

Work Efficiency of Battery-Powered Chainsaws during the Commercial Thinning in the Young Pine Stand [†]

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Abstract: The beginnings of the petrol chainsaw in forestry date back to the early 20th century. For more than a century, engineers have been refining the chainsaw to make it as efficient and comfortable as possible for woodcutters. In recent years, environmental protection and reduction of CO₂ emissions policies have been particularly prominent. As a consequence, the use of battery-powered electric tools, including chainsaws, has become increasingly widespread, especially in gardening. However, electric chainsaws have limited battery capacity and, therefore, are not used daily in forestry. This study aimed to determine the efficiency of a battery-powered chainsaw during commercial thinning. The research compared the work efficiency of the petrol chainsaw Dolmar PS 5000 and the battery-powered Echo ECCS-58V during commercial-thinning in a 14 years old pine stand. In seven repeats the following variables were measured each time: working time, working area and noise load to which the logger was exposed. Obtained results were used to calculate average productivity, a weighted equivalent continuous sound pressure level (L_{Aeq}) and a weighted noise exposure level normalized to a nominal 8h working day ($L_{EX,8h}$). The average operating length of the battery-powered chainsaw was 00:41:26 and was comparable to the working length of a petrol chainsaw for which the average working time was 00:41:41. The average work output of the petrol chainsaw was 100 m²/h higher. The recorded noise exposure L_{Aeq} and $L_{EX,8h}$ were lower for the battery-powered chainsaw. Using a battery-powered chainsaw was less workload, because of smaller noise levels and zero emissions. This study found that 6 fully charged batteries allowed the user to effectively complete a work shift. It can be concluded that battery-powered chainsaws can be used effectively during commercial thinning. Further tests should be run in winter to determine the effect of low temperatures on battery consumption.

Keywords: electric chainsaw; ergonomics; forestry; productivity; working comfort; woodcutter