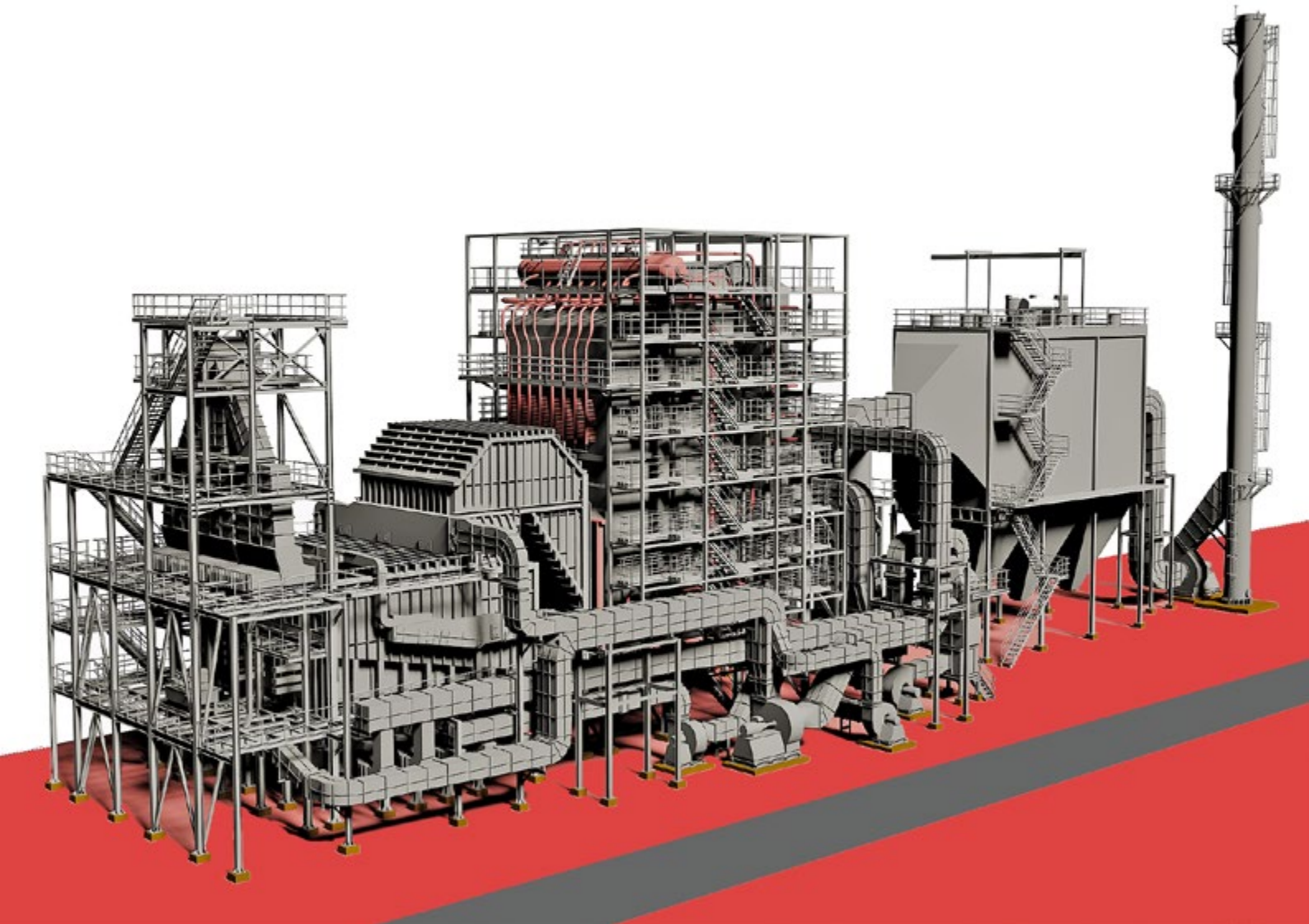
LAWI

ENGINEERING

Renewable Power Plant Technology

COMPANY PROFILE



What's the Difference – Why LAWI?

In a world of solid waste utilization, variations in the fuel characteristics are common and unavoidable and quality of fuel is often low. Utilizing such fuels efficiently and guaranteeing high operation reliability requires a great level of hands-on experience together with sophisticated understanding of the thermal process. Our approach of designating the combustion chamber to the combustion process and the boiler to the heat transfer and steam generation allow us to design and build power plants that fully comply with the engineering design data. This fact enables us to provide our service reliability and efficiency to our clients, even where fuels substantially deviate from the original design specification to secure the economics of the project in all cases.

That's the difference and that is what LAWI has been doing in the last decades and what LAWI will be doing in future!

We believe that this real investment security reflects the market and our client's requirements.

We welcome you to be part of the LAWI experience.

Dieter Langer
Founder and CEO of LAWI

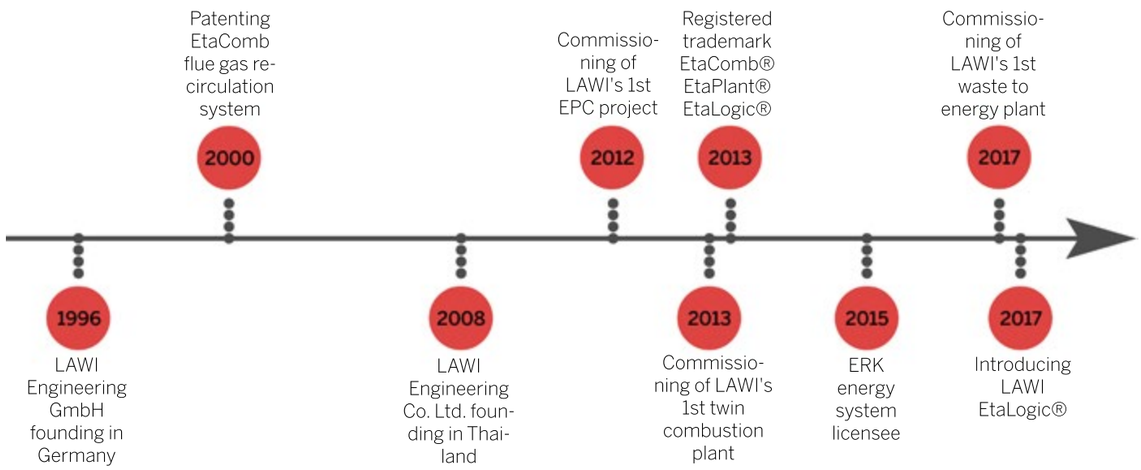
LAWI ENGINEERING

Founded in 1996 in Kiel/Germany, LAWI Engineering has developed itself to be one of the technology leading enterprises for the design and construction of high-efficient systems for the thermal utilization of solid wastes – such as all kinds of biomass, municipal waste, agricultural waste, industrial waste and others.

LAWI is considered as a reputed and trusted one-stop-service technology provider for medium size solid waste power plant projects, supplying its customers with the entire process technology to convert all kinds of solid waste fuels into energy - reliably, efficiently and environmentally friendly.

Solid wastes are available in large quantities almost all around the world and its thermal utilization is an efficient approach of not only carbon neutral power generation (biomass) but also in terms of waste management and the creation of value from waste (MSW, RDF & bio waste). By nature, solid waste fuels, especially in multi-fuel applications, are non-homogenous fuels, which vary in size, heating value and moisture. Hence, the design and control of the combustion is the most essential part of an efficient thermal utilization and therefore ...

... the combustion is the very heart of every such power plant.



LAWI ENGINEERING

LAWI Engineering has dedicated the last 20 years into extensive and proactive R&D and hands-on experience to develop the unique LAWI EtaComb® multi fuel combustion technology. Today the German patented LAWI EtaComb® combustion technology combined with our LAWI EtaPlant® boiler island is used in a steadily growing number of biomass and waste to energy power plants around the world, providing a maximum of operation flexibility and reliable returns on investment.

LAWI's commitment to innovate technology, to thorough project management, quality control, cost accountability, and on-time delivery has won us respect and trust in the market. In fact, over 75 % of our business is from repeat customers and direct recommendations.

20+ YEARS OF EXPERIENCE

45+ REALIZED POWER PLANT PROJECTS

445 MWe TOTAL INSTALLED CAPACITY

✓ ALL PROJECTS SUCCESSFULLY COMPLETED

Our international and enthusiastic team comprises all project management and engineering disciplines in-house, which gives our clients the advantage to have a direct and single point-of contact, allowing projects to flow smoothly and thereby reducing the amount of time needed to complete each discipline - saving our client time and money.

Having a full scale in-house team further enables LAWI to accompany our clients from the development phase, through the design, construction & commissioning phase and way beyond. Today LAWI services include regular maintenance, plant optimization and revamping works as well as project development consultancy, project financing and spare part delivery by our after sales service.

In 2008, the founding of LAWI Engineering (Thailand) Co. Ltd. further extended our range of services to highly price competitive Asian fabrication and procurement, Asian project management as well as complete EPC contracting for the boiler island or the complete turn-key power plant.

BENEFITS

Multi Fuel & Low Quality Fuels
Stable and reliable operation with an unique variety of fuels.

Optimal Combustion
Thoughtful combustion design achieving over 98 % efficiency.

Guaranteed Performance
Proven technology with no failed installations.

Investment Security
Highest operation flexibility & robust design optimizes plant availability.

Made in Germany
German engineering & German technology for outstanding quality.

Emissions
Unsurpassed low emission through optimal combustion control.

Award Winning Technology
LAWI technology has won several renewable energy awards.

Advanced Process Automation & Optimization
AI based process optimization results in optimal operation and high automation grade.

High Life-Cycle & Low Maintenance
Low speed, low velocities and low thermal stress design to keep maintenance efforts on low levels and increase the life cycle.

Customized Design
Each project is designed individually according to its requirements.

Your strong partner for reliable & profitable power plant projects.

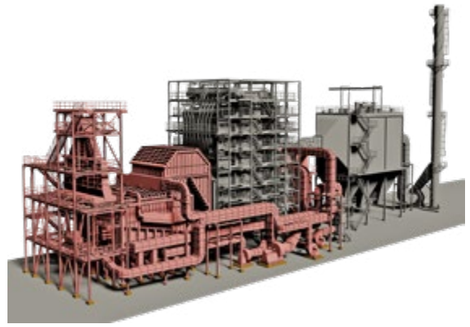
PRODUCTS

LAWI ETACOMB® - COMBUSTION SYSTEM

The flagship of the LAWI Eta products: The LAWI EtaComb® semi and fully adiabatic combustion system with post-combustion chamber and advanced air and recirculation gas system. A high efficiency multi-fuel combustion system available with different design features for different applications.

LAWI ETAPLANT® - BOILER ISLAND

The complete and well proven boiler island, that incorporates the entire LAWI know-how and process technology of a solid waste fired power plant. The LAWI EtaPlant® boiler island is ready to “plug n play” with any TGS, BoP and automation system.

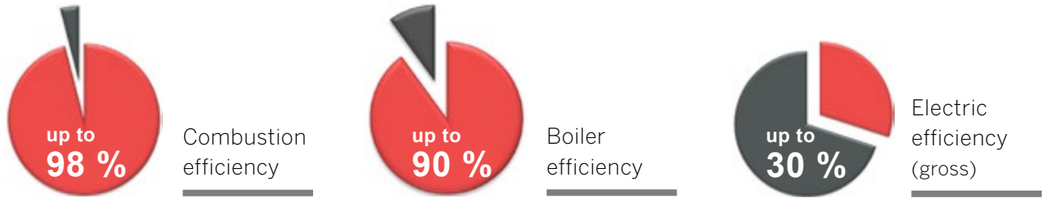


LAWI ETALOGIC® - PROCESS & OPERATION OPTIMIZATION

The EtaLogic® is a high-end process optimization unit that to boost efficiency, process stability and automated operation of any solid fuel power plant. It uses customized intelligent control techniques, based on various LAWI power plant experiences with immediate improvements and short payback time.
The simplicity and understandability for the operation team and ease of tuning and service are only a few of many advantages of the system.

TECHNOLOGY

Solid waste fuels such as agricultural biomass waste, biomass waste from the process industry, industrial waste, household waste or even biomass crops are inhomogeneous by their character and the efficient utilization of such fuels require a profound understanding of their characteristics and behaviors – an often underestimated risk of solid fuel fired power plant projects.



LAWI’s experience as well as international evidence suggests that over the lifetime of a project, more than 80 % of solid waste power plant projects are not able to source the original design fuel with feasible efforts. This leads either to increasing cost of fuel procurement or, in the worst case, even to forced shutdowns.

An individual and thoughtful analysis of all possible fuels that are about to be applied accompanied by a real multi-fuel utilization design, is the very basis of each tailor-made design and optimization process at LAWI. This challenge to design a system, that not only works for the design fuel available today but which is capable to take over whatever may come in the future means: designing the future – This is what LAWI’s mission is.

FUEL RANGE DATA

BENEFITS

"LAWI has designed our power plant to use multi-fuel biomass with moisture content up to 55 %. However, during the raining season we are confronted with biomass of 70 % moisture. Using the LAWI EtaPlant®, we are able to operate the plant with every biomass available. I have been in the biomass business for over 30 years and as a user of the LAWI EtaPlant®, I can say that I have not yet seen such a robust and reliable technology on the market.
For me LAWI is the no. 1 technology for biomass power plant projects"

Mr. Sang Sun Lee – CEO of GIMCO/CEO of Nabou Green Energy

Following our design philosophy to separate the heat generation and the heat transfer from water to steam allows us to design each equipment specifically to its sole purpose with the result of the unrivalled LAWI EtaPlant® that combines everything what investors may ask for:

HIGHEST EFFICIENCY THROUGH OPTIMAL COMBUSTION

The adiabatic LAWI EtaComb® combustion system with recirculation gas operates with maximum process stability on a very low excess air rate, keeping the oxygen content between 3-4 % and guaranteeing complete burn-out of the fuel.
This results in a combustion efficiency of over 98 % and CO emissions and unburned hydrocarbons on unsurpassed low rates. The very low excess air rate further leads to low exhaust gas flow rates and consequently minor heat losses, that can increase the overall boiler efficiency to more than 90 %.

OUTSTANDING MULTI-FUEL APPLICATION

From the first idea and stretch, the LAWI EtaComb® combustion system has been designed with the focus to efficiently combust an outstanding range of fuel characteristics allowing highest possible operation flexibility.
With the LAWI EtaComb®, changes in the fuel characteristics – which are typical for any kind of waste fuels – are compensated by its adiabatic design and sophisticated application of recirculation gas. Thus, allowing stable flue gas flow, temperatures and heat transfer even when the fuel characteristics such as moisture or LHV are varying. Even hard-to-burn fuels such as high moisture fuels with water content of up to 65 % and a LHV down to 4,500 kJ/kg can be efficiently utilized with the LAWI EtaComb® combustion system.
Last but not least, the extraordinary easiness of fuel flexibility allows potential increases in the fuel market prices to be compensated by switching to substitute fuels and therefore increasing overall investment security.

BENEFITS

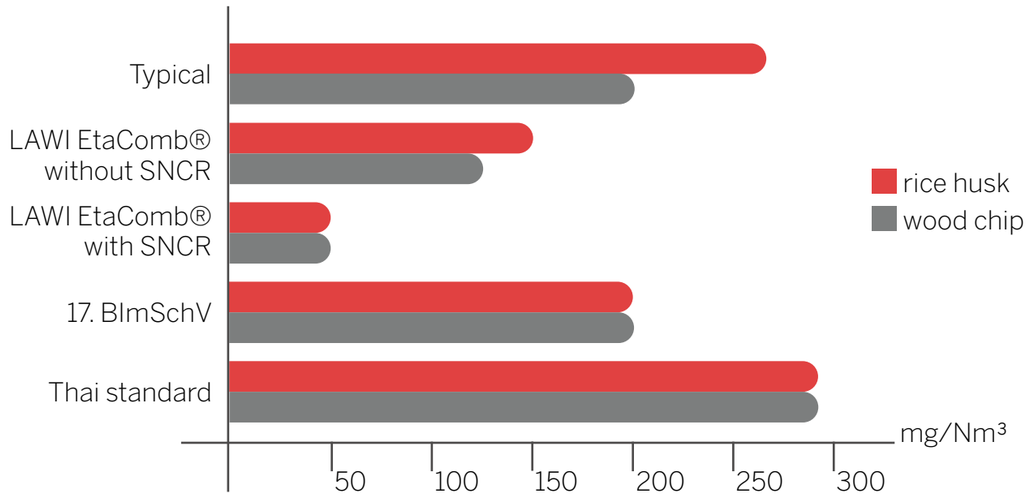
LOW MAINTENANCE AND HIGH AVIALIBILITY

LAWI's sophisticated German engineering and state-of-the-art heavy duty industrial design standards keep wear and tear on low levels and availability high.
Our proven process stability significantly reduces the thermal stress of the combustion and boiler equipment to minimum levels and therefore increase the life time of the equipment. A lifetime no-erosion guarantee of heat exchangers is made possible by the LAWI EtaComb® as well as reduced fly ash design through optimal flue gas velocity and retention times in the post-combustion chamber and boiler radiant chamber.

LOW EMISSIONS

Very low CO and VOC emissions are not only the result of low excess air rates but also of an adiabatic design that always ensures a temperature above ignition-temperature of CO and totally avoids cold zones.
Low excess air ratio in combination with the hot spots from recirculation gas in combustion chamber leads to very low NOx emissions at stack.

NO_x Emission



all emissions based on 11 Vol.% O_2 and 0 °C, dry unless other stated

FUELS

BIOMASS FUEL EXAMPLES

Waste and residues from wood processing industries as wood chips, wood bark and roots, sawdust.

Waste and residues from food processing industries as straw and husk from rice and grain; bagasse and sugarcane leaves; oil palm leaves, shells and empty fruit bunch (EFB); cassava; corn cob and stalk; coconut shells, husks and coir, coconut palm leaves; peanut shells; cacao residues.

Waste and residues from agriculture industries as bamboo, cotton gin trash, chicken litter.

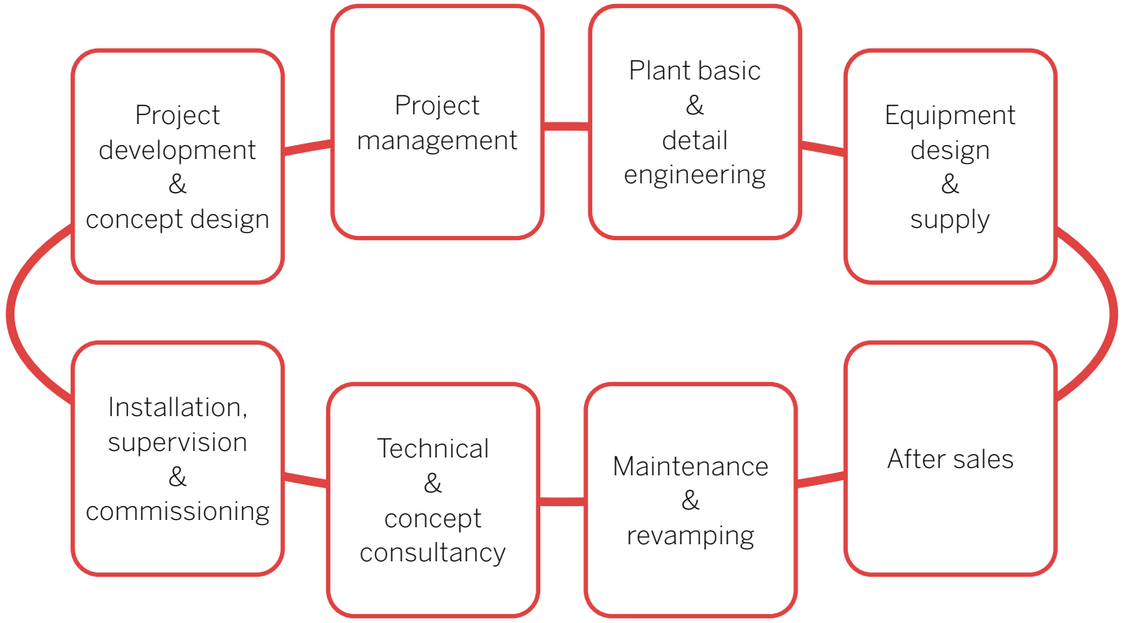
Green energy plant cultivation as giant napier grass (elephant grass), sorghum, gliricidia and poplar (green energy plants differ in species and cultivation method from food plants and animal feed).

Invasive species as marabou wood or water hyacinth.

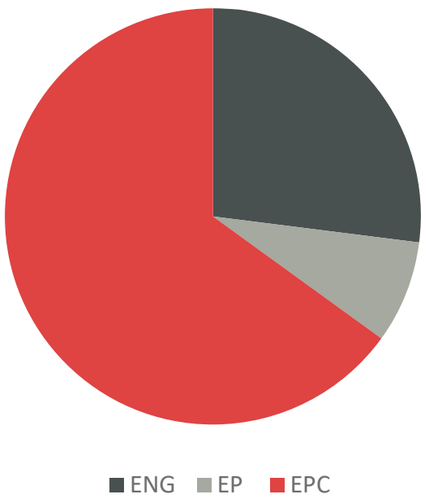
WASTE FUEL EXAMPLES

Refuse derived fuels (RDF) and Solid recovered fuel (SRF)
made from municipal solid waste (MSW), industrial waste, wood waste, landfill or dewatered sludge

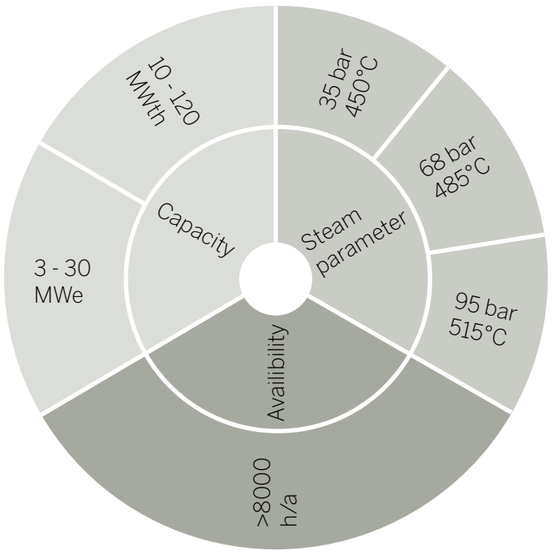
LAWI SERVICES



PROJECT FOCUS



TECHNICAL DATA TABLE



SERVICE

LAWI CUSTOMERS

... are quality oriented and desire proven & efficient technologies with high reliability

... seek solid and reliable returns on their investment

... are looking for a competent, trusted and customer-oriented partner for a long-term business cooperation

SELECTED REFERENCES

WASTE-TO-ENERGY POWER PLANT 7 MW
LAWI EtaPlant®
COD: July 2019

Design fuel | RDF
Location | Ayutthaya, Thailand

TECHNICAL PROJECT DATA

Firing design capacity | 30 MW_{th}
Steam boiler design data | 35 tph, 53 bar(a), 450 °C
Generator capacity | 7 MW_{el}

SCOPE OF LAWI SUPPLY

Engineering, procurement, installation & commissioning (EPC) of LAWI EtaPlant® boiler island with LAWI EtaComb® 300 incl. ash handling system, TGS interconnecting piping and LAWI EtaLogic® optimization unit

BIOMASS POWER PLANT 9.5 MW
LAWI EtaPlant®
COD: August 2017

Design fuel | Multi fuel with para wood & para root as design
Location | Songkhla, Thailand

TECHNICAL PROJECT DATA

Firing design capacity | 40 MW_{th}
Steam boiler design data | 45 tph, 68 bar(a), 485 °C
Generator capacity | 9.5 MW_{el}

SCOPE OF LAWI SUPPLY

Project development & turn-key engineering, procurement, installation and commissioning (EPC) of complete power plant incl. civil works

SELECTED REFERENCES

BIOMASS POWER PLANT 12 MW
LAWI EtaPlant®
COD: August 2017

Design fuel | Multi fuel with gliricidia as design
Location | Nabou of Viti Levu, Fiji

TECHNICAL PROJECT DATA

Firing design capacity | 51.2 MW_{th}
Steam boiler design data | 57 tph, 36.3 bar(a), 440 °C
Generator capacity | 12 MW_{el}

SCOPE OF LAWI SUPPLY

Engineering, procurement, commissioning (EPC) of LAWI EtaPlant® boiler island with LAWI EtaComb® 500 incl. fuel conveying, ash handling system, flue gas cleaning, TGS interconnecting piping and plant automation system (DCS)

WASTE-TO-ENERGY POWER PLANT 9.4 MW
LAWI EtaPlant®
COD: June 2017

Design fuel | RDF
Location | Saraburi, Thailand

TECHNICAL PROJECT DATA

Firing design capacity | 45 MW_{th}
Steam boiler design data | 50 tph, 53 bar(a), 450 °C
Generator capacity | 9.4 MW_{el}

SCOPE OF LAWI SUPPLY

Engineering, procurement, installation and commissioning (EPC) of LAWI EtaPlant® boiler island with LAWI EtaComb® 450 incl. ash handling system and TGS

SELECTED REFERENCES

LAWI ENGINEERING

BIOMASS POWER PLANT 6 MW
LAWI EtaPlant®
COD: June 2014

Design fuel | Multi fuel with gliricidia as design
Location | Mahiyangana, Sri Lanka

TECHNICAL PROJECT DATA

Firing design capacity | 27.5 MW_{th}
Steam boiler design data | 32.9 tph, 68 bar(a), 485 °C
Generator capacity | 6 MW_{el}

SCOPE OF LAWI SUPPLY

Overall plant basic engineering & supplier consultancy
Engineering, procurement and commissioning (EPC) of LAWI EtaComb® 300 incl. fuel conveying and ash handling system

BIOMASS POWER PLANT 20 MW
LAWI EtaPlant®
COD: April 2013

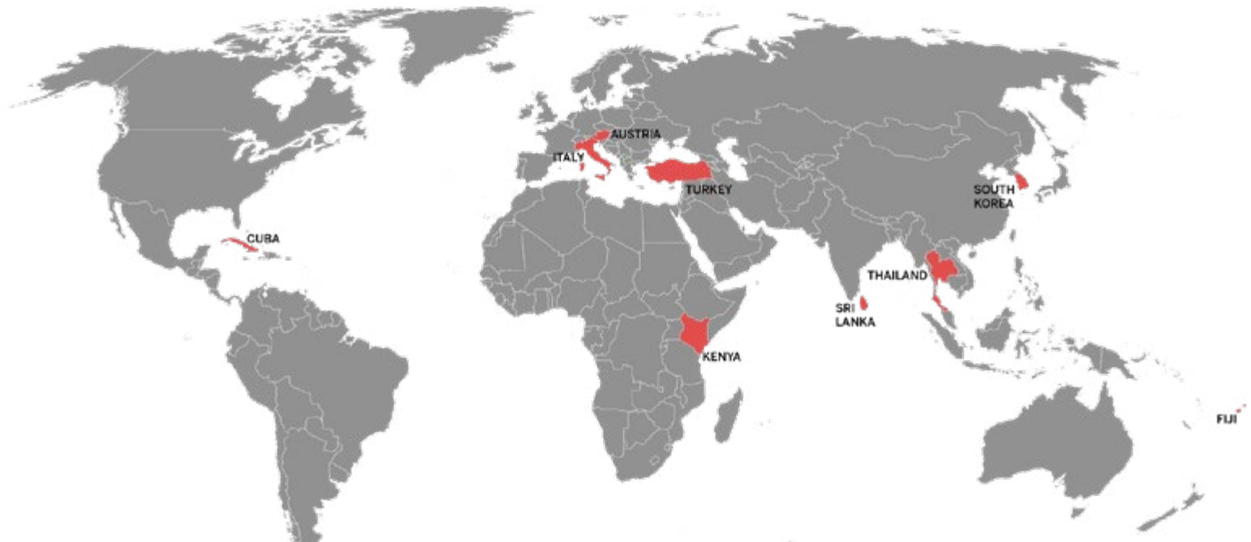
Design fuel | Multi fuel with rice husk and wood chip as design
Location | Khon Kaen, Thailand

TECHNICAL PROJECT DATA

Firing design capacity | 80 MW_{th}
Steam boiler design data | 88 tph, 67 bar(a), 485 °C
Generator capacity | 20 MW_{el}

SCOPE OF LAWI SUPPLY

Overall plant basic engineering and supplier consultancy
Engineering, procurement & commissioning (EPC) of LAWI EtaPlant® with LAWI EtaComb® 800



LAWI Engineering GmbH

Head office
Siemensstraße 8
24118 Kiel
Tel.: +49 431 66 65 65 0
info@de.lawipower.com
www.lawipower.com

Engineering department
Werdauer Straße 1-3
01069 Dresden
Tel.: +49 351 64 75 39 0

LAWI Engineering (Thailand) Co. Ltd.
C Building 7th Floor
177/49 Moo. 17
Mitraphap Road
Nai Muang, Muang
Khon Kaen 40000
Tel.: +66 43 468741

LAWI Engineering (M) Sdn Bhd (897408-K)
Level 3-06 Plaza Seri Setia
No.1 Jalan SS9/2, Seri Setia
47300 Petaling Jaya
Selangor / Malaysia
Tel.: +603 78 74 52 12