Summary

Maintenance of belt conveyors can be difficult and expensive. This is caused by the human involvement, the geographical location, the local environment and the dimensions of the belt. One aspect of the maintenance at belt conveyors considers the roller bearings. If a bearing fails, this may even lead to stopping the belt. Because bearing failure (thus friction) is preceded by an increase in temperature and noise, placing sensors which measure one of these features might be a way of detecting failure before it is gone too far.

This research is carried out in order to investigate the applicability of a Wireless Sensor Network in a conveyor belt environment. For this WSN, L-nodes of SOWNet are used. The research is a follow-up to the research of Vleeshakker et al., in which T-nodes from SOWNet were tested. The question is whether L-nodes are better applicable then T-nodes. In Vleeshakker et al., the signal from the nodes was not very strong, and disturbances were not tested.

The first test (3.1.1) is carried out to make the comparison between the T-nodes and the L-nodes. The main output is the signal strength. Every series of tests is performed on 1, 2, 4 and 6 meters distances between receiver and L-node and with a 3.6V lithium AA battery, with the L-node aligned with a plastic cover. The result is that the L-nodes perform better than the T-nodes, but they vary more in quality. Even though the L-node should have lower power consumption, the coin cell batteries still show voltage drops.

The second test (3.1.2) goes more into the real situation. What is the influence when you move the L-node entirely inside the shaft? In this comparison, the L-nodes are tested inside the shaft, with 3V CR2450 battery. The outcome of this second test is that the signal weakens in relation to the first test, but on average still is stronger than the signal of the T-nodes with the old antenna.

In the third test (3.2) it is tested what happens when another power supply is used. In this comparison, the L-nodes are tested inside the shaft, with 3V CR2450, 3.6V AA and a 3V supply box. The outcome of this third test is there cannot be said which of the power supplies is better. The correlation between distance and signal strength faded with the supply box.

In the fourth test (3.3), disturbance is added. Here, we investigated the influence of a disturbance by using a conveyor-belt. The comparison is made with a distance of 2 meters between L-node and receiver, with and without conveyor-belt, and with the conveyor belt switched on and off. The outcome of this fourth test was that putting in a metal construction (e.g. a conveyor belt) as a disturbance between the nodes weakens the signal, but at a distance of 2 meters the signal is still acceptable (>100dBm). At 4 meters, the power consumption of the L-nodes increases because it is not possible to get the link to 100% (thus due to package loss). Furthermore, a moving conveyor belt causes no more disturbances than a static one.

It can be concluded that the L-nodes are stronger than the T-nodes, and that it could be feasible to use them in a conveyor-belt environment. The disturbances of the metal in our test set-up weren't able to stop the signal. However, before using this technology for production, it is necessary to do further testing in a real environment with the number of L-nodes per repeater.