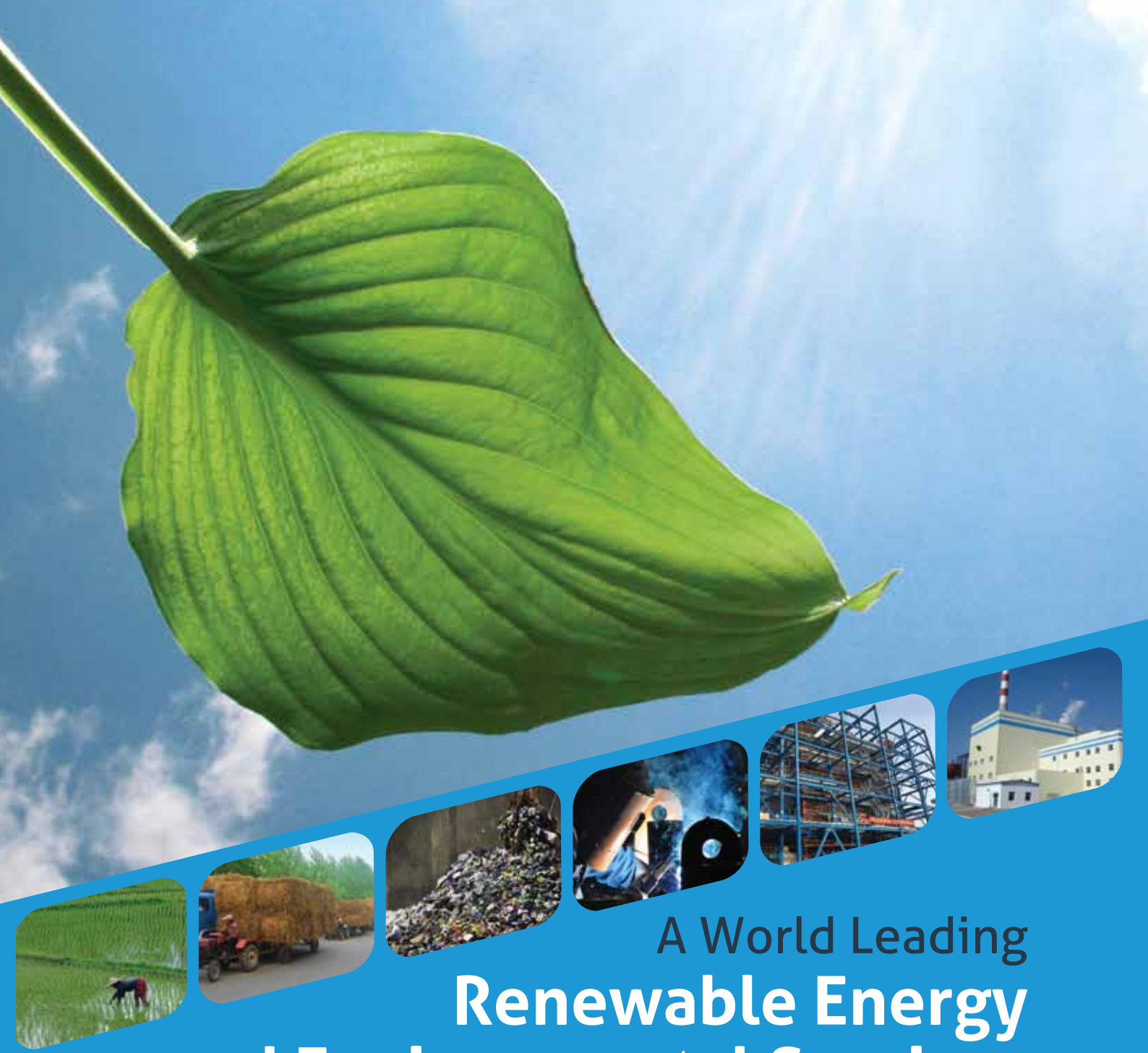


A World Leading

Renewable Energy and Environmental Services Company

DP CleanTech Group

Clean energy, natural solutions

Creating Value from Waste

DP's focus is on providing the most advanced; reliable and competitive range of products and services for converting organic and inorganic waste materials into clean energy and other products.



Simon Parker,
CEO, DP CleanTech Group

From our pioneering origins in biomass combustion, we have progressively extended our scope to encompass complementary technologies, and our portfolio is supported by the best expertise in the industry. We deliver best-in-class solutions that are economically and environmentally sustainable.

Our geographic organization reflects our global customer base, and our project and customer-focused approach is underpinned by central engineering hubs and a global supply chain. The executive management team is culturally diverse, affording the benefits of different perspectives and opinions in defining and executing robust business strategies. Our depth of knowhow and experience is demonstrated by a reference list second to none.

At DP, we have always been dedicated to providing the right advice, the right solutions, and long term results to our customers, suppliers and employees in order to ensure the economic viability that is necessary to drive environmental sustainability. The ever increasing pressure on our environment is demanding constant innovation and evolution and we believe that with our technologies, competences and our ability to make a difference DP has a key role in shaping this future.

- **Our Mission:**
  Creating Value from Waste
- **Our Vision:**
  A World Leading Renewable Energy and Environmental Services Company
- **Our Core Values:**
  Teamwork, Excellence, Innovation, Accountability
- **Our Company Philosophy:**
  Think and Act like an Owner

In brief.....

DP CleanTech (DP) is an independent, global company specializing in the management and conversion of various waste streams to sustainable energy and products.

The High Temperature High Pressure combustion technology at the heart of DP's product portfolio was first deployed in Denmark in 1990, and since then the company has focused on the development of additional technology solutions to service the waste to energy and environmental services industry. Through strategic partnerships and acquisitions DP owns the IP for leading European biomass-to-power, AD and waste management technologies; and has the engineering design; equipment manufacturing and sourcing; installation, commissioning and servicing capabilities to support a robust and integrated product and services proposition.

Today, our reference list of over 300 projects has over 80 biomass-to-power plants around the world using combustion technology; and over 200 references in biogas, waste sorting and landfill management.

Geographically, DP is headquartered in Europe and has 9 offices in 8 countries across Europe, Asia and the Middle East, employing ~100 employees worldwide.

A common sense of purpose and commitment is the thread which has brought leading technology companies to work with DP. Many of today's standard waste management solutions were originally developed and patented by the IUT Group, now a part of DP. Technological leadership through innovation and continuous improvement; and a forward looking, customer-centred approach is at the heart of the Group.

DP also offers a range of complementary services to the industry, from consulting and feasibility on new projects; to plant optimisation, upgrade, retrofit and maintenance programmes on existing projects.

Waste streams and technologies



Biomass and MSW Combustion

DP is the recognized expert and pioneer in biomass and MSW combustion technology. DP technology was behind both the world's first straw biomass combustion power plant in Denmark; and the first HTHP biomass plant in China. In Thailand, DP completed the world's first "All Coconut Waste" biomass combustion plant, showcasing the possibilities of using complex fuel types. The technology is also highly suitable for RDF.



Biogas Technology for Organic Wastes

DP has well- proven and commercialised biogas technologies for the conversion of organic waste types such as MSW organic fraction; animal and kitchen waste. These plants can be used independently, or as part of a combined combustion and biogas waste solution (DP AIMS) for treatment of MSW.



Landfill Management

In most countries, landfilling has at some time been a primary solution for waste disposal; but has led to significant environmental problems. In others, landfills are occupying valuable real estate. To address these environmental pollution problems and to reclaim dump sites for alternative use, DP has proven technologies and expertise that can be used independently or as part of an integrated plant solution.



Supporting Technologies

Our supporting technologies such as flue gas cleaning, automation or water purification equipment are developed and optimized for use with DP systems. They are well integrated into our core technologies and solutions, improving efficiencies and reducing integration risk.

The DP Difference

OUR PHILOSOPHY & APPROACH

Innovation and teamwork are key foundations for our success. Our company growth and structure reflects a genuinely international mindset that embraces the best ideas and people, wherever they are in our organization. Our collaborative culture is embedded in our company philosophy to “Think and act like an owner”.

Our size allows us respond quickly and flexibly, yet we are experienced and credible. Our transparent processes and systems drive productivity and support dialogue with all stakeholders. We hold ourselves to global, professional standards of integrity and performance, for which employees are individually and collectively accountable.

WASTE TO ENERGY CONVERSION AND RELATED TECHNOLOGY

Our business encompasses all aspects of the conversion of organic and inorganic waste into clean energy. With this scope, we have attracted and retained some of the best and most committed experts in the waste management industry. Building on our successful straw fired technology, we have developed and maintained an unmatched understanding of biomass, MSW, biogas and related technologies across varied operating environments. This fundamental knowledge and pioneering approach has sustained our groundbreaking role in the development and optimization of technologies and knowhow.

GLOBAL AGILITY

We are a global company with a European heritage and a multicultural execution and management platform. Our headquarters, Global Engineering Centres and in-house manufacturing capabilities are in Europe; with Sales and Project offices located in 8 countries around the world. Our supply chain is global, and our specialized, energetic and experienced teams can respond to client needs – wherever they are. Our diverse cultural perspectives, skills, knowledge and experience are central to a forward facing organization which is open to learning and adaptation. Our modern, process driven approach to business transcends borders and cultures, and supports our local experts.

CUSTOMER INTERFACE & ENGAGEMENT

The breadth and depth of our capabilities have been demonstrated in over 300 references worldwide, across all our technologies. Our global expertise encompasses multiple project and technology types throughout the value chain and project development process. This both facilitates and drives opportunities for engagement with prospective customers and existing customers, providing new opportunities to develop and refine the next generation of technologies.

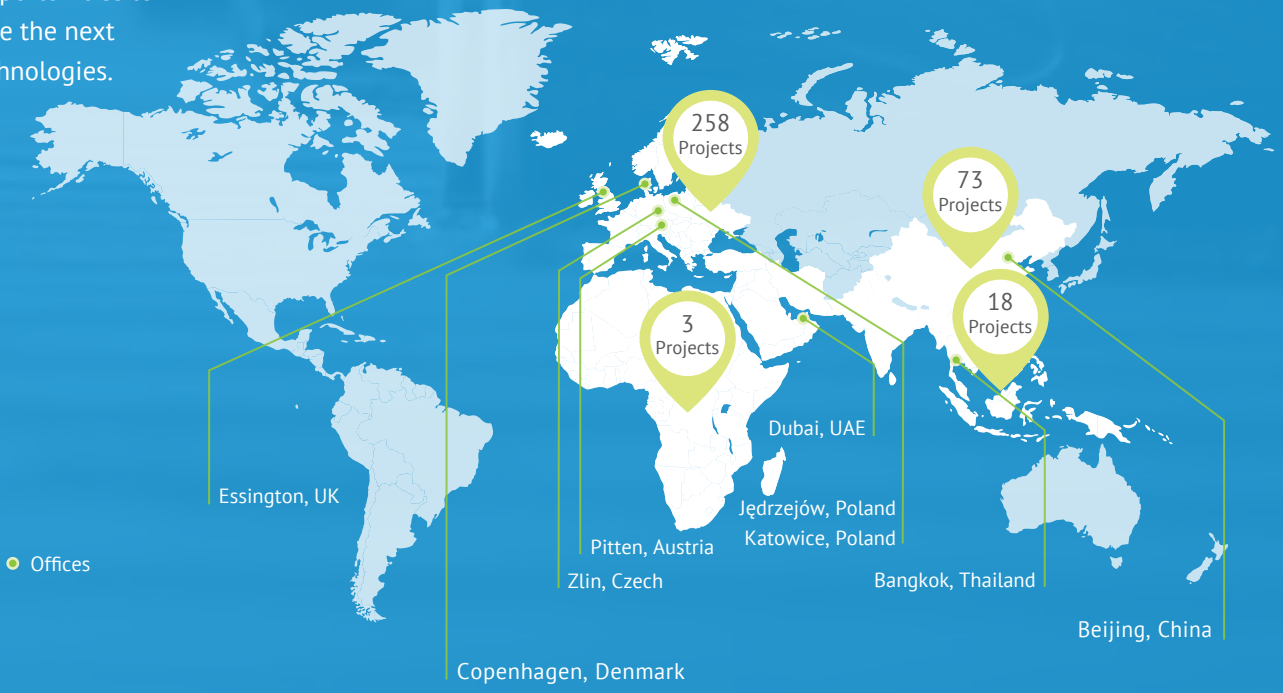
INTEGRATED SOLUTIONS

We are strongly committed to maximize productivity and financial returns for our customers. To do this we develop integrated solutions that are truly fit for purpose, providing the optimum balance of performance and cost. Our central technology and execution platform uses rigorous systems and processes to draw together and effectively deploy knowledge and resources. In-house manufacturing and tightly controlled supply chains ensure cost competitiveness.

GUARANTEED PERFORMANCE

DP's technologies are not only amongst the most proven in the world, they are cost competitive and performance guaranteed, with quality standards that conform to international governance and audit requirements.

DP Offices and Projects Around the World



DP CleanTech's History Has Shaped Biomass Power Today

1990'S

PIONEERING TECHNOLOGIES IN THE WASTE MANAGEMENT INDUSTRY

Danish company Bioener pioneered the world's first successful straw-fired biomass power plant in Rudkobing, Denmark. The 2.3 MW CHP plant is still running very well today. Austrian company the IUT Group pioneered the development and implemented many "first of type" products and processes in the management of waste streams, including collection and sorting; treatment and production of renewable energy, and landfill stabilization and mining. These pioneering companies brought a wealth of technology and industry expertise to DP.

2004

DP CLEANTECH FOUNDED

DP was originally the engineering and construction arm of Dragon Power - the first company in China to license and use patented Danish biomass HTHP technology. In 2006, the first 30MW HTHP plant in Shanxian province was handed over to owner/operator National Bio Energy (NBE); and it is still one of the best performing biomass power plants in China. In 2009 DP fully acquired Bioener technology from Europe and further adapted it for new fuels, diverse regulatory conditions and specific customer requirements.

2010

AN INDEPENDENT COMPANY

DP diverged from DragonPower to become an independent, global company concentrating solely on the design, engineering, manufacturing, commissioning and servicing of biomass and waste-to-energy power plants.

DP CleanTech

2010-2011

MANUFACTURING, NEW TECHNOLOGY AND GLOBAL EXPANSION

A 2,500 m^2 manufacturing workshop was opened in Poland. The facility works alongside specialized suppliers throughout Europe and Asia to supply equipment for some of the most advanced biomass and waste-to-energy plants in the world.

Acquisition of specialist Flue Gas Cleaning Technology team in the UK to focus on emissions control as a core component of our integrated solutions.

DP opened offices in Thailand, India and the Philippines.

2012-2013

NEW MANAGEMENT, MARKETS AND PROJECT SOLUTIONS

DP was bought out by the current CEO and successfully secured contracts in new, international markets and industries. A boiler island solution contract in Singapore, the first-of-type 2nd generation ethanol (lignin) power plant in China; a turnkey EPC solution in Thailand; and an EPC waste-to energy contract in Ethiopia were all significant achievements in furthering the geographic and market expansion for DP solutions.



2014-2015

FURTHER BUSINESS EXTENSION

DP in Poland expanded the business scope to provide customised component design, fabrication and retrofit services for a growing number of clients in Europe. Engineering partnerships were formed in Latin America and new projects secured in South Africa and Chile.



2016-2018

NEW FUELS AND TECHNOLOGIES

DP completed the world's first biomass plant to use coconut waste from the whole coconut palm, showcasing the development of specialist anti-corrosion (MaxMulti Plus) and automation (DPAAC) products for complex fuel combustion. Partnerships were formed with leading European companies in gasification, automation and water treatment to bring leading edge solutions for MSW/RDF and waste water.

2018-THE FUTURE

Over 30 years of technological innovation in Europe are combined with the unparalleled experience and scale derived from developing and operating over 60 biomass power plants in China; giving DP the knowledge and confidence to identify relevant, complementary new technologies with which to extend our products and services.

In 2018, the acquisition of the IUT Group and Gyrecat waste water technology consolidated our breadth of solutions, experience and knowhow to be the most extensive available waste to energy industry. The business in China was divested to existing employees in late 2019, providing a stable partner for ongoing China business; and the platform is now geared towards international growth. We continue to focus on what our customers need, and on leveraging our knowhow, global systems and centres of excellence to develop and deliver appropriate solutions with the highest standards of quality and service.

DP Understands the Business of Waste to Energy:

- Performance Certainty
- Minimise Execution Risk
- Cost efficiency







FEASIBILITY & DESIGN PLANNING

- We help customers complete feasibility studies and achieve financial close.
- The characteristics of waste inputs are fundamental to the design, performance and longevity of a plant. Our profound knowledge of waste is derived from over 300 projects. We conduct expert assessments to determine the chemical composition; calorific value and moisture content of a proposed fuel, and use our considerable operational experience to define solutions that are fit for operational purpose, proven and performance - guaranteed.

DESIGN & ENGINEERING

- Multidisciplinary local Engineering teams collaborate and follow best practice to design customised, fit-for-purpose solutions.
- Conduct pre-engineering studies to facilitate faster project delivery.
- Full database for 3D design.
- CFD simulation software.
- Designed to guaranteed levels of plant efficiency (92% efficiency) and availability.

PROJECT DELIVERY

- Project - led organisation.
- State-of-the-art ERP system and project management frameworks ensure on-time on-budget project delivery.
- Globally integrated engineering, design and supply chain
- Dedicated site services and project management
- Manufacturing facilities in Poland and strategic partnerships with key suppliers globally.
- EPC turnkey delivery.

Our clients have different project requirements, but all are seeking solutions with accountable, predictable and reliable performance, a low risk profile; at a competitive cost. We specialize in advising our clients on the underlying factors and dynamics affecting their specific business objectives; and we design and build effective solutions to achieve them. We deliver the appropriate advice, solutions and implementation – from project feasibility to after-sales and plant optimisation.

Our high quality global supply chain and skilled project management reduce the cost of production and the execution risk, thereby delivering enhanced performance solutions with reduced life cycle costs. We have the capability of delivering a scope ranging from boiler islands to full turnkey power plants and where appropriate will also work with local EPC contractors.





COMMISSIONING, AUTOMATION & TRAINING

- Skilled plant commissioning and automation are crucial elements of success. In regions where such skills are not always readily available, we have proven the value of our specialist skills.
- DP's specialized commissioning and automation teams ensure that the integration process between installation and full operation is flawless.
- We provide automation solutions that will ensure the most efficient plant operation whilst reducing staff overheads.
- Our package includes plant testing, preparing documentation, training operating staff and making appropriate changes for automation.

PLANT SERVICES, O&M

- Ongoing, reliable and consistent performance is highly dependent on proper, scheduled maintenance. DP provides service and maintenance packages and operator training to protect your investment.
- When problems do arise or a plant is not performing well, DP's experts can rapidly diagnose the issues and provide the solutions to address or optimise plant performance.

Our Technologies, Capabilities and Services

DP offers customers the most advanced and reliable technologies for the waste management industry. We continually scan the environment for innovative products, technologies and services to complement our existing business portfolio and we apply our considerable expertise to ensure that they meet our criteria for reduced risk, guaranteed performance and cost effectiveness.

DP COMBUSTION / INCINERATION

DP's High Temperature, High Pressure (HTHP) and Water Cooled Vibrating Grate (WCVG) combustion technology is the original foundation of our business. Designed initially for optimum straw fired combustion, the increase in available fuel types to include complex fuels and non-traditional fuel sources such as RDF has led to groundbreaking modifications and improvements to effectively handle such fuels. Additional auxiliary equipment has been well integrated to provide cohesive solutions that range in scope from boiler islands to turnkey power plants.

DP BIOGAS

Biological treatment is highly suitable for the clean conversion of all organic wastes and organic waste fractions from MSW. DP offers 2 biogas technologies. The highly flexible and well proven ADOS (Anaerobic Digestion of Organic Slurry) thermophilic process has the highest gas yield compared to similar processes. The DAD (Dry Anaerobic Digestion) has less fuel flexibility and yield but a lower capital cost. These modular, scalable technologies can be used with a wide range of organic waste materials. Collaboration with Bst (Italy) provides biogas solutions for agricultural biomass.

DP EMISSIONS MANAGEMENT

DP offers specialized Flue Gas Cleaning technology as an important and necessary part of our portfolio. With increasingly strict emissions standards being imposed worldwide, DP's state-of-the-art Dry Scrubbing Systems can be effectively incorporated into most existing plants, or as part of a new project to ensure that such standards are met. Our Flue Gas Cleaning team is based in the UK and has extensive experience in redefining complex requirements in order to deliver specialized solutions.

DP LANDFILL MANAGEMENT

DP has advanced knowhow and expertise in landfill mining, remediation, aeration, design and management that are derived from the IUT technologies and IP. Addressing typical problems such as groundwater contamination, air pollution, problems from naturally occurring toxins and compounds; explosion hazards and landfill collapse, DP's design solutions and Smell-Well system can eliminate the hazards and improve the environment to create valuable real estate. The extraction of valuable materials from landfills is an important element in volume reduction and added value, whilst LFG plants maximise sustainability and revenue.

DP AUTOMATION

Optimising a plant's operational and financial performance is best achieved through automation. DP has designed and implemented an Advanced Automatic Boiler Control solution (DPAAC) which controls the complete boiler process. The automatic regulation of boiler load and output ensures a stable operation; enhances performance and reduces cost. As a standalone improvement, automation can minimize the workforce whilst simultaneously reducing human errors to have a positive and significant impact on boiler performance and lifetime. DP offers advanced, customised automation packages for integration with both new and existing plants; as well as providing the commissioning and operator training to ensure that the benefits are fully realised.

DP WASTE WATER

Waste water is a necessary by product of many industrial and agricultural processes, and needs to be properly treated to ensure sustainable water management. DP's total solution philosophy extends to the treatment of waste water and we have partnered with water purification experts Watercare International to offer customized solutions for waste water purification. DP's patented "Gyrecat" process is a photocatalytic hybrid of an advanced oxidation process. Using UV light and a non-slurry based titanium dioxide reactant, the unique process enables effective treatment of a wide spectrum of organic compound contaminants, and is developed for application and integration in both large scale industry and smaller agri-rural water treatment facilities.





DP CONSULTANCY, FEASIBILITY STUDIES AND INDUSTRY INSIGHT

DP has always been at the forefront of change in the global biomass industry, accumulating knowledge and gaining experience with which to expand our capabilities and add value. For clients seeking to better understand or capitalise on the industry's global dynamics and opportunities, we offer a unique business and operational perspective which reflects our multidimensional, multicultural expertise and longstanding experience.



DP PLANT SERVICES

Retrofit, Upgrade and Conversion

With a reference list of over 80 plants, DP has a wealth of knowledge in modification work and servicing for retrofits and upgrades. We replace or add new technologies to existing plants to maintain the highest possible efficiencies or upgrade outdated equipment. As well as our expertise in biomass power plants, our partnership with leading WtE service companies Dublix and TISKA in Europe provides us with the relevant expertise to provide retrofits, servicing and support for ageing WtE plants.

Plant Optimisation, O&M Services

Plant optimisation to improve the efficiency flexibility and economic performance of existing plants, is a core DP competence. We use our considerable experience to systematically assess, identify and eliminate boiler island malfunctions and DP's expert diagnostic processes identify the best technology and solutions for retrofits, conversions and modifications.

Regular reviews and service overhauls are essential to maintain optimal plant performance and to reduce long term operational risk. DP reviews plant operations; undertakes problem diagnosis; assesses maintenance needs, and recommends the appropriate solutions.

Customer References and Fuel Expertise

BIOMASS







NATIONAL BIOENERGY (NBE), CHINA

Background

Founded in 2005, NBE owns and operates around 60 biomass power plants in China and is one of largest biomass power operators in the world. NBE partnered with DP CleanTech and the China State National Grid to establish China's first biomass power plant in 2006 and DP and NBE have a longstanding partnership for future projects.

DP Solution

DP's standardized and cost-optimised solution has been specially adapted for NBE and the China market. The technology has been adapted for fuel flexibility as well as for the high moisture and ash content commonly found in Chinese agricultural residues. Emissions control options are designed to meet the stringent NOx requirements in China of 300mg/m^3.

To date, DP has provided NBE with over 40 plants in China, with a total installed capacity of over 1356MW. DP uses operational data and operator feedback to make continuous improvements in plant performance, whilst devising modifications for the future.

VATTENFALL, DENMARK

Background

Vattenfall is a Swedish owned power company and one of Europe's largest generators of electricity and heat. In 2006, Vattenfall sought a cost effective way to diversify their energy portfolio and simultaneously improve their environmental credentials. Their requirement was for a flexible and fully automated state-of-the art straw-fired plant to utilize local agricultural waste at one of the company's large coal-fired facilities in Fynsvaerket, Denmark.

DP Solution

DP Cleantech designed a 35 MWe 85MW, fully automated thermal straw-fired plant which is one of the most advanced in the world. It was provisioned to allow co-firing with wood chips, pellets and granulated fuels to preclude fuel supply disruptions. Since commissioning in 2009, the plant has been running at full load, requiring only 2 operators. It is one of the fastest regulating plants in Vattenfall's portfolio. In 2012, the plant was flawlessly recommissioned to co-fire both wood chips and straw.

CHINA EVERBRIGHT INTERNATIONAL, CHINA

Background

China Everbright International is a Hong Kong Stock Exchange listed enterprise, and part of the Everbright Group. The company's business portfolio includes significant environmental protection and new energy investments in China's fast growing renewables industry. In 2009, and with over 50 waste to energy projects already operating in China Everbright identified Anhui province as the best location for its first biomass project. Everbright had only limited knowledge and experience of biomass, and DP was contracted to design and deliver the optimum solution.

DP Solution

In September 2011, a 130t/h customized mixed fuel boiler started operation in Dangshan, Anhui province. The 30MWe plant was designed to consume 200,000 tons of fuel per year; and, to generate 2*10kWh of clean electricity annually. Dangshan and 5 other DP projects have been the top performing plants in Anhui in recent years. The success of Dangshan has led to the signing of further contracts as well as ongoing collaboration to further R&D of biomass and waste to energy technologies.

COMPLEX BIOMASS FUELS

MAHACHAI, THAILAND

Background

Mahachai Green Power Co., Ltd. is a Thai joint venture between TPC Power Holding Co., Ltd. (owned by Thai Polycons); EnBW (a German utility); and minority shareholders NC Coconut Co., Ltd. and Green Power Producer Group Co., Ltd. The project is located in Samut Sakhon Province, Thailand. An innovative solution was needed to efficiently turn all the waste residues from a coconut processing plant into clean energy. This required the ability to handle all the herbaceous and woody biomass from a complex tropical fuel, for which there was no pre-existing solution. The project was delivered on an EPC turnkey basis.

DP Solution

In April 2016 DP delivered a state-of-the-art 9.5MWe HTHP plant, including all electro-mechanical systems and ancillary plant. The plant is fueled by coconut waste residues, (husk, shell, fronds and leaves). The boiler is designed to operate at high steam parameters (92 bar and 540°C), producing 9.5MWe of electricity. The plant is fully automated to achieve an efficiency net heat rate of 13250 KJ/KWH, 27% with a design fuel at 44%. Emissions are lower than the regulatory standards. Full automation also ensures a stable operation and reliable performance, with minimal stoppages and reduced manpower requirements. This allows the plant to operate at full capacity for more than 7,900 hours per year.

MSW

DP has continued to expand its knowledge and experience of new, complex or low calorific value fuels and related technologies. Our recent breakthroughs in combustion techniques and our specially modified solutions are suitable for specific types of MSW and RDF.

BOFA, DENMARK

Background

BOFA (Bornholm Waste handling – a county owned organisation) owns a waste to energy plant on Bornholm Island, Denmark. The plant combusts the local municipal and industrial waste to supply local district heating. The total amount of waste generated by the island at that time was approximately 26,500 tonnes per annum, with expected growth of 1-2% a year. With an annual consumption of 20,000 tonnes per annum, the existing plant was unable to meet the capacity requirement and was experiencing increasingly costly downtime for weekly manual cleaning. BOFA wished to improve the efficiency of the existing plant as well as increase the capacity and reduce downtime.

DP Solution

DP's redesigned the boiler island to a 2-pass system, incorporating modifications and improvements which required the redesign and installation of new components. These included a new feeding system and heat surfaces; air preheater, water-cooled wear zones and a wet drag conveyor system. The improved efficiency and plant availability increased the plant capacity to the required 26,000 tonnes of waste per year.

EEP, ETHIOPIA

Background

As part of the Ethiopian Government's "Climate-Resilient Green Economy Strategy" Ethiopian Electric Power (EEP) is pioneering the development of waste-to-energy facilities through its first project in Addis Ababa. For the last 45 years, the 37ha Reppie site has been an open landfill dumping area. Adjacent to the modern facility will be a covered 7ha area, reducing the environmental hazards associated with open landfills. The solution needs to be able to process over 1,000 ton of unsegregated municipal waste daily and enable a production capacity of 185GWh electricity per year.

DP Solution

The design of the advanced 50MW (2 x 25MW) waste-to-energy plant has drawn on DP's fuel handling, analysis and combustion expertise to develop a state-of-the-art solution that transforms unsegregated, low calorific value fuel to clean energy. When operational it will be the first base load power in the country able to provide electricity 24 hours a day for over 330 days of the year.



Customer References and Fuel Expertise

LANDFILL REMEDIATION

All over the world, landfills and open dumping have been a default option for waste disposal. However in many cases they are also environmental hazards, and occupy potentially valuable real estate. With the right treatment, landfills can become a resource for scarce materials and energy, and add much needed land for development.

DEPOT RIVE, QUEBEC, CANADA

Background

The Depot Rive North landfill is located in Quebec, Canada. The landfill owner wanted to increase the value of the investment without incurring difficult approval procedures. This could only be done by increasing the volume of the existing landfill, retaining the original footprint, and ensuring that the environmental impact of the total landfill was sustainably reduced. The added difficulty of the climatic conditions, with temperatures of -30°C, and melting snow cover provided a real test for the process and equipment.



DP Solution

3.7 million m^3 of landfill waste was remediated and processed, releasing 50% of volume for profitable re-use. In addition, the bottom of the landfill was deepened with excavation. These actions extended the usage and life of the landfill - and increased the value of the investment - without difficult approval procedures.

Remediation work using the Smell-Well system began in September 2007 and finished in June 2013. The excavation took place at 3m levels, and the treatment of the excavated material took place in mobile rotating drum screens. The objective of the treatment was to produce a landfill cover material (fine fraction) which could develop a methane oxidizing level and reduce the gas emissions from the landfill surface. The remaining oversize fraction was compacted and buried again in the new area of the landfill. Throughout the project, the equipment and system were unaffected by the hostile operating environment.







BIOGAS

CITY OF BENESOV, CZECH REPUBLIC

Background

In 2006, the city of Benesov in the Czech Republic had an existing waste sorting plant which needed an upgrade to add a 1MWe digestion plant for the conversion of organic waste to energy. The feedstock was primarily organic waste - waste from households, industry, foodwaste and slaughterhouses and other organic waste from the local area.

A joint investment and operating venture (Bio Servis Benešov spol.s r.o) was established as an international Public Private Partnership (PPP) with the IUT Group (Austria) to develop and operate the plant. Work began on the plant in 2006.

DP Solution

A food waste treatment plant was designed to sort the waste and convert it to energy and fertilizer, using the ADOS System for thermophilic digestion of the organic waste. The process of sorting, digestion, hygienisation and fertilizer production are all co-located on one site. The MSW fuel is shredded and sorted using rotating drums and screens and metal separators to remove inorganic materials - metal, plastics >60mm in size and ash <10mm. The commercial waste that cannot be used in the digester is separated and sent to landfill.

After separation, the remaining waste is fed to the 2 ADOS mills to create an organic slurry that is pumped into the 2 x 10000m^3 digester units. The slurry is continuously circulated at the ideal temperature for bacterial breakdown and biogas generation of 6000m^3/day. The biogas is extracted and stored prior to use in 2 x gas engine generators to generate electricity. Hot air from the engines is extracted and used to heat the slurry in the digesters. Residual slurry is removed and treated with air control (scrubbers) before use as fertiliser on local farms.

Construction started in Autumn 2007, the plant was commissioned in 2008 and full operations commenced in February 2009. An extension and upgrade to the facility was made in 2019, improving performance and capacity.

NAGA CITY, CEBU, THE PHILIPPINES

Background

TFDR Integrated Resource Recovery Management Inc. (FDR-IRRMI) is based in Cebu and is the owner/operator of the Philippines' first hybrid Dry Anaerobic Digesting (DAD) biogas plant. The waste-to- energy facility was designed and constructed by IUT GmbH.

The DAD biogas facility is the latest addition to the resource recovery operations in Naga City, Cebu. It already has a material sorting facility, a facility for RDF production from residual waste (for use by a cement plant), and a composting facility.

DP Solution

The DAD biogas plant produces electricity and heat by fermenting pre-sorted organic waste from domestic garbage which is being collected from the Cities of Naga, Carcar and the Municipality of Minglanilla in Cebu Province. The plant capacity can treat up to 130 tpd of organics, and produces 650 kWh/h electric power which is used to run FDR's facilities and delivered to grid. This production of renewable energy by fermenting organic waste fractions is the first project of its kind in the Philippines. The organic fraction used in the process (kitchen, garden and market waste) consists of screened mixed solid waste and organic waste delivered directly from household, commercial and industrial entities.

The equipment was delivered in 2016, and the plant was operational in early 2017. Its success has led to an extension of a 150 ton/day RDF and 1 MW anaerobic digestion plant.



DP CleanTech Group

Contact Us

DP has 9 offices around the world in 8 countries – Austria, China, Czech Republic, Denmark, Poland, Thailand, UAE and UK.

To ensure that we can address your needs appropriately, please email **info@dpcleantech.com** for enquiries or further information.

www.dpcleantech.com

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