

Doosan Lentjes

# Sustainable energy solutions for tomorrow





# Your partner for clean energy generation

Doosan Lentjes is a leading German engineering specialist providing products and services for efficient and sustainable energy generation



## Advanced technologies for eco-friendly power

Doosan Lentjes' advanced technologies covering circulating fluidised bed boilers, waste-to-energy and air quality control systems help customers around the world to efficiently generate eco-friendly power from both renewable and fossil fuels.



## One-stop partner

As a member of the global Doosan group, we have the resources to deliver complete process solutions from one trusted source, making us the one-stop partner of choice for all your energy generation requirements. Drawing on Doosan's global network, we combine international market know-how with proven German state-of-the-art engineering – a winning combination with the experience and capacity to make your project a resounding success.



## Global references

Our wide range of global references reflects our rich heritage in developing advanced technologies and state-of-the-art products and services that are perfectly adapted to our customers' individual needs.

## Our history

Ferdinand Lentjes founds boiler manufacturing company

1928

Company designs, builds and commissions the world's first commercial CFB boiler

1982

Acquisition of Gottfried Bischoff GmbH – a specialist in flue gas cleaning technology

1984

Company acquires intellectual property from Kablitz GmbH, a specialist in grate firing technology

1989

The Doosan Group acquires the company – renamed to Doosan Lentjes

2011

## Our global energy expertise network

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.

### DOOSAN LENTJES

More than  
**80**  
years

expertise in delivering  
next-generation thermal power  
and environmental technologies

A trusted energy partner  
for engineering  
innovation and cleaner,  
greener energy

In 1981

Designed and built the world's first CFB boiler with a fluidised bed heat exchanger



#### Our capabilities:

**Circulating fluidised bed (CFB) boiler technology**  
More than 110 installed units worldwide with capacities up to 350 MW<sub>e</sub> in a single unit, totalling approximately 22 GW<sub>th</sub>.  
Applicable for a wide range of fuels ensuring highly efficient carbon burn out of 98-99% and low SO<sub>2</sub> and NO<sub>x</sub> emissions.

**Waste-to-energy (WtE) technology**  
Leading innovations to help reduce waste volumes by more than 90% and reduce reliance on fossil fuels.  
77 units in 45 plants contracted around the world converting millions of tonnes of waste into energy every year.  
Using advanced and dependable technologies, such as, grate combustion to maximise energy recovery from waste for commercial and domestic power use.

**Air quality control systems**  
Desulphurisation technologies successfully installed in more than 150 worldwide locations.  
SO<sub>2</sub> reduction efficiencies of up to 99% achieved with minimum space requirements.  
Offering simple, low maintenance air quality control to suit environmental requirements and economic constraints.

### POWERFUL COMPANIES

**Doosan Babcock**  
A pioneering technology and service provider in thermal power, nuclear, oil and gas, petrochemical and process sectors.

**Doosan Lentjes**  
A global power in CFB combustion, waste-to-energy and air quality control systems technology.

**Doosan Škoda Power**  
A world leader in turbine technology and manufacture.

Combined

**€845 MILLION**

turnover  
in 2016

and  
**4500**  
employees

### UNITED CULTURE

We have 1 consistent global working culture – the Doosan Way – based on our 2G strategy of growing business through growing people and our 6 point Credo:

CULTIVATING  
PEOPLE

INHWA  
(TEAMWORK  
PHILOSOPHY)

LIMITLESS  
ASPIRATION

OPEN  
COMMUNICATION

TENACITY &  
DRIVE

PRIORITIZATION  
& FOCUS

### ENERGY PORTFOLIO

- BOILERS
- TURBINES
- WASTE TO ENERGY
- AIR QUALITY CONTROL SYSTEMS
- ASSET MANAGEMENT AND THROUGH-LIFE SUPPORT
- NUCLEAR

**1<sup>st</sup>**

### WORLD FIRSTS

- 1932 Fusion welded steam drum
- 1956 Steam-raising plant for world's first commercial nuclear power station
- 1957 HRSG/Waste heat boiler
- 1960 Platen superheater
- 1982 Commercial CFB boiler
- 1989 Cooled cyclone CFB boiler
- 2002 Low mass flux positive flow once through boiler
- 2003 Largest operating downshot boiler for anthracite
- 2007 Low mass flux positive flow downshot supercritical boiler

### WORLDWIDE REFERENCES

- Subcritical boilers 140,403 MW<sub>e</sub>
- Supercritical boilers 85,441 MW<sub>e</sub>
- Subcritical turbines 92,575 MW<sub>e</sub>
- Supercritical turbines 21,703 MW<sub>e</sub>
- Circulating fluidised beds (CFB) 22 GW<sub>th</sub> + approx. 2 GW<sub>e</sub>
- Waste to energy plants 9,299,200 t/a
- Wet flue gas desulphurisation (FGD) 83 GW<sub>e</sub>
- Seawater FGD 8 GW<sub>e</sub>
- Circoclean® FGD 13 GW<sub>e</sub>

### We have seven key operational bases in

the UK, the Czech Republic, Germany, Poland, the US and South Korea.

Further plants, projects and references in more than 30 countries across the Americas, Europe, Africa, the Middle East and Asia.

### GLOBAL PRESENCE WITH A LOCAL TOUCH



### PARENT ORGANISATION

We are part of Doosan Heavy Industries & Construction (DHIC).

DHIC focuses on: Casting and Forging. Power and Environmental Plants. Water Desalination, Water/ Waste Water Treatment. Construction. 18,300 employees with €5 billion turnover in 2016.

Driving global economic development and growth through leading market expertise.

### COMMERCIAL STABILITY

We are owned by  
The Doosan Group  
Forbes Global 2000 company with

**41,400** in **38**  
employees COUNTRIES

and  
**€13.2 billion**

turnover in 2016.

### OEM LEADERSHIP

We offer more than than

**360**

years' of combined experience in world leading energy technology and innovation

- 1859 Škoda Engineering established
- 1891 Babcock and Wilcox established
- 1928 Lentjes boiler manufacturing established
- 2006 Babcock acquired by Doosan
- 2009 Škoda Power acquired by Doosan
- 2011 Lentjes acquired by Doosan
- 2013 Doosan Global Boiler and Turbine R&D Centres established

Doosan Lentjes is part of a powerful force in the building, maintaining and optimisation of energy facilities.







## The way we work

At Doosan Lentjes, we understand that our products and services are only as good as the people behind them, so we work hard to recruit, train and develop the very best in the industry.

People Focus

Corporate Social Responsibility

Quality Health, Safety and Environment

### People Focus

Our people are at the centre of who we are, so we take genuine care in their development, making their cultivation our long-term priority. We are also committed to the development of new design, engineering and project management talent and retain an unparalleled expanse of knowledge within our company. Transferring knowledge and experience to the next generation strengthens the stability and longevity of our business and gives our customers reassurance that our engineering competency is sustainable for the long term.

### Corporate Social Responsibility

In all territories in which we operate, we embrace customer and community visions for sustainability. Doosan Lentjes' Corporate Social Responsibility (CSR) programme is built on three pillars: education, sustainability and community. This provides us with a framework through which to promote excellence in science, technology and engineering, minimise the environmental impact of our operations, and make a positive difference in our local community.

### Quality, Health, Safety and Environment

Our performance is based on providing high levels of quality, outstanding safety performances and environmental vision – embracing our commitment for the safety and well-being of our people and local communities.

With our safety approach we aim to make safety transcending all our commercial operations – ensuring full commitment to the safety of our employees, partners and the communities we serve.



Doosan Lentjes delivers the highest level of customer satisfaction through best-practice procurement of goods and services. Our focus is on optimising cost and efficiency while achieving full regulatory compliance.

# Our procurement capabilities

We define global sourcing strategies that draw on the full capabilities of the Doosan group while focusing on a geographically balanced and locally anchored portfolio of best-in-class suppliers who support us to identify the most valuable supply chain solutions.

We, at Doosan Lentjes, understand that our suppliers make a vital contribution to our performance which is why we aspire to create long-term mutually beneficial relationships that help to ensure consistent quality.

In pursuing project interests, we are always mindful of our ethical and social responsibilities and our commitment to sustainability and transparent business practices. In order to achieve this, we have established our Suppliers Code of Conduct that is based on our corporate values. This helps us to make sure our suppliers follow ethical and responsible behaviours, practices and standards while fully complying with all applicable laws and regulations.



Doosan Headquarters, Korea



Doosan Chennai, India



Doosan Vina, Vietnam





We understand that flexibility and sustainability are vital to the success of your business, which is why our customised solutions are tailored to your specific environmental and economic goals.



# Exceeding your expectations

Doosan Lentjes is proud to be the Doosan group’s global Centre of Competence for circulating fluidised bed boilers, waste-to-energy technologies and air quality control systems. We continuously invest in the advancement of our technologies to make sure we remain at the forefront of our industry, and consistently deliver products and services that exceed our customers’ expectations. This ongoing investment also underpins a culture of continuous improvement that permeates our entire organisation.

In order to provide our customers with solutions that help to achieve their individual economic and environmental goals, we developed the Doosan Lentjes Operating Model. This approach helps to maximise cost-efficiency, optimise project execution time and deliver high flexibility by integrating product requirements into modular solutions that are adapted to specific customer requirements. With the continuous integration of all lessons learned into the modular solutions during the project execution phase we ensure a consistent learning process to the benefit of all future projects. In combination with our continuous investment in the advancement of our technologies we are one step ahead when it comes to both state-of-the-art technology and a sustainable business performance, leading your project to an outstanding success – essential in times of changing market requirements.

We are driven by the anticipation of our clients’ needs and differentiation through focused innovation. With the Operating Model we integrate, consolidate and realise synergies to achieve a sustainable performance in a challenging business environment.

## Our operating model





Doosan Lentjes is a recognised pioneer and leader in CFB boiler technologies, providing efficient combustion solutions across a wide range of different fuel types.

# Shaping the future of CFB boiler technologies

Our engineering and project management excellence is backed by the global capabilities of Doosan Heavy Industries, including 175 GW<sub>e</sub> installed capacity and a pressure parts fabrication facility with a production capacity equivalent to 9 GW<sub>e</sub> per year.

At Doosan Lentjes, our CFB boiler technologies cater to multiple fuels, including those with the most demanding combustion properties, such as, low calorific values, high moisture levels, high ash content or lower ash melting temperatures.

Our CFB boiler solutions achieve the highest levels of cost-efficiency by utilising an integrated desulphurisation control system that requires no external emissions control, combined with an integrated design. This unique design gives you effective CFB combustion that fully delivers on your environmental and economic objectives.

Doosan Lentjes’ research continues to shape the future of advanced CFB boiler technologies. Working together with our colleagues at Doosan Heavy Industries & Construction, we develop products for supercritical and ultra-supercritical steam conditions.

## Design

Utility-size circulating fluidised bed boilers ranging from 50 - 350 MW<sub>e</sub> per unit. USC units with up to 600 MW<sub>e</sub> under development

## Fuels

All kinds of biomass, coals, waste coals, coal residues, pet coke, as well as, co-firing

## References

Over 110 units in operation worldwide

## Case study: Berlin, Germany

Contract award: 1987

Main fuels: Hard coal, lignite, biomass

Number of lines: 1

Plant output: 100 MW<sub>e</sub>

In 1987, Doosan Lentjes was awarded the contract by BEWAG to provide a circulating fluidised bed (CFB) firing system for the 100 MW<sub>e</sub> combined heat and power (CHP) plant located in Berlin, Germany.

In 1990, the plant received the International Power Plant Award for its efficiency and extremely low emissions. Thanks to the flexibility of the CFB system, the plant is now capable of reliably burning biomass fuels, such as, wood.







Case study:  
Harlingen,  
The Netherlands

Contract award: 2009

Main fuels: Municipal, bulky and  
similar pretreated waste

Number of lines: 1

Plant capacity: 1 x 280,000 t/a

In 2009, Doosan Lentjes was selected by RECB. V. – a subsidiary of Afvalsturing friesland N.V., to deliver essential components, such as, grate, boiler and balance of plant (BoP) on an EPC basis for the waste-to-energy plant in Harlingen, the Netherlands.

An integrated and highly efficient combustion system enables high plant availability and a substantial reduction of operating costs while simultaneously providing high flexibility to meet the requirements of changing waste qualities.

# Converting waste to energy

Doosan Lentjes is a leader in the generation of energy from waste. With 77 units contracted around the world equivalent to converting millions of tonnes of waste-to-energy every year, we are an experienced partner in planning and building individual process sections, chute-to-stack solutions or full turnkey plants.

Thermal waste treatment is an essential part of a modern waste management concept. At Doosan Lentjes, our technologies can reduce waste volumes by more than 90%, as well as, generate high levels of energy recovery. With our advanced technology, we help you to recover more than 65% of the energy initially contained in the waste, which can be subsequently converted into power and heat for local communities and industry.

Our flexible grate types, such as, reciprocating (air and water-cooled), as well as, roller grate are tailored to suit various waste incineration behaviours resulting from different waste characteristics, such as, moisture contents, calorific values and waste volumes.

Our proven flue gas cleaning solutions achieve reliable compliance with all applicable international emissions regulations by maximising the reduction of pollutants and toxins from your waste, thus, minimising the ecological impact of your plant.

Integrated design

Excellent ecological performance

Cleaner carbon footprint



With a heritage in air quality control systems that includes more than 50 years’ experience and 150 installations worldwide, Doosan Lentjes is a leading provider of cutting-edge products and services that deliver cleaner, greener energy.

# A breath of fresh air

Our environmentally-friendly flue gas desulphurisation (FGD) solutions are tailored to your individual requirements to help you achieve maximum sustained emissions reduction and compliance with even the most stringent environmental emissions directives.

Our proprietary proven technologies include:

- Wet limestone FGD – the world’s most commonly used FGD process, especially designed to meet the specific requirements of high-sulphur applications and large oil and coal-fired power plants by effectively removing sulphur dioxides from the flue gases.
- Seawater FGD – a proven alternative for oil and coal-fired power plants located in coastal regions, delivering the same levels of desulphurisation as the wet limestone process.
- Circoclean® FGD – a beneficial solution to reliably remove pollutants, such as, dust and sulphur dioxides (SO<sub>2</sub>) from the flue gas. The process can be used downstream of coal and oil-fired boilers, as well as, biomass, refuse derived fuel and domestic and industrial waste incineration plants.

Wet limestone FGD

Seawater FGD

Circoclean® dry FGD

## Case study: Rabigh 4, Saudi Arabia

Contract award: 2010
DeSO <sub>x</sub> technology: Seawater FGD
Main fuels: Heavy Fuel Oil (HFO)
Number of lines: 4
Plant capacity: 4 x 700MW <sub>e</sub>

In 2010, Doosan Lentjes was contracted by Doosan Heavy Industries & Construction (DHIC) to provide key technology for a seawater flue gas desulphurisation system, as well as, basic engineering, core components and support services during assembly and commissioning of the Rabigh thermal power plant. With an overall desulphurisation efficiency of more than 97%, the plant delivers on all environmental emissions directives.





# Energy generation in 360° at Doosan Lentjes

Visit our homepage and take a virtual journey through our facilities around the globe – a great opportunity for you to experience our reference plants in an impressive 360° environment and convince yourself of our capabilities! To start the tours, please type the address below in your internet browser and open the Virtual Doosan World.

[www.doosanlentjes.com](http://www.doosanlentjes.com)





## Doosan Lentjes

**Doosan Lentjes** is a global provider of processes and technologies for energy production from renewable and fossil fuels. Our specific areas of expertise include circulating fluidised bed boilers, key technologies for the generation of energy from waste, and flue gas cleaning systems. We have been pioneering energy solutions for 90 years and convert millions of tonnes 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.



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