1. Summary

In this report a topology optimization tool for ANSYS is introduced. It appears to be a very powerful tool in optimization. It can be used for nearly all volume elements. In most cases the final optimal topology is reached within an acceptable number of iterations. Moreover it is possible to apply multiple loadcases and the result is an almost black and white picture, there are almost no intermediate densities.

However, the difficulty is in the step from example problems to engineering problems. In this report this step is made by applying the topology optimization tool on a part of the arm of a new type of excavator. This gave rise to a few problems:

- Because of the large complexity, it takes significantly more iterations to reach a solution for the excavator arm. After 100 iterations the solution was still not converged. To overcome this problem the use of a penalty for intermediate densities is suggested. This will force the density to its extreme values. However, currently this influences the final topology. Therefore measures have to be taken to make the topology penalty independent. This could probably be done by starting with penalty 1 and gradually increasing the penalty as the iteration process progresses.
- It is still difficult to translate the final topology to a design. To improve this, one could increase the resolution and one could use cubic elements instead of elements of all kinds of shapes.
- The compliance shows exceptional behavior: in some cases it becomes negative. The reason for this behavior is not known yet.