschaft m.b.H., AT	CFD aided design of the furnace of the biomass CHP plant based on an ORC cycle – TILLY HOLZINDUSTRIE G.m.b.H., Treibach/Althofen (Carinthia, Austria)	2005	Biomass grate furnace with thermal oil boiler and hot water economiser; nominal thermal capacity: 10 MW thermal oil boiler and 1.5 MW hot water economiser; nominal electric capacity: 1.5 ORC process; fuel: untreated woody biomass fuels (wood waste and wood chips); duration 2005
Tiroler Wasserkraft AG, AT	Simulation and support of biomass furnace and boiler design for the Kufstein CHP plant Tiroler Wasserkraft AG, Innsbruck (Tyrol, Austria)	2002	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
LINZ STROM GmbH, AT	Simulation and support of biomass furnace and boiler design for the CHP plant of LINZ STROM GmbH, Linz (Upper Austria, Austria)	2002	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
Tilly Holzindustrie Gesellschaft m.b.H., AT	CFD aided retrofit of the biomass under feed stoker combustion plant / TILLY HOLZINDUSTRIE G.m.b.H., Treibach/Althofen (Carinthia, Austria)	2002	Biomass grate furnace and water tube steam boiler; nominal fuel power related to NCV: 6.5 MW; fuel: untreated woody biomass fuels (wood waste); duration 2002
Josef Bertsch Gesellschaft m.b.H. & Co, AT	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)	2001	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

Further applications

Customer	Abstract	Project start	Specifications / Scope overview
Andritz AG, AT	CFD aided further development, optimisation and scale-up of a new torrefaction reactor technology for biogenic fuels of the company Andritz AG, Graz (Styria, Austria)	2013	Torrefaction reactor
Wopfinger Baustoffindustrie GmbH, AT	Simulation and support of the development of an optimised concept of a collector for waste heat recovery from a rotary cement kiln of the company Wopfinger Baustoffindustrie GmbH, Waldegg (Lower Austria, Austria)	2009	Rotary cement kiln; fuel: lignite and refuse derived fuel (paper fibre residues, plastic waste, etc.); thermal capacity (recovered waste heat): 1.3 MW; project period: 2009-2010

Customer	Abstract	Project start	Specifications / Scope overview
Scheuch GmbH, AT	Simulation, further development and optimisation of electrostatic precipitators for biomass combustion plants / Scheuch GmbH, Auroldmünster (Upper Austria, Austria)	2001	Duration 2001-2002

Selected References

(R&D Projects)

Fuel characterisation and fuel specific technology development

Customer	Project start	Specifications / Scope overview
Austrian Research Promotion Agency (FFG, project number 838762), AT	2013	An additivition guideline for agricultural biomass fuels which are problematic in terms of combustion should be developed. By the targeted application of additives these fuels should be designed to be utilised in conventional medium and large-scale wood combustion systems at economically and environmentally sound constraints. Advanced fuel characterisation tools shall form the basis for the development of a strategy for the selection of a technologically and economically optimised additive and additivition ratio for each agricultural biomass fuel.
European Commission (Framework Programme 7, Project No 282826)	2012	Production of Solid Sustainable Energy Carriers from Biomass by Means of torrefaction
Austrian Research Promotion Agency (FFG, project numbers 836124, 842129), AT	2012	CFD aided further development, optimisation and scale-up of a new torrefaction reactor technology for biogenic fuels
Republic of Austria, Province of Styria and Province of Lower Austria	2009 2012	Advanced characterisation of novel biofuels as well as their evaluation concerning combustion related aspects. Investigation of the effects of fuel pre-treatment as well as fuel blending and the utilisation of additives on the fuel quality
Research project in cooperation with BIOENERGY 2020+ GmbH, AT	2009	Advanced characterisation of novel biofuels as well as their evaluation concerning combustion related aspects. Investigation of the effects of fuel pre-treatment as well as fuel blending and the utilisation of additives on the fuel quality
Amt der Steiermärkischen Landesregierung, AT	2006	Investigation of mass flows and reasonable utilisation of and recycling of residues from sewage sludge in Styria
Gemeindebetriebe Frohnleiten, AT	2004	Technical and economic pre-evaluation of a new sewage sludge gasification technology as well as a new sewage sludge combustion technology
Komptech Farwick, Heissenberger & Pretzler GmbH, AT	2002	Characterisation of waste wood and development of a waste wood processing plant
Österreichische Draukraftwerke, AT	1999	Techno-economic analysis of biomass co-combustion in large-scale power plants in Austria
SEEG Südsteirische Energie und Eiweisserzeugung Reg.Gen.m.b.H., AT	1997	Evaluation of the co-combustion of glycerine phases from RME and AME production in biomass furnaces and comparison with material utilisation possibilities

Development of biomass combustion plants and furnaces

Customer	Project start	Specifications / Scope overview
RIKA Innovative Ofentechnik GmbH, AT	2014	Pellet stoves; nominal thermal load 8 - 10 kW; fuel: wood pellets; project period 2014 CFD-based development and optimization of innovative pellet stoves of the company RIKA Innovative Ofentechnik GmbH, Micheldorf (Upper Austria, Austria)
HDG Bavaria GmbH, DE, HET – Heiztechnik und Energie-Entwicklungs GmbH	2013	Development of a wood chip feeding technology for small-scale biomass boilers (<500 kWth)
Josef BINDER Maschinenbau- und Handelsges.m.b.H., AT	2013	Development of a new low emission biomass grate furnace technology for fuels with very high moisture content; Josef BINDER Maschinenbau- und Handelsges.m.b.H., Bärnbach (Styria, Austria)
GUNTAMATIC Heiztechnik GmbH, AT	2013	CFD-based optimization of furnace and boiler as well as optimization of the annual utilization rate based on the results of TRNSYS-Simulations and test runs, GUNTAMATIC Heiztechnik GmbH, Peuerbach (Upper Austria, Austria)
KWB Kraft & Wärme aus Biomasse GmbH, AT	2013	Simulation and support of the design and optimisation of a new boiler technology for biomass small-scale furnaces; KWB Kraft & Wärme aus Biomasse GmbH, St. Margarethen/Raab (Styria, Austria)
RIKA Innovative Ofentechnik GmbH, AT	2012	Development of low-emission stoves; Wood log fired stove; fuel: wood logs
Standardkessel GmbH, DE	2012	Development of a straw-wood co-firing; Standardkessel GmbH, Duisburg (North Rhine-Westphalia, Germany)
Josef BINDER Maschinenbau- und Handelsges.m.b.H., AT	2012	CFD-based development of a new low emission biomass grate-combustion technology for very wet fuels, Bärnbach (Styria, Austria)
ETA Heiztechnik GmbH, AT	2012	Development of a high temperature boiler and a high temperature circuit to feed in the CraftEngine power generation module, Hofkirchen (Upper Austria, Austria)
Mawera Holzfeuerungsanlagen Gesellschaft m.b.H, AT	2011	CFD-based development of a new Biomass grate-combustion technology for very wet and ash rich fuels; capacity range: 700 kW to 13 MW; Mawera Holzfeuerungsanlagen Gesellschaft m.b.H, Hard (Vorarlberg, Austria)
Josef BINDER Maschinenbau- und Handelsges.m.b.H., AT	2011	Simulation and support of the development of a Low-NOx-combustion system for new biomass fuels in the medium capacity range; Josef BINDER Maschinenbau- und Handelsges.m.b.H., Bärnbach (Styria, Austria)
Marstal Fjernvarme a.m.b.a., DK	2010	Simulation and support of the design of the next generation hybrid CHP system based on biomass, solar power and an ORC process - EU-Project "Sunstore 4", Marstal (Ærø, Denmark)
RIKA Innovative Ofentechnik GmbH, AT	2010	Simulation and support of the design and optimisation of different stoves of the company RIKA Innovative Ofentechnik GmbH, Micheldorf (Upper Austria, Austria)

Customer	Project start	Specifications / Scope overview
Fröling Heizkessel- und Behälterbau GmbH, AT	2010	Simulation and support of the design and optimisation of the prototype of a new 100 kW pellet furnace of the company Fröling Heizkessel- und Behälterbau GmbH, Grieskirchen (Upper Austria, Austria)
POLYTECHNIK Luft- und Feuerungstechnik GmbH, AT	2010	Preliminary design of a 13 MW grate fired combustion system for mixtures of wood chips and peat for POLYTECHNIK Luft- und Feuerungstechnik GmbH, Weissenbach (Lower Austria, Austria)
Windhager Zentralheizung GmbH, AT	2009	Simulation and support of the design and optimisation of the prototype of a new pellet furnace for low-energy houses of the company Windhager Zentralheizung GmbH in the size-range from 1.7 to 6 kW, Seekirchen (Salzburg, Austria)
KWB Kraft & Wärme aus Biomasse GmbH, AT	2007	Simulation and support of the development of a new multifuel furnace for woody and herbaceous biomass fuels of the company KWB Kraft & Wärme aus Biomasse GmbH in the size-range from 8 to 120 kW, St. Margarethen/Raab (Styria, Austria)
HAAS + SOHN OFENTECHNIK GMBH, AT	2007	Simulation and support of the design and optimisation of the new wood log fired stoves "i-series" of the company HAAS + SOHN OFENTECHNIK GMBH with a nominal thermal capacity of 8 kW, Puch (Salzburg, Austria)
Windhager Zentralheizung GmbH, AT	2007	Simulation and support of the design and optimisation of the prototype of a new pellet furnace of the company Windhager Zentralheizung GmbH, Seekirchen (Salzburg, Austria)
Viessmann Werke GmbH & Co KG, DE	2007	Simulation and support of the design and optimisation of different small-scale pellet furnaces of the company Viessmann Werke GmbH & Co KG (nominal thermal capacity < 150 kW), Allendorf (Hessen, Germany)
Viessmann Werke GmbH & Co KG, DE	2007	Simulation and support of the design and optimisation of different small-scale wood log furnaces of the company Viessmann Werke GmbH & Co KG (nominal thermal capacity < 80 kW), Allendorf (Hessen, Germany)
Oschatz GmbH, DE	2006	Simulation and Support of the design of biomass furnace and boiler for fuel blends - Thermische Verwertungsanlage Schwarza (TVS) in Thüringen, Germany - Oschatz GmbH, Essen (Nordrhein-Westfalen, Germany)
POLYTECHNIK Luft- und Feuerungstechnik GmbH, AT	2005	Simulation and support of the design and optimisation of different biomass grate combustion systems of POLYTECHNIK Luft- und Feuerungstechnik GmbH in the medium and large capacity range, Weissenbach (Lower Austria, Austria)
Action Renewables, IE	2005	Project "Renewable Energy Installer Academy" - Training of installers and engineers concerning layout, installation and maintenance of biomass combustion plants in Ireland
Energieverwertungsagentur (E.V.A.), AT	2004	Quality management for wood-fired heating plants - planner manual

Customer	Project start	Specifications / Scope overview
Tiroler Wasserkraft AG, AT	2002	Simulation and support regarding the design of the biomass furnace and boiler at the CHP plant Kufstein – Tiroler Wasserkraft AG, Innsbruck (Tyrol, Austria)
KWB Kraft & Wärme aus Biomasse GmbH, AT	2002	CFD based design of the prototype of a new pellet and wood chip-fired furnace of KWB Kraft & Wärme aus Biomasse GmbH, St. Margarethen/Raab (Styria, Austria)
Tilly Holzindustrie Gesellschaft m.b.H., AT	2002	CFD-supported reconstruction of the biomass combustion plant at TILLY HOLZINDUSTRIE G.m.b.H., Treibach/Althofen (Carinthia, Austria)
Josef Bertsch Gesellschaft m.b.H. & Co, AT	2001	Waste wood-fired CHP plant based on a steam turbine process, Grossaitingen (Bavaria, Germany)
Österreichischer Biomasseverband, AT	1999	Seminars for planners of biomass heat and power plants for the optimised plant design and conception
Bundesministerium für Wissenschaft und Verkehr, AT	1999	Application of buffer storage systems in biomass heating plants and biomass combined heat and power plants for an optimised load management
Bayernwerk AG, DE	1998	Weak-point analysis of district heating networks of biomass combustion plants with a nominal thermal power from 0.8 to 1.2 MW _{th}
Bayernwerk AG, DE	1998	Weak-point analysis of biomass combustion plants with a nominal thermal power of from 0.8 to 1.2 MW _{th}
Bayernwerk AG, DE	1997	Analyses of existing biomass fired district heating plants

Emission reduction

Customer	Project start	Specifications / Scope overview
Styrian provincial government, AT Environment Department of the City of Graz, AT	2014	Efficient reduction of fine particulate emissions from small-scale biomass heating systems by electrostatic precipitators - field tests, evaluations and accompanying research
Josef BINDER Maschinenbau- und Handelsges.m.b.H., AT	2011	Simulation and support of the development of a Low-NO _x -combustion system for new biomass fuels in the medium capacity range; Company Josef BINDER Maschinenbau- und Handelsges.m.b.H., Bärnbach (Styria, Austria)
European Commission (Framework Programme 7, Project No 286217)	2011	Cost efficient biomass boiler systems with maximum annual efficiency and lowest emissions
European Commission (Framework Programme 7, Project No 286189)	2011	Next generation small-scale biomass combustion technologies with ultra-low emissions
Austrian Research Promotion Agency (FFG, Project No 829868), AT	2011	Evaluation of the availability and efficiency as well as further development of ESPs for small-scale biomass combustion systems
Amt der Steiermärkischen Landesregierung, FA17c, AT	2007	Investigations regarding the availability, applicability and efficiency of fine particle precipitators for small-scale biomass combustion systems
Windhager Zentralheizung GmbH, AT	2006	Development of an ESP for small-scale biomass boilers

Process control development for biomass combustion systems

Customer	Project start	Specifications / Scope overview
POLYTECHNIK Luft- und Feuerungstechnik GmbH, AT	2013	Implementation of a model-based control strategy for biomass grate furnaces with hot water, thermal oil or steam boiler
Austrian Research Promotion Agency (FFG, Project No 834542), AT	2012	Low emission wood chip-fired furnace based on a modelbased control strategy
Austrian Research Promotion Agency (FFG, Project no 825472), AT	2009	Development of a model-based control strategy for automated small-scale biomass combustion systems, which allows a shorter reaction time in case of changing operating conditions. By this way, a significant emission reduction and an increase of the plant efficiency can be achieved
Research project in cooperation with BIOENERGY 2020+ GmbH, AT	2004	Development of a model based control system for medium-scale biomass combustion plants

Development of new and innovative biomass combined heat and power technologies

Customer	Project start	Specifications / Scope overview
Austrian Research Promotion Agency (FFG, Project No 843799), AT	2014	Development of innovative biomass small/micro-scale CHP technologies
Austrian Research Promotion Agency (FFG, Project No 834427), AT	2012	BIOconSOLAR - "CHP - Combination of CSP with a Biomass CHP-Plant using ORC-Technology" - Development of a model for combined solar-biomass CHP plant and techno-economic optimisation of the system incl. dynamic simulations - economic and ecological evaluation and determination of side constraints for an economic application - market analysis and evaluation of sustainability performance for the technology
Austrian Research Promotion Agency (FFG), AT	2006	100 kW(el) Microgasturbine based on biomass and natural gas
Landesenergieverein Steiermark, AT	2004	Technical consultancy regarding the realisation of demonstration projects (heating plants and CHP plants) within the UNDP/GEF project "Biomass Energy for Heating and Hot Water Supply in Belarus"
Siemens AG, DE	2001	Investigation of the operation of a Pebble-Heaters downstream a biomass furnace with special respect to ash related problems
European Commission (fifth framework)	1999	Biomass CHP plant based on Stirling engine technology – project BioStirling
European Commission (THERMIE)	1998	Biomass CHP plant based on an ORC cycle and a newly developed fuzzy logic control system - Stadtwärme Lienz - EU-THERMIE demonstration project, Lienz (Tyrol, Austria)
European Commission (THERMIE)	1998	Biomass CHP plant based on an ORC cycle - STIA Holzindustrie, Admont - EU-THERMIE demonstration project, Admont (Styria, Austria)

Ash related problems in biomass combustion systems

Customer	Project start	Specifications / Scope overview
Research project in cooperation with BIOENERGY2020+ GmbH, AT	2011	3D Simulation of the corrosion potential in biomass fired boilers (BioCorrSim)
Research project in cooperation with BIOENERGY 2020+ GmbH, AT	2010	Basic research on corrosion in biomass fired boilers
Gemeinschaftskraftwerk Schweinfurt GmbH, DE	2009	Pyrometer and high-temperature impactor measurements at the MSW combustion plant of Gemeinschaftskraftwerk Schweinfurt GmbH
European Commission (Framework Programme 7, project No 218916)	2008	Polygeneration of energy, fuels and fertilisers from biomass residues and sewage sludge
ASH DEC Umwelt AG, AT	2005	Development and detailed conception of a method and prototype for the production of a multi-nutrient fertiliser from sewage sludge ash

Selected References (Plant monitoring)

Customer	Abstract	Project start	Specifications / Scope overview
Josko Fenster und Türen GmbH, AT	Biomass CHP plant based on an ORC cycle – Josko Fenster und Türen GmbH, Kopfing (Upper Austria, Austria)	2008	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.
RWP-Bioenergie GmbH, AT	Agricultural biogas CHP plant based on a gas engine, Saaz (Styria, Austria)	2004	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.
Fernwärmeversorgungs-genossenschaft Vitis, AT	Biomass CHP plant based on a screw-type engine cycle / Fernwärmeversorgungs-genossenschaft Hartberg – EU demonstration project (Styria, Austria)	2003	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.
Tiroler Wasserkraft AG, AT	Biomass CHP plant based on a steam turbine process, Kufstein (Tyrol, Austria)	2003	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.
Josef Bertsch Gesellschaft m.b.H. & Co, AT	Waste wood-fired CHP plant based on a steam turbine process, Grossaitingen (Bavaria, Germany)	2003	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.
Biostrom Erzeugungs GmbH, AT	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)	2000	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.

Customer	Abstract	Project start	Specifications / Scope overview
<p>Stadtwärme Lienz Produktions- und Vertriebs-GmbH, AT</p>	<p>Biomass CHP plant based on an ORC cycle and a newly developed fuzzy logic control system – Stadtwärme Lienz – EU-THERMIE demonstration project (Tyrol, Austria)</p>	<p>1998</p>	<p>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.</p>
<p>STIA- Holzindustrie GmbH, AT</p>	<p>Biomass CHP plant based on an ORC cycle – STIA Holzindustrie, Admont – EU-THERMIE demonstration project (Styria, Austria)</p>	<p>1998</p>	<p>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.</p>