Doosan Lentjes

PRESS KIT 2021

Contents

Section 1:

About Doosan Lentjes

1. About Doosan Lentjes

A global environmental technology provider

Doosan Lentjes provides proprietary environmental technologies for thermal waste treatment and energy generation. Our areas of expertise include the incineration of renewable fuels such as waste, sewage sludge and biomass, heat recovery systems and flue gas cleaning equipment. We deliver flexible solutions for long-term waste disposal safety and climate-friendly steam and power generation.

As a member of the global Doosan Group, Doosan Lentjes is part of a strong international network of companies providing 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 waste management and energy 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 (circulating fluidised bed) boiler
1984: Acquisition of Gottfried Bischoff GmbH – a specialist in flue gas cleaning (FGC) technology
1989: Company enters the grate-based waste-to-energy (WtE) 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
2020/2021: Doosan Lentjes expands its market leadership in thermal waste treatment in Poland with further orders in Olsztyn and Warsaw

Part of the Doosan Group

As a member of the global Doosan Group, the environmental technology specialist Doosan Lentjes provides the resources to deliver complete process solutions from one trusted source.

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
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40880 Ratingen
Germany

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dl.info@doosan.com
www.doosanlentjes.com

Board of management

Board of Management	Thomas Stetter, Chief Executive Officer *(CEO)* Dirk Stokvis, Chief Financial Officer *(CFO)*

Areas of activity

Doosan Lentjes provides proprietary environmental technologies for thermal waste treatment and energy generation.

Products

Waste-to-energy (WtE) technologies

Sewage sludge incineration (SSI) technologies

Circulating fluidised bed (CFB) boilers

Air quality control systems (AQCS)

Media contact

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Section 3:

Environmental technologies and Doosan Lentjes

3. Environmental technologies and Doosan Lentjes

Our industry

The environmental technology industry is a key sector when it comes to reducing people's ecological footprint and creating a green future for generations to come.

Driven by climate change and global population growth, the demand for environmentally friendly waste disposal and energy generation is increasing. While waste can no longer simply be dumped in landfills, but must be given appropriate treatment that conserves resources, power generation must be as clean as possible. The goal here is to support the ideas of a circular economy and implement the global energy transition.

Our technologies

Doosan Lentjes is a specialist in the development of environmental technologies for thermal waste treatment and energy generation. The company's product portfolio includes waste-to-energy (WtE), sewage sludge incineration (SSI) technologies, circulating fluidised bed (CFB) boilers and air quality control systems (AQCS).

Waste-to-energy

Doosan Lentjes' waste-to-energy (WtE) technologies help to efficiently treat non-recyclable waste in a safe and environmentally friendly way. Doosan Lentjes has been commissioned to supply more than 80 lines worldwide that reduce the volume of waste and harness the energy contained in the fuel. Furthermore, residues from the incineration process can be fed into recycling processes to recover valuable materials such as metals and minerals.

Different flue gas cleaning (FGC) processes are available to comply with the requirements of the 13th, 17th or 44th BImSchV or the revised European BREF *(Best Available Techniques Reference)* documents.

Sewage sludge incineration technologies

Doosan Lentjes' proven sewage sludge incineration (SSI) technologies have been developed to realise safe treatment of municipal sewage sludge according to the latest legal guidelines: The use of mono-combustion solutions enables the recovery of valuable phosphorus from the incineration ash in a separate process step. And reliable flue gas cleaning systems help to comply with the requirements of the German 17th BImSchV or the European BREF regulations.

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

Circulating fluidised bed boilers

Doosan Lentjes circulating fluidised bed (CFB) boilers offer maximum flexibility in the combustion of renewable or alternative fuels whose combustion characteristics are often difficult. No matter how low the calorific value, reactivity value or ash melting temperatures may be, CFB boilers ensure efficient use of the fuels for steam and power generation.

To meet strict emission regulations, an integrated emission 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 meet energy needs in line with climatic aspects.

Air quality control systems

Doosan Lentjes offers advanced flue gas cleaning (FGC) technologies for waste and sewage sludge incineration plants, power stations and industrial plants. The (multi-stage) solutions include the (semi-)dry Circoclean® and dry direct injection FER-DI® processes, wet scrubbers, SNCR/SCR denitrification technologies and filters.

By means of these methods, acid gases, hydrocarbons, heavy metals, dust as well as nitrogen oxides are removed from the flue gases. The strict emission regulations according to the revised BREFs are complied with.

In more than 150 plants that Doosan Lentjes has supplied worldwide, emissions are reliably reduced to the applicable local guidelines.

Section 4:

Press releases

PRESS RELEASE

Collaborating in new ways

ARIKON and Doosan Lentjes manage projects with Newforma

13 December 2021

The construction group ARIKON AG and Doosan Lentjes, a global provider of proprietary environmental technologies for thermal waste treatment and energy generation, are breaking new ground together in terms of digital collaboration. The current joint construction project, a thermal waste treatment plant in Wiesbaden, is being centrally managed in the planning and execution phase with the project information management (PIM) software solution "Newforma Project Center".

"In view of the growing amount of data in construction projects, efficient project information management is essential in order to increase economic efficiency and sustainability in construction", explains Ingo Habig, Managing Director of ARIKON Hoch- und Ingenieurbau GmbH HIB.

In terms of collaboration with external partners, additionally implemented IT infrastructures mean more data silos which represent major hurdles. What is needed are intelligent filesharing solutions that offer high usability due to easy handling for internal users and external project partners.

Newforma Project Center uses existing infrastructures

ARIKON AG and Doosan Lentjes chose the Newforma software solution for the planning of the Wiesbaden waste-to-energy (WtE) plant. It supports working in their existing IT infrastructures, provides effective integration of external partners and has a rapid implementation. Unlike cloud-based systems, the Newforma software can be operated on-premises in ARIKON AG's IT infrastructure, so no new data silos are created. The construction file data can simply be synchronised back to the project based on their Microsoft file server structure without migration.

But it is not only under the aspect of compliance that the software solution from Newforma is the best choice for the ARIKON - Doosan Lentjes cooperation. *"The project information system is particularly user-friendly,"* says Falk Huneke, CDO of the ARIKON Group. *"All major file formats are supported and the software also offers extended integration capabilities (Microsoft Teams, SharePoint, Revit, AutoCAD) and – particularly important for complex construction projects - the possibility of email integration in the form of plug-ins with optional automatic filing*

of project emails. By avoiding data redundancies, we expect an overall improvement in communication between all those involved in the project."

Problem-free implementation in day-to-day operations

"The internal support effort during the implementation phase was minimal from our side and did not affect our day-to-day business. Newforma Project Center runs smoothly and with low maintenance in everyday operations. The proof of concept was completed as planned at the beginning of October 2021 and the platform was transferred to productive operation", says Sebastian Hoffmann, CIO of the ARIKON Group.

Michal Korte, Managing Director of ARIKON Digitale Baukunst GmbH, adds: *"With the introduction of the Newforma Info Exchange platform, we were already able to offer external partners, such as specialist planners, an easy way to exchange extensive planning data with us via the web portal during the proof of concept in the planning phase of the project. The central consolidation in Newforma Project Center offers transparent traceability of all information flows. This saves valuable time in the coordination and planning process."*

Secure exchange of large amounts of data

Michael Oberländer, Engineering Manager at Doosan Lentjes GmbH, is also enthusiastic about the system's possibilities: *"We are very pleased to be breaking new ground in cooperation with ARIKON in the field of project information management. Newforma Project Center enables us to easily and securely exchange large amounts of data, such as those generated by 3D modelling of the entire plant. The software also allows us to share structured project information. Messages are automatically indexed via the e-mail management feature, and required information is available in seconds via the exceptional keyword search. We access the project platform via the web portal which is intuitive and easy to use. This usability increases the project participants' acceptance of the tool."*

Once completed, the MHKW planned for Wiesbaden will thermally treat around 240,000 tonnes of municipal and commercial waste from the greater Wiesbaden area annually. The energy contained in the waste, which is largely of biogenic origin, will be used for the environmentally friendly generation of electricity and district heating.

PRESS RELEASE

Doosan Lentjes and Arikon to supply the Wiesbaden waste-to-energy plant

27 September 2021

Doosan Lentjes and ARIKON have been awarded the contract in a consortium for the turnkey delivery of the new waste-to-energy (WtE) plant in Wiesbaden, Germany. Doosan Lentjes, a specialist in environmental technology, will be responsible as general contractor for the turnkey planning, delivery, assembly, and commissioning of the entire plant. ARIKON Hoch- und Ingenieurbau GmbH, meanwhile, will be responsible for the civil works. The commissioning of the new plant is expected to start early 2024.

The new power plant will comprise one process line, including grate, boiler, and dry flue gas cleaning as well as water-steam cycle. The owner and operator will be MHKW Wiesbaden GmbH. After completion, the facility will thermally treat about 200,000 tonnes of municipal and commercial waste from the greater Wiesbaden area per year.

"We are pleased to be able to support our client in establishing safe and future-proof disposal capacities," says Gerhard Lohe, Director of Thermal Waste Treatment at Doosan Lentjes. *"MHKW Wiesbaden GmbH benefits from our proven technologies, which enable reliable plant operation with high availability. At the same time, the processes can be flexibly adapted to changing fuel properties. Thus, even possible changes in the composition of the waste will not prevent the plant from reliably operating over its lifetime."*

"Together with Doosan Lentjes, we are building one of the most modern plants in Europe on behalf of MHKW Wiesbaden GmbH. As ARIKON Hoch- und Ingenieurbau GmbH with its focus on industrial construction, the project is a great opportunity to bundle our competences together with Doosan Lentjes and to contribute to the establishment of modern environmental technologies in the field of energy generation," continues Ingo Habig, Managing Director of ARIKON Hoch- und Ingenieurbau GmbH.

In the overall technological process, the plant technology applied will produce electricity and district heating from the energy contained in the waste. The use of this energy, which is largely of biogenic origin, represents a sustainable alternative to burning fossil fuels. Thus, the MHKW will make an important contribution to saving climate-damaging CO_2 emissions.

Wiesbaden will be the first project of this kind that Doosan Lentjes and ARIKON deliver together. The two companies have a long history of working together on various power plant projects outside the field of waste incineration. The results showed that customers can trust that they will receive a reliable solution tailored to their individual needs with an optimal cost-benefit ratio.

Doosan Lentjes is a specialist in thermal waste utilisation and supplies proprietary technologies along the entire value chain.

PRESS RELEASE

Doosan Lentjes is to deliver technology for the new waste-to-energy plant in Warsaw

11 May 2021

Doosan Lentjes is pleased to announce that it was selected to supply key grate and boiler technology for the new waste-to-energy facility in Warsaw, Poland. The contract includes the engineering, procurement, and delivery of the equipment as well as advisory services for construction, commissioning, and acceptance test.

As a key subcontractor to POSCO Engineering & Construction Co, Ltd of South Korea, Doosan Lentjes will deliver a complete boiler island including SNCR (selective non-catalytic reduction) to the new Warsaw facility. Doosan Lentjes will apply its proven air-cooled reciprocating grate and a horizontal-type steam generator.

The new plant will consist of two lines that nominally process a total of 265,200 tonnes of municipal solid waste per year and will make a decisive contribution to improving the local disposal infrastructure.

“This latest success is further proof that Doosan Lentjes' technology is in demand on the Polish market”, says Rafal Psik, Director at Doosan's Katowice office. *“The construction of the incineration plant in Olsztyn was also awarded to a consortium of Doosan Lentjes and parent company Doosan Heavy Industries & Construction last year. With POSCO Engineering & Construction, we already successfully built the Krakow plant about eight years ago, which has been reliably thermally treating the residual waste of more than 750.000 local citizens ever since. Doosan Lentjes will use this extensive experience gained in previous projects for the benefit of the final customer, the Warsaw waste handling company MPO.”*

After completion, expected in 2024, approximately 1/3 of the installed combustion capacity in Poland will be secured with Doosan Lentjes technology. The plants will support Polish efforts to comply with EU requirements for sustainable waste management. According to the European waste hierarchy, thermal recovery is given priority over simple landfilling. Feeding non-recyclable waste into the incineration process allows a reduction of the required landfill capacities and at the same time harnesses the energetic potential of the waste. In addition, valuable materials can be recovered from the incineration ash, which can be

used for, e.g., road construction. When completed, the new waste incineration plant in the Polish capital will be the largest of its kind in the country.

Doosan Lentjes is a specialist in the delivery of proven and reliable waste-to-energy 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.

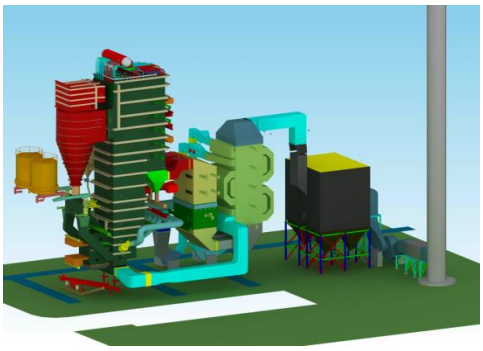
Section 5:
Selected case studies

Waste-to-energy, Olsztyn, Poland

Award date: 2020
Main fuel: Refuse derived fuel (RDF)

Doosan Lentjes, in consortium with Doosan Heavy Industries &Construction, will supply the new WtE plant in Olsztyn, Poland, on a turnkey basis. The new facility will apply Doosan Lentjes' proven water-cooled reciprocating grate, boiler, and flue gas cleaning technology. Compliance with all BREF emission limits will be secured.

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 MW_e 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 cleaning, Dinslaken, Germany

Award date: 2020
Main fuel: Waste wood (class I-III)

Doosan Lentjes was commissioned in 2020 to supply the complete flue gas cleaning system for the new waste wood incineration plant in Dinslaken. Upon completion, the customer will benefit from a reliable flue gas cleaning solution that ensures compliance with emission limits in accordance with the revised European BREF documents.

Section 6:

Environmental technologies in 360°

Environmental technologies in 360°

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

Section 7:

Corporate Social Responsibility (CSR)

Corporate Social Responsibility (CSR)

Doosan Lentjes takes corporate social responsibility (CSR) very seriously: We aspire to create a world driven by mutual respect. In this world, people live and do business in harmony with the environment and nature.

To this end, our CSR strategy is based on three key pillars that have been developed in line with these goals: People, sustainability, and charity.

People are at the heart of everything we do. Our efforts are focused on all the people we influence through our corporate existence. The aim is to create an environment that promotes motivation and creativity and gives top priority to physical and mental well-being.

The second pillar focuses on sustainability. Here, we not only implement individual measures to improve our environmental performance, but also understand sustainability as the basis of our business model and activities. Along our entire value chain, we prioritize the highest environmental standards and the reduction of our carbon footprint.

Charity forms the third pillar on which our CSR activities are built. With this element in our social responsibility strategy, we follow our conviction that it is our corporate duty to make a positive difference for others. In doing so, we do not limit ourselves to our community but help where help is urgently needed. Here, too, we do not implement measures from the top down but do so together with our employees.