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Optimisation of the offset distance between idler rolls to minimise stress within conveyor belting

De Andrade, Nelson Sergio

2017

https://hdl.handle.net/10539/25505

De Andrade, Nelson Sergio (2017) Optimisation of the offset distance between idler rolls to minimise stress within conveyor belting, University of the Witwatersrand, <https://hdl.handle.net/10539/25505>

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Abstract

This research report describes the creation of a unique experimental facility for investigating localised stresses that can develop in conveyor belting during operation. High localised stresses can cause premature failure of conveyor belts, requiring expensive replacement. A key objective of carrying out research in this field is to gain a fundamental understanding of the stress that develops in various types of conveyor belting as it crosses over idler rollers. An experimental facility was developed that will be able to measure the stress and the deformation for different types of belting, such as solid woven/PVC and ply belting, with different belt classes. Particular attention was given to the various effects at the junction point caused by different idler configurations.

Idler arrangements are configurable in the 24m–long test facility for inline, offset and belt-friendly types. Belt stresses at the idler junctions of these configurations are measured by applying strain gauges and load cells. The offset distance can be varied to determine the effect this has on the developing idler junction stress. This will allow comparison of the stresses as the class of belt increases, for each type of belt. The value of doing so is to determine the effect that the weft strength or stiffness has as the belt is forced into the idler junction.

The test facility that was designed and built was shown to meet the requirements of the project. The instruments were calibrated to an acceptable uncertainty. The test facility can handle the full range of planned tests in terms of the design strength and is modular enough to handle a variety of other research initiatives. This establishment of a large, specialised experimental facility constitutes the first phase of an ongoing research programme into improving the design standards for belt conveyor systems.