Stork Thermeq Newsletter news ... techtalk ... interviews ... information ...

STORK® Thermatics

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Mr. Nutte Dijkstra, Mr. Kees Meijer

"Intensive technological research for improving GT performance"

## Increasing installed base for SwirlFlash®

Maximizing the power output from gas turbines (GTs) and reducing their NOx emissions are two major issues that power plant operators face in today's market. For older GTs in particular nitrogen oxide emissions are generally much too high for current licensing requirements. But also for new GTs the SwirlFlash® system has proved to be a competitive solution for cooling GT inlet air by evaporating water. The Product Managers Mr. Kees Meijer and Mr. Nutte Dijkstra explain results at customer plants using SwirlFlash® on different GT installations.

### Combined Heat and Power (CHP)

The first example is an industrial cogeneration plant in Germany with a GT10B. SwirlFlash® gave 10% power increase and 30% NOx reduction with over 2,800 operational hours and minimal injection water rate of 1.1% of the mass flow of air. Another example in CHP is a power plant in Europe operating a V94.2. This system is used for grid support, runs a limited number of hours (300 per year) and makes approximately 20 starts per year. The SwirlFlash® system realizes the power increase - 9% at 15°C - within 30 seconds and is therefore accepted as a spinning reserve.

### Refineries

A German refinery with steam injection NOx combustors shows a 10% power increase at a nominal 26.3 MW PG5371. Equally important, the amount of steam injected into the combustors is reduced by 40% to maintain constant NOx emission levels while preserving valuable process steam.

### Utilities

In the home market, an Essent power station installed SwirlFlash® on an older 30 MW GT9D. A power increase of 10.5% was realized - and

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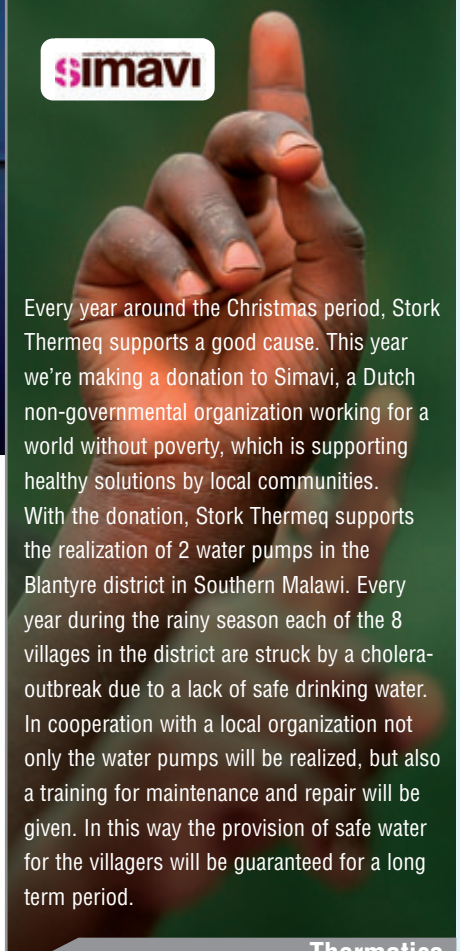
## Safe water for all!




Every year around the Christmas period, Stork Thermeq supports a good cause. This year we're making a donation to Simavi, a Dutch non-governmental organization working for a world without poverty, which is supporting healthy solutions by local communities.
With the donation, Stork Thermeq supports the realization of 2 water pumps in the Blantyre district in Southern Malawi. Every year during the rainy season each of the 8 villages in the district are struck by a cholera-outbreak due to a lack of safe drinking water. In cooperation with a local organization not only the water pumps will be realized, but also a training for maintenance and repair will be given. In this way the provision of safe water for the villagers will be guaranteed for a long term period.

### Thermatics

more than 41% reduction in NOx emissions at average conditions of 21°C (70°F) ambient temperature and 65% relative humidity.

**Ongoing research for nozzle development**
By using the test rig at Stork an extensive technical research programme has been implemented for lifetime analysis of nozzles. Today, after many thousands of hours of testing with more than 50 different nozzles in the test rig, Stork is able to supply nozzles with a guaranteed lifetime equal to one year GT operation. Further developments on lifetime improvement figures are proceeding. These research and customer cases are important for GT OEM-companies in order to improve their performance.

## World Solar Challenge


Foto: Sander Bocktin

**Twente One comes sixth in World Solar Challenge!**
The World Solar Challenge is behind us. The Twente One, sponsored by Stork Thermeq, finished sixth after the 3,010-kilometre drive through the Australian desert. True to tradition, the crew - together with the other five teams - were allowed to jump into the fountain in Adelaide's Victoria Square. The Netherlands was best represented in the race with two vehicles in the top ten. In fact, the race was won for the fourth time in succession by the Nuna4 of Delft Technical University. But we were all winners since this World Solar Challenge has once again provided us with a heap of innovative solutions. And that means profit for the entire world - and the reason that we at Stork Thermeq stood four-square behind the Twente One!

## History revival

In 1919 Stork established the Wilhelmina Fabriecksschool (Factory School) for boys aged 12 to 13 who had to go to work and learn a trade. After three years at the factory school the aspiring Stork employees were placed in an apprenticeship system as paid employees: two weeks workplace, one week at school. The apprentices visited every workplace according to a rotation system. They learned to deal with machines and materials in the model-making department, the fitters' shop, the foundry, the turning department, the pipe-bending shop and the plate steel and construction shop.

Work and study still go hand in hand, but at present things are a little different. At the moment three enthusiastic students are doing the rounds with us: Allan Peters (21), Ron Harmsen (20) and Mike Olthues (17). The three are following training as construction fitters at the Regional Educational centre and go there two half days per week. In addition to the 8 hours they spend at school, they do the remaining 32 hours in our workplace. At school they are taught theory (social sciences, maths and how to read technical drawings). They learn the practical side with us, and are given practical assignments at school that they have to elaborate with us. In this they are very happy with their practical teacher Gerrit Slaghuis, himself a product of the original Stork school. Some of the assignments so far completed include a compressed air motor, a fire grate and a bicycle luggage carrier.

The young men have been here since the summer holidays and are well pleased with their stay at Stork Thermeq. All three of them opted for the apprenticeship trajectory because they no longer wanted to spend so much time at school and this arrangement enabled them to earn a salary immediately. At present they no longer work with a rotation system but the young men are placed in a fixed department where they remain throughout their training.

## The EU on the way to lower emissions

**By 1st January 2008 all EU Member States have to conform to the Revised Large Combustion Plants (LCP) Directive. They have to approach the Emission Limit Values or take their standards from a National Plan. What effects will this measure have and what can we expect as regards emissions policy in the coming few years? The person who can tell us more about this is Mr. P. Brouwer, European Commissioner for the Environment. Jan Temmink, Marketing Manager for Conversion (Ombouw) at Stork Thermeq spoke with him.**

***Mr. Brouwer, how is EU policy on NOx emissions developing – and in particular where it involves the LCPD and/or the NECD (National Emission Ceilings Directive) as applied to solid, fluid and gaseous fuels?***
"NOx emissions from industrial sources have decreased during the last decades. For instance at EU level from about 6000 tonnes in 1990 to about 4000 tonnes in 2000. However, models and estimations have shown that further reductions are needed to meet the NEC 2010 objectives."

***How should Member States translate this at national level?***
"The NEC Directive provides an overall ceiling per Member State and per pollutant. It is then up to the Member State to decide which measures they have to take - for instance in the area of transport, industry and agriculture - to meet this ceiling. The LCP and IPPC (Integrated Pollution Prevention and Control) Directives are some of the tools that they can use. National measures might also be necessary in certain areas."

***Are there differences between countries as regards ELVs and concrete observance?***
"There are indeed significant differences between Member States since EU legislation allows for some flexibility - for instance the NERP in the case of LCP plants, local conditions in the case of IPPC installations - in the way permit conditions are set. The Commission has recently carried out several studies in the context of the revision of the legislation on industrial emissions and the studies are ongoing. These studies have confirmed the large differences of standards applied in the various Member States."

***How are the aspirant EU countries - like Turkey, for instance - going to interpret the NOx regulations? Possibly with extra investments?***
"When new countries join the EU, they have to implement the so-called "acquis" which means all EU legislation. In the case of the control of industrial emissions, the implementation of EU legislation usually leads to new investments in new Member States in order to comply with these standards."

***Does the BREF LCP continue to lead as far as licensing is concerned or will there be – for example – new BATs (Best Available techniques) in the shape of Ultra-Low NOx burners, which will make adjustments necessary?***
"The BREFs are subject to a review about every 8 years in order to ensure that they reflect new technological developments. This will also be the case for the LCP BREF adopted in 2005. The BREFs are developed by the Commission based on an extensive exchange of information with all stakeholders (Member States, industry, NGOs). Following on this consultation, the Commission formally adopts the BREFs."

## Cooperation Steinmüller Engineering for waste-to-energy

The activities of Stork Thermeq in waste-to-energy companies are basically focused on services, for instance shut downs for boiler inspections and maintenance. Customers also ask for specialized engineering and consultancy jobs in many fields: CFD, boiler calculations, techniques for emission reduction, etc..
For that reason we started in November 2007 a cooperation with Steinmüller Engineering in Gummersbach (Germany). They have a track record in complicated engineering and consultancy projects for waste-to-energy, especially grid design and flue gas treatment.

In 2008 we will start a "turn-key" approach for engineering and consultancy for waste-to-energy companies. Within Stork Thermeq Mr. Boelie Fokke is available for further details about this cooperation (T. + 31 (0) 6 53288645; E. boelie.fokke@stork.com).

## Order highlight 3rd & 4th quarter

- Ochatz, Germany: Three deaerators for Ma'aden project in Saudi Arabia.
- Aalborg Industries, Denmark: Deaerator for Parenco.
- Siemens, Germany: Deaerator for Electrabel, Belgium.
- Thermax Babcock and Wilcox, India: In line grid burners for EID Parry project.
- Doosan Heavy Industies, South-Korea: Engineering, manufacturing and supply of seven inline grid burner installations for the Jebel Ali M1 IWPP project in the U.A.E.
- Chevron Ltd, United Kingdom: Retrofit of cascade type to Stork type deaerator.
- Shell Eastern Petroleum, Singapore: Retrofit of waste heat boiler.
- Istro Energo, Slovak Republic: Deaerator for Wilton Teeside.
- Several deaerator licenses with end-users for locations all around the world like for China, Germany, Pakistan, etc.
- Electrabel Rodenhuize, Belgium: Retrofit Low NOx gas burners, boiler 2, 3 and 4.
- PDVSA Venezuala: supply of aircoolers.
- Waste incenerator Twence, the Netherlands: manufacturing and supply of membrane walls boiler 1.
- Curaçao Utilities: supply and replacement economizer, boiler B3101, B3102 and B3103.
- Electrabel Bergum, the Netherlands: Modification HD Bypass, BG20.
- Corus, the Netherlands: Engineering, manufacturing and replacement of ECO 1 and ECO2.
- Corus, the Netherlands: Manufacturing and supply of interconnection steam pipe.

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# Investigation of Turkey's future power market

Stork Thermeq is doing a market investigation of the Power sector in Turkey together with the University of Groningen (Netherlands). At the moment Max Verhoeven and Teun Brinkman from the University, together with Mr. Clarence Payet of Stork Thermeq, are exploring Turkey's future market. Turkey is a fast-growing economy and is preparing to join the European Union in the future. There are a lot of possibilities and chances for companies to do business in Turkey, especially with the current energy crisis and the excessive emission levels produced by power plants. The investigation will be a combination of desk research in the Netherlands and customer and government interviews in Turkey. Results are expected at the beginning of 2008.

# Order Highlight: A closer look

The Electrabel Rodenhuize power plant, with a total of 450 MW, had three units (2, 3 and 4, unit 1 is no longer operated) and burns furnace gas on units 2 and 3 and blast furnace gas, pulverized coal and biomass on unit 4. During the start-up, peak load or when compensating lack of blast furnace gas, heavy fuel oil is burnt. Due to emission problems and maintenance on heavy fuel oil installations, the heavy fuel oil will be replaced by natural gas.

In the current configuration, the pilot burners work on propane. Since natural gas will be available on the boilers, the pilot burners will be switched to natural gas to replace the further use of propane.

This technical specification covers the technical requirements for the design, supply and installation and commissioning of low NOx burners, retrofitting existing burners, retrofitting natural gas pilot burners and auxiliary equipment such as flame detection valves and instrumentation.

**Function boilers 2 and 3:**
The completely new burner (4 x 12.5 MWth or 2 x 25 MWth) to be placed on row 4 of the boilers of units 2 and 3 will be of the latest generation of low NOx burners and will be able to burn natural gas. These burners will be used for start-up, peak load and compensating blast furnace gas.
The existing blast furnace gas/heavy fuel oil burners on row 2 of unit 2 and 3 will be modified to burn natural gas (4 x 12,5 MWth in front) instead of heavy fuel oil for start-up, and will remain able to burn blast furnace gas.

**Function boiler 4:**
The existing burners on row 1 on unit 4 currently burn pulverized coal and will be modified to burn natural gas (2 x 4 x 12.5 MWth in boxer) for start-up while remaining able to burn coal in the conditions as specified.

The existing coal/heavy fuel oil burners on row 3 of unit 4 will be modified to burn natural gas (2 x 4 x 12.5 MWth in boxer) instead of heavy fuel oil for start while remaining able to burn pulverized coal in the conditions as specified.

All pilot burners (currently burning propane) will have to be able to start the corresponding main burner using natural gas only.