



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.: 08 **Year:** 2022

Project Field: Exergy Analysis

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Project Title:

Total Site Exergy Analysis, Using a New Conceptual Method

Abstract:

In this research, a new graphical tool entitled Omega Total Site Profile (OTSP) is introduced to simply calculate the exergy destruction and losses within a total site. This new diagram is obtained by the development of Omega Composite Curves (OCC) used for exergy destruction and loss calculations within an individual process. The OTSP diagram is linear and the enclosed area between process and utility streams has a rectangular shape and shows the thermal exergy destruction and losses within a total site. Having combined the new diagram with a mathematical optimization like Genetic Algorithm, a method to a new design or retrofit a total site is presented. Next, two case studies are used to demonstrate the performance of the proposed diagram and the optimization procedure. In the first total site case study by considering flexible temperature levels for utilities, the optimum scheme resulted in 14.6% and 24% lower exergy destruction and losses compared to the current design with fixed temperature levels for utilities. In the second total site case study, by considering three temperature levels of utilities, the optimum heat recovery design resulted in 24% lower exergy destruction and losses compared to the base case.