Both qualitative and quantitative analyses from a second law perspective were done for both power plant configurations. It was found that in both *cycles* the HRSG design was the main source of entropy generation due to the large heat that was transferred and the big temperature differences. However, when the second power plant configuration was analysed, the largest irreversibility occurred in the supplementary heat exchanger as a consequence of the large heat transferred and the temperature difference. Heat demand, and not process heat temperature, was the process heat parameter that had the largest effect on both efficiencies, being the variable that limits the most the power generation in the steam turbine.

The power plant with supplementary heat exchanger was independent of the process heat temperature due to the nature of the optimal solution, leading to poor efficiencies and low power production. As a consequence, the simple Rankine cycle is considered as the best of the two proposed alternatives because it does not only have better first and second law efficiencies but it is also able to generate more power for a specific process heat.

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