

## NextBAT®: We are ready for the future

The best of the best - from crane to stack. This is the content of our NextBAT® plant concept, made possible by the acquisition of Götaverken Miljö.

**NextBAT®**  
FROM CRANE TO STACK

**Together we can supply a comprehensive waste-to-energy plant, which optimises everything from energy efficiency to flue gas treatment.**

99% thermal efficiency, 99% clean flue gas. This is the signature of the new plant concept, which will combine both state of the art and brand new technology for waste-to-energy in the future, allowing EU countries to fulfil the stricter requirements for both electrical efficiency and flue gas treatment.

In short, the high percentage shows what a waste-to-energy plant can deliver with regard to energy utilisation and flue gas treatment by using the newest technology from Babcock & Wilcox Vølund and Götaverken Miljö respectively. All in all this provides Babcock & Wilcox Vølund with significant excess for meeting the new EU requirements.

"Since we can easily comply with the upcoming requirements, we view them as an invitation," says Ole Hedegaard Madsen, Director of Technology and Marketing at Babcock & Wilcox Vølund.

### Requirements and demand lead to NextBAT®

The new requirements come in the form of a reference note (BREF note) under the EU's Waste Directive. Ole Hedegaard Madsen expects that the BREF note in particular will lead to stricter requirements for electrical efficiency and flue gas emissions.

"With the acquisition of Götaverken Miljö we can supply a waste-to-energy plant which optimises operations, energy utilisation and flue gas treatment from crane to stack. This allows us to fulfil the EU requirements and comfortably achieve the expected halving of all emission values. However, it is just as important that we carefully target our new market's demand for total solutions and high electrical efficiency," says Ole Hedegaard Madsen with reference to plants in southern European countries and countries without district heating systems.

These countries are very dependent on being able to improve the electricity efficiency as they cannot optimise energy through utilisation of the heat. He explains that demand has been a significant part of the driving force behind Babcock & Wilcox Vølund's investment in the NextBAT® plant.

### State of the art and brand new technology

NextBAT® is 80 per cent state of the art technology and 20 per cent R&D technology, straight from the research department.

Examples of the state of the art technology are Götaverken Miljö's patented ADIOX® technology for removing dioxins from the flue gas using composite restoration elements with activated carbon and Babcock & Wilcox Vølund's boiler cleaner that can clean the panel wall tubes during operation.

An example of the emerging technology is a RESOX™ plant that returns sulphur from the flue gas treatment to the incineration. The sulphur reduces the content of the highly corrosive bleach in the deposits in the tube, which can double the service life of the tubes in the boiler. The technique has been in full scale use at a waste-to-energy plant in Göteborg.

"The brand new and patented technologies mean that we have an outstanding opportunity to set new standards, for example when we bid on a prestige project such as Amagerforbrænding's 'Amager Bakke', says Ole Hedegaard Madsen, referring to the tender for the almost four billion DKK plant project, with its external architectural function as a ski slope and that shall internally contain the finest technology for energy utilisation. The tender will be decided in February 2012.

### Moving the boundaries, now - and going forward

The technologies in Babcock & Wilcox Vølund's NextBAT® plant mean that the tender for Amagerforbrænding can include bidding for a plant with increased electrical efficiency. The RESOX™ technology enables operations at much higher steam temperatures and pressure than before.

Correspondingly, a new method for flue gas condensation in two steps can increase the plant's overall energy utilisation from the waste by 20-25 per cent.

Finally, Ole Hedegaard Madsen is happy that NextBAT® anticipates future requirements in areas such as flue gas treatment during normal operating conditions and levels for ultrafine particles.

# NextBAT®

## FROM CRANE TO STACK



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|---|--|
| ① Water-cooled DynaGrate®                     | ①7 Condensing scrubber stage with ADIOX® packing |
| ② Separately cooled wear zone in furnace      | ①8 Final particle removal                        |
| ③ Combustion chamber with Inconel clad walls  | ①9 Reheater                                      |
| ④ Ignition control with air                   | ②0 Emission monitoring equipment                 |
| ⑤ Advanced flame front control                | ②1 Flue gas fan                                  |
| ⑥ VoluMix™ zone in 1st pass                   | ②2 Heat exchangers in condensing system          |
| ⑦ Inconel clad 1st and 2nd boiler pass        | ②3 Absorption heat pump                          |
| ⑧ On-line Boiler Washing System™              | ②4 District heating system                       |
| ⑨ Integrated baffle walls in 3rd pass         | ②5 Buffer tanks                                  |
| ⑩ Evaporator section                          | ②6 Waste water treatment                         |
| ⑪ Superheater sections                        | ②7 CUTNOX™ and RESOX™                            |
| ⑫ Economizer sections                         | ②8 Turbine/generator                             |
| ⑬ Dust removal                                | ②9 Condenser                                     |
| ⑭ Quenching                                   | ③0 Deaerator/feed water tank                     |
| ⑮ Acid scrubber stage with ADIOX® packing     | ③1 Feed pump                                     |
| ⑯ Alkaline scrubber stage with ADIOX® packing | ③2 Feed water heat exchangers                    |

### 99 per cent clean flue gas with a wet scrubber system

**Target of 99 per cent clean flue gas, free of chlorine, sulphur and particles.**

New EU requirements for flue gas emissions may provide a market boost for the wet treatment of flue gas.

This is the view of Ole Hedegaard Madsen, Director of Technology and Marketing in Babcock & Wilcox Vølund. Using a wet scrubber system the flue gas is 95-99 per cent cleaned of all emissions when released through the stack. This is particularly pleasing since the outlook is for increasingly stricter requirements for flue gas emissions from waste-to-energy plants. Ole Hedegaard Madsen expects that new EU regulations will halve all emission values as early as 2013. Babcock & Wilcox Vølund has, through the acquisition of Götaverken Miljö, targeted wet treatment. He adds: "We experience that many tenders have already changed requirements. They are often much stricter than today's legislation."

### From toxic residues to recycling and waste water

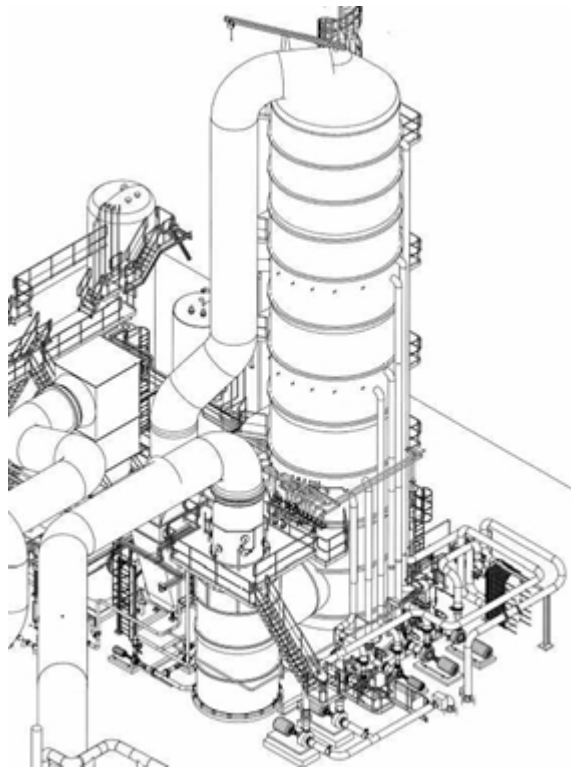
Götaverken Miljö's wet treatment is carried out in several compartments in one wash tower. The technology is third-generation flue gas treatment that has previously included dry treatment and semi-dry treatment. Both types of dry treatment require the addition of large quantities of lime, which leaves a certain amount of toxic residue (such as reaction products and fly ash) that must be disposed of in line with specific rules.

The wet treatment does not produce anywhere near as much toxic residue. The majority of residues from wet treatment can partly be reused in the process and partly be managed as waste water with subsequent disposal of sludge.

## Wet treatment means significantly lower chemical usage

Wet treatment is based on chemical treatment that requires more complicated waste water cleaning. Wet treatment is initially more expensive than dry or semi-dry treatment. In turn, the cleaning can follow stricter emission requirements over time, with significantly lower chemical usage and without exponentially increasing quantities of residues, which is the case with semi-dry treatment.

This is another benefit which, according to Ole Hedegaard Madsen, is far from insignificant as it is also quite likely that there will be stricter requirements for managing residues from flue gas treatment in the future.



Wet scrubber



The NextBAT<sup>®</sup> concept was presented at ISWA's Beacon conference in Malmö. To the left is Ole Hedegaard Madsen from Babcock & Wilcox Vølund and to the right is Per Lindgren from Götaverken Miljö.