SUMMARY

The aim of the thesis was to determine the effect of different wood species and lay-up on the mechanical properties of plywood. Birch, grey alder, black alder and aspen were used in research. Plywoods were made either only birch or birch with one other species at the time. From lay-ups six different were used: standard, combi, combi mirror, twin, direction face and direction core.

In this thesis is used lignin phenol formaldehyde adhesive in comparison to traditional phenol formaldehyde glue. For sustainable manufacturing, there is strong demand to remove formaldehyde from resins, as it is toxic and carcinogenic material. Lignin on the other hand is 100% bio-based, it is non-toxic and non-hazardous renewable material.

In this research following results were made:

- Birch has the highest tensile strength, then black alder. Grey alder and aspen had the lowest.
- Birch plywoods had the highest densities. Aspen-birch plywoods were next due to highest adhesive consumption.
- Birch plywoods had the highest thickness and were best to retain its shape. Grey alder were most easily compressible.
- LPF adhesive performed extremely low in bonding quality, as it has low bonding strength and insufficient water resistance. In overall in each test PF had better results.
- All the LPF Direction core products had shear strengths under 1.0 N/mm² and as they all have wood fibre failure less than required, they failed to get to class 2 by bonding quality, which is meant for humid conditions.
- Direction face bending strength in cross-wise direction had clearly the lowest results, as two plies in cross-wise direction will not stand tension. On the other hand it had higher results in parallel direction.
- Birch Direction face had the topmost compressive extension with 27.4 mm at maximum compressive load. Despite so high compressive extension in cross-wise direction, product placed in fifteenth position out of eighteen by bending strength in that direction.

Other than lay-up directions, all the plywoods were relatively equal. Direction face proved to be better in parallel direction than direction core, but with this product should be kept in mind to use it only in forces parallel to direction. By this research aspen and birch combined plywoods are strongest match for all birch layered plywoods.