DP CleanTech
Creating value from waste

DP customized solutions
Upgrade of waste-to-energy plant

BOFA Bornholm Island, Denmark

Introduction

BOFA (Bornholms Affaldsbehandling Waste Handling – a county owned organization) owns a waste-to-energy (WtE) plan on Bornholm Island, Denmark. At the inception of the project, approximately 20,000 tons of municipal solid waste and industrial waste were combusted annually in order to supply district heating to the island community. However the total amount of waste generated by the island is approximately 26,500 tons per year, and will likely continue to increase by 1-2% per year.

Requirements

The original 20 year old Smoke Tube Boiler was becoming increasingly inefficient and problematic in terms of cleaning requirements. Over time, the plant required progressively more downtime, and the frequent cleaning obligations were increasing the labour costs. The smoke tubes required daily manual cleaning, and in order to minimize downtime, this was often done with the boiler in operation, which raised health and safety concerns. In addition, the boiler load had to be manually reduced during the cleaning activity, reducing the availability of the plant.

The furnace was also severely affected by heavy slag fouling, which frequently had to be physically removed with pneumatic hammers and chisels. This increased plant downtime and also raised safety issues.

The DP Solution

DP's proposal was both the most cost effective technical solution to increase capacity and efficiency; as well as being able to address the health and safety concerns. Critically, the installation of a fully automated DCS transformed the plant performance to operate optimally, at all times.

Boiler

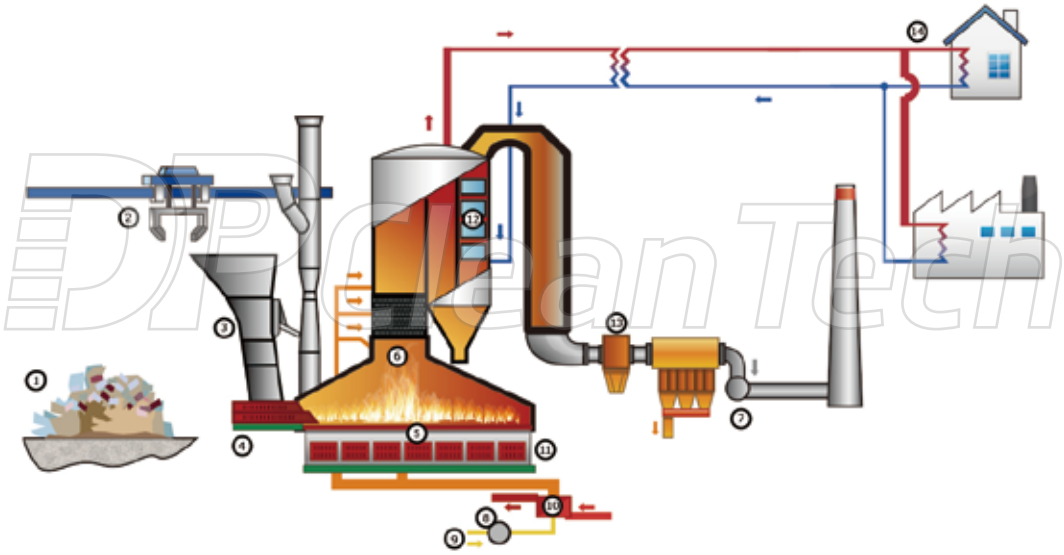
- DP designed a Water Tube boiler to replace the Smoke Tube boilers
- The new boiler comprised 3 passes – 2 radiation passes and one convection (economizer) pass. Out of the 2nd radiation pass, the flue gas temperature was reduced to below 400^{0}c, and out of the economizer pass, the flue gas temperature is controlled to set point of 155^{0}c. This provides optimum operating conditions for the downstream flue gas treatment.
- The 3rd convection pass was built as a freestanding economizer tower with four bundles of tube coils.

Cleaning

- A specially developed "shock blast cleaning" system which uses air shockwaves instead of water to continuously clean radiation surfaces was installed. This is far superior to water cleaning – typically used for this purpose - as it maintains a low level of fouling; does not contribute to thermal stress, and does not cause corrosion on boiler surfaces. Finally, as there is low energy absorption compared to the combustion-like water washing, it does not cause oscillations to the boiler load controller.

DP CleanTech
Creating value from waste

Waste Fired Boiler (Hot water generation)



1 Waste bunker
2 Crane
3 Feeding hopper
4 Pusher
5 Step grate
6 Combustion chamber
7 Induced draught fan
8 Forced draught fan
9 Combustion air intake
10 Air preheater
11 Ash conveyer
12 Economizers
13 Flu gas cleaning
14 District heating

Image cannot be reproduced without permission of DP CleanTech

Automation

- Huge variations in waste can drive inefficiencies in combustion, but DP developed and installed a completely new and fully automated DCS to allow continuous optimization of plant performance and emissions. The system also addresses the cleaning system, and enables continuous cleaning of heating surfaces resulting in stable boiler operation and temperature.

Resulting Plant Performance

The boiler modifications, together with the enhanced cleaning process and the advanced and fully automated control system have ensured optimum combustion in all load scenarios. There has been no increase in fouling during operation, or between planned maintenance periods. Water consumption in the furnace has also been reduced, resulting in improved plant efficiency.

Together with the improved feeding and combustion air control these changes have produced an excellent plant performance, and only one annual plant shut down is needed.

The improved efficiency and availability mean the capacity of the plant is now at 26,000 tons of waste per year.