

Summary

The most used standard in belt conveyor design is the DIN22101 and is for example used to calculate motor power, driving torque and required belt rating. These calculations are based on a quasi static approach and have been used since 1942. The question is if FEM has the capability to become a powerful tool working alongside the DIN22101 in order to assess the high capacity long distance conveyors the standard was not originally intended for. The Finite Element Method (FEM) does provide designers with a full dynamic approach and allows them to check the component selection based on the DIN22101 calculations. Using FEM models the behavior of the system can be examined in an early stage of design, down to a component level, which allows the use for optimization purposes, but to what extent is this preferable.

An introduction into FEM and belt conveyors is included and the FEM models being used to analyze the systems behavior during non stationary operation are elaborated. The results of these models are accurate when compared to the theoretical formulas and this inspires confidence when they are used to examine the long distance, high capacity conveyors. FEM is also capable of examining a belt splice in such a way that its efficiency can be improved which leads to a lower belt rating and therefore a cheaper belt. Driving components can be examined in terms of lifespan and design propositions can be tested for their effectiveness using a FEM model. FEM can also be applied to model items like scrapers, support frames and even idlers; however the results of such analyses do not contribute significantly to a higher conveyor performance.

FEM definitely has the potential to become the powerful tool that allows designers to optimize their systems behavior and to improve parts in terms of lifespan. However conveyor designers must also realize that FEM is not always the best method of calculation and impressive as the models and results may seem, they must still be assessed in accuracy and interpreted correctly. The recommendation for further research is that it should focus on contributing knowledge to the DIN22101 to make it a more complete standard that yields proper performance of the high capacity long distance conveyors being designed nowadays.