ALTA PROCESS SOLUTIONS

AFFILIATED TO ALTA ENERGY SOLUTIONS CORPORATION

ALTIUS CENTRE – SUITE 2500 – 500 4th AVE SW CALGARY, AB, T2P 2V6 CANADA

INFO@ALTAENERGY.CA | WWW.ALTAENERGY.CA | WWW.ALTAPROCESS.CA

SCIENTIFIC & RESEARCH PROJECTS

Project No.: 01 **Year:** 2012

Project Field: Combined Heat & Power / Co - Generation

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Project Title:

Optimal Design of Cogeneration System in a Kraft Process Using Genetic Algorithm

Abstract:

Cogeneration is one of the best methods for energy saving which makes a better use of fuels by using recovered heat and producing heat and power simultaneously. In this study, the implementation of a cogeneration system (CHP) integrated with an industrial pulp and paper mill is studied. The cogeneration system consists of an air compressor, a combustion chamber, a gas turbine and a single pressure heat recovery steam generator (HRSG) with supplementary firing which are integrated with a back-pressure steam turbine available in the mill. This system is designed for producing 35 MW of power required in the mill and 192 t/h of superheated steam at 61 bar required for driving the steam turbine. Aspen plus software is used to simulate the proposed CHP system.
Afterwards, genetic algorithm (GA) is used for optimization of this cycle using both thermodynamic and thermo-economic models. Two objective functions are considered which are Total Annual Cost (TAC) of the cogeneration system to be minimized and exergy efficiency of this system to be maximized and five decision variables are considered in the optimization procedure. By applying the proposed CHP system both power and heating requirements of the pulp and paper mill can be supplied with a payback of 1.1 year. Also, it is shown that by applying GA method, TAC of the CHP system is improved by 18.5 % compared to one resulted from general simulation.