CHP WITH INTERNAL AND EXTERNAL COMBUSTION ENGINES

Infoportals, Associations

COGEN EUROPE
European Association for the Promotion of Cogeneration
http://www.cogen.org/

Cogen Europe is the European Trade Association for the Promotion of Cogeneration. Its principal goal is to work towards the wider use of cogeneration in Europe for a sustainable energy future.
Cogeneration is the most efficient way to deliver heating, cooling and electricity. It is based on the simultaneous production of electricity and thermal energy, both of which are used. The central and most fundamental principle of cogeneration is that, in order to maximise the many benefits that arise from it, systems should be based according to the heat demand of the application.
COGEN Europe is promoting the widespread development of cogeneration in Europe and world-wide. To achieve this goal, COGEN Europe is working at the EU level and with Member States to develop sustainable energy policies and remove unnecessary barriers to its implementation.

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Combined Heat and Power Association
http://www.chpa.co.uk/

The aim of the CHPA is to promote the wider use of combined heat and power and community heating. Combined Heat and Power (CHP) technology is now in use in a large and growing number of locations in the UK and it is likely that there will be at least double of today's 3.8GWe of capacity by the year 2010. However some of the more significant gains come from the development of community heating networks which use CHP as their heat source. Such systems are widely used in many of the Scandinavian countries, albeit in different political and economic circumstances. Yet the UK has the building blocks essential to the development of these larger systems. Over 2% of Britain's houses are already heated by district heating for instance.

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Micro Combined Heat & Power (micro CHP)

http://www.microchap.info/

This site is provided for the benefit of the general public and students interested in micro CHP. Over the past few years, interest in micro CHP has grown greatly. In early 2004, the first true micro CHP units became available in the UK. This site is intended to provide background information on the concept and its applications. It is anticipated that, ultimately, micro CHP may provide 20% or so of the UK's electricity generating capacity, more than is currently obtained from nuclear power. On this website you can have access to papers, product information and news about forthcoming and past micro CHP events.

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MICROPOWER COUNCIL

http://www.micropower.co.uk/

Micropower Council was launched in April 2004 to represent the whole microgeneration sector and includes all the large trade associations and a number of leading companies with interests in microgeneration, and acts as the industry's main contact point for government, opinion formers, the press, and the public. The objectives of the Micropower council are

- To raise political awareness of microgeneration and its benefits
- To continue to work constructively in partnership with the Government to help ensure that the Microgeneration Strategy is implemented effectively
- Regulatory Issues. A number of areas need specific changes to make life easier for customers who wish to install microgeneration technologies.
- Public Policy. The Council supports the introduction of several public policy measures that would help micropower technologies overcome market failures and fulfil their potential contribution to the country's climate change ambitions.

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Stirlingmotor.com

www.stirlingmotor.com

Stirlingmotor models, publications, proceedings, books can be ordered. Information on who is who in the stirlingmotor world, events can be found.

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Stromerzeugende Heizung (Power producing heating)

http://www.stromerzeugende-heizung.de/ (in German)

The power producing heating can cover up to 100 % of the heat and 80 % of the demand of electric power in the own house. By the "own production" of the electric power, the current purchase from the

public net can be reduced and thus energy costs can be saved. Additionally in the total balance by the power producing heating with same energy consumption in the house up to 40 % less CO2 are transferred to the atmosphere.
This info portal is supported by eight industry partners (producers and energy suppliers). All new developments regarding on the market available plants (technical data, industry, important links) or in development existing ones, publications about field tests with different CHP Plants (Whispergen, lion etc.) can be found on this website. On the following two links you can find an overview of Micro CHP which are on development and experience phase and which are available on the market incl. some specifications of the plants:
http://www.stromerzeugende-heizung.de/download/verfuegbare_geraete.pdf
http://www.stromerzeugende-heizung.de/download/entwicklung_erprobung.pdf

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STIRLINGMOTOR - Industry (Manufacturers and Utilities)

ENATEC Micro-cogen b.v.

www.enatec.com

ENATEC has been active in the development, production and marketing of Free Piston Stirling Engines since 1997. These Stirling engines are distinctive for being maintenance-free, reliable and durable. ENATEC Free Piston Stirling Engines are applied in micro CHP systems for domestic use. In 2003 and 2004, the company subjected these micro CHP systems to extensive field trials.
Since the start of 2005, ENATEC, Rinnai Corporation (located in Japan) and Infinia Corporation (in the USA) have been working together on a project that is aimed at the serial production of Stirling engines for application in micro CHP installations towards the end of 2007
The expected technical specification can as follows:

- · Thermal output, nominal : 4-35 kWth
- · Electrical output : 1 kWe: at 230V and 50 Hz
- · Return entire system : > 98% (condensing)

Solo and Stirling

http://www.stirling-engine.de/engl/index.html

SOLO has been concentrating on Stirling technology since 1990. Initially, three 9 kW engines were designed and manufactured in solar version for the test station "Distal" by Schlaich, Bergermann and Partner (SBP), Civil Engineers in Stuttgart. The test site is located at Plataforma Solar in Almeria / Spain. SOLO acquired the license from SBP for the most advanced Stirling engine SPS V160 with regard to life expectancy and reliability. The SOLO Stirling 161 Cogeneration Unit can be modified for electrical power output between 2 - 9 kW and for thermal energy output between 8 - 26 kW. This feature allows suitable application for medium to large living areas, factories or semi-government facilities. Not only solar energy but natural gas, biogas or solid biomass, waste heat can be utilised with a stirling engine. Cold can be produced with a stirling engine as well (refer to the principle of creating cold by absorption) which is of benefit particularly in warmer climates.

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STIRLING SYSTEMS AG

www.sticore.com

Stirling Systems Ltd., a Swiss corporation, was founded on April 04, 2004 in Schaffhausen, Switzerland. The Stirling Energy Module (SME) of Stirling Systems functions in a fully automatic way as conventional boiler (flow temperature controlled) and warms up the water in the heating-circuit (or in a heat reservoir). Simultaneously it produces electricity that may be used locally or fed into the public grid. Subject to contrary feeding rules, the SEM may be directly plugged into a power socket and thus may be integrated into the electric net very simply. The system shows following technical data: ca. 1.2 kWel, 5 kWth, working fluid Helium, overall performance >90%. The reliability of the five field test units has successfully been proven under real conditions during more than 20'000 hours of operation. This is particularly valid for those units which are operated in inhabited real estate. The field tests are planned to terminate mid of 2007.

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SUNMACHINE

www.sunmachine.de

SUNMACHINE Stirling heat and electricity generators are domestic heat and power units. The new SUNMACHINE 2006 transforms wood into gas, gas into heat, heat into electricity. A modern wood gasifier, burning pellets with a vertical flame, combined with the latest generation of Stirling engine.
The electrical efficiency amounts approx. 35% and a condensing boiler overall efficiency up to 105% with the possibility of using different gaseous, liquid, solid, fossil and regenerative fuels. According to the producer the SUNMACHINE engine runs for years without requiring maintenance (up to 80,000 operating hours).

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WHISPERGEN Ltd

http://www.whispergen.com/main/acwgnews/

WhisperGen Limited (licensee of Whisper Tech Limited) formed in 1995, has along its head office, its research and development and manufacturing facilities also based in Christchurch, New Zealand.
The AC WhisperGen micro combined heat and power system is grid-connected and ideal for the home or small business. It is gas- or LPG-fired and designed to replace a central heating boiler for water and space heating and simultaneously generate electricity. Similar in size and shape to a domestic dishwasher, the WhisperGen is quiet and requires minimal maintenance. The overall performance is more than 90%. Electricity generated can be fed back into the electricity grid or used in the home, reducing electricity costs even further. The WhisperGen is being evaluated internationally with systems operating in several countries, including the UK, Netherlands, Germany and France. Powergen has been working on the market introduction of the AC WhisperGen system in the UK with an initial focus to complete the installation of the technology in 400 homes throughout Great Britain. The AC WhisperGen is now commercially available. Technical data: electric output 0,4-1,2 kW, thermal output 0-8 kW.

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FURTHER CHP TECHNOLOGIES

Eternal Energy GmbH

www.eternalenergy.de

The RaptorS BHKW uses as fuel vegetable oil and has following technical data: electrical gross output 3-7 kW (at a caloric value of vegetable oil of 38.000kJ/kg; in summer 3 kW, in winter 7 kW)), thermal output 6-14 kW, consumption of ca. 1,3-2,9 l/h, overall performance ca. 80%, weight 490 Kg, maintenance interval 1000 operating hours, buffer storage volume 1000 l, oil tank 9 l, operating modus heat oriented, covering of peak loads through boiler or electrical heating rod in the buffer storage, exhaust gas temperature 160°C.
RaptorS is suitable for all kinds of vegetable oil and fuel oil, and is in operation only if heat is needed in the buffer storage similar to a heating system with oil or gas.

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HONDA

http://www.hondanews.com/categories/1048

American Honda Motor Co., Inc. and Climate Energy, LLC announced in April 2007 the official start of retail sales of freewatt™, their collaborative Micro-sized Combined Heat and Power (Micro-CHP) cogeneration system for homes. The freewatt™ Micro-CHP system is comprised of an MCHP cogeneration unit with Otto-engine developed by Honda, which is paired with a furnace or boiler produced by Climate Energy. The MCHP unit produces 3.26 kilowatts of heat and 1.2 kilowatts of electric power and has a weight of 81 kg. In addition, the system produces 30% less carbon dioxide emissions than a conventional heating system with electricity provided from the grid.
Initial sales of the heat and power units will be targeted at customers living in the Northeastern United States in conjunction with select local utility providers. This is due to the cold climate and high heating demand in the region which allows the system to provide the greatest benefit. The freewatt™ Micro-CHP systems will only be available through certified, trained, and authorized Climate Energy installation professionals. The units will be assembled domestically in the United States with components supplied by both companies. Currently, a similar version of an MCHP system is retailed in Japan, with over 45,000 units sold since its introduction in 2003.

SenerTec Kraft-Wärme-Energiesysteme GmbH (A BAXI Group Company)

http://www.senertec.de/englisch/frames.php

The Dachs is a micro CHP unit based on a natural gas, LPG, fuel oil or bio diesel fueled internal combustion engine. The Dachs has a continuous output of 5.5 kW electricity and 12.5 kW heating and achieves an overall efficiency of approx. 90% with a fuel input of 20.6 kW. An additional external exhaust heat exchanger can provide a further 2,5 kW of thermal energy, raising the efficiency up to approx. 98%. In combination with a SenerTec SE 750 buffer vessel, domestic hot water module (capacity 30 litres at 45 °C) and an integrated peak load boiler the so-called Dachs SE solution can meet a heat demand of up to 35 kW. SenerTec GmbH, and its partner network have installed over 13,000 units.

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OTAG Vertriebs GmbH & Co.KG

http://www.otag.de/

Important component of the lion powerblock is the LINATOR, a free-piston steam engine with integrated linear generator, possible fuels at the moment are natural gas and liquid gas. The (modulating) output is 0.2 to 2.2 kWel and 2.5 to 16 kWth, the total weight is approximately 190 kg. The most important advantages of the steam operated double piston are quiet operation, low maintenance costs and extended service intervals. Lion works without any rotating parts. The gas burner heats up water in a pipe still to process steam of approx. 350 oC with a pressure of 25-30 bar. The Lion powerblock is designed for single- and multi-family houses. In case the LINATOR generates no electricity works lion as a conventional heater. In Germany exist about 30 Lion Powerblocks in fieldtests at different sites.

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PowerPlus Technologies GmbH (A company of the Vaillant Group)

www.ecopower.de

PowerPlus Technologies GmbH was founded as a wholly-owned Vaillant subsidiary at the beginning of 2004. The technical data of the ecopower micro CHPU with a specially designed gas fired combustion engine are: electrical output 1.3 to 4.7 kW modulating, thermal output 4 to 12.5 kW modulating, overall efficiency >90%, fuel natural gas, liquefied gas (Propane), flue gas temperature <90 0C, weight 395 kg, easy installation, low maintenance costs. The unit dimensions do not exceed the size of a conventional heating boiler. The ecopower CHPU is used to cover the basic or medium load while a heating boiler is directly activated to cover peak loads. The ecopower micro CHPU has been developed especially for the use in small-up to medium –scale buildings and offers a vast range of applications thanks to its output modulation

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UTILITIES

EON Ruhrgas

http://www.eon-ruhrgas.com/cps/rde/xchg/er-corporate

The focus of EON Ruhrgas activities lies on natural gas powered micro CHP devices with an electrical output of 1,5 to 4.5 kWel. In co-operation with manufacturers and research institutes they examine both Fuel Cell Heaters as well motor driven systems (e.g. internal engine combustion, stirling engines, steam piston driven). EON Ruhrgas tests fuel cells, gas turbines, gas engines and other components. The emphasis of the investigations lies in all cases how different gas composition affects the operational behaviour, the efficiencies and the emissions of the plants. Also the active participation in demonstration projects and field tests (for example of fuel cell heaters) is a firm component of EON Ruhrgas activities.

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GASAG AG

www.gasag.de (in German)

GASAG started in March 2007 a two years field testing programme with WhisperGen plants driven with natural gas at private households (http://www.gasag.de/de/privatkunden/energie/Feldtest_MikroKraftwerk/FAQ/index.doc.html).
A goal of testing is to prepare the broad introduction of these systems on the market in Berlin. Already existing experience of field tests show that WhisperGen systems even compared with a modern boiler can save up to a ton of CO2 annually. With WhisperGen plants 40% of the electrical power demand will be covered. With approximately 44 decibels the house energy installation WhisperGen is not louder than a modern dishwasher. GASAG has tested some Lion Powerblock as well

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MVV Energie AG

www.mvv-energie.ag

The Mannheimer MVV energy started in October 2006 a field test with 20 WhisperGen Stirling plants. 9 of these plants were set up in single family houses of MVV gas customers. 11 WhisperGen plants are tested by MVV holding companies in private households in Kiel, Solingen and Ingolstadt. In Germany are tested approximately 30 WhisperGen plants of different development stage. The tests will last two years.

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RESEARCH AND DEVELOPMENT

Fraunhofer ISE

www.ise.fhg.de

The group HLK for residential buildings at Fraunhofer ISE of solar energy systems will operate middle of 2007 a test stand for micro CHP plants (in particular Stirling engine with wood pellet firing) in order to measure the plants under different operating conditions and further develop the operating modus of prototypes and optimize the plant conception..
The group of HLK pursues the goal of the development and optimization of components and devices of the heating and ventilation for highly optimized residential buildings, in particular under the aspects of the efficiency increase, the handling and inclusion of solar plants.

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FfE-Forschungsstelle für Energiewirtschaft

http://www.ffe.de/english/index1.htm

The FfE was established as a neutral scientific research institute, having no preference for any source of competitive energy carrier. The organisation employs a scientific approach to address issues concerning power engineering, energy technology and economy and their impacts on the environment. With a staff of 20 employees, the FfE is one of a few institutes to perform detailed metrological analyses in both laboratories and field tests. It evaluates the test results with a view to improve the practical aspects of theoretical and statistical system analyses. FfE has done a numerous of studies and field test on Micro-CHP, details and publications can be found on the website of FfE.

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Hochschule Reutlingen

http://userserv.fh-reutlingen.de/~thomas/ (in German)

At the institute a comparative investigation about micro CHP Plants will be finished middle of 2007. This research project is supported by the German Ministry of Education (BMBF, FKZ: 1708303. running time: 1.11.2003 - 31.5.2005) and deals with the efficiency of different devices. A test stand was established and the CHP plants experimentally examined. Following micro CHP technologies were examined: Dachs of Senertec, SOLO Stirling, PowerPlus technologies as well as an Stirling aggregate of the Danish technical University of (DTU, with the use of biogas) were tested under different conditions. A goal of the measurements was the determination of performance data like electrical and thermal output as well as the necessary fuel use. Additionally emissions like CO, NO, NO2 and unburned hydrocarbons CxHy were determined. The test stand is operated at present with natural gas, and the electrical output is fed into electricity net of the university.

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STANDARDS, REGULATIONS, TECHNICAL GUIDELINES

DVGW

http://www.dvgw.org/en/

DVGW (Deutsche Vereinigung des Gas- und Wasserfaches e.V. - Technisch-wissenschaftlicher Verein = DVGW German Technical and Scientific Association for Gas and Water) is the non-profit organisation to contact for the industry self-regulation in the gas and water supply industry.
Areas of activity are:

- Regulation and Standardisation
- Testing and Certification
- Research and Development
- Vocational Training

At the European level, the DVGW is the largest certification body for gas-related products in accordance with the EC Gas Appliance Directive, the EC Boiler Efficiency Directive and the EC Pressure Equipment Directive.
DVGW VP 119: Brennstoffzellen-Gasgeräte bis 70 kW

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VDI (The German Association of Engineers)

www.vdi.de

VDI 4655 “Refenrence load profils of single and multi-family houses for the use of CHP-systems”, 2007-05

VDE (The Association for Electrical, Electronic & Information Technologies)

www.vde.de

DIN VDE 0130-1000; VDE 0130-1000:2004-09**:** Requirements for the connection of micro-cogenerators in parallel with public low-voltage distribution networks, 2004-09

CENELEC

http://www.cenelec.org/Cenelec/Homepage.htm

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