Doosan Lentjes

PRESS KIT 2019





Contents

- Section 1: About Doosan Lentjes
- Section 2: Doosan Lentjes at a glance
- Section 3: Steam and power generation at Doosan Lentjes
- Section 4: Press releases
- Section 5: Selected case studies
- Section 6: Steam and power generation in 360°
- Section 7: Quotes
- Section 8: Corporate Social Responsibility



Section 1: About Doosan Lentjes



1. About Doosan Lentjes

A global technology provider

Doosan Lentjes is a global provider of processes and technologies for steam and power generation from both sustainable and conventional fuels. The company's specific areas of expertise include circulating fluidised bed boilers, key technologies for the generation of steam and power from waste and sewage sludge, as well as, flue gas cleaning systems. Doosan Lentjes' technologies have been pioneering energy solutions for 90 years and convert millions of tons of waste into energy every year.

Doosan Lentjes is part of a powerful combination of companies united under the Doosan Group to deliver complementary technologies, skills and value to customers the world over.

Integrated solutions

Doosan Lentjes has a long history of project management experience. The company offers integrated customised solutions and expertise for the power generation industry from a single source. Solutions are synonymous with technological leadership and developed on the basis of a true understanding of individual customers and their business requirements.

Important dates

- 1928: Ferdinand Lentjes founds boiler manufacturing company
- 1982: Company designs, builds and commissions the world's first commercial CFB boiler
- 1984: Acquisition of Gottfried Bischoff GmbH, a specialist in flue gas cleaning technology
- 1989: Company enters the grate-based waste-to-energy market
- 2011: AE&E Lentjes GmbH became proud member of Doosan Group to form Doosan Lentjes GmbH
- 2016: Doosan Lentjes celebrated the 40th anniversary of its CFB combustion technology
- 2018: 90th company anniversary & re-entry into the market for the incineration of municipal sewage sludge



Part of the Doosan Group

As a member of the global Doosan Group, the steam and power generation technology specialist Doosan Lentjes provides the resources to deliver complete process solutions from one trusted source — making the company the one-stop partner for all energy generation requirements.

With Doosan's global network, Doosan Lentjes combines international market know-how with German state-of-the-art engineering — a winning combination for providing innovative solutions for customers the world over.

Doosan Lentjes benefits from the Group's international sourcing and manufacturing capabilities. High quality workshops under the full control of Doosan in Changwon/Korea, Chennai/India and Vina/Vietnam provide best practice procurement of goods and services while maintaining and ensuring compliance with laws, regulatory guidelines and internal control procedures. Procurement hubs in Beijing and Shanghai/China underline Doosan Lentjes' efforts for cost optimised solutions.



Top left and right: Changwon, Korea Bottom left: Vina, Vietnam; bottom right: Chennai, India



Section 2: Doosan Lentjes at a glance



2. Doosan Lentjes at a glance

Full company name and address

Doosan Lentjes GmbH

Daniel – Goldbach – Straße 19Tel.: +49 (0) 2102/ 166 – 040880 Ratingendl.info@doosan.comGermanywww.doosanlentjes.com

Board of management

Board of	Thomas Stetter, Chief Executive Officer
Management	Dirk Stokvis, Chief Financial Officer

Areas of activity

Doosan Lentjes is a specialist in the development of technologies for efficient and environmentally-friendly steam and power generation from both sustainable and conventional fuels.

Products

Circulating fluidised bed boilers Waste-to-energy technology Sewage sludge incineration technologies Air quality control systems

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Section 3: Steam and power generation at Doosan Lentjes



3. Steam and power generation at Doosan Lentjes

Our industry

The power generation sector is an essential service industry that uses a variety of technologies to produce electricity and or / heat for a range of municipal and industrial applications.

Driven by global population growth and industrialisation, the demand for energy continues to grow. However, governments and industry around the world now recognise that while this demand for energy must be met, power generation must be as clean as possible. As a result, new legislation is in force to limit emissions from thermal and conventional-fuel power stations. The aim is to reduce the emission of damaging elements, such as, sulphur dioxide, nitrogen oxides, and dust into the environment.

Our technologies

Doosan Lentjes is a specialist in the development of technologies for efficient and sustainable steam and power generation from both sustainable and conventional fuels. The product portfolio includes circulating fluidised bed (CFB) boilers, waste-to-energy (WtE) and sewage sludge incineration (SSI) technologies, as well as, air quality control systems (AQCS).

Waste-to-energy

Doosan Lentjes' waste-to-energy technologies help to efficiently generate steam and power from waste by simultaneously reducing the waste volume. With more than 75 units contracted around the world equivalent to a total throughput of millions of tons of waste which are converted into energy every year, Doosan Lentjes ensures a reliable power supply for municipalities.

Focusing on the specific requirements of waste-to-energy plants, Doosan Lentjes has developed a tailor-made flue gas cleaning system called Circoclean®, which is based on the company's proprietary circulating fluidised bed technology. By removing up to 99% of pollutants, the Circoclean® flue gas cleaning system ensures full compliance with all emissions directives.



Sewage sludge incineration technologies

Doosan Lentjes' proven sewage sludge technologies are developed to implement a safe incineration of municipal sewage sludge according to latest legal directives: Applying mono-incineration solutions allows phosphorus to be recovered from the incineration ashes in a separate process step. And reliable flue gas cleaning systems help to significantly exceed the requirements of the German 17th BImSchV or European IED regulations.

In Germany and beyond, Doosan Lentjes has built more than 10 incineration plants which all secure a reliable and legally-compliant disposal of municipal sewage sludge.

Circulating fluidised bed boilers

Doosan Lentjes' circulating fluisided bed (CFB) boiler has been designed to enable the combustion of a wide range of fuel types, including those with low calorific and low reactive values, or fuels with a low ash melting temperature. With more than 110 successfully installed units worldwide, the CFB design guarantees a high level of flexibility – essential for the combustion of low quality fuels.

In order to deliver on EU emissions directives, an integrated emissions control system removes sulphur dioxide from the process by adding limestone, while a low combustion temperature prevents the formation of thermal NO_x.

Doosan Lentjes' CFB boiler technologies contribute to efficient and environmentally-friendly power generation to satisfy the increasing energy demand associated with increasing global economic growth.

Air quality control systems

Doosan Lentjes' air quality control systems (AQCS) are designed to remove pollutants from flue gases after the combustion process. The systems developed work with a wide range of different fuel types.

Installed in more than 150 plants around the world, Doosan Lentjes' AQCS systems reliably remove sulphur dioxide, dust and other pollutants from the power plant's flue gases. They also enable plants to comply with the most stringent environmental emissions standards by providing a sulphur removal rate of more than 99%.



Section 4: Press releases



PRESS RELEASE

Flue gas desulphurisation project in Vietnam completed

09 July 2019, Ratingen, Germany

Doosan Lentjes is pleased to announce that the delivery and commissioning of two flue gas desulphurisation (FGD) units in Vietnam were completed. The FGD system deploying seawater FGD technology was installed at the 2 x 620 MWe coal-fired power plant Vinh Tan 1, located in Vietnam. Owner of the plant is Vinh Tan 1 Power Company Limited.

Doosan Lentjes' FGD technology was installed to reduce sulphur dioxide (SO2) from the power plant's flue gas which helps to decrease the ecological impact of the energy generation process. As verified during the performance tests, both units achieve SO2 removal efficiencies that are far below the governmentally required emissions directives.

René Neust, Director Project Management at Doosan Lentjes, comments: "The excellent absorption performance will help the plant owner to comply with, in future, even stricter environmental regulations and secure ongoing operation permissions of their boilers. Simultaneously, it will support the delivery of sustainably generated power to the residents of the Vinh Tan area — essential to keep tomorrow's world clean and safe."

Doosan Lentjes' scope of work included the engineering and delivery of key FGD equipment along with advisory services for erection and commissioning. Main contractor of the Vinh Tan 1 project was Guangdong Electric Power Design Institute Co., Ltd. (GEDI).

Doosan Lentjes is a specialist in the delivery of advanced air quality control systems, helping customers across the global utility, municipality and industrial sectors to achieve cleaner power generation.



PRESS RELEASE

Doosan Lentjes speaks about supercritical CFB boiler solutions at the POWER-GEN Africa

13 May 2019, Ratingen, Germany

During the POWER-GEN Africa, Doosan Lentjes will speak about supercritical CFB (circulating fluidised bed) boiler solutions designed for low grade local fuel types. The event will take place from 14 – 16 May in Cape Town, South Africa.

Supercritical CFB boilers help to increase the efficiency of steam and power generation units, whilst, at the same time, reducing their negative environmental impact.

By operating according to the proven CFB principle, the supercritical CFB units provide unchanged optimum conditions for the exchange between gas and solids, ensuring excellent ash burnout and heat transfer. This principle ensures maximum fuel flexibility and, thus, enables the efficient combustion of various fuel types, especially those with demanding combustion properties, such as, high ash contents. At the same time, it also makes applications for biomass co-firing possible, which further increase the environmental balance of the power generation process.

Compared to subcritical applications, supercritical units operate with enhanced temperature and pressure parameters, allowing the maximum performance potential of the steam generated to be utilized. This reduces the consumption of coal and, thus, the emissions, especially CO2.

Against the background of its positive characteristics for increasing the sustainability of steam and power generation, the World Bank has announced that it will finance only this type of investment. Subcritical targets will not be further considered.

In Cape Town, Doosan Lentjes will outline the certain design strategy for supercritical units, while, at the same time, addressing the impact of biomass cofiring on both boiler and equipment. Scheduled on 14 May, the speech will be part of the POWERGEN Africa Knowledge Hub

The PowerGen & DistribuTECH Africa is Africa's leading electricity event uniting industry professionals from across Africa and beyond.



Doosan Lentjes is a specialist in designing, supplying and commissioning flexible circulating fluidised bed (CFB) boiler solutions, helping customers around the globe to generate efficiently and environmentally-sound power from a wide range of fuel types.



PRESS RELEASE

Doosan Lentjes develops young future female talents

28 March 2019, Ratingen, Germany

On 28 March, the German energy technology provider Doosan Lentjes participated in a country-wide initiative called "Girls' Day". It is a day where young girls are inspired to focus on scientific, technical, engineering and maths (STEM) disciplines. Almost 10 girls were welcomed at the company's premises to discover the global plant engineering business.

The pupils aged between 14 and 16 experienced via "virtual reality" a walk through a waste-to-energy plant which enabled them to get a deeper understanding of the processes and technologies applied. During a physical visit to a pilot plant near the office, the young women were given a detailed 1:12 scale insight into the processes of a power plant. To get an idea of the practical work, in the afternoon, the girls visited the engineering departments including process, layout, mechanical, and electrical.

With its engagement in the Girls' Day, Doosan Lentjes aims at developing young female professionals of tomorrow which is a critical success factor in times of increasing lacks of skilled people.

In this context, Roland Muszkiewicz, Head of Quality, Health, Safety and Environment (QHSE) and Corporate Social Responsibility (CSR), says: "The competition for talented minds will become ever more intense in the future and women will play a key role in meeting the increasing demand for skilled people. To ensure that our business can grow sustainably, it is essential to motivate girls to start a career in STEM subjects. The Girls' Day offers a good platform to show young women that engineering is a versatile profession with high levels of responsibility, creativity and flexibility. With us, the girls had the chance to talk to and exchange with a number of women holding technological positions. In doing so, the pupils have learned that engineering disciplines are not an exclusive man's business, but provide suitable career opportunities for women."

Doosan Lentjes is pleased to secure its technological leadership within the industry with its talent promotion program. This helps to remain an innovative provider of safe and sustainable energy generation solutions covering future demands.



Section 5: Selected case studies



Waste-to-energy, Krakow, Poland



Award date: 2012 Main fuel: Municipal solid waste, bulky and similar pre-treated waste

Doosan Lentjes delivered key technology – including the grate and boiler – for efficient and sustainable waste incineration in Krakow, Poland. The new WtE plant meets the stringent EU Industrial Emissions Directives (IED).

Circulating fluidised bed boiler, Sodegaura, Japan



Award date: 2018 Main fuel: Biomass

Doosan Lentjes is currently providing key CFB boiler technology for the new 75 MWe biomass-fired power plant located in Sodegaura, Japan. The contract comprises engineering and procurement of the boiler island including the major boiler and flue gas cleaning equipment.

Flue gas desulphurisation, Pomorzany, Poland



Award date: 2016 Main fuel: Coal

Currently, Doosan Lentjes together with its Polish consortium partner Polimex Energetyka is delivering a turnkey flue gas desulphurisation (FGD) project at a 2 x 156 MWth power plant in Szczecin, Poland. The contract comprises the retrofit of the two existing coal-fired boilers with semi-dry Circoclean® facilities along with dry ash separation plants.



Section 6: Steam and power generation in 360°



Steam and power generation in 360°

Visit our homepage, <u>www.doosanlentjes.com</u>, open the Virtual Doosan World and take a journey through our reference plants around the world.

If you have a Google Cardboard available, open the Virtual Doosan World, click on the goggle icon, change your smartphone settings to horizontal mode, place the phone face upwards on the cardboard flap and close the lid. If you do not have a Cardboard, contact us to get your personal one.









Section 7: Quotes



Gerhard Lohe, Product Director Waste-to-Energy



What prospective business opportunities have you discovered on the markets [...] in the South Eastern Europe (SEE) region?

"Doosan Lentjes faces promising WtE business opportunities in SEE [...]. The stringent European waste disposal and emissions directives require [these countries] [..] to set up a sustainable waste management infrastructure – a valuable opportunity for Doosan Lentjes to provide reliable and environmentallysound process solutions enabling [..] [local] customers convert residual waste into energy while complying with all applicable European standards"

Source: Energy Review Magazine, Issue 2/2016

Helmut Moshammer, Sales Director



What opportunities do you see for Doosan Lentjes?

"I see many opportunities. All three of our product lines follow different market strengths. If we have only a few live projects on one line, the others are at a different point in the market cycle, so there is an even spread to the contracts we are managing. But we have a huge advantage in being a one-stop shop, so we can offer a wide range of solutions, from individual systems up to a complete plant."

Source: Spark Magazine, Issue 2, 2014 (published by Doosan Power Systems)



Section 8: CSR at Doosan Lentjes



Corporate Social Responsibility (CSR)

Doosan Lentjes believes that a robust Corporate Social Responsibility (CSR) programme is not only our corporate duty, but is also critical to developing a sustainable business. The company is committed to making a positive contribution to the community, to the environment and to the wellbeing of its workforce.

CSR activities are built on three key pillars: Education, Sustainability and Community.

Education embraces a commitment to people development and to the promotion of science, technology, engineering and mathematics (STEM) subjects amongst young people. This helps to inspire people to pursue professions in engineering, helping us provide the energy solutions of tomorrow.

Sustainability efforts focus on minimising the environmental impact of the company's operations and prioritising product quality, health and safety. This is essential to the provision of a cleaner and greener environment for generations to come.

Doosan Lentjes' commitment to the local community aims to provide benefits to people in need, helping to create a better environment and quality of life for them.



