Doosan Lentjes

PRESS KIT 2020





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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 key technologies for the generation of steam and power from waste and sewage sludge, as well as, circulating fluidised bed boilers and flue gas cleaning systems. Doosan Lentjes' technologies have been pioneering energy solutions for more than 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

Waste-to-energy technology Sewage sludge incineration technologies Circulating fluidised bed boilers 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

Doosan Heavy Industries & Construction and Doosan Lentjes to deliver their first joint waste-to-energy project in Poland

13 October 2020

Doosan Heavy Industries & Construction (DHIC) and its subsidiary and consortium partner Doosan Lentjes have been awarded the turnkey contract to supply a new waste-to-energy (WtE) plant in Olsztyn, Poland. It is the first joint WtE project between the Korean EPC company and its German engineering technology subsidiary. The new plant will be based on Doosan Lentjes' proven water-cooled counter-reciprocating grate and boiler as well as flue gas cleaning technology.

Contracted by the plant owner and operator, Dobra Energia dla Olsztyna, the consortium will deliver the entire one-line plant including combustion grate, boiler and dry Circoclean flue gas cleaning, and Selective Catalytic Reduction (SCR). Furthermore, civil works and two gas-fired peak load boilers (PLB) along with site management will be part of the supply.

Commenting on the project, Gerhard Lohe, Product Director Waste-to-Energy at Doosan Lentjes, says: "This project is the first waste-to-energy plant that DHIC and Doosan Lentjes are executing together. It proves that international EPC experience in large-scale plant construction projects as well as a rich heritage and competence in modern WtE technology is a strong combination of capabilities that meets the demands of the industry. Customers can therefore expect an interface-optimized delivery of the project from one source. Our two companies can look back on many years of experience in the execution of large, but also smaller power plant projects all over the world. The joint entry into the global WtE market now represents the next step in the exploitation of synergy effects within the Group."

Co-funded by the EU, the plant will meet all European requirements with regard to recycling and disposal, while, at the same time, complying with the emission limits according to the new BREF documents (Best Available Techniques Reference).

The new plant, scheduled to be completed in 2023, will be capable of processing up to 110,000 tons of refused derived fuel (RDF) produced by the citizens of the greater Olsztyn area. Covering roughly 30% of the district heating demand in the region, the new plant will help to compensate for the heat loss that will accompany the closure of the local coal-fired Michelin power plant in the near



future. This will ensure a continuously reliable and secure supply of district heating to the local citizens. At the same time, using the energy contained in the waste offers a sustainable alternative to fossil fuels. In addition, the thermal treatment of the waste makes it possible to reduce the landfill space required.

Commenting on the project, Mariusz Marciniak, Director for Central and Eastern Europe, says: "The new plant in Olsztyn will be a milestone in improving the waste management infrastructure in Poland. It is the eighth plant of this type to be built in the country and it is crucial for achieving the objectives of the EU waste hierarchy. This hierarchy gives priority to energy recovery from waste over simple landfill and, thus, requires the energy potential of solid waste to be harnessed. One of the eight plants, the one in Krakow, was built with the involvement of Doosan Lentjes as technology provider for both grate and boiler. The plant benefits from the technological experience of Doosan Lentjes and reliably converts municipal waste from the Krakow region into energy since 2013. Doosan Lentjes will apply the experience gained in Krakow to the second project recently won on the Polish market to the benefit of the customer and final client, the local energy provider, MPEC Olsztyn."

Doosan Heavy Industries & Construction is a leading EPC contractor offering a wide range of services ranging from the manufacturing of castings and forgings, power generation systems to the construction of power plants.

Doosan Lentjes is a specialist in the delivery of proven and reliable waste-toenergy technology, converting millions of tonnes of waste into valuable energy every year. This helps customers all over the world reduce their waste volumes and simultaneously provide a sustainable energy source.



PRESS RELEASE

Doosan Lentjes is to deliver lot 1 of the new wood-fired combined heat and power plant in Dinslaken

12 October 2020

Doosan Lentjes was awarded the contract by DHE (Dinslakener Holz-Energiezentrum) to build the lot 1 of the new wood combustion plant, located in Dinslaken. The order comprises the turnkey delivery, installation and commissioning of two incineration lines on a chute-to-stack basis. Start-up is expected to be in mid of 2023.

Once in operation, the new plant will thermally treat about 200,000 tons of waste wood (class I-III) per year. Applying effective incineration technology will ensure that the maximum of the climate-friendly energy contained in the wood is harnessed to generate sustainable electricity and heat. This will reduce the share of fossil fuels required to meet local energy needs and save more than 125,000 tons of CO2 per year, helping the City of Dinslaken to pursue its strict decarbonisation policy.

Doosan Lentjes' scope of delivery will include the fuel supply and transports as well as the combustion and boiler plant based on water-cooled reciprocating grate technology. In addition, the company will provide a complete dry flue gas cleaning system, stack as well as electrical & control systems.

The modern air quality control facility will ensure compliance with emission limit values according to the revised European BREF (best available techniques reference) documents. Harmful acid gases, hydrocarbons and heavy metals will be treated and separated in the Circoclean® gas cleaning system to be installed, while the selective catalytic reduction (SCR) will remove nitrogen oxides.

Gerhard Lohe, Product Director Waste-to-Energy at Doosan Lentjes comments: "In Dinslaken, we are ready to prove the flexibility of both our incineration and flue gas cleaning processes. Originally used in traditional waste-to-energy applications, we will adapt our grate technology to the combustion properties of biomass fuels and thus ensure efficient use of their energetic potential. Furthermore, the plant will be the first of its kind to comply with the new BREF requirements. This means that it will not only burn an almost CO2-neutral fuel, but will also produce negligible emissions. This reflects our efforts to support the industry in shaping the energy transition and make tomorrow's heat and power generation more sustainable."



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PRESS RELEASE

Doosan Lentjes is to supply another fabric filter to the Czech Republic

18 June 2020

Doosan Lentjes is pleased to announce that it has signed a contract to supply a fabric filter for the power station in Chvaletice, Czech Republic. It is the second contract for the supply of filters for this plant that Doosan Lentjes has received from the owner, Sev.en Energy, who will act as the main contractor for the new project.

The current order includes the retrofit of boiler 2 of the 4x205 MWe power plant with a new low-pressure pulse-jet bag house filter.

Doosan Lentjes' scope of work in the project will include the engineering, the delivery of key filter internals and the fly ash transport system. Completion is expected in the second half of 2021. An extended scope including plate work for filter, bypass heating system and a complete flue gas duct system is currently under discussion and will be awarded separately.

The new filter systems will remove solid particles from the flue gases and ensure full compliance with the relevant emissions legislation. The plant will thus help to reduce drastically the effects of dust emissions on human health. In addition, the retrofit measures will enable a more efficient fly ash transport, which will reduce the operation costs of the conveyors.

"The so far fruitful cooperation with Sev.en Energy is reflected in the second order we have now received from them in the last 12 months", says Daniel Borke, Product Manager AQCS (Air Quality Control Systems) at Doosan Lentjes. "With this current project, we have further demonstrated our capabilities as a reliable and experienced partner for filter technology and further strengthened our position as a competent partner for large power plant projects in Eastern Europe."

Frank Oberheid, Product Director AQCS at Doosan Lentjes, adds: "Decisive for our performance in Eastern Europe is our cooperation with our colleagues at Doosan Lentjes Czech. This not only strengthens our local presence, but also enables us to generate cost advantages that allow us to realize projects of this kind in an economically attractive framework."



In August last year, Doosan Lentjes had received the order to equip the boilers 3&4 of the Chvaletice power plant with fabric filters. The project is currently under execution and expected to be completed and handed over to Sev.en Energy at the end of this year.

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



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.



