



STREBL ENERGY™
RENEWABLE ADVANCED TECHNOLOGIES

Thermal Waste Treatment Technologies Incinerators

Typical Products / References

Rotary Kiln Incineration



4000 t/yr Medical Waste Incinerator,
Completion 2015

Pyrolysis/Gasification



60000 t/yr Chemical Waste Gasification,
Completion 1998 - 2007

Mercury Waste Treatment



120 - 500 t/yr Mercury Waste High
Temperature Desorption,
Completion 2011

Distillation
(Solvents+ Waste Waters)



1500 t/yr Solvent
Distillation / Recovery
Completion 2010

Waste Handling / Transport /
Storage



30000 t/yr 700 mm bore
120 bar Solid Waste Pump
Completion 2004

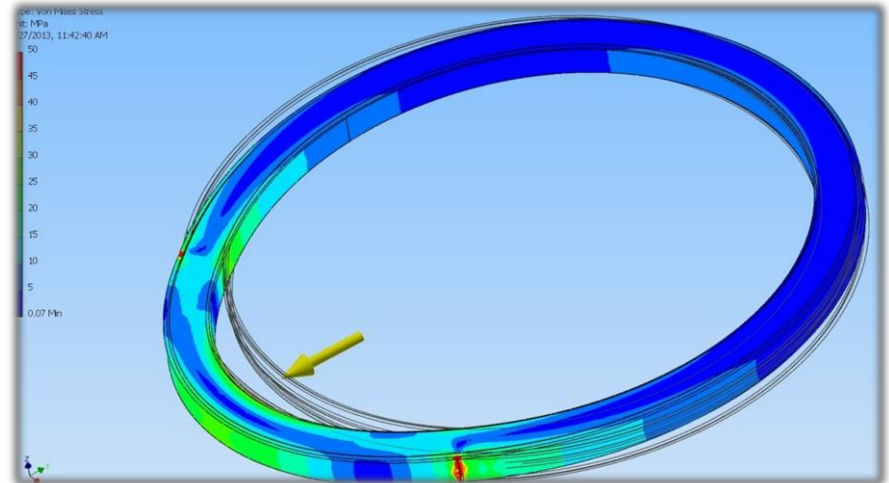
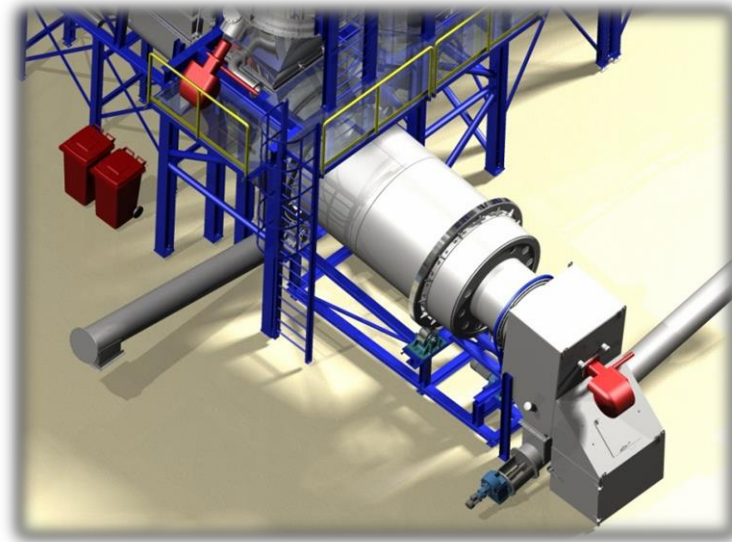


Oil/water/sludge storage/
decanting tankfarm
completion 2008

Methodology

Strebl Energy uses the latest design techniques to develop their products. All our designs are made using 3D engineering packages, evaluated with FEM (Finite Element Methods) and are fully automated to the latest standards in plant automation.

Detail of 500 kg/hr medical waste incinerator, Thailand (Commissioned in 2016)



Kiln riding ring Finite Element Analysis (on stress / deformation)

Technologies

Rotary kiln technology

Our main focus is to provide rotary kiln based thermal waste processing plants. This simply because this is the most versatile (in waste acceptance), the most reliable (in day to day operations and maintenance), the most technical straightforward (proven reliability on end quality and emissions) and as a result the most optimum solution for most waste treatment issues.

Yes, we are aware of alternative “modern” technologies (we have even build/operated most of them, see next pages), but rotary kiln technology simply works; if built correctly off course. No rocket-science, as long as you know the tricks of the trade

52 m x 4.4 m rotary kiln (ATM-NL)

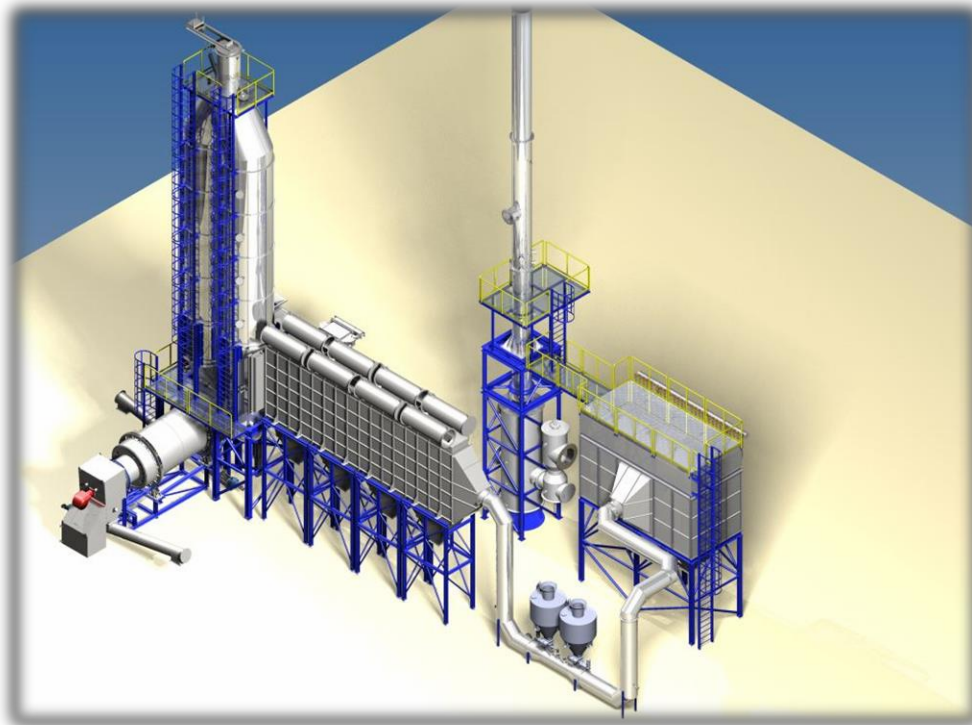


Technologies

Rotary kiln technology

Counter-Current Rotary Kiln Incinerator

500 kg/hr medical waste / 3 Megawatt with energy recovery, in full compliance with EU emission regulations. In operation since 2016.



**all technical knowledge
to construct both Co-Current as
Counter-Current kilns, in a
thermal input range of 1 to 50
Megawatt.**

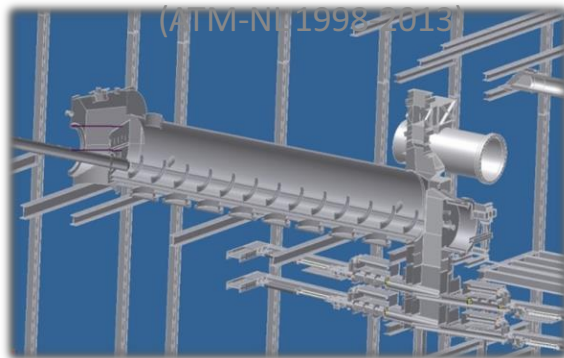
Technologies

Pyrolysis / gasification

Strebl Energy has built a 60.000 tons/year chemical waste gasification plant, now in operation for more than 15 years (which is rather unique on the planet) and knows – out of practice- the advantages and disadvantages of such a process.

Strebl Energy has developed this specialized know-how and in specific applications pyrolysis has major advantages over conventional incineration; making it a practical advisable solution for specific applications.

3D model of chemical waste gasification plant

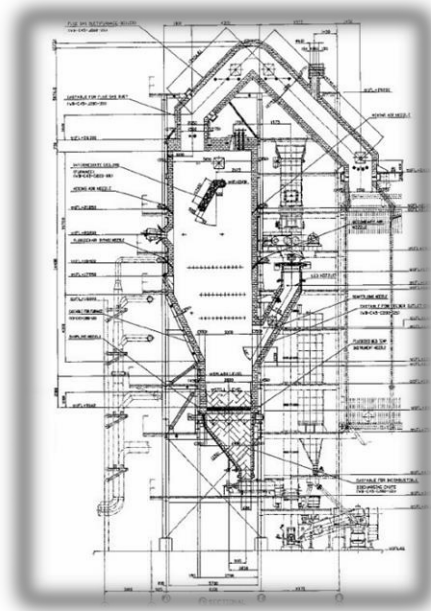


Chemical waste gasification plant (ATM-NL 1998-2013)

Technologies

Fluidized bed technology

Strebl Energy has operated and improved fluidized bed technology for many years: similar to gasification/pyrolysis, fluidized bed can have specific advantages on dedicated waste streams. Although definitely not as versatile as rotary kiln technology, fluidized bed incineration does have its reason for living if applied to specific waste streams (generally speaking with well-defined properties).



Cross section of
fluidized bed
furnace, Thailand

Technologies

Mercury treatment technology

Strebl Energy has successfully built and operated the first Mercury treatment facility in South East Asia, complying with all international standards; resulting in complete non-hazardous end products with typically $< 5 \text{ mg Hg/kg}$. Typical Mercury removal efficiencies $> 99.97\%$!



Virtual picture of Hg treatment facility, Thailand

Hg treatment facility, Thailand, 2012 (high temperature vacuum desorption)



Technologies

Waste storage and transfer technologies

To store and pump wastes is not “as easy as it looks” and severely underestimated generally speaking in the project evaluation and engineering phase. Waste storage and pumping is a very specific and unique technology, at least if you want to do this in a reliable way. Strebl Energy has the proven know-how to deal with your waste in a reliable way.



120 bar process pressure solid
chemical waste pump
(The Netherlands)



Liquid waste
storage tanks
(Thailand)

References

25 years experience in thermal waste processing and relating technologies.
Projects prior to 2012 were completed under other company names.

Some of the references are:

- Engineering, construction and startup:

1995 – 2007: Pyro plant, ATM – The Netherlands: design, construction and operation of a 60.000 tons/year hazardous waste gasification process

1989 – 2007: TRI, ATM – The Netherlands: design, construction and operation of several main components for the soil thermal desorption facility, max. 200 tons/hr

1989 – 2007: Several other projects, processes, including:

- Oil recovery system from oil/water sludges, originating from ships and storage tanks
- Large scale solid waste transfer pumps
- Industrial Microwave heating processing for wastes

2007-2011: MAEH, Thailand/Singapore/Indonesia: oil/water recovery and treatment facilities

2009 – 2011: MAEH, Thailand: design / construction of a 120 t/year Mercury contaminated waste treatment facility

2012 - ...: Thailand: design / construction of a 500 kg/hr medical waste incinerator, including heat recovery system for medical waste storage room cooling

References

- Plant improvement, commissioning, startup:

2007 - 2011: Technochem – Singapore: improvement of existing hazardous waste rotary kiln incinerator, resulting in a 300% production increase in 2 years

2007 - 2011: BPEC – Thailand: successful startup and operation of the 1st successfully operated large scale fluidized bed industrial waste incinerator in Thailand

2012 - 2015: Plant improvement, commissioning, operational and technical support for rotary kiln, fluidized bed and stepped grate incinerators in:

- The Netherlands
- Saudi Arabia
- Singapore
- Thailand
- South Korea

- Medical waste incineration operations:

DI (Thailand) Co. LTD. currently operates a 400 kg/hr medical waste incinerator via a sister company of DI-TH: Thai Environment Systems Co. LTD. In Thailand

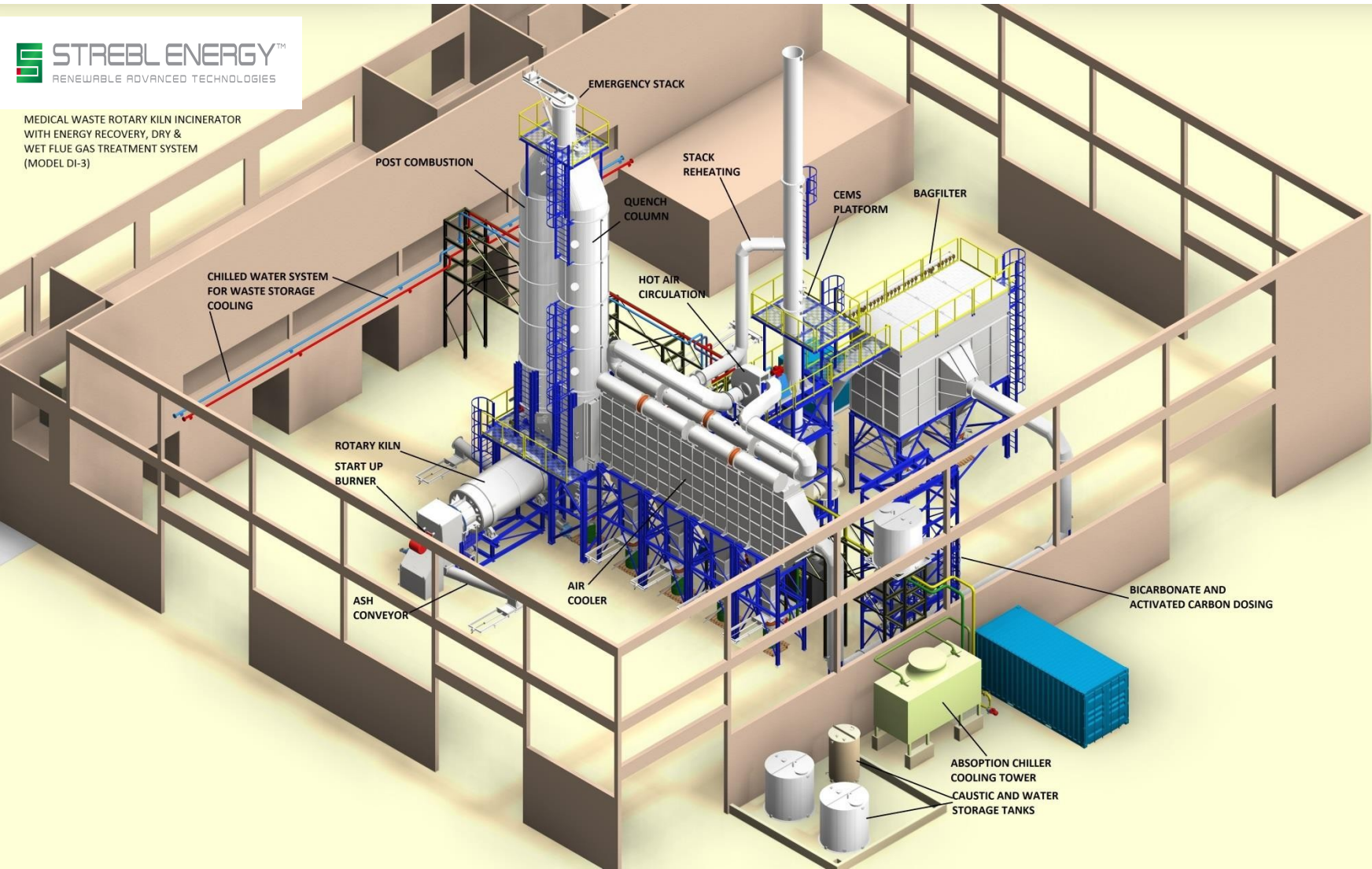
Turn- key projects

- ***CASE 1:***
- ***12 tons/day medical waste incinerator, currently in operation, Thailand***
- ***3 MW thermal input***
- ***No auxiliary fuel needed for day to day operations***
- ***System including energy recovery for waste storage room cooling***
- ***Emissions in full compliance with EU regulations***
- ***Two stage dry and wet scrubbing based scrubbing system***
- ***Fully enclosed waste feed system, fully hygienic***
- ***Automated fully enclosed ash discharge systems***

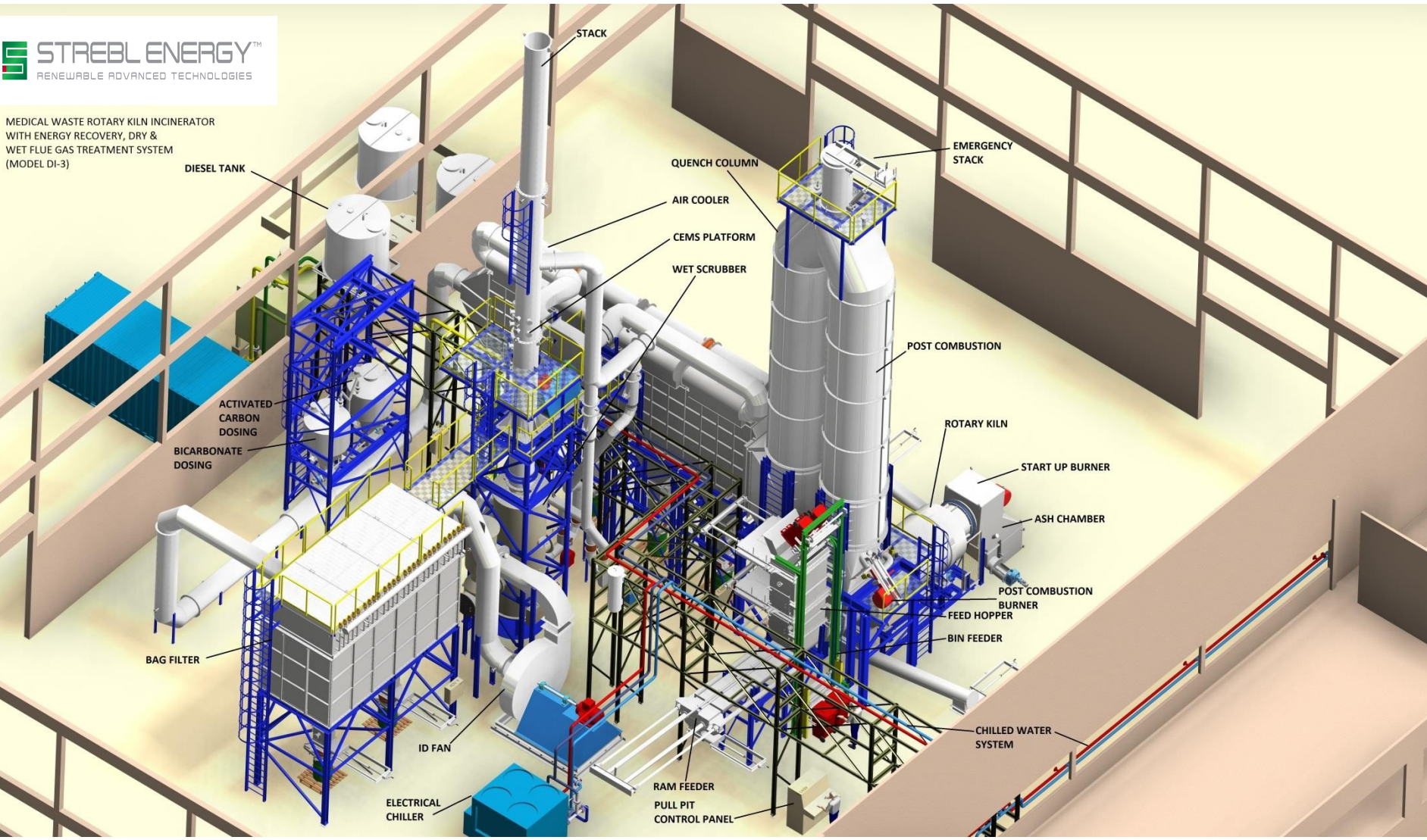
SYSTEM CONCEPT – D13 MEDICAL WASTE INCINERATOR



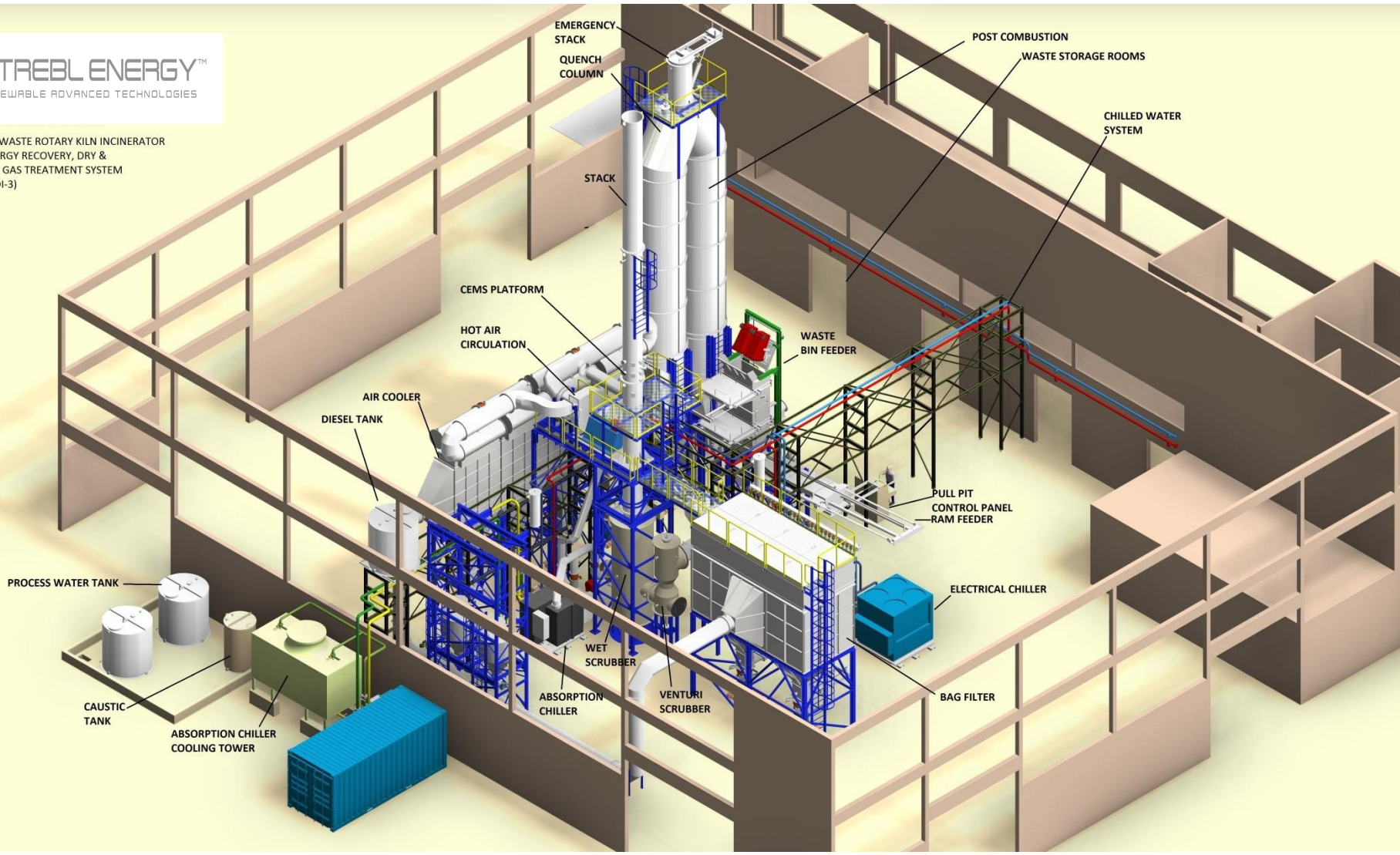
MEDICAL WASTE ROTARY KILN INCINERATOR
WITH ENERGY RECOVERY, DRY &
WET FLUE GAS TREATMENT SYSTEM
(MODEL DI-3)



MEDICAL WASTE ROTARY KILN INCINERATOR
WITH ENERGY RECOVERY, DRY &
WET FLUE GAS TREATMENT SYSTEM
(MODEL DI-3)



MEDICAL WASTE ROTARY KILN INCINERATOR
WITH ENERGY RECOVERY, DRY &
WET FLUE GAS TREATMENT SYSTEM
(MODEL DI-3)



PRACTICAL IMPLEMENTATION – D13 MEDICAL WASTE INCINERATOR - THAILAND



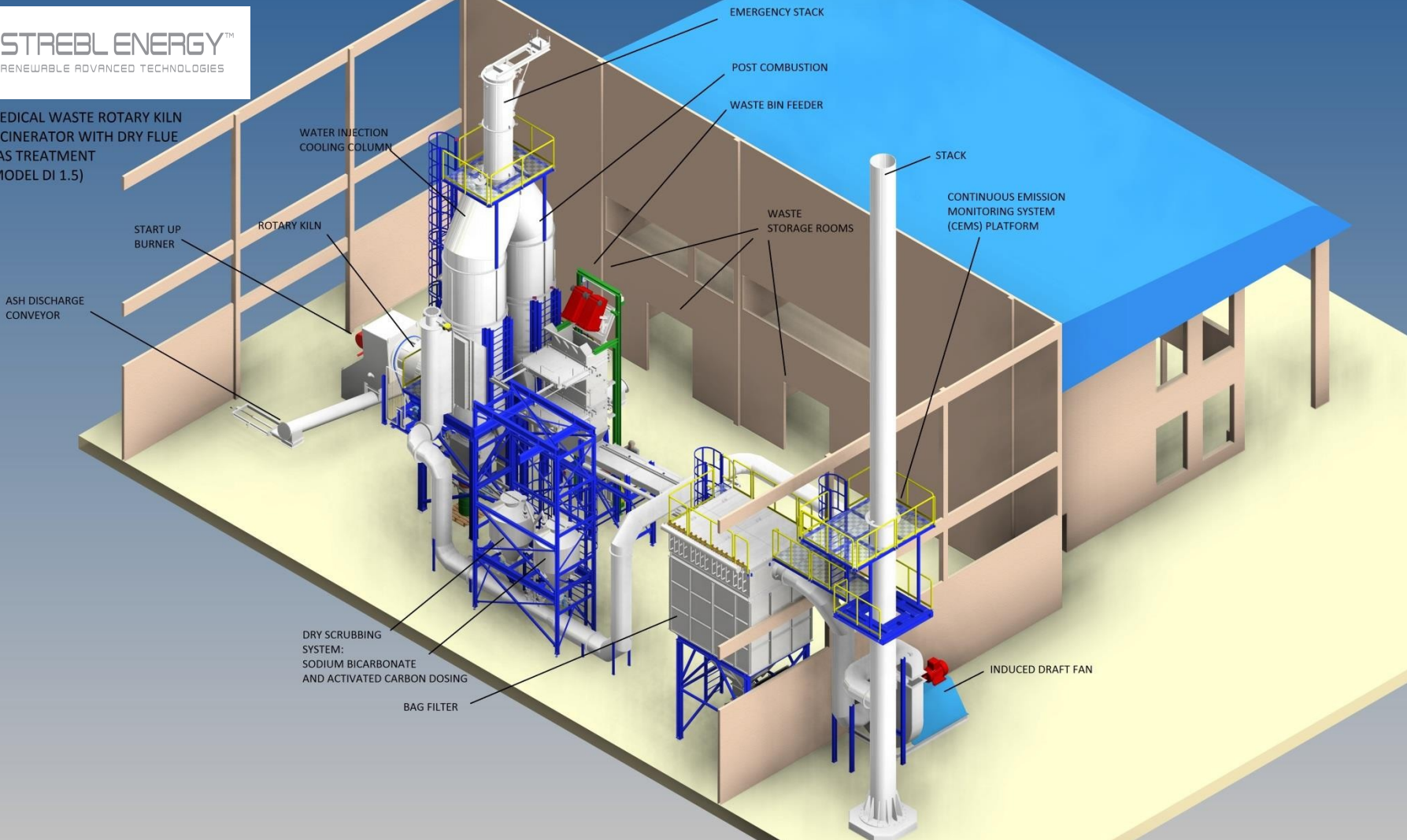
Turn- key projects

- ***CASE 2:***
- ***6 tons/day medical waste incinerator, currently under construction, Thailand***
- ***1.5 MW thermal input***
- ***Cost effective solution***
- ***No auxiliary fuel needed for day to day operations***
- ***Emissions in full compliance with EU regulations***
- ***Single stage dry sodium bicarbonate based scrubbing system***
- ***Fully enclosed waste feed system, fully hygienic***
- ***No waste water discharge, no water consumption***
- ***Automated fully enclosed ash discharge systems***

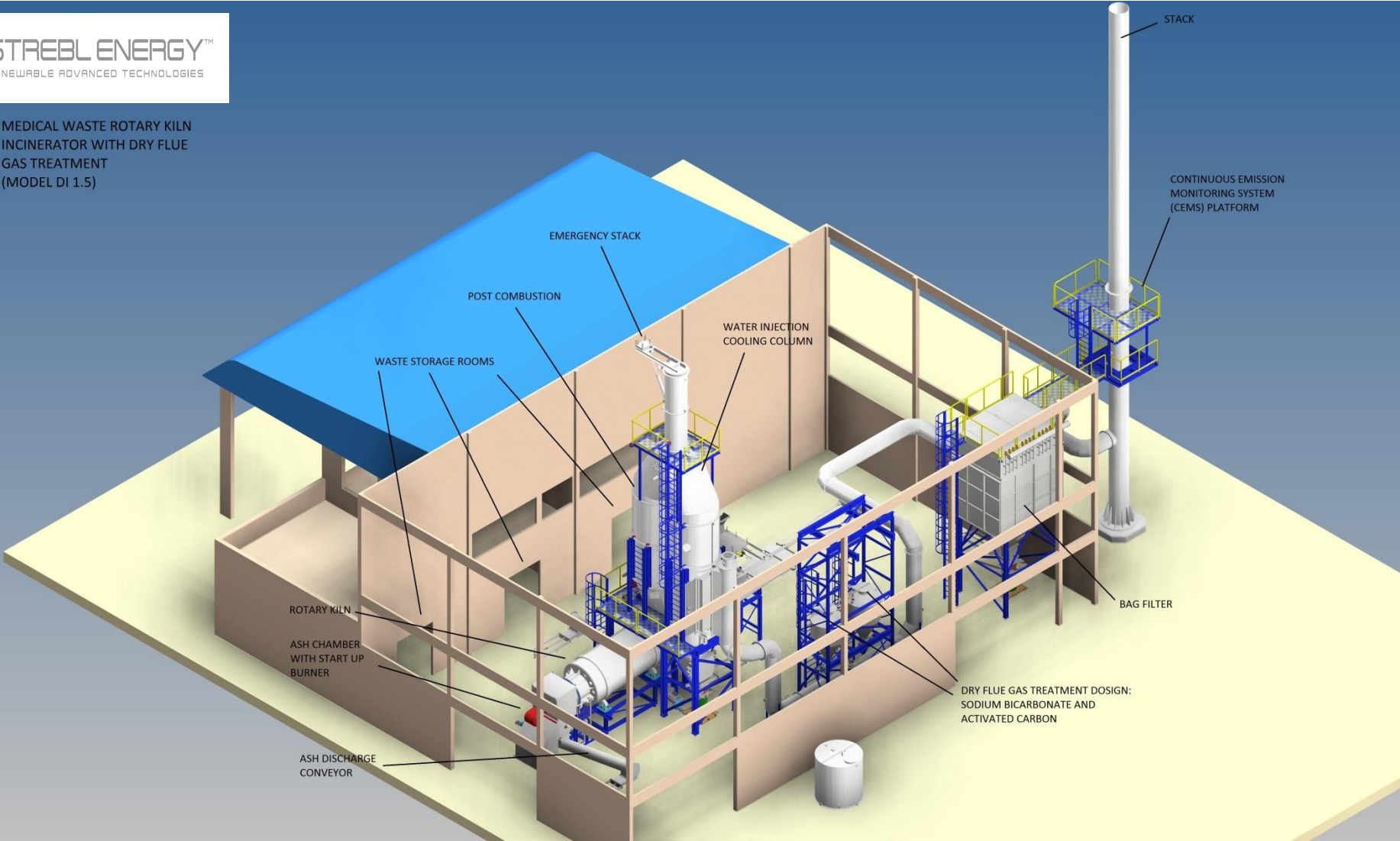
SYSTEM CONCEPT – DI 1.5 MEDICAL WASTE INCINERATOR



MEDICAL WASTE ROTARY KILN INCINERATOR WITH DRY FLUE GAS TREATMENT (MODEL DI 1.5)



MEDICAL WASTE ROTARY KILN
INCINERATOR WITH DRY FLUE
GAS TREATMENT
(MODEL DI 1.5)



**MEDICAL WASTE ROTARY KILN
INCINERATOR WITH DRY FLUE
GAS TREATMENT
(MODEL DI 1.5)**

ASH DISCHARGE
CONVEYOR

WATER INJECTION
COOLING COLUMN

ROTARY KILN

EMERGENCY RELIEF STACK

POST COMBUSTION

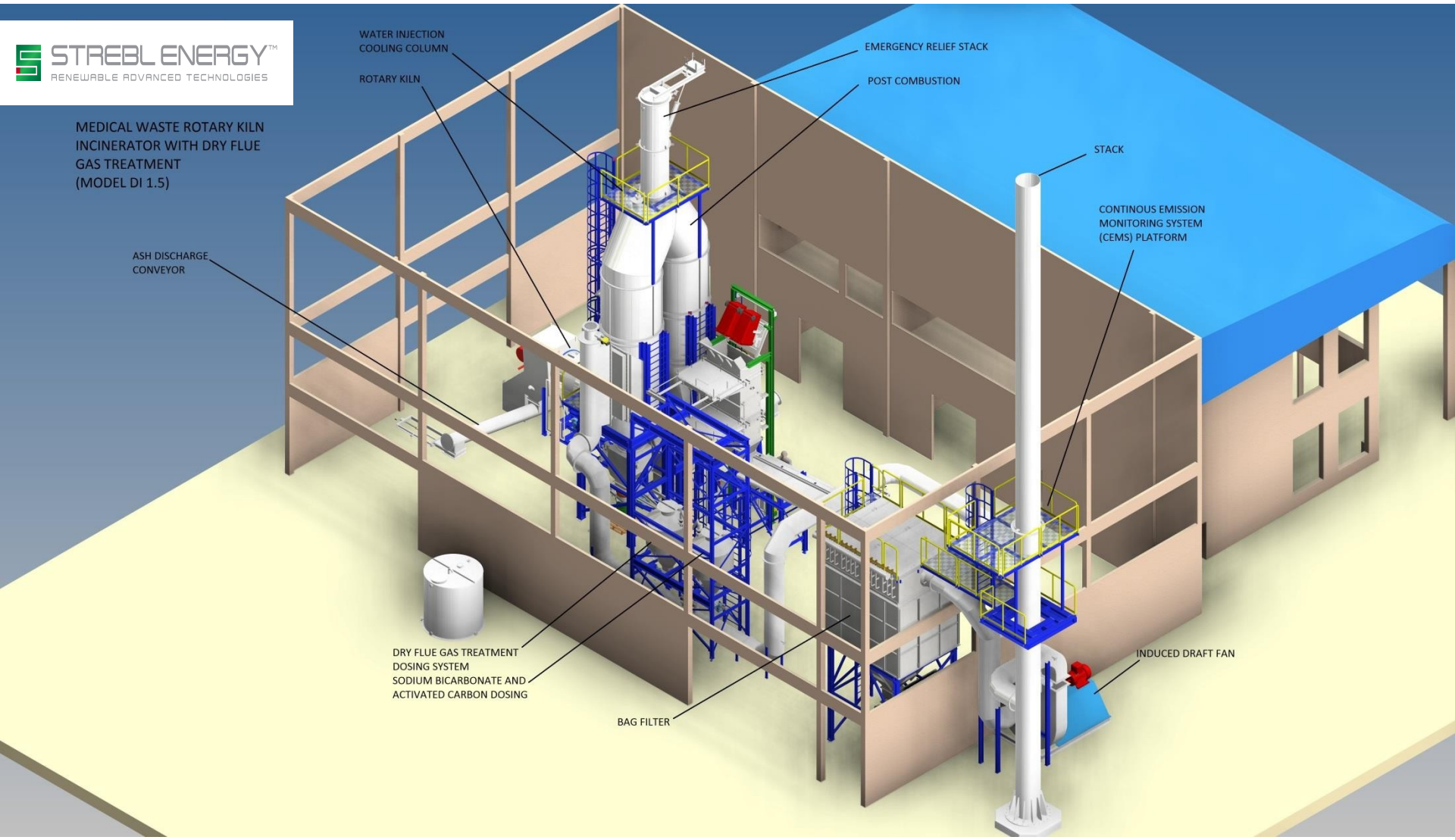
STACK

CONTINUOUS EMISSION
MONITORING SYSTEM
(CEMS) PLATFORM

DRY FLUE GAS TREATMENT
DOSING SYSTEM
SODIUM BICARBONATE AND
ACTIVATED CARBON DOSING

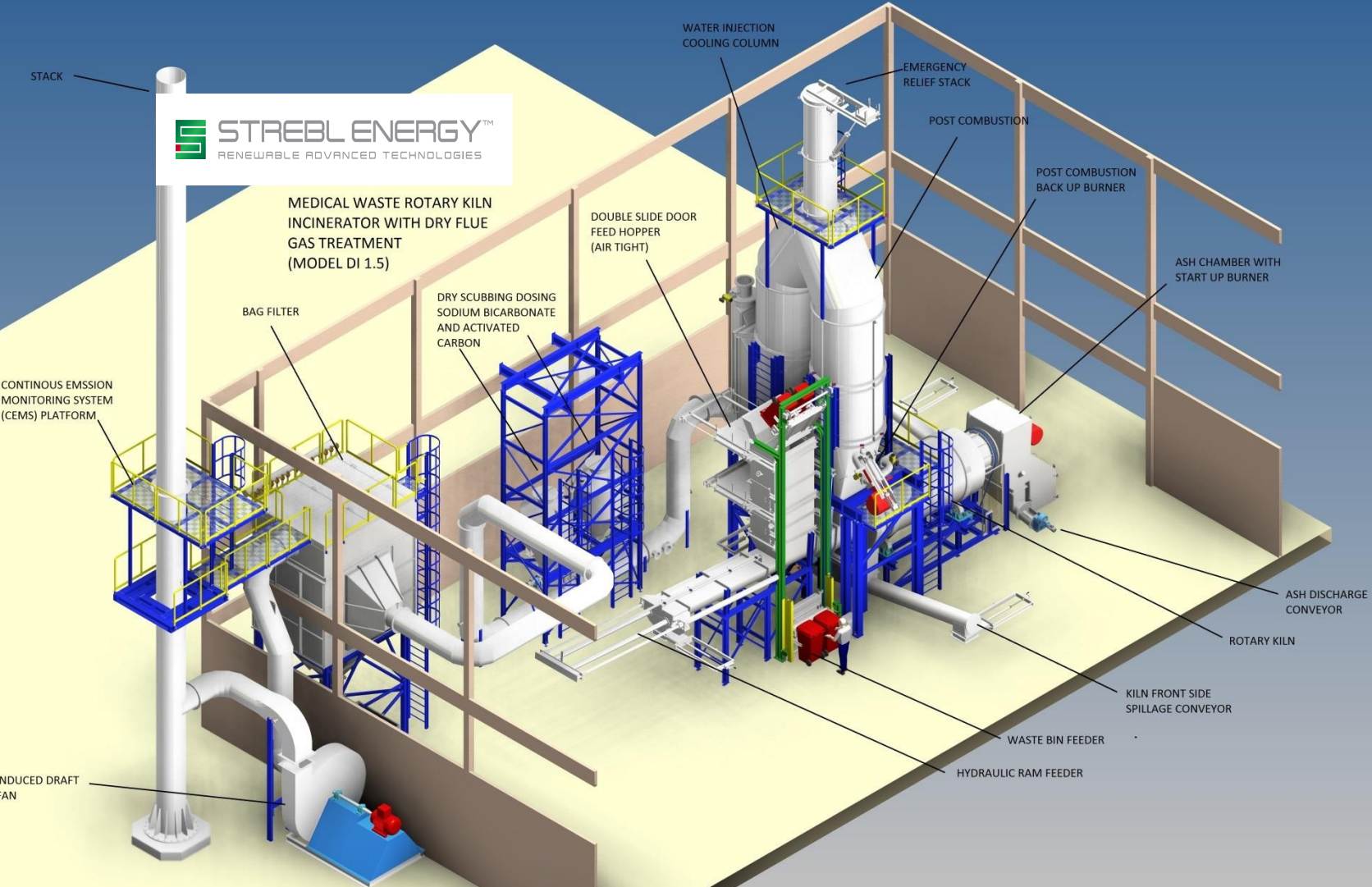
BAG FILTER

INDUCED DRAFT FAN





MEDICAL WASTE ROTARY KILN INCINERATOR WITH DRY FLUE GAS TREATMENT (MODEL DI 1.5)



STACK

WATER INJECTION COOLING COLUMN

EMERGENCY RELIEF STACK

POST COMBUSTION

POST COMBUSTION BACK UP BURNER

ASH CHAMBER WITH START UP BURNER

DOUBLE SLIDE DOOR FEED HOPPER (AIR TIGHT)

DRY SCUBBING DOSING SODIUM BICARBONATE AND ACTIVATED CARBON

BAG FILTER

CONTINUOUS EMISSION MONITORING SYSTEM (CEMS) PLATFORM

ASH DISCHARGE CONVEYOR

ROTARY KILN

KILN FRONT SIDE SPILLAGE CONVEYOR

WASTE BIN FEEDER

HYDRAULIC RAM FEEDER

INDUCED DRAFT FAN



STREBL ENERGY™
RENEWABLE ADVANCED TECHNOLOGIES

STREBL ENERGY Pte Ltd

316 Tanglin Road #02-01, GreenHub, Singapore 247978

Office: +65 6801 0693 Mobile: +65 8404 7347 Email: info@streblenergy.com

www.streblenergy.com