RENEWABLE ENERGY AT SUSTAINABLE COST USING A COMBINED HEAT AND POWER WTE-FACILITY IN THE PAPER INDUSTRY

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ABSTRACT

In March 2008, Keppel Seghers started the engineering, supply, construction and commissioning of a Combined Heat and Power (CHP) Waste-to-Energy (WtE) plant in Åmotfors (Sweden). When completed in 2010 the plant will process close to 74,000 tons per year of household waste (average LHV = 10.5 MJ/kg) and limited quantities of (demolition) wood resulting in a yearly production of about 108,700 MWh of steam, 12,100 MWh of heat and 13,400 MWh of electricity. Herewith, the Åmotfors WtE-CHP is sized to meet the joined energy needs of the local paper production, neighboring industries and buildings at an overall net plant efficiency of almost 65%.

The WtE-CHP will offer state-of-the-art combustion and energy recovering technology, featuring Keppel Seghers’ proprietary Air-Cooled Grate, SIGMA combustion control and integrated boiler. Waste is fed into the combustion line with an automatic crane system. To surpass the stringent EU emission requirements, a semi-dry flue gas cleaning system equipped with Keppel Seghers’ Rotary Atomizer was selected as economic type of process for purifying the combustion gas from the given waste mixture. Furthermore a low NOx-emission of 135 mg/Nm³ (11%O2,dry) as imposed by Swedish law is achieved by SNCR.

The plant engineering is described with a focus on the overall energy recovery. As stable steam supply to the paper mill and the district heating system needs to be assured under all conditions the design includes for supporting process measures such as combustion air preheating, steam accumulation, turbine bypassing, buffering of the main condenser and back-up energy supply from an auxiliary fuel boiler. Additionally, external conditions can trigger distinct plant operation modes. A selected number of them are elaborated featuring the WtE-plant’s capability to conciliate a strong fluctuating steam demand with the typical intrinsic inertia of a waste-fired boiler.

With prices for fossil fuels increasing over the years, the cost for generating process steam and heat has become dominant and for paper mills even makes the overall difference in viability. As will be documented in this paper, the decision to build the Åmotfors WtE-CHP was taken by Nordic Paper after a quest for significant cost-cutting in the production of process energy. Moreover, the use of industrial and household waste as fuel brings along the advantage of becoming largely independent from evolutions on the international oil and gas markets. By opening up the possibility for a long-term secured local (waste) fuel supply at fixed rates, WtE-technology offers a reliable alternative to maintain locally based industrial production sites. The Nordic Paper mills in Åmotfors are therefore now the first in Sweden to include a waste-fired CHP on a paper production site.

1. INTRODUCTION

In general, the (European) first-generation WtE-plants – often owned and operated by public (municipal) companies – have been conceived as stand-alone facilities with a main purpose to combust the residual household waste from the local