Preface

This report is the result of a literature study conducted while following the assignment presented at the start of this document. I would like to thank ir. J.H. Welink for his time and supervision.

Summary

Due to the increase in material transportation, the conveyor industry has reached a new level; heavier material is transported with wider belts over longer distances. Energy consumption forms a large part in the total conveyor costs, over 40%. As a result, the demand for more efficient, less energy consuming belt conveyors increases more and more. In the past decades, several different energy saving systems are designed, each targeting different parts of the belt conveyor.

The different energy saving methods can be separated in three groups, methods in which the driveline is changed, methods in which the parts of the conveyor itself are redesigned and methods in which the operation philosophy is changed.

Driveline changes
One of the two systems changing the driveline, is the motor sequencing controller. This controller is able to control a multiple drive system in such a way, that all the engines used to power the belt run in their optimal efficiency range.
The second system, frequency converters, enables the speed of the belt to be adapted to the amount of material transported. This causes the belt to be fully loaded at all times, thus optimizing the conveyor efficiency.

Design changes
The belt conveyor basically consists out of the belt itself and the idler carrying this belt. These two parts are redesigned in energy saving systems. A new idler is introduced, which reduces the amount of mass being rotated during operation. Another concept idler, the ESIdler, carries the belt on four rolls instead of three, increasing belt support and thus reducing the overall resistance.
The belt itself is researched by multiple parties, which resulted in new rubber compounds, reducing the total rolling resistance of the belt by approximately 10%.
The design of the total belt conveyor influences the energy use as well. New types of conveyors may help optimizing the conveyor route, while lowering energy consumption.

Operating changes
Multiple sources describe models which help optimize the operating philosophy of a belt conveyor system. If possible, the operating hours are rescheduled to low energy cost hours, while maintenance and idle times are planned during peak-hours. This is not an energy saving method, but it might reduce the total energy cost with more than 60%.

When deciding whether to apply one of these systems, the weight of the transported material is in most cases one of the decision characteristics. If the material is too light, the savings might not be sufficient to compensate for the investment made to install the energy saving system.
The energy efficient idler seems to be applicable in most situations, but this concept has not been tested yet.

When comparing al energy saving methods, the low resistance rubber and the ESIdler seems to be the most versatile systems, both receive high scores on multiple criteria's. However, his doesn't mean that these systems are the best option in all situations. For each belt conveyor guidelines can indicate what method suits the situation best, but in most cases research and analyses are required to determine whether a system will produce significant savings.