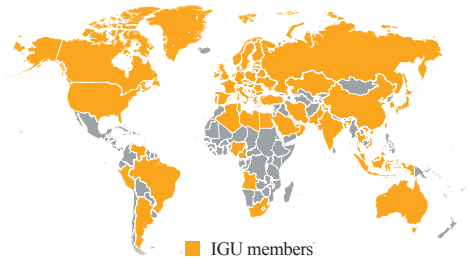
IGU

The International Gas Union is a worldwide non-profit organisation aimed at promoting the technical and economic progress of the gas industry. The Union has more than 100 members worldwide on all continents. The members of IGU are national associations and corporations of the gas industry. IGU's working organisation covers all aspects of the gas industry, including exploration and production, storage, LNG, distribution and natural gas utilisation in all market segments. IGU promotes economic growth through sustainable development of the gas industry. For more information, please visit www.igu.org.



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International Gas Union (IGU)

News, views and knowledge on gas – worldwide

- IGU Gas Efficiency Award 2008/2009
- IGU Social Gas Award

Abstracts of the Proposals

October 2009

Foreword from the President

Nowadays the world is experiencing increasing pressure to improve efficiency in the use of energy, in order to achieve a more sustainable future and enhance security of supply. As a socially responsible organization, in 2008 IGU launched the first edition of "Gas Efficiency Award" aimed at obtaining greater efficiency in the use of gas. All IGU members are annually invited to nominate innovative, feasible and achievable projects to participate.
Starting 2009, the International Gas Union also arranged the "IGU Social Award" to support pedagogical and educational programs that encourage gas-saving efficient behaviour. This new challenge increases social awareness of the importance of gas efficiency and conservation and, together with the first one, shapes a virtuous circle in promoting the generation of a sustainable future for our planet and its people.

Natural Gas is the cleanest fossil fuel that will certainly contribute to reduce greenhouse gas emissions, lowering the impact on the environment. Besides, gas has long been the fuel of choice because of the efficiency of this form of energy distribution, gas's flexibility and controllability in use, and on account of its low emissions of CO_2 and low levels of pollutants.

Then, the Natural Gas Network will contribute to the promotion of energy efficiency which is essential to minimize environmental impact, to adopt a precautionary approach, to support research and efficient gas utilization, to motivate and educate employees and customers, and to promote transparent and objective communication.

IGU is proud of these initiatives; in the next pages you will find a description of the submitted programs.

Ernesto López Anadón

President
International Gas Union

Word of Appreciation to the Members of the Evaluation Committee

The IGU Gas Efficiency Award was launched to encourage and support innovation in the field of energy efficiency as it offers a powerful and cost-effective tool for achieving a sustainable energy future. The Gas Efficiency Award is oriented towards technical innovations while the Social Gas Award was established to encourage initiatives related to gas efficient behaviour and education.

On behalf of IGU I would like to extend a special appreciation to the "external" members of the Evaluation Committee. Their advice and support has been critical to the success of this initiative.

- Mr Nobuo Tanaka, the Executive Director of the International Energy Agency (IEA) has been involved in the selection process of both awards. IEA has taken a very active role in promoting energy efficiency, and has extensive expertise in this field. The support of IEA in the evaluation of these awards has contributed to a successful outcome of this programme.

- Professor Rainer Reimert of the Karlsruhe University has been our scientific advisor supporting the committee in the evaluation of all the project proposals. He has been closely involved in the process of judging the projects' potential of savings and efficiency gains. His thorough and dedicated engagement has been crucial in making the most just decisions.

In this booklet we have only listed those projects which the authors approved to be mentioned. However, I would like to thank all of the more than fifty authors that forwarded proposals for the IGU awards in 2008 and 2009, and trust that they can be an inspiration for all of us in the energy sector.

Torstein Indrebø

Secretary General
International Gas Union

Members of the Evaluation Committee

- **The President of IGU, Ernesto López Anadón (Chair)**
- **The Executive Director of IEA, Nobuo Tanaka**
- **Prof. Rainer Reimert from Karlsruhe University**
- **The Chairman of the IGU Coordination Committee, Roberto D. Brandt**
- **The Secretary General of IGU, Torstein Indrebø**

Content

IGU Gas Efficiency Award 2008/2009

34 Vladimir V. Emelianov, OAO Gazprom, Gazprom Transgas Tchaikovsky, LLC (Russia)
Method of Reducing Natural Gas Losses During Maintenance of the Main gas Pipelines Objects

35 Svatoslav S. Stetsyukevich, Victor A. Rozhkov, Andrey V. Bandurko, OAO Gazprom, Gazprom Dobycha Noyabrsk, LLC (Russia)
Automatic Control of Gas Air-Cooling Devices within Preset Parameters

36 Sergey I. Ivanov, Vassiliy I. Stolypin, Sergey A. Molchanov, Alexsey A. Brjukhov, Mikhail M. Morozov, Dimitry V. Panteleev, OAO Gazprom, Gazprom Dobycha Orenburg, LLC (Russia)
Efficiency of Additional Hydrocarbon Components Recovery from Natural Gas by Helium Plant Gas Separation Cryogenic Technology Improvement

37 Ignasi Malloi Sangrà, GasNatural SDG S.A. (Spain)
Doña Juana Landfill gas-to Energy project

40 Dr. Mahmood Farzaneh-Gord, Semnan Iran Company (Iran)
Employing vortex tube to produce refrigeration at entry of natural gas into customer premises

40 Robert Mellema, Gasunie Engineering & Technology (The Netherlands)
Introduction of a mobile energy and environment measurement unit in the Russian ESCO sector

41 Ejaz ul Haque, Pakistan Petroleum Limited (PPL) (Pakistan)
Flare reduction initiative at PPL ADHI field 2008-2009

42 Fazal ur Rahman, BP Pakistan (Pakistan)
Flare to Fuel

IGU Social Gas Award

44 Mohammad Rezaei, Mazandaran Gas Company in cooperation with Mazandran Construction Engineering Organization (Iran)
Freely Caulking the Houses of Natural Gas Consumers in Mazandaran Province – Iran
Winner of the IGU Social Gas Award

44 APRUE – National Agency for the Promotion of the Rational Use of Energy (Algeria)
Replacement of existing furnace burners by new generation burners for the Chlef cement plant

46 Farhad Torabi, Kerman Science Park (Iran)
Encouraging Gas Efficient Behaviour

48 Nobuhisa Kobayashi, The Japan Gas Association (Japan)
National Family Cooking Contest

49 Toshihiko Yamada, Tokyo Gas Co., Ltd (Japan)
Educating the Next Generation through Social Activities

50 NGVRUS – Natural Gas Vehicles Association of Russia (Russia)
Blue Corridor Project – The use of natural gas as a motor fuel in international on-road traffic

IGU Gas Efficiency Award

Winners of the IGU Gas Efficiency Award 2008

Winner of overall projects IGU Gas Efficiency Award 2008/2009

Paul Vloon, Bosch Thermotechnik GmbH (Germany)
A new generation of Gas-fired-Heat-Pumps

The efficiency of Gas-using Boilers is limited at 110% (lcv) and the condensing boiler market is starting to approach its maturity phase. A possibility to reach higher efficiency's with gas-using appliances is to develop gasfired-heatpumps as possible successor.

Interesting for dwellings is the Diffusion Absorption principle, which makes no noise, has no moving parts, and is well known from the refrigerators. The efficiency can go up to approx. 170%. Configuring it in 2004 as a bivalent system with a 4kW heat-pump and a condensing boiler in parallel, to deliver the peak-load and domestic hot water, we learned that this solution was too expensive. We had a double system with too much components. The appliance worked well, but the consumer price was too high compared to the price of the condensing boiler.

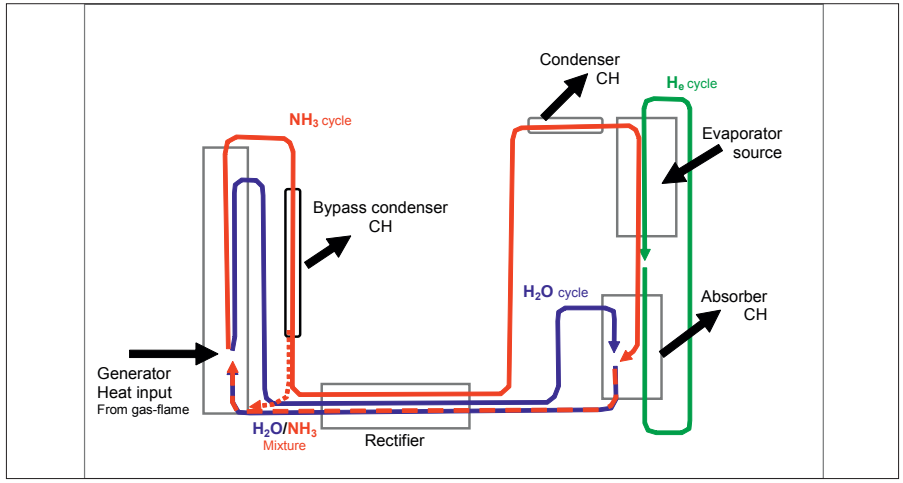
The best option would be to develop a monovalent system in which the heat-pump takes over the functions of the condensing boiler. So it must be redesigned for modulating, delivering a peak-load and for working with higher supply temperatures to produce domestic hot water.

We found the solution by adding an extra condenser to the diffusion absorption cycle which is working in parallel with the generator, the so-called bypass-condenser. This bypass-condenser is leading back a part of the NH3 to the input side of the generator. This delivers the peak load and makes it possible to work at higher supply temperatures.

Till 6kW the system behaves like a heat pump, and when the bypass-condenser is switched on (> 6kW), it behaves like a boiler with a heat-pump in parallel. It makes also the production of domestic hot water possible at much higher efficiencies than the condensing boiler.

The advantages comparing to the previous bivalent system are:
- No need for a "peak-load boiler".
- Higher savings, especially on domestic hot water.
- Lower investments and higher savings, so a better pay-back time.
- Smooth change-over from GHP alone to GHP + peak-load.
- Smaller dimensions and volume (-20%)

The process layout is shown below (the bypass-condenser is the new element). We closed the feasibility phase and started a project to come to market introduction, tentatively in 2010.



New process scheme

Hideki Yamaguchi (author), Yoshinori Hisazumi (coauthor) - Energy Technology Laboratories Osaka Gas Co., Ltd (Japan).
An Economical Thermal Network Cogeneration System for Apartment Building (Neighboring Cogeneration system)"

1. Introduction
In order to spread economically viable distributed generation systems for apartment buildings, it is essential to develop an efficient and low-cost heat supply system. We have been developing an economical thermal network cogeneration system (Neighbouring Co-Generation: NCG). The key concept of this system is to install a heat storage unit equipped with a hot water supply and a space heating function at each household and to connect heat storage units by a single-loop of hot water piping. As a result, time levelling of the heat supply and heat transferring among households become possible. Thus, the costs of the piping and heat source equipment decrease. Furthermore, because of the large capacity of accumulation of the system, the cogeneration can generate according to the electricity demand. Thus, a high operating rate of the cogeneration can be achieved.

In this study, we have developed a new heat storage unit, and installed an NCG system for actually 7 lived-in households in an experimental condominium (NEXT21). It is confirmed that this system could supply heat stably to meet the large heat demand in winter.

2. Idea of the NCG System

The conventional heat supply system circulates hot water full time at a constant flow rate to satisfy the customer's heat demand in the pipe shafts of the building as shown in Figure 1. The plate type heat exchanger in each household receives heat from the hot water pipe and provides hot water, bath water heating, and space heating. Two three-inch insulated pipes are needed for 50 households to meet winter peak heat demands.

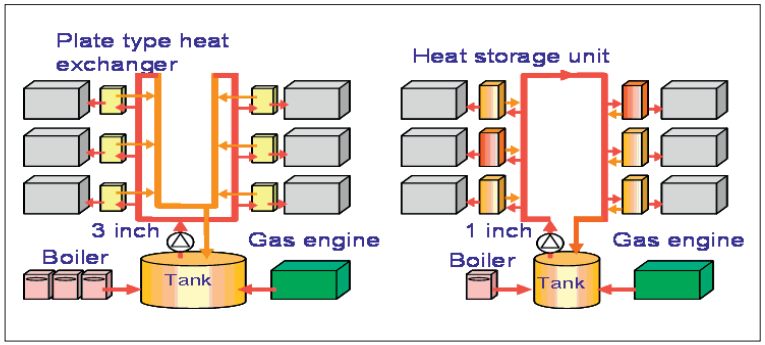


Figure 1. Conventional system.

Figure 2. The NGC system.

On the other hand, the NCG system installs a new heat storage unit equipped with a hot water supply and a space heating function in every household, and these units are interconnected by a small one-inch single-loop pipe. Hot water is circulated full time at the flow rate of an inverter pump controlled by heat load of the single-loop pipe as shown in Figure 2. At the peak of heat demand, the units first supply heat already stored, so that the total heat load of the single-loop pipe is levelled to enable heat supply to 50 households in winter Figure 3. As a result, the pipe diameter and length of proposed system can be reduced to a third and a half, respectively, compared with conventional system.

For this reason, the pump power and the heat loss from the pipe can be reduced to approximately 1/9 and 1/6, respectively. Thus, our system has a great advantage in operating cost and pipe equipment cost over the conventional system.

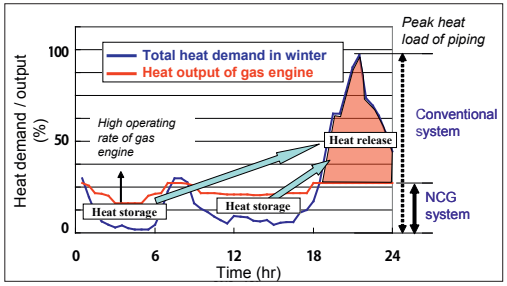


Figure 3. The effect of time levelling of heat supply.

Furthermore, because all the hot water storage units store heat, the total heat storage capacity is large enough for cogeneration to generate according to the electricity demand and with high operating rate. When compared an NCG system which consists of 50 households in the Kansai area of Japan to a system with a boiler in each household, NCG can reduce the primary energy consumption by 15% over the course of a year.

3. Development of a Heat Storage Unit

We developed a new heat storage unit which is equipped with a hot water supply and a space heating function. A system flow sheet and the external appearance of the heat storage unit are shown in Figure 4. The unit consists of a 100 L water tank, three plate heat exchangers (heaters), two pumps, and six control valves.

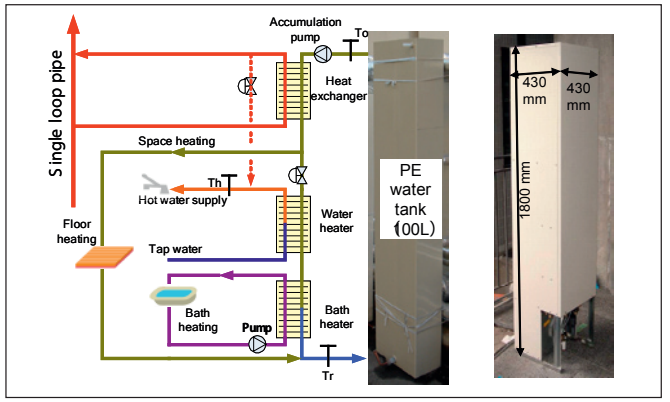


Figure 4. Flow sheet and external appearance of the heat storage unit.

The atmospheric pressure water for space heating is used for the tank water, thus a plastic tank can be used and it can be rectangular in shape. As a result the unit is compact and low cost.

It can store 6 kWh of heat from the single-loop pipe through the heat exchanger. During heat storage, the heat load is controlled not to exceed 10 kW, so that the total heat load of the system is levelled.

Hot water is supplied in two modes. When the tank water temperature is higher than a preset temperature, tap water is heated through the water heater. When the tank water temperature becomes lower, the hot water in the single-loop pipe is directly supplied. In this mode, each resident can use enough hot water without the hot water in the single-loop pipe falling in temperature.

4. Heat Supply Test for 7 Households

4.1. Heat supply system for 7 households

Osaka Gas has an experimental condominium (NEXT21), where we installed a heat supply system for 7 lived-in households. The process flow diagram is shown in Figure 6.

Figure 5. NEXT 21.

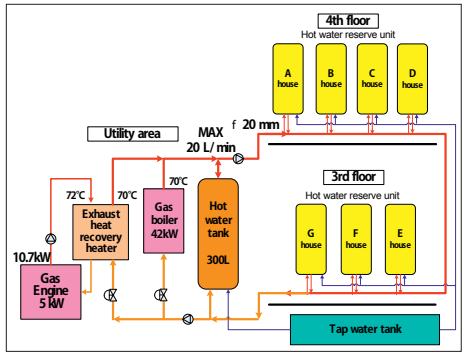


Figure 6. Flow sheet of the heat supply system installed to NEXT 21.

To ensure that all the households, even the last one, can use enough hot water, the outlet flow rate of the single-loop pipe was controlled by a hot water supply inverter pump according to the flow rate and temperature of the return line.

4.2. Heat supply result of one day in winter

A heat supply performance of the total system of one day in winter is shown in Figure 7. Main results are below.

- This system could supply enough heat stably to meet the peak hour heat demand (160 kW) with small heat sources (a gas engine and a backup boiler) and an inner diameter 20 mm single-loop pipe with the help of the accumulation of the heat storage units.

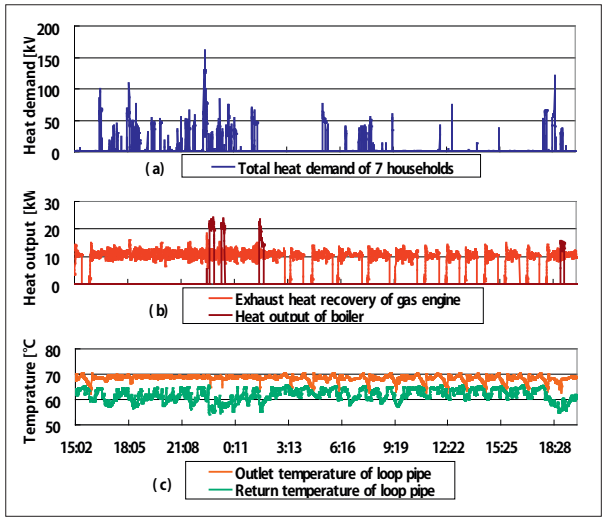


Figure 7. A heat supply performance of one day in winter.

- The gas engine and the backup boiler are operated efficiently according to the heat demand. Operating rate of the backup boiler is controlled to be as low as possible.
- Even the last household could use 55 ºC hot water by the inverter control of the pump of the single-loop pipe.

5. Conclusions

The NGC system is a cogeneration system for apartment buildings that is

- Energy saving system
- Low cost piping and heat storage unit
- Consisting of conventional apparatuses with conventional technology so this system could wildly spread.

In this study

- A low-cost heat storage unit that was suitable for the single-loop interconnected heat supply system was developed.
- A heat supply system for 7 households was constructed with a 5 kW gas engine and a 42 kW boiler as heat sources.
- By means of the heat supply test for 7 households, it was confirmed that this system could supply heat stably to meet the large heat demand in winter and time levelling of the heat supply became possible. Thus, the cogeneration can generate with a high operating rate.
- As the next step, we will commercialize the heat storage unit, and install an NGC system to larger apartments.

Proposals

Hudson Brito, Instituto Brasileiro de Petróleo (Brazil)
Reutilization of combustion gases

According to Motta (2004), the Santa Gertrudes Ceramics complex in São Paulo (Brazil) is composed of about 40 ceramics manufacturers, yielding a monthly production in the order of 30 million square meters of floor cladding and dry glazed surfaces, comprising the largest productive concentration in the whole of Brazil, amounting to more that 58% of the total Brazilian output. This amount, plus the Santa Catarina and other smaller outputs, puts Brazil as third biggest producer in the world. A typical characteristic of the Santa Gertrudes complex is a basic tile (over which the glazed finish is applied) made entirely from agilaceous material (clay).

For each square meter of floor surface one cubic meter of natural gas is consumed. Natural gas is the most competitive form of energy for this sector, by virtue of its technical and economic qualities. Because natural gas is an ecologically correct fuel and its spent gases are cleaner, this means that the flue gases can be utilized for the drying process. Today, the ceramic sector represents 1% of Brazil's GNP.

The manufacturing process for ceramic tiles is a modern and up-to-date one, composed of a production line – presses, glazing equipment, stoves/kilns, sorting and packaging machinery – very efficient and automated, with a number of robotic applications. Tiles are produced speedily and the thermal process is especially rapid – the stove residence time for each tile being a maximum of 25 minutes, including heating up, soaking and cooling down. In the glazing process, the consumption of natural gas represents about de 30% of the total cost of the product. Any energy economies that can be made in this process will contribute greatly to production cost improvements.

The highly competitive nature of local enterprises has led to a continuous quest for improvement. For this reason, businesses in the Complex have invested heavily in operational cost reduction.

The result of the study is shown in the table below.

Industry	Consumption during: January 2008 (m^3/month)	Consumption during: February 2008 (m^3/month)	Consumption during: March 2008 (m^3/month)	Gain (%)
Ceramic A	1,138,434	1,147,217	1,013,393	12,33
Ceramic B	421,479	324,970	323,531	30,27
Ceramic C	951,217	956,716	878,130	8,32

Conclusion:
Economy by re-utilization of spent gases is on average 15% - by using hot gases to pre-heat up the air for combustion.

Profit obtained in this way means that companies can make capital and reinvest in part in their factory installations, by further modernization towards more a competitive business.This is a region where the consumption of natural gas is around the 30 million m^3 mark, and if all of the ceramic segment factories located there (38) adopted energy conservation methods, there would be a 15% reduction of flue gases (CO_2, NOx, etc.) emissions to the atmosphere.

Jean Schweitzer, Danish Gas Technology Centre (Denmark)
Chemical Looping Combustion: a gas specific way to capture CO_2 in efficient CCS natural gas industrial processes

House and building heating is in many countries the main utilisation of gas in the domestic and commercial sectors. In Europe, building heating is ranked as the no. 2 sector in energy utilisation just after the transport sector. Therefore, even few improvements on the efficiency of installed appliances have considerable impact on the energy saving and the CO_2 emissions in the EU (more than 6 million central heating boilers are sold in EU every year).

In Denmark, as in most EU countries, the majority of the installations is using central heating technology. A boiler is heating the house through a hydraulic system with radiators, convectors or floor heating.

The choice of the appliance and its installation will determine the overall efficiency of the heating system. Central heating boilers are generally sold via installers who practically choose the boiler for the end user. Only few end users have the expertise to be involved in the choice of their boiler, as it seems too complicated for most users. As a result, boilers that are installed are not always chosen with consideration to energy savings: These market mechanisms, therefore, constitute a barrier for the wider dissemination of the best available gas technologies and global energy savings.

Therefore, in order to change these mechanisms and to promote the wider dissemination of high-efficient boilers, the Danish gas industry through DGC (since its creation) has been operating a number of projects through the years which have lead to a very successful improvement of the market profile towards the best available technologies. The latest of the projects (BISON) is aiming at disseminating the Danish results in more EU countries.

This very new project started in December 2007 and is a collaboration between companies from four EU countries with DGC as the co-ordinator.

The main idea of this project is to create a European tool that would enable a market change similar to the one already obtained in Denmark. Basically, this would be done by developing a web based dynamic information and calculation system on heating appliance efficiency that will allow customers, installers and energy advisers to choose a suitable boiler based on system performances.

Nicolas Richard and Clotilde Villermaux, GDF SUEZ (France)
Development of a technical-economical numerical tool to help investment decision for steel furnaces

Today energy savings become one of the most important issues for industrial steel plants. In the field of high temperature furnaces, a new generation of burners, namely the regenerative flameless combustion technology, has been developed as a solution to improve both energy efficiency and environmental performances. Though this combustion technology has numerous applications in Japan steel industry, in Europe, it has some difficulties to convince.

Gaz de France strategy is to help industrial companies to understand the profit they can obtain by choosing this technology. If best adapted to their processes, and to demonstrate that, some times, the regenerative flameless combustion technology has a good potential in terms of energy efficiency, environmental pollution, and cost savings.

In this context, an innovative tool was developed during Odyssee project involving GDF SUEZ, ArcelorMittal, Fives Stein and with the financial support of Ademe.The aim was to help to better promote the regenerative flameless combustion technology by comparison with other existing technologies, not only on a technical point of view, but also with economical aspects and to help investment decision on furnaces, integrating different criteria among which energy efficiency.

Nicolas Richard and Clotilde Villermaux, GDF SUEZ (France)
Efficiency of regenerative burners to preheat low calorific value gas on for a walking furnaces

Today energy saving becomes one of the most important discussion for industrial steel plants. An innovative solution was developed during SISCO project involving Gaz de France and Fives Stein and with the financial support of Ademe to optimise the furnace operation using lean gas. The aim was to help to better promote the regenerative flameless combustion technology, with a feedback from experience on an industrial site. The concerned furnace is used for reheating steel billets. The customer wished to use the gas stemming from the blast furnaces of the plant, which is an extremely lean gas. This constraint was bypassed optimising the flue gas heat recovery. On the one hand, regenerative burners were used to preheat the gas and on the other hand, the combustion air is preheated through a centralised recuperation unit to reach a high enough temperature to heat up the products.

After a little more than one year of furnace operation, in a series of measurements the burners' efficiencies were determined under real operating conditions and at a furnace equipped with a great number of regenerative burners.

Characterising two pairs of burners, aim of the SISCO project, made it possible for us to confirm the performance expected from them on an industrial scale (yield, efficiency).

Frédéric Aabinet, Olivier Bordelanne, Philippe Liegeois, Patrick Subreville, GDF SUEZ (France)
The "green" system for bleeding NGVs

Transportation sector is currently facing 3 major challenges: the greenhouse gases emissions reduction, the energetic diversification and the reduction of the local and urban pollution. Road transportation is responsible for more than 93% of the CO_2 emissions of this sector. Thus, the European Commission has taken a harder line both on the CO_2 emissions from vehicles (by proposing to issue a decree fixing a maximum level of emission at 125 g CO_2/km by 2015 then 95 g CO_2/km by 2020) and on the urban and local emissions (by issuing the EURO 5 and EURO 6 norms forcing to massively reduce for instance the NOx and particles emissions).

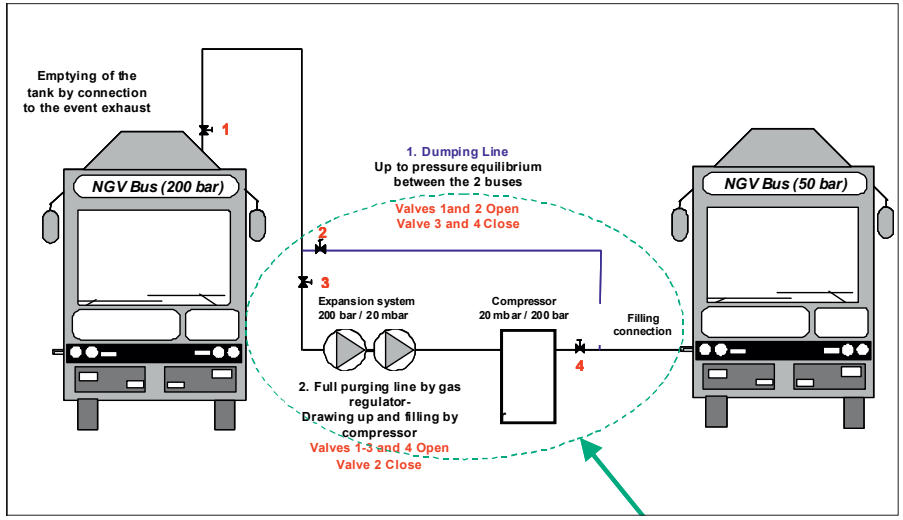
For more than 20 years, GAZ DE FRANCE has been working alongside the players of the road transportation sector to prove that natural gas and biogas/biomethane represent an efficient and sustainable alternative to gasoline and diesel fuels.

All around the world and across Europe, Compressed Natural Gas (CNG) continues its development and today more than 7 millions of Natural Gas Vehicles (NGVs) are in operation. Behind the leading nations which Argentina and Pakistan with more than 1.6 millions of NGVs in operation, France ranks in the 27th position in the world ranking with more than 10,500 NGVs in operation.

The development of the NGV sector in France has started initially with the local authorities and professional fleets. Thus, actually more than 2,000 NGV buses are in operation in France more than 650 cleaning NGVs and 7,500 light/light duty vehicles. GAZ DE FRANCE always had the ambition to contribute to the development and the competitiveness of the NGV sector in total respect of the environment (especially by fighting against the greenhouse gases emissions).

Therefore, it invested in the TRANSVEGAS system which helps to reduce the venting of methane to the atmosphere during pressure relief of the CNG tanks before their inspection which takes place about every 3 years. According to the TRANSVEGAS system the methane to be released is sucked from the tank to be inspected and simultaneously fed to another vehicle's tank via a compressor.

The NGV bus to be bled is connected to the TRANVEGAZ system by a rubber gas pipe. TRANVEGAZ is then connected to the NGV bus to be filled by a typical connection from NGV filling station.



Transvegaz principal

Brigitte Ponty, Catherine Xueref, Olivier de Lorgeril, GDF SUEZ (France)
Improving energy efficiency by a mix of technical, economic and social measures

The project entails the promotion of a modern and profitable technical-economic solution which will save money and reduce heating and hot water costs for social housing tenants.

It comprises the use of solar thermal energy, the installation of condensing boilers and the introduction of individual billing.

The strategy is to work on a long-term basis 1., to provide a reproducible model 2. and to bring together as many regional players as possible 3.

1. A coherent relationship development process driven by an information programme running over a period of months, to develop awareness of the effectiveness of the solution and drive the implementation of flagship projects;
2. Creating a reproducible marketing operation;
3. Communicating and involving different players such as:
   social housing: social housing for its client role – this customer segment, with its particular sensitivity to natural gas prices, was chosen in order to underline the social role of GDF SUEZ;
   local authorities: local authorities are involved in spatial planning and drawing up the specifications for ZAC (designated development zones). In their political role, they are receptive to GDF SUEZ choice of the social sector as one of its priorities. We invited representatives of municipalities, communities of municipalities and the Region

Michael Chardon, Daniel Bourdin, Christian Clavel, Adeline Hamza – Sagot, GDF SUEZ (France)
Demonstrating very high energy performance with reversible absorption natural gas heat pumps

The project we are presenting aims to demonstrate that it is possible for the gas industry to meet the dual challenge of:
- installing gas absorption heat pumps, technological gas solutions even more efficient than condensing boilers, in synergy with the other improvements introduced by building designers, to achieve greater energy efficiency;
- guaranteeing results over time.

This project is the outcome of a teamwork between Cofely (the GDF SUEZ Group's Services Branch), the engineering firm Rostain Coste and the gas heat pump manufacturer Robur. The European directive on energy performance makes it a requirement to build more energy-efficient buildings.

There are several ways of doing this: improving the thermal efficiency of the buildings envelopes, installing more efficient energy equipment, managing energy consuming technical systems more efficiently.

In most cases, designers meet the challenge through solutions involving the building envelope, such as insulation, ventilation with recovery of energy, the addition of sunscreens to keep out summer heat, etc.

As regards the supply of energy, they employ techniques based partly or completely on renewable energies: electric heat pumps, solar thermal systems, photovoltaic cells, etc. As regards gas technology, until recently the only solutions available were condensing boilers, a technology that is in fact considered in most European countries to be the "basic" solution.

Feedback on these energy efficiency operations often reveals that the expected savings do not transpire. One of the reasons for this is the failure to maintain and manage systems properly, especially in the case of new technologies.

We chose to work on the specific case of a new 1,300 m^2 office building – called Cepalyne currently under construction in Gap (the Hautes-Alpes Department) for rent to multiple occupants.

Because of the climatic conditions in Gap (300 days of sun per year) and the need for the owner to be able to attract prospective tenants, this building needs to include summertime air-conditioning.

The selected reversible absorption heat pump can deliver hot and chilled water whereby saving 20 % of natural gas for heating as compared to a condensing boiler, and 10 % of primary energy for air conditioning as compared the reversible electric heat pump solution.

Harald Weber, Lamtec GmbH (Germany)
CO Control, the better alternative of O_2 control for gas-fired furnaces

CO Control, the better alternative of O_2 control for gas-fired furnaces Sensors and Systems for Furnace Technology

As an alternative to the existing O_2 control technology a new type of empirical burner control method, based on a modified zirconium dioxide probe has been developed. This probe uses the co-products of the combustion (CO/H_2).

Monitoring and control of the combustion process is basically necessary for saving energy and reducing pollutants in the flue gas to prevent the environment and humans from damage because of the pollutants. The measurement of the oxygen in flue gas does not itself provide any information about the unburned components of the fuel gas. Because of this it is really important to measure and reduce the amount of unburned components in the flue gas. These components normally include carbon monoxide (CO) and hydrogen (H_2) as well as hydrocarbons (HC). The summary of all is called as COe.

With the Probe KS 1 it is now possible to detect in situ the COe in flue gases from gaseous fuels without added equipment. The control with using this technology is optimizing the process itself.

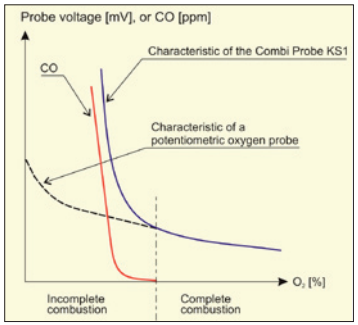


Figure 1: Sensor characteristics

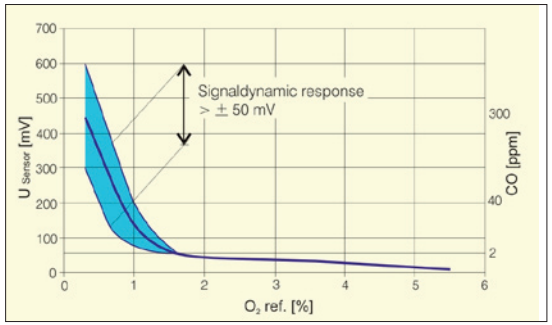


Figure 2: Dynamics of the sensor voltage

Measurement principle of the Probe KS1
The structure of the KS1 is similar the same like that one of a potentiometric oxygen probe. The only difference between is the material of the measurement electrodes. While the electrodes of the oxygen probes have a high catalytic activity, the catalytic properties of the electrodes of the probe KS1 has been intentionally reduced.

The measured sensor voltage is a mixed potential, consisting of a component that is depending on the O_2 reaction and a second component depending of the reaction of the COe. It is also a function of the ratio between oxygen and COe (Figure 1). But the point is that even with low concentration of COe the potential because of COe is much higher than the potential because of the O_2. The response time t60 of the sensor is less than 2s.

The main advantages of the CO control are
- Higher energy saving
- Improved control behavior due to substantially reduced response lag
- Fail-safe, because of independence of secondary air
- Highly dependable, robust and maintenance free

An additional indicator of unburned (CO/H_2) is the dynamic response of the sensor voltage (Figure 2). The dynamic response increases as the unburned component content is increasing.

Control principle
Starting at a high Lambda, reduce Lambda continually until the sensor voltage and the dynamics of the voltage is increasing. Than higher Lambda a bit and set the operating point for the firing process. This point is near the emission point to safe as much as possible energy and far enough to emit no or less pollutants.

This process will be repeated in constant intervals, so that the optimum of the operating point is always known, even unfavourable weather and plant conditions. If the Probe KS1 detects COe, eg. due to unmodified plant-specific conditions the operating point is immediately shifted to a higher Lambda.

Plant engineering
The simultaneously measured O_2 value is not required for the actual CO control. It is used only for monitoring and visualization purposes. If for combustion process reasons it is not possible to go to the COe emission point over the entire load range, there is the option of switching progressively from CO control to O_2 control in dependence on load. With multi-fuel burners, it is possible to select, according to the specific fuel, whether the CO control or the O_2 control is active.

The CO control is fail failsafe and it is tested and approved for continuous operation by TÜV-South, Munich. This means that, compared with the O_2 control, it was possible to improve combustion efficiency by a further 0,3 – 0,8 %, corresponding to a fuel saving equal to average-capacity combustion processes (Figure 3).

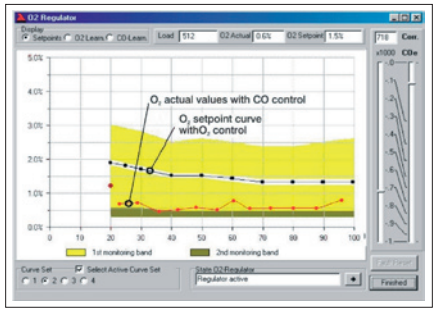
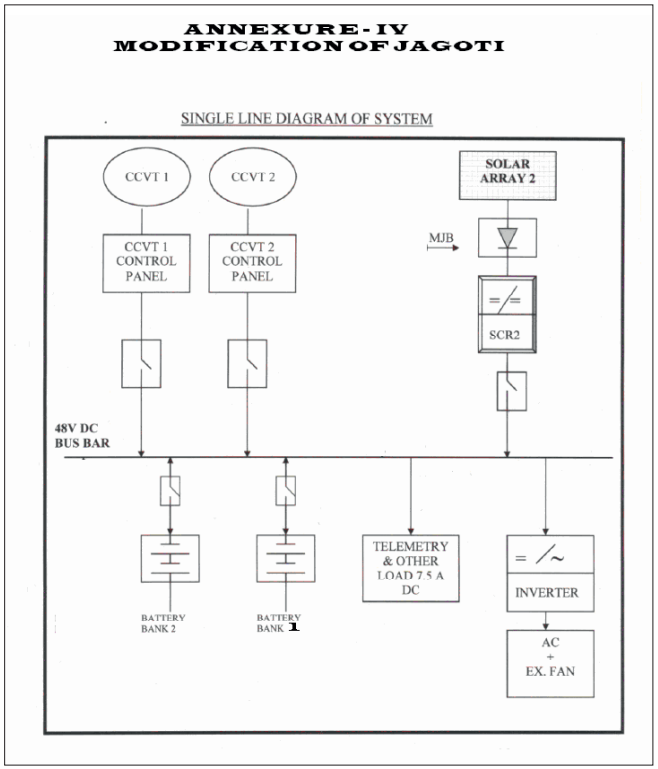


Figure 3: Set points of Lambda compared between O_2-Control and CO-Control

Sh Ranjan Kumar, Gail Limited (India)
First green RR/IP/SV Station in Gail – Replacement of CCVT at RR Station by renewable energy

The project aims for a replacement of gas fuelled closed cycle turbo generators (CCVT), typically of 2 kW output, needed to provide the electric energy required for transmitter stations (RR), lighting etc. along a gas transportation pipeline. After comparing various generation solutions, photovoltaic combined with the already existing battery banks was selected.

The suggested solution can secure an uninterrupted power supply being indispensible for safety. Gail has a strong communication set up. As a part of its communication system, there are Radio Repeater Station (RR Station) at predecided distances, along the pipeline route. At SV stations, there are no electrical equipments and therefore do need any electric power. However at RR/IP station we have remote controlled valves (controlled from Master Control Centre), Cathodic protection system, inert gas flooding system, Telecom system, Remote Terminal Unit (RTU),etc in addition to the lighting, air conditioning, etc. There is a



need for uninterrupted power supply to run the above to ensure the health of the pipeline while also ascertaining the highest safety standards.

The two CCVT have been run continuously with an emergency back up given by battery banks of 48 volt and 600 Amperehours (AH).

As a replacement to the old solution it was installed an solar array of 3.96 kwp on 29/09/2007 and we carried out 48hrs manned load test with both CCVT in off condition and solar power in line under three different conditions:

a) Only emergency load (7.5A)
b) Emergency load, battery exhaust and air conditioning in fan mode (13A)
c) all load, with air conditioning system in cool mode (25A)

Except (c) it was possible to run on 3.96 kwp solar system

Considering an additional load of 12 A due to compressor of air conditioning system, the load is not continuous but intermittent as per temperature requirement an addition solar array of 3.96 kwp rating without any additional battery bank. The final single line diagram for JAGOTI shall look as per ANNEXURE-IV.

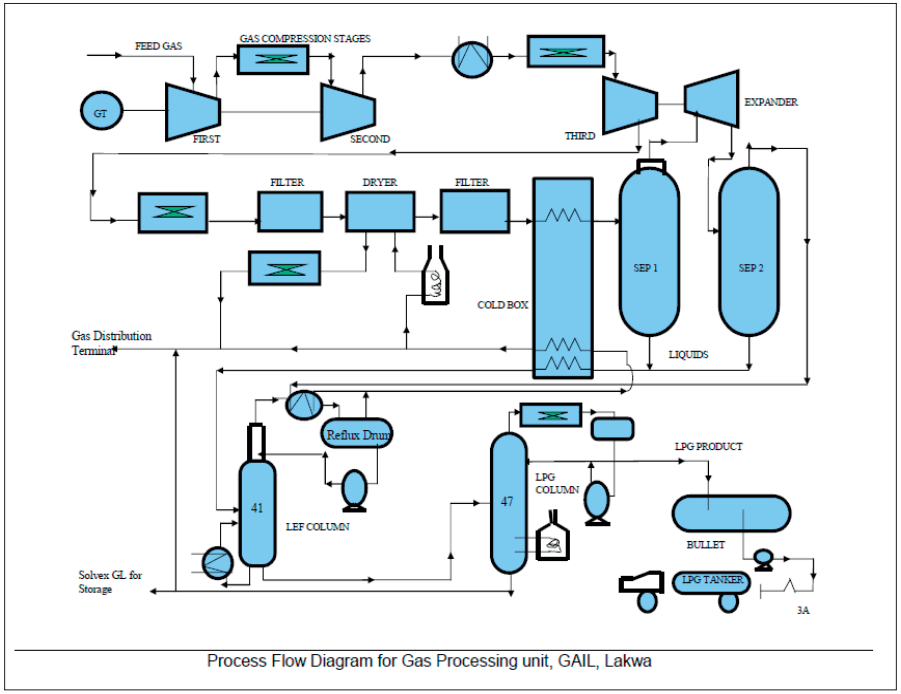
The above material was installed and commissioned on 22/02/2008 and we have now kept a/c unit in compressor mode. It is running successfully with both CCVT in off conditions.
We are very much confident that the above system shall work even in bad weather and give the desired result of replacement of CCVT by solar, a first green station in our company, where we run even our air conditioning unit also on solar energy.

All inclusive expenditure system with two CCVTs are INR 2,4 Million including gas consumption. The cost of solar power generating system for replacement of both CCVTs is INR 2.6 Million. The IRR calculation for replacement of both CCVT by solar power system is about a year. The above findings of the pilot project are as per best of our practical experience and knowledge and put up for consideration by the scholars for assessment of its suitability for the IGU Gas Efficiency Award.

Shri Sanzeev Medhi, Gail Limited (India)
Improved burner arrangement and operation in a heater for regeneration gas supplied to an adsorption type gas drying unit

GAIL Limited (India) owns and operates a Gas Processing Unit (GPU) at Lakwa, Sivasagar, Assam to process 2 MMSCMD (million metric std cubic meter per day) of Natural Gas, however the plant is presently run at approximately 30% of its design capacity, the world's lowest utilisation ratio in gas processing units (normal value of turn down ratio of gas processing plants is low at 50%). We have analyzed the three critical equipment:
a) Gas Turbine Feed Gas Compressor(GTC)
b) Expander Compressor
c) Gas Engine Generator(GEG)

The heater for the gas employed for regenerating the molecular sieve dryer had a low energy efficiency and some other drawbacks. The inefficiency is mainly related to the burner section, shown in Figure 1.



Process Flow Diagram for Gas Processing unit, GAIL, Lakwa

Figure 1

The plant has after the changes run consistently at this low load for a whopping 361 days out of 365 calendar days, out of which 2.5 days of the remaining 4 days were reserved for planned shutdown for 2007-08 financial year.

The existing system was replaced by a new one exhibiting the following features:

YEAR	TOTAL LHC(MT)	SHRINKAGE DUE TO LPG & SOL(MMSCM)	TOTAL IC(MMSCM)	POWER GEN.(MWH)	GAS PROCESSED (MMSCM)	PLANT CAPACITY UTILISATION (%)	PLANT ON STREAM DAYS
April 04-March 05	30803	11.99	38.68	7882	204.845	30.81	332
April 05-March 06	24875	14.45	35.49	7518	153.319	22.63	338
April 06-March 07	31036	13.11	39.34	7494	215.002	33.18	310
April 07-March 08	33194	14.13	42.40	8327	233.775	32.35	361

Kazuya Imai, Osaka Gas Co., Ltd (Japan)

Development of the "High-power EXCEL" GHP Air Conditioning System Featuring a Generator Capable of Serving External Loads

The number of gas heat pump (GHP) air conditioners installed is growing every year due to increased awareness of their advantages such as energy efficiency, small power consumption and low running cost. The installed capacity of GHP air conditioners within the Osaka Gas service area reached approximately 3.96 million kW at the end of FY2007 (106% compared with the previous fiscal year). In April 2003, we released the "High-power MULTI" GHP air conditioning system, which featured a small generator. The generator generates 1 kW of electric power using the excess capacity of the gas engine during space cooling and heating operations, and this power is supplied to the cooling fan and coolant pump, reducing the external power consumed by the outdoor unit. In the case of the 20HP model, the electric power consumed by this GHP air conditioning system is just 1/150 of that by an electric heat pump (EHP) air conditioner of the same class. By the end of March 2008, some 11,500 of these GHP air conditioning systems had been installed within the Osaka Gas service area. Our latest "High-power EXCEL" GHP air conditioning system combines the high air conditioning efficiency of earlier models with the capacity for simultaneously and efficiently generating about 4 kW of electric power. The generated electricity covers all electricity consumed by the outdoor unit, and also lowers the grid power consumed by indoor units, lighting and other loads inside the building because the generated electricity is fed into the building through a grid interconnection. As a result, the High-power EXCEL GHP air conditioning system achieves even higher energy efficiency and lower running cost than earlier GHP air conditioning systems.

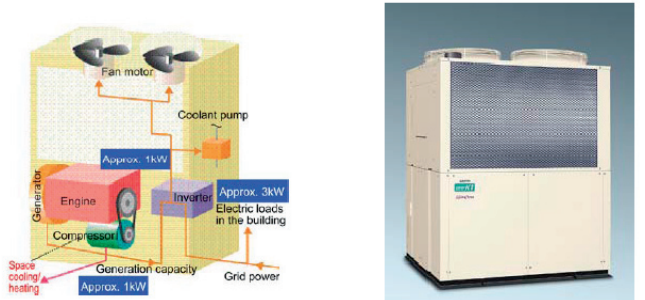


Figure 1 *System diagram of "High Power Excel"*

Figure 2 Appearance of *"High Power Excel"*

Ken-ichi Ishida, Sekisui House, Ltd. Tokyo Gas Co, Ltd. (Japan)

"CO_2 Off House" That Combines Energy Conservation, Photovoltaic Generation and Natural Gas Reforming Fuel Cell

This project aims at reducing energy consumption and CO_2 emissions in Japan's residential sector by increasing the popularity of 'CO_2 Off House' that achieves the highest level of energy efficiency, thus contributing to global warming prevention and energy security enhancement.

A residential fuel cell system, which runs on hydrogen – a new energy source – retrieved from natural gas, is a very high efficient gas cogeneration system because it makes efficient use of waste heat from power generation. We developed a new house, which is named as a 'CO_2 Off House', by integrating the fuel cell system into the entire system of housing equipment with a photovoltaic generation system, and it improves the energy efficiency of the entire house and balances out CO_2 emissions to zero. Thus it can be called a type of carbon neutral houses. Moreover, it increases the value of the fuel cell system beyond its functionality as a power-generating water heater. The CO_2 Off House is based on the newest ideas and technologies, and is very significant in the context of promoting residential fuel cell systems.

Furthermore, as a country that depends on imports to fulfill a major part of its domestic energy demands, Japan needs to have the option to use hydrogen as an energy source that can be produced from natural energy sources without depending on imported resources. A hydrogen society is not something that can suddenly emerge one day. Rather, it requires a step-by-step approach through the development and expanded use of fuel cells and other appliances necessary for building such a society. In the future, when the technologies for hydrogen production and storage have made further advances, CO_2 Off Houses will evolve into energy self-reliant houses. Then, people living comfortably in a typical residential house may use electricity from a photovoltaic generation system to produce and store hydrogen to be used by a fuel cell system. In this context, CO_2 Off Houses mark the first step toward the realization of a hydrogen society, which is simultaneously the first step toward the realization of energy self-reliant houses.

Table 1 *Comparison of annual electricity and heating expenditure between a conventional house and a CO_2 Off house (in Japanese yen)*

Electricity and heating expenditure	Electricity	Gas	Total	Savings
Conventional house	158,905	70,037	**228,942**	
CO_2 Off House	-46,729	102,899	**56,170**	**172,772**

Kazumichi ARAKI, Tokyo Institute of Technology (Japan)

Next Generation Energy System with SOFC & PEFC Co-Production

This project aims to combine two types of fuel cells with different operating temperatures to achieve major gains in generating efficiency.

By combining a solid oxide fuel cell (SOFC), which operates at a high temperature, with a polymer electrolyte fuel cell (PEFC), which operates at an ordinary temperature, it is theoretically possible to achieve a generating efficiency of close to 55 percent (higher heating value, or HHV; same below) at near-atmospheric pressure operation. The project takes up the concept of using a SOFC to obtain electrical energy directly from natural gas, and then using a PEFC to convert excess hydrogen produced from SOFC waste heat into electrical energy. It seeks to translate this concept into practice by building and installing equipment in a new campus building currently under construction, with R&D undertaken toward the practical application and commercialization of the technology.

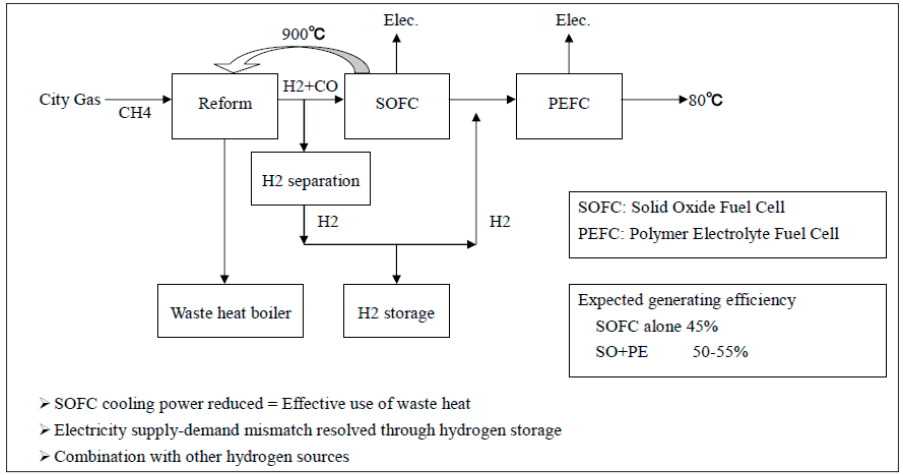


Figure 1. Project outline and Figure.

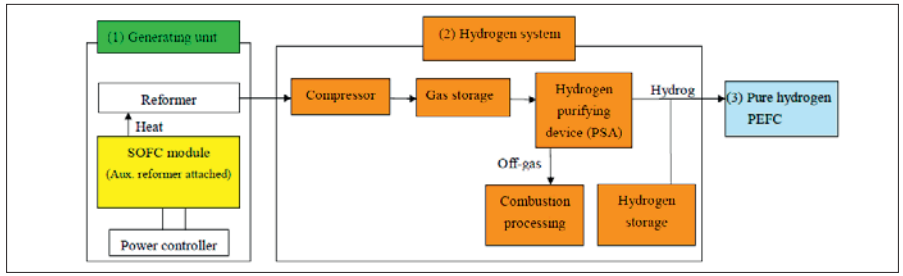


Figure 2. Configuration diagram.

Hans Overdiep, SenterNovem (The Netherlands)
HRe®-Boiler concerning - Large-scale Introduction of 10,000 HRe®-Boilers in the Netherlands

What is micro-CHP?
CHP stands for the combined generation of heat and power (cogeneration). Utilization of the heat released during electricity production already takes place on a large scale in various manufacturing industries and in greenhouse farming. As a result of technological developments it is possible to make use of cogeneration on an increasingly smaller scale - even, with micro-CHP, in single homes. Micro-CHP is defined here as cogeneration on the level of a single household, with a maximum capacity of approx 5 kWe, for use on low-voltage grids. The most obvious market to adopt cogeneration is that of existing houses and utility buildings, because high-temperature release systems pose no problem for cogeneration, and the higher demand for heat and the longer heating season are favourable for an effective management of cogeneration.

HRe®-Boiler
At this moment the adoption of micro-CHP in individual households is in its start-up phase. Knowledge has been built by means of field tests in several areas, including the installation process, operational behaviour, and behaviour on the low-voltage grid. Large-scale market introduction is expected to start in the beginning of 2009, when micro-CHP will be installed with replacement central-heating boilers. Those appliances will be provided with a quality mark, developed by the Energy Performance Test Foundation: the 'Gaskeur HRe' (gas mark HRe). This quality mark guarantees a minimum efficiency, meaning significant energy savings compared to a standard HE boiler. Appliances with this quality mark may be marketed as HRe®-boilers, with the e standing for electricity.

Right now several types of HRe®-boilers are being developed, with the Stirling engine being nearest to market introduction. At the time of market introduction these appliances will have a heat/power ratio of 5/1, with a greater overall efficiency of the gas consumed, because the heat which is being released, is also utilized. Other options now being developed are fuel cells, gas engines, steam engines, and gas turbines. The heat/power ratio of certain types of fuel cells appears to be nearing 1/1, uncovering a vast potential of energy savings.
The boiler manufacturers developing the HRe®-boiler, united in the Smart Power Foundation (SPF), have formulated their market expectations for micro-CHP: 1.4 million HRe®-boilers installed by 2020, and 3.8 million by 2030.The first large-scale introduction of 10,000 boilers should set the market in motion, to make it possible for the SPF's market expectations to be realized.

The boiler manufacturers expect that, after the large-scale introduction in 2009-2011, the scaling-up of the production will have led to a drop in the price of the HRe®-boiler, large enough to make a financial incentive no longer necessary.

What is innovative?
In comparison with countries around us, the Netherlands already use natural gas with an exceptionally high efficiency in the built environment for the heating of houses, offices, and other buildings. This project is unique in that it adopts on a large scale - approx 10,000 houses - HRe®-boilers with an overall efficiency of 125 percent of the lower heating value. What makes the HRe®-boiler extra special is that its electricity production is twice as efficient as that of a modern STAG power plant without utilization of residual heat. In the long term new possibilities will arise with the HRe®-boiler. The cooperative Smart Power System has been established to explore these possibilities. These new possibilities will be found in the areas of fitting in with sustainable sources (PV/wind), optimizing grid quality, and economic optimization. Ultimately, this will lead to Virtual Power Plants in the future.

Sergey A. Boiko, OAO Gazprom, Gazprom Transgaz Moscow, LLC (Russia)
Effective Gas Utilization Projects Competitive Bid

Gazprom Energy Saving Technologies
Kaluga Turbine Plant-Manufactured 500 kW Modularized Heat Recovery Package (MHRP)

Gazprom compressor fleet with installed power capacity of 41 million kW transports natural gas from wellhead to burner tip. Meanwhile, gas turbine, electric and reciprocating drives account for 86%, 13% and 1%, respectively.

According to Gazprom and VNIIGAZ experts, in the years to come such power drive percentage will prevail and the number of turbine-driven units will continue to grow gradually. The gas turbine fleet has been formed during 40 years and consists of more than 20 types of 2.5 MW – 25 MW gas pumping units, 23% - 35% rated efficiency. The latter value relates to new generation units. With a running gas turbine engine, a sufficiently large quantity of 440°C exhaust gas is emitted. This heat energy comprises a significant energy saving reserve in the industry. The estimated overall heat power emitted by gas pumping units is 1.260 mln GJoules/year that may generate up to 5 000 MW. The most cost-effective option to recover compressor station piping exhaust gas may be implemented by integration in a compressor station and gas pumping unit with a steam turbine heat recovery plant that utilizes exhaust gas to generate steam in a waste heat boiler and to direct the steam to a steam turbine to generate power needed for compressor stations and the market.

Using exhaust gas at the steam turbine heat recovery plant that generates power, the resource and energy saving challenge is met and up to 10 bcm/year of gas is saved. It should be noted that the foregoing concept is well-known and already in use at some compressor stations. This solution relates to cogeneration plants. To date, the required power equipment has been fabricated to be installed at the modularized heat recovery packages (MHRP) designed to be integrated into a wide range of compressor stations.

Yuri Baranov, Yuri Kantemirov, OAO Gazprom, VNIIGAZ, Ltd (Russia)
Modernization of Surveying and Geodetic Monitoring System of Oil and Gas Fields Areas by Means of Satellite Radar Interferometric Measurements of Land Displacements

Russian Federal Agency of Ecological, Technological and Nuclear Control (Rostechnadzor) regulates Earth surface displacements monitoring of each gas field. Today this monitoring must include creation of the fixed reference points system both in limits of gas field contour and outside of it (i.e. inside the area of possible man-caused land subsidence and outside this area). Traditional geodetic methods of measurements (mostly 2nd class leveling) should be regularly applied on this system of reference points.

Obviously, traditional geodetic measurements are of exact accuracy. However, their main disadvantage is low operativeness, especially on large area or large length objects. For instance, on giant Urengoi gas field surveyors sometimes need 2 or even 3 years to complete one cycle of profile leveling; the second leveling cycle is sometimes made after 10-20 years. Moreover, leveling gives information about the displacements only for a group of points or for a profile line and does not give information about an area. Besides, some reference points can be affected by local ground movements (for example, cryogenic ones). Therefore, taking into account the aforesaid, traditional geodetic methods do not provide all the required information and these methods may have some errors. They need to be supplemented by more effective methods, providing estimation of land displacements for area (in addition to line and point methods). Then comparative analysis of all results received by different methods of displacements measurements should be applied in order to remove errors of each particular method. In 2008 VNIIGAZ, Ltd proposed to modernize surveying and geodetic monitoring system of oil and gas fields areas by means of satellite radar interferometry and continious GPS-measurements on a limited amount of reference points on each large gas field (or group of smaller fields).

Practical satellite radar interferometry is a relatively new technology of displacements measurement. It makes it possible to get on a regular basis (every year, every month or every week) a displacement map for the whole area of each gas field and for the whole length of each pipeline system segment. The accuracy of such map is up to ±5 mm scale. This is one of the most modern, innovative and developing technologies for diplacements measurements. New variations of it appear every year. New radar satellites which acquire images in different bands and in different spatial resolution and with different scene size are launched or planned to launch in the near future. The leading software for interferometric processing of radar data is updated almost every month. VNIIGAZ suggestion is to switch from theoretical and experimental step to practical application of radar interferometry technology for land displacements monitoring on industrial scale (for all gas development, transportation and storage facilities of "Gazprom" JSC).

The possible errors of interferometric phase can be removed by using point calibration of displacement map by data from continuous GPS-measurements on a very few reference points. Once in several years the results of satellite radar interferometric and GPS monitoring should be correlated with traditional geodetic measurements results. The application of such complex of monitoring methods will allow to monitor land displacements – both natural and man-caused – with high accuracy, regularity and efficiency. This will help to decrease risks of natural disasters and man-caused accidents on gas development, transportation and storage facilities. Thus, such operative satellite monitoring will allow gas suppliers to provide continuous and reliable gas flow to consumers.

Sergey N. Balayev, Igor S. Morozov, Vsevolod V. Cherepanov, Ruslan G. Oblekov, Mikhail V. Masnik, OAO Gazprom, Gazprom Dobycha Nadym LLC (Russia)
Resource-saving technology of the temperature warming up of columns of development gassers after the protracted wells shutdown

In the process of exploitation of gassers there are production situations, when it is necessary to halt their work on the protracted term.

It can be bound with the different types of repair works, made on communications and equipment, requiring the halts of work of well, with petroleum geophysics researches, conducted at the static state of well, with reduction of gas production from the deposit. Besides, all fund of operating gassers of deposit is closed on period of the planned stop of the system of complex preparation of natural gas to the distant transport. Duration of stop usually makes a few days.

It should be noted that there are permafrost rocks (PFR) in the cut of deposits, that determine some characteristics in well operation, in particular, warming up of columns of mining holes for prevention of formation of hydrate or ice corks in boreholes and gas pipeline -trains.

Temperature warming up of columns of gassers, being in temporal preservation or protracted simple, concordantly, "Technology of regulation on exploitation of UKPG of deposits of "Yubileynoe" and Yamsoveyskoe" and "Instructions on developing and research of development wells on the gas and gas condensate deposits of BPO "Tyumen'gasprom" at the cluster drilling" (RD 9510-62-85) makes two days.

On existent technology, before starting of downhole production in gas pipeline -train, it is necessary to transfer the well in work on a clustered horizontal smoke jet, through a puck by a diameter 25-28 mm, for the conclusion of well on an operating temperature condition. Thus, the normative losses of gas on one well average 1800 thousand m^3. By the authors of resource-saving actions was offered and introduced "Resource-saving technology of the temperature warming up of columns of development gassers after the protracted wells shutdown», allowing to avoid the irretrievable losses of natural gas in an atmosphere and give it on plant of complex preparation of natural gas (PCPG), that in the total results in the increase of saleable output of natural gas extraction. Before starting of mining well the interval of perforation is filled with anti-hydrated inhibitor (methanol), in gas pipeline-train (on a well) is injected 1-2 m^3 of methanol (depending on a diameter, length of train) and the well at once started in work on UKPG-PCPG. Warming up the columns of well and train produced simultaneously, without annealing on the flare plant, at depressions of not exceeding possible. At that eliminated

gas kick in an atmosphere, paying for losses of gas, and also fines for the harmful affecting ecology. Expenses on application of the described technology are minimum (cost of injected methanol). This technology was developed in 2001 and has been used on oil and gas condensate fields "Yubileynoe" and "Yamsoveyskoe" Gazprom Dobycha Nadym.

Basic situations at which this technology is used are after scheduled repair works on UKPG, related to the stop of all working fund of wells, after repair of gas pipeline-trains, related to the stop of separate welt clusters, and also at the input of new wells the outage of which is related to temporal conservation on the period of arrangement.

This technology allows to regulate operatively a gas expense on UKPG in the period of reduction of gas production, related to the stop of wells, to destroy gas trade on the mode in minimum short terms. By this method it was succeeded to reduce the terms of stop of GP in a summer period during the realization of the planned repairs on 2 days. It is necessary to mark that on the results of the researches conducted by the services of the Engineering-Technical Centre LLC «Gazprom dobycha Nadym» and subsequent revisions of separation devices of UKPG, no influences were exposed from application of this technology to work of equipment. Total economy of natural Gas for period 2001-2008 presented more than 80 mcm.

Alexandr I. Bereznyakov, Andrey N. Kharitonov, Viktor A. Gugnyakov, Valida Mikail-kyzy Mamedova, OAO Gazprom, Gazprom Dobycha Nadym LLC (Russia)
Resource-saving technology of the temperature warming up of columns of development gassers after the protracted wells shutdown

One of the basic instruments for getting information about the state of exploited deposits is gas-hydrodynamic methods of researching of beds and wells.

The main task of taken researches consists of getting initial data for setting technological, hydrodynamic and thermodynamic conditions of work of wells and ground buildings, estimation of the efficiency of work on intensification of gas and control for exploitation by the way of setting of productive description of wells.

Gazprom Dobycha Nadym, LLC - OAO Gazprom carries out three large fields of hydrocarbons in the north of Western Siberia: Medvezheye, Yubileinoye and Yamsoveiskoye.

By the exploitation projects of the fields the annual control of description of every well is provided, that consist of about 600 investigations in a year, which are conducted as a rule by the method of fixed selections and in most cases are accompanied by discharge of gas in atmosphere.

This measure is considered as forced and is connected with lack of possibility to connect every well to the measuring centre of gas expenditure.

The experience of exploitation of senoman deposits of north region showed that the applying methods and technical means at conducting of gas- hydrodynamic researches are not enough efficient and do not permit to get required information in the whole amount.
For raising the efficiency of gasdynamic investigations of wells a new technology based on use of methods non-stationary filtration of gas and modern programming-technical complex – Field Working Station (FWS) – "mPC", intended for collecting and progressing data.

Suggested technology of carrying out gasdynamic investigations consists of the following: investigations are made on 2-3 work conditions of the well with the duration of 15-20 minutes. Field working station continuously records pressure in the mouth of well, as well as pressure and temperature on DUKTe, by which expenditure is determined. All massif of data received continuously from data units and are recorded by field working station, are processing with the help of special program provision.

In contrast to analogs, energy saving technology of carrying out the investigations permits to solve questions, appearing in the process of operation the deposits.

Patents were received for devices invented by authors ansd one of the enumerated developing was presented at the 29 International Salon of Inventions (Geneva, 2001) and was awarded the Gold medal.

Oleg P. Andreev, OAO Gazprom, Gazprom Dobycha Yamburg, LLC (Russia)
Stand-Alone Telemetry System for Non-Electrified Gas Well Clusters

One of the most important problems during development of gas-and-condensate field in severe natural and climate conditions of the Far North of Russia is to provide a continuous monitoring and control over production well operation in real time. Telemechanic systems are used to solve this problem which include well production rate measuring instruments, actuating mechanisms for flow rate regulation and control of hydrate inhibitor (methanol) injection, a complex of devices to process signals and transmit information to the central control room. As a rule, operation of telemechanic systems is supported by centralized network power supply. A task to create a stand-alone telemechanic system for gas well clusters was put forward during development of Aneryakha and Kharvuta site of Yamburg oil-gas-condensate field. During development of Aneryakha site a set of special technical devices for such a system have been developed and tested under operational conditions. Using these specially designed devices and commercial technologies a telemechanic system for Kharvuta site was created and deployed in 2007. For the first time in the world the problem of well operation mode control, actual well operation status data generation and transfer from well clusters with no centralized power supply under conditions of polar night and severe frosts of the Far North was solved. As a result we have a complex of state of the art scientific and technical developments, design and system decisions, which were used to create cost and operating characteristics competitive telemechanic system. This solution is absolutely in line with IGU Guideline Principles of Sustainable Development.

The system includes following newly developed components:

- wear-resistant flow meter for gas wells with self-contained power supply designed for three years of operation;
- regulating valve with low power consumption electric drive;
- low power consumption inhibitor (methanol) injection system;
- sensor-indicator of sand and liquid production with low power consumption;
- self-contained power supply system controller with low power consumption; - thermo-electric generator;
- thermal protection means for efficient operation of microelectronic devices and rechargeable battery pack;
- software.

In addition, the well cluster set and central control room set include commercially available technologies: wind-powered generators, solar batteries, rechargeable batteries, controllers and equipment for processing, transmission and visualization of information. The following types of renewable energy sources have been chosen for system electric power supply: wind-powered generator (wind energy), solar battery (sunlight energy) and thermoelectric generator (using the difference between temperature of extracted gas and ambient temperature). Their combination and simultaneous work provide for all-year-round system operation under conditions of seasonal and instantaneous accidental changeability of natural factors. Besides, a spare unit of rechargeable batteries is used for the same purpose. Special well cluster set controller controls batteries charging mode, selects the most effective mode of system power supply and monitors energy supply status. One of the most challenging problems solved during system development was stabilization of temperature conditions for cluster equipment operation. Cluster equipment cannot be positioned in the open air, because the ambient temperature at the northern Russian fields varies from -50°C to +40°C.

Accordingly it has been decided to put equipment under ground at the well cluster. For this purpose an assembly pit is built at the well cluster and the cluster equipment is installed in it. For additional thermo-insulation and precipitation protection the pit is covered by thermo insulating cap. In immediate proximity to the pit a mast for installation of antenna feeder arrangements, solar batteries and wind-powered generator is mounted. Thermoelectric generator is mounted on the gas pipeline which transports gas from gas well to the Complex Gas Treatment Plant.

Vladimir V. Emelianov, OAO Gazprom, Gazprom Transgas Tchaikovsky, LLC (Russia)

Method of Reducing Natural Gas Losses During Maintenance of the Main gas Pipelines Objects

Activities like pipelines repairs, replacement of defective sections and valves as well as annual preventive maintenance of compressor shops are regularly conducted during OAO Gazprom' gas mains system operation. In accordance with general practice, a pipeline section under repair (with a standard pressure of 7.5 MPa) is locked by check valves and natural gas (of 6.5 MPa pressure) is discharged into atmosphere. In most cases this gas cannot be utilized by customers because the section, as a rule, is not connected to the Gas Distribution Station (GDS). We propose to use gas inside the section under repair for own needs of compressor shops as a fuel gas of Gas Compressor Units (GCU) before the start of scheduled maintenance. For the reason of pipeline arrangements and equipment variety within OAO Gazprom by way of example we take a conventional compressor station of conventional multi-pipelines corridor. None the less this project can be applied for major part of linear compressor stations within OAO Gazprom Gas Transportation System. The project deployment will provide for tangible gas savings by decreasing 1.5-2.5 times irretrievable gas losses from discharging gas into atmosphere prior to a main gas pipeline maintenance. In particular (by way of example described above: conventional gas pipeline diameter - 1400 mm, length of section under maintenance - 30000 m, initial pressure - 6.5 MPa, minimum allowable pressure - 3.0 MPa) gas savings will amount to about 4.6 million normal m^3.

Project realization (engineering, procurement, construction, commissioning) requires single capital investment, which cost is incommensurably less than that of compressor stations equipment. This project can be introduced on the compressor stations under construction as well as by refurbishment of linear compressor stations of existing gas pipelines system.

Svatoslav S. Stetsyukevich, Victor A. Rozhkov, Andrey V. Bandurko, OAO Gazprom, Gazprom Dobycha Noyabrsk, LLC (Russia)

Automatic Control of Gas Air-Cooling Devices within Preset Parameters

This innovation was provided to TyumenNIIGiprogaz, LLC as a specification for the Phase II booster compressor station (BCS) introducing additional changes to the gas air-cooling device (GACD) construction. These changes specify operation of ventilators in reverse mode, i.e. air-cooling of the pipe clusters is provided by adjoining ventilators which are operated so that one pushes the air upwards, the other one – downwards. Thus an even air-cooling of the pipe clusters is achieved.

Prior to this innovation ventilators' operating modes in the gas air-cooling devices didn't support control of the quantity of cooling agent (air) which went through the pipe clusters. At ventilators' constant maximum rpm rate when the ambient temperature changed (especially in winter period) gas chilling to the gas hydrate formation point in the low rows of pipes took place resulting in pipes break. This problem is vital practically in all gas fields producing in the Far North conditions.

The authors of this innovation have proposed to use frequency control of the ventilators' motors to automatically control gas temperature after its compression in the GACD. Frequency control provided for the introduction of algorithm for maintaining gas temperature within preset range.

Maintaining the temperature at approximately +15°C made it possible to improve quality of dehydration of gas having challenging characteristics of dew point (within -25°C – -30°C). This has also increased the efficiency of GACD.

Power savings take place (of up to 30%) due to the automatic reduction of voltage on the motor while reducing the load to the level set by user; when the load is reduced to the level close to idling electric motor stops. Benign performance mode of motor is ensured thanks to voltage stabilization of power circuit; when momentary dump of supply voltage occurs the current speed of engine rotation is "caught up".

The implementation of this innovation has made it possible to decrease manhour budget of personnel on adjustment of temperature with the help of GACD adjustable louvers. There is no need to change the angle of attack of ventilator fan during season changeovers «winter – summer» and «summer – winter». Risk of gas hydrate formation in the pipe clusters of GACD is minimized.

Sergey I. Ivanov, Vassiliy I. Stolypin, Sergey A. Molchanov, Alexsey A. Brjukhov, Mikhail M. Morozov, Dimitry V. Panteleev, OAO Gazprom, Gazprom Dobycha Orenburg, LLC (Russia)

Efficiency of Additional Hydrocarbon Components Recovery from Natural Gas by Helium Plant Gas Separation Cryogenic Technology Improvement

The Orenburg gas-chemical complex (OGCC) has been operated since 1974. The source of raw materials is gas of the Orenburg oil gas condensate field (OOGCF). The OOGCF gas is unique for helium content (0.055% by volume).

The OGCC includes the gas processing plant (GPP) and the Orenburg helium plant (OHP). The main requirement for gas supplied to the helium plant is restriction on H_2S, sour sulfur, CO_2 and moisture content. Gas cleaning from H_2S and preliminary dehydration are executed at the GPP, and after that gas is supplied to the OHP for more fine dehydration (up to the dew point temperature of -70 º C) and sour sulfur scrubbing and further supplied to the helium blocks for helium and hydrocarbon components recovery.

At the OHP the following products are recovered from natural gas by its low temperature condensation and rectification:
- helium concentrate;
- ethane fraction;
- natural gas liquids (NGL)
- high pressure methane fraction (HPMF)
- medium pressure methane fraction (MPMF)
- low pressure methane fraction (LPMF)

The authors suggested updating the zeolite regeneration process, changing the design. Use of the methane fraction and nitrogen-methane fraction has been suggested instead of dehydrated and treated gas for the zeolite regeneration.

The novelty lies in an increase of the degree of target components recovery from natural gas – helium, ethane, natural gas liquids owing to including into deep processing of 1.5 billion m^3/year of dehydrated and treated natural gas, before used as zeolite regeneration and cooling gases. Simultaneously high quality production, stability of the regeneration and cooling processes, increase of zeolite life time, reduction of power consumption is provided.
But cleaning of the methane fraction from compressor's oil is required, because it is a contaminant for zeolite. The cleaning is performed on free equipment of the de-ethanizing gas preparation block with wasted zeolites application.

The potential increase of OOGCF gas processing volume owing to the invention application amounts to 1.5 billion m^3/year, and at the same time additional production increases and reaches:
- helium - 738000 m^3/year;
- ethane – 34750 t/year;
- NGL - 81000 t/year.

Ignasi Malloi Sangrà, GasNatural SDG S.A. (Spain)

Doña Juana Landfill gas-to Energy project

Abstract
This project focus on the capture and energy recovery of the landfill gas in order to reduce fugitive emissions of methane, a greenhouse gas which is one of the main components of the landfill gas. The project involves landfill gas collection at the Doña Juana landfill site and its thermal energy use at the nearby industries as a renewable fuel source. The expected results are a reduction of 700.000 tCO_2/year and an energy recovery of landfill gas in 250.000 MWh/year. The project is being developed in accordance with the modalities and procedures of the Clean Development Mechanism – CDM of the Kyoto Protocol and this is the first experience of this technology in Colombia.

Background
The Doña Juana Landfill is used from 1988 for the disposal of municipal solid waste generated by the people of Bogotá (Colombia), providing a solution to dump an average of 2 million tonnes of household waste per year. The Unidad Administrativa de Servicios Públicos - UAESP is the owner of the Doña Juana landfill and the public organization for waste management planning, supervision and coordination in the municipality of Bogotá.

In October 2007, the UAESP awarded the Consortium Biogas Doña Juana a public concession contract for the collection, treatment and energy use of the landfill gas for 23 years. The technical proposal involves the design, construction and operation of landfill gas collection and treatment facilities, as well as the supply of the processed landfill gas into a dedicated landfill gas distribution network for industrial users operated by Gas Natural ESP, a natural gas distributor company in Colombia.

Biogas Doña Juana S.A. ESP, the project developer, has been constituted as a public Services Company predominanly shared by Gas Natural SDG and GRS Valtech. Gas Natural SDG is a

multinational energy utility company with activities in Spain, France, Italy and Latin-America. GRS Valtech is a subsidiary of Veolia Propreté, which focus in engineering and equipment supply for landfill gas collection and energy recovery systems.

Project overview

The landfill gas results from the organic waste degradation in anaerobic conditions. It is usually composed of more than 50% methane and less than 50% carbon dioxide CO_2, both of which are the main gases causing the greenhouse effect, with methane having a greater global potential warming (21 times higher than CO_2). Collection and flaring of methane in landfill gas is a preventive measure against climate change according to the Kyoto Protocol. Collection and flaring of landfill gas are usual in modern operated landfill sites in order to prevent local risks like fire, instability or stenches. Landfill gas could be an alternative fuel source because of its lower heating value that could be in the range of 4 - 5,5 kWh/m^3(n) depending on the methane content. When technical and economically feasible, landfill gas is applied usually in power generation reciprocating engines, where energy content in landfill gas is recovered to produce electricity.

The project involves the thermal use of the landfill gas in the ceramic industries near to the landfill site where powdered coal is used as their energy source at present. The use of the landfill gas in the nearby industries is much more environmentally friendly than using conventional energy sources. The thermal use of the gas in brick producing kilns will improve the efficiency in the energy recovery of the landfill gas and it will also help the industrial activities to reduce their environmental impact.

The potential market of landfill gas consumers are approximately thirty brick factories. A landfill gas dedicated pipeline will be constructed to supply the gas to the industrial costumers. This polytethilene pipeline will be approximately 18 km in length with one injection point and multiple users in connection. Customer's kilns will be converted for burning landfill gas instead of coal.

Landfill gas supply requirements are high availability and continuous operation, impurity-free landfill gas, low moisture and constant heating value and pressure supply. Estimated energy saving of the project is 250.000 MWh/year, which displaces approximately the use of coal in 30.000 t/year.

Equipment and facilities

The project involves the construction of a landfill gas collection network, a gas processing plant where landfill gas extraction and treatment systems will be centralized and a landfill gas distribution pipeline to the industrial users.

Landfill gas will be collected from a dedicated gas wells network in the waste. A high density polyethilene collection piping system will be installed to connect the gas wells to the active extraction system. The design of the landfill gas collection network will minimise low points, where condensates could obstruct gas collection, and pressure losses.

A blower station will create the required negative pressure in the collection network to extract the landfill gas and to take it to the gas treatment system. Raw landfill gas will be cleaned to achieve the conditions for the use of landfill gas. Gas treatment will mainly consist of dewatering and filtration of the landfill gas. Depending on the presence of other impurities, like H_2S or siloxanes, a second stage treatment will be use to avoid damage in landfill gas engines or in the industry end users.

Mostly the outlet landfill gas from the treatment system will feed the compressors station, where the gas pressure will be increased and injected into the dedicated landfill gas network for industrial users. Landfill gas will also supply two engine generators for on-site electricity generation to provide energy to the landfill gas processing and compression facility.

The surplus landfill gas which cannot be burnt through the gas dedicated pipeline or the landfill gas engines will be directed to an enclosed flare system. The flares will ensure a retention time and a temperature for a methane destruction rate close to 100%. The flare system will be designed to ensure the combustion of the entire quantity of collected landfill gas, to maintain stability conditions in the landfill gas collection network in case of low demand of landfill gas from the industrial users.

As the project it is being developed under the guidelines of the Clean Development Mechanism - CDM procedures, extensive instrumentation, monitoring and recording equipment will be installed to provide the necessary information of the landfill gas volume and composition, as well as the main performance parameters for the flares, landfill gas treatment, engines and compressors.

In the nearby industries, facilities will be adapted to be supplied by a gaseous fuel without affecting the brick quality. The new burners and fuel injectors will be designed to specific gas properties, such as pressure, lower heating value and combustion air-gas ratio.

Project benefits

The Doña Juana gas-to-energy project will make a positive contribution to the climate change prevention by reducing greenhouse emissions: The project will capture and destroy the uncontrolled emission of methane and fuel switch from coal to landfill gas will also contribute to reduce greenhouse gases emission.

Landfill gas capture and treatment will produce long-term additional environmental improvements and prevent risks in vicinity of the landfill site like atmospheric pollution, fire and unpleasant odours. Jointly to other good operational practice, like of waste compacting or leachate collection, landfill gas collection could contribute to the stabilization in the landfill disposal areas.

Landfill gas used in brick factories will improve air quality reducing particulate and sulphur oxides from combustion emissions respect to the present situation. Fuel switch from coal to landfill gas will enhance air quality and thus health conditions in the area.

Renewable energy use from the landfill gas will suppose a knowledge and technology transfer for Colombia. This is the first experience of this technology in this country, so it will be a reference project for a renewable scheme and an opportunity to get experience in advanced landfill operation techniques.

The project will support economic and social development. Local staff will be required for the construction, operation and maintenance landfill gas extraction and treatment systems. Under the CDM scheme, certified emission credits will help to the development of social projects in the neighbouring area.

Dr. Mahmood Farzaneh-Gord, Semnan, Iran Company (Iran)
Employing vortex tube to produce refrigeration at entry of natural gas into customer premises

When a natural-gas distribution pipeline nears a customer, the high-pressure gas needs to be reduced to a working level. Throttling valves are currently utilized to reduce the gas pressure. This wastes valuable pressure exergy of the gas. Due to low natural gas consumption at customer premises, it is not feasible to utilize expansion machines (such as turbo expander). So, the paramount candidate to replace a throttling valve is a vortex tube. The vortex tube is a simple device without a moving part which is capable of separating hot and cold gas from a higher pressure inlet gas. Despite its reliability, it has been put to a few practical uses. In this study, a new idea has been proposed to take advantage of the vortex tube and natural gas pressure reduction. The idea is to put the vortex tube in natural gas pressure reduction system and take advantage of the cooling capacity. For this purpose, an experimental study has been carried out to investigate thermal behaviour of Natural gas as pass through a vortex tube. In addition, the effects of the cold orifice diameter and hot tube length on the vortex tube separation behaviour have been studied. The results show that temperature difference is maximized for a specific orifice diameter and hot tube length. An equation has been obtained for the VT isentropic efficiency as function of cold mass fraction. For current study, the isentropic efficiency is calculated to be around 0.1 which is lower comparing with other work such as Saidi and Valipour [9]. This causes that temperature drop to be around 11 K and cooling capacity to be around 10 kj/kg. By improving the VT to obtain higher isentropic efficiency as in [9], one could create 50 K temperature drop and 45 kj/kg specific cooling capacity. This suggests that the VT could be a suitable candidate to replace current throttling valves. Employing the VT as proposed here would probably have big impacts on energy saving in gas industry.

Robert Mellema, Gasunie Engineering & Technology (The Netherlands)
Introduction of a mobile energy and environment measurement unit in the Russian ESCO sector

Gasunie Engineering & Technology (GET) in a project sponsored by EVD - a bureau of the Dutch Ministry of Economic Affairs - has supplied a state of the art and fully equipped mobile energy and environment measurement unit to the Russian company 'Lighthouse Energy Investments' (LEI). LEI is starting up business as a commercial energy service company (ESCO) in the Russian Federation. Novelty of the concept is that not only hardware was supplied, but also knowledge of, and many years of experience in the field of energy audits were taken into a region that is only starting to discover the worth of energy conservation. Local engineers were enabled to immediately apply the techniques and methodologies that were developed in the Netherlands over a long period of time.

From 1985 till 2005, GET engineers were involved in the Gasunie 'Environmental Plan for the Industry' (EPI), in which industrial gas consumers were advised how to save energy. In this work ever more advanced technologies and methodologies were used to identify energy savings opportunities and to perform energy audits in an accurate and cost efficient way. After Gasunie's unbundling in 2005, EPI was abandoned and GET decided to market its knowledge and experience in the field of energy efficiency consultancy

In the project, with a total budget of k€ 860, project partners GET, Royal Haskoning (RH) and LEI co-operated intensively to meet the main condition set by EVD of saving a total amount of 200 TJ of primary energy per year. The measurement van was constructed at GET, certified according to Russian standards, and shipped to Moscow in October 2007 where it was officially handed over by the Dutch P.M. Mr. Balkenende to its new owner. LEI energy savings experts were already trained at GET in operating the measurement van and practiced again in Moscow after the van's arrival.

In December 2007, the first real audit was done. In a co-operation between GET, RH and LEI, the district heating company 'Troitskteploenergo' was assessed on energy efficiency using the measurement van. The company followed some of the less cost intensive advises in the audit report and in the summer of 2008, the measures were implemented. By comparison of the company's gas consumption in the winters of 2007/2008 and 2008/2009, it was determined that a total amount of 196 TJ of primary heat, equalling some 5,5 mln m^3n (k€ 340 and 10,6 ktons of CO2 p/a) of natural gas, had been saved (compensated for weather conditions in both periods). These savings were verified by Russian authorities. The project ended February 1, 2009 and the van is now deployed by LEI autonomously. The project shows that practiced international collaboration in the field of energy conservation can bring very substantial savings indeed.

Ejaz ul Haque, Pakistan Petroleum Limited (PPL) (Pakistan)
Flare reduction initiative at PPL ADHI field 2008-2009

Pakistan Petroleum Limited (PPL) Adhi field is situated at about 70 Km from the capital city Islamabad, The area is dotted with many villages and 10 ~ 12 thousand people live very near to the processing facility, The wells are scattered in a 15 Km radius and the gas processing trains are situated almost in the middle.

The field is comparatively small but is versatile as it produces 42 MMscfd Natural gas, 3500 BPD Natural gas liquids, 150 tons/ day LPG and 2000 BPD oil. There are three trains to handle the process two are dedicated for handling wet gas and a third smaller one is installed to stabilize crude oil. There are three separate flares for the three trains.

Flared gas quantity is a concern not only for the company in terms of loosing precious gas but it is also an environmental and social concern. It also produces unwanted sound and light pollution for the surrounding community and contributes in carbon dioxide addition with other Hydrocarbons in the air.

As a progressive E&P company PPL put high importance to the efficient utilization of resources, and strives to be environment and community friendly. An initiative to reduce flare amount was taken in 2008 to achieve this goal.

As a target 1st step, limits of flare given by Canadian Association of Petroleum Producers were used. It can be proudly said that we have achieved the set target for all three process trains in October 2008.

PPL has always put emphasis on reduction in waste of resources and minimizing impact of environmental aspects.

Even though PPL Adhi Field is a small entity its flared gas quantity remained on higher side. Quantification of flared gas amount was only based on rough estimates. In 2007 the total flared amount is 310 MMscfd based on reported data.

The situation was alarming as almost 0.9 MMscfd gas was burnt daily in 2007. PPL was loosing money and image in the surrounding community due to sound and light pollution.

Operation group at PPL is responsible for processing plant operation we took it as challenge to curtail the flared gas amount to minimum possible allowed by the available technology.

The Slogan of the project was taken as “ROTI NA JALAIN FLARE GHATAIN” in Urdu Language which translates into English as “Do not Burn Your Bread; Check your Flare”.

Fazal ur Rahman, BP Pakistan (Pakistan)
Flare to Fuel

At one of BP Pakistan’s operated facility in Badin, we are producing around 300 bopd through four oil wells, producing oil on artificial lift systems called Jet Pump. These units are basically driven by engines, gas or diesel, depending on produced well stream. The associated gas produced along with oil at all of these wells contain significant amount of high end hydrocarbons which are not suitable to operate gas driven engines used to drive artificial lift systems. Hence, the total gas produced from these wells, 0.078 MMscfd was routed to the flare header at the facility and flared to atmosphere. Moreover, the engines at individual well locations had to be operated on diesel instead of gas. The annual quantity of gas flared from this location amounts to 29 MMscfd.

The challenge here is how to optimize utilization of 29 MMscfd of natural resource which has to vanish into thin air.

The solution to our challenge will be found with installation of hardware called Vaporsep. Vaporsep is a gas conditioning unit which filters higher end hydrocarbon content of gas or inert gas (as required) rendering the stream useful for usage as fuel gas in gas driven engines. Hence the opportunity for us is to replace diesel driven engines with gas engines and utilize the 29 MMscfd gas which we are flaring at facility end, annually. Not only that but the skid will allow us to save $1.5m annually along with a reduction in maintenance & lube oil cost. The project on a single location has a roughly estimated cost of $150, 000 and has a pay-back period of 9-12 months.

IGU Social Gas Award

Winner of the IGU Social Gas Award

Mohammad Rezaei, Mazandaran Gas Company in cooperation with Mazandran Construction Engineering Organization (Iran)
Freely Caulking the Houses of Natural Gas Consumers in Mazandaran Province – Iran

Mazandaran is a province in north of Iran and it has five cold months in year. 35 cities, 900 villages are gas piped with up to 700000 consuming residential unites [statistics 2008]. The most of houses have builded traditional. Rate of gas consumption for family section in 5 cold months reaches to 3300 m^3. Research has shown about 156 kcal/h of the energy lost from windows, doors and other house's cracks. But most of people don't pay attention to this important problem.

We experienced just laws and money can't make efficiency, but a freely insulation will be achieved as following:

- **Conservation resources**
- **Families well-being and economic development**
- **Reducing air pollution**

Finally efficiency must be a "ISM" between all of people and we are inevitable to make a new word in the world named "EFFICIENCISM" about energy .

This project is a votary of that and its results are:

1. Minimum rate of gas consumption saving in a year: 110 Million (m^3)
2. The money saving in year: 5 Million $
3. Electric energy could be saved for cooling houses in warm seasons of the year. (by powerhouse): 660,000 (Mw)
4. Reducing air pollution: 196,000 ton (CO_2)
5. Training and persuasion people especially children for conservation of natural gas resources for now and future.

APRUE – National Agency for the Promotion of the Rational Use of Energy (Algeria)
Replacement of existing furnace burners by new generation burners for the Chlef cement plant

Algeria has a wide range of industries, energy consumption in this sector is about 25% of the total consumption, which is spread over 6 main sub-sectors, as the cement plants, canneries, brick-making industry, chemical industry, fertilizer industry, and iron and steel industry.

The National Agency for the Promotion and Rationalization of energy use (APRUE) conducted a reconstruction of the structure of consumption per use, it shows that 77% of energy consumption of the national industry are in manufacturing processes (furnaces, dryers, etc.).

In the context of implementation of the first National Program for Energy Control, APRUE has specified the projects which receive financial support by the National Fund for Energy Control (FNME) in order to achieve energy efficiency projects in industry.

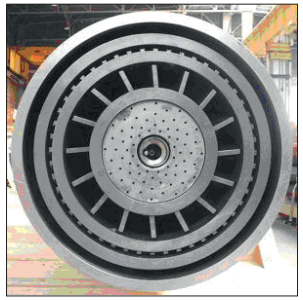
The company of cements and its derivatives of Chlef (ECDE) is among the seven (07) projects selected under the context of this program with an investment aid: Replacement of existing furnace burners by new generation burners.

The characteristics of the existing burner are:

- Type : natural gas combustion
- Maximum flow of the main burner (furnace): 16.000 Nm^3/h
- Natural gas pressure in use : 10 bars
- Nominal Pressure of auxiliary burner (preheating tour): 3500 Nm^3/h
- Maximum flow of the auxiliary burner: 4750 Nm^3/h
- The flame, main element of the furnace is at about 2000 °C.

The objectives marked by the acquisition of new generation burner are:

- Reduction of thermal consumption of the furnace (fuel economy by about three (03) million thermal unity per year);
- Extending the life of the furnace refractories;
- Preservation of the furnace mechanics ;
- Preservation of the clinker cooler mechanics;
- Decreasing the maximum pressure available of natural gas (4bars instead of 7bar);
- Trend to reduce greenhouse gas emissions and NOx gases;
- A better definition of the flame form.



New generation burners "ROTAFLAM NOZZLE"

The two furnaces of the Chlef cement plant

The Criteria of the new generation burners “Tuyere ROTAFLAM”:

- Optimisation of the flame hanging
- Positioning of coal circuit within the two air circuits
- Axial exceeding of the outer tube relative to the burner’s edge
- Air outlets in axial jets separated

Farhad Torabi, Kerman Science Park (Iran)

Encouraging Gas Efficient Behaviour

Till now different ways and methods have been studied and proposed for energy economization, which were not so successful. I believe the main reason that these methods were not so efficient is the approach which is regarded in these methods is not a logic and correct approach. That is, the approach of our statesmen has been a request approach in justifying the people to economize their energy consumption. Therefore our people think of it as a marginal phenomenon because they find economization of energy consumption as an economic phenomenon and therefore they do not pay attention to it as expected. In fact I want to say we should not try to find a suitable method in complex mathematical formulas. This is the point that many of our strategists have been confused and were not able to find appropriate methods to make people justified in this theme. By this proposal I introduce a new modern approach to energy economization and seriously I affect that this is a psychological approach which can be very efficient to justify the people to economize their energy consumption.

First of all we have to know what the phrase gas efficient means and then we ought to find why we should be gas efficient. The answer of the first question is to prefer natural gas to other energy commodities and secondly, to economize our consumption. The answer of the second question is to improve productivity of energy. Simply, gas efficient means: improving the productivity and efficiency of energy by natural gas and economizing the consumption. Observations show most of people do not do this and their consumption is essentially irregular. The question which comes to mind immediately is: why people are not gas efficient and the more important is that how can they be conscious of importance of the matter? In this article we will investigate these two questions and their answers and finally we will offer some ideas on this theme.

To answer these two questions, we should go deep into the matter. For the first question I think, four fundamental reasons can be expressed.

1. Majority of people do not have technical knowledge and therefore do not know the advantages of natural gas consumption to other energy commodities, such as electricity for example.

2. Many individuals have a wrong basic vision to energy and think of consumption as an expense-based phenomenon, i.e. they suppose since they incur the expenses, they are allowed to consume energy immethodically. Indeed these individuals have weak cultures and should be psychologically brainwashed. They ought to understand that economization of energy needs a belief-based approach and is necessary to be regarded even it is achieved free of charge.

3. Most people do not seriously believe in energy resources to be depletable. They are not conscious that these resources might come to an end some day. In fact these people do not recognize what rights they are making futile from their generations.

4. Common people do not know the complexities and difficulties of stages of natural gas treatment, such as extraction, refinement, and piping and related expenses. More important is that many people are not aware that how many engineers and workers lose their health and perhaps their lives in gas industry to create welfare for us.

From these four answers we find that we should create a new serious insight for people to energy. For this purpose, I suggest four feasible and achievable ideas as the answer of the second question. So I hope my opinions be effective in this context.

1. Most of people are impressed by special persons. Some worship popular sportsmen, some worship movies stars, some worship popular musicians, and …. In fact, this impression develops a special influence. For example, if on a T.V program, a very famous footballer talks about acting gas efficient, no doubt many of his followers will improve their energy behavior. Or assume a popular musician put a label about energy on his or her cassettes or CDs, many of his or her listeners will be impressed. Indeed instead of justifying common people to act gas efficient, the gas industry leaders had better to justify popular persons, in different fields, by disposing seminars and asking them for encouraging their followers on the theme. In addition, justifying popular persons, because of their high culture and logic is easier for us and on the other hand, justifying common people, because of their obedience culture, is easier for their thought leaders.

2. From the view of psychology, it has been proved that a matter which is learnt in childhood will never be forgotten. Therefore gas industry leaders had better to develop specific links with educational organizations and ask them for assigning subjects on energy and econo-mization in text books. In addition, they must provide scientific visits for students to gas treatment complexes. That is, the kids must become familiar with energy, its importance and economization from primary school.

3. The results of economization of energy must be expressed in a more understandable format for the people on TV programs and on publicity boards in public places. For example, the value of economization of energy in such and such a country in such and such a year has been equivalent to price of such and such a number of aircrafts. Stadiums are probably the best public places for this kind of propaganda.

4. Appropriate opportunities and conditions can be programmed for common people to have short term visits to energy, especially natural gas treatment complexes. This makes people to understand the depth of the story. How this way, people observe the problems, difficulties and complexities of energy treatment and do find a serous belief in energy as a blessing and will realize energy treatment is not as easy as they think. Many different tours such as religious or travelling ones are always programmed in whole of the world. Many people travel to other countries to see historical constructions. I think if the suitable circumstances are available the energy treatment complexes will not be less attractive than ancient buildings.

Nobuhisa Kobayashi, The Japan Gas Association (Japan)
National Family Cooking Contest

Amid calls to promote a food education campaign as a national movement to address the worsening eating habits, the With Gas Club (for which the Japan Gas Association acts as secretariat) launched the National Family Cooking Contest in 2007. The purpose of this contest, which is supported by gas utilities nationwide, is to nurture communication between parents and children by encouraging families to cook and eat together and deepening their enjoyment of cooking and interest in diet. The contest highlights how "cooking over a flame" fosters children's vitality and contributes to their mental and physical growth.

Contestants are recruited through activities in collaboration with local educational authorities, with many elementary schools adopting participation in the contest as a summer assignment for their pupils. A total of 4,134 families participated in the second contest held in FY2008, more than twice the number in the initial year. The contest includes judgment of practical skills. The preliminary rounds and practice sessions provide many opportunities for families to cook and eat together, promoting communication between parents and children and deepening recognition of the value of "cooking over a flame."

Toshihiko Yamada, Tokyo Gas Co., Ltd (Japan)
Educating the Next Generation through Social Activities

To convey the information that needs to be conveyed is not as easy as it is thought to be. Business organizations send out a considerable amount of information to stakeholders everyday. However, if the message is not actually accepted understood and put to use, it is meaningless to transmit the information blindly.

As a utility company, Tokyo Gas is committed to establishing infrastructure incorporating earthquake safety measures in order to ensure a safe and stable supply of city gas. In addition, every effort to convey the important safety messages to our customers is made. Introduced here are two examples that have had significant public relations success.

Using Candies to Make Customers Aware of the Safety Functions of Gas Meters
Realizing that conveying the information in the usual manner was insufficient, Tokyo Gas took an unusual method – the use of "Sakuma Drops", which are popular candies among all ages in Japan. Contained in appealing package which shows instructions for safe functioning of gas meters and recovery methods. These candies became a promotional tool to inform customers about the safety function built into the gas meters and used as an emergency food item if necessary. In addition, in case of disaster injured people can use the can the candies come in as a rattle or noisemaker to alert rescue personnel of their presence.

Conducting Disaster Prevention Events for Parents and Children in Cooperation with an NPO
In cooperation with the NPO Plus Arts, Tokyo Gas has been conducting events designed to entertain children while providing them and their parents the skills and knowledge they will need if an earthquake occurs. We devised many programs for children to learn while enjoying themselves – for example, participants divided into teams compete in bucket relays in which they join together with others to extinguish fires, or also in races in which they learn how to carry an injured person in a blanket, finally they might learn how to use a fire extinguisher while trying to hit a target. These events are held several times a year, and word-of-mouth effect has brought more and more people each time. Up to the present, about 20,000 people have participated.

Through the communication activities, Tokyo Gas will continue to actively and comprehensively respond to the demands of customers and society as a whole by addressing social issues through education, disaster prevention, community building and other initiatives, adding value in order to ensure increased use of natural gas. At the same time, Tokyo Gas will strive to increase the presence of the Tokyo Gas group companies in the field of energy.

Two Conducting Disaster Prevention Events for Parents and Children in Cooperation with an NPO

NGVRUS – Natural Gas Vehicles Association of Russia (Russia)
Blue Corridor Project – The use of natural gas as a motor fuel in international on-road traffic

The Blue Corridor Project (BCP) was initiated by the Non-Governmental Ecological Vernadsky Foundation (Russian Federation) in 2000, and supported by the Natural Gas Vehicles Association of Russia (NGVRUS). Its main objective is to establish European natural gas filling stations along the transport corridors for vehicles using gaseous fuels (natural gas and/or biomethane) in the international transportation of passengers and goods. The establishment of the infrastructure will provide an incentive to the transportation companies to switch from gasoline or diesel to environmentally cleaner and cheaper transportation fuel – compressed and liquefied natural gas (CNG and LNG). Biogas injected into the natural gas distribution network may also be compressed or liquefied at the filling stations and used for on-road vehicles.

In spring 2002 following the initiative of the Vernadsky Foundation and under the umbrella of the UN Economic Commission for Europe (UNECE) Gazprom, NGVRUS and the European Natural Gas Vehicle Association (ENGVA) have formed a special international Task Force representing experts from both gas and transport sectors. The Task Force had to assess the technical and economic viability of the Blue Corridor Project and modalities of its implementation.

In late 2003 the UNECE has printed out and distributed the Final Report of the Task Force on the Blue Corridor Project.

The basis of the report consists of the analysis of the economic and environmental effect of the project implementation along the three pilot transport corridors: Helsinki - St. Petersburg - Moscow; Moscow - Minsk - Warsaw - Berlin; Berlin - Prague - Rome. The analysis is fully positive.

The pilot motorway Moscow – Berlin is playing an important role in trade and humanitarian exchanges between Western and Eastern Europe and the potential environmental, social and economic effects of the Blue Corridor project look very impressive.

In September 2008 the NGV Association of Russia together with Gazprom and its affiliates organized a CNG motor caravan named “The Blue Corridor Saint-Petersburg – Moscow” which ran through such cities as Novgorod and Tver. Fourteen (14) heavy duty (both trucks and buses) together with light duty NGVs took part in the caravan.

The measurement and calculations made in the course of the event have basically confirmed the economic and environmental conclusions of the UNECE Task Force. In particular fuel cost savings for HDV totalled from 11 to 17 euro per 100 km, and for LDV form 3 to 6 euro per 100 km depending on the model and fuel consumption. For the spring 2009 a new NGV caravan from Rostov-on-Don to the Sochi city is being planned. Sochi has been chosen as the final destination of the caravan not accidentally: in 2014 this city will host the winter Olympic and Paralympic Games, and there is an important challenge to make the local transport environmentally cleaner.