

From tree to wood powder – novel one-step mill technology

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INTRODUCTION

Wood powders are usually made from wood chips in a multi-step process (Fig. 1). The purpose of this study was to evaluate a new multi-blade shaft mill (MBSM) (Fig. 2) for making wood powders directly from tree stems (logs) in a single step.



Fig. 1. Conventional pathway to make wood powders relies on intermediate chipping, drying and hammer milling, in addition to handling operations.

MATERIALS and METHODS

Mill performance was analysed using a designed series of experiments combined with multilinear regression modelling. The controlled milling parameters were moisture content of wood, log feeding speed and sawblade speed.

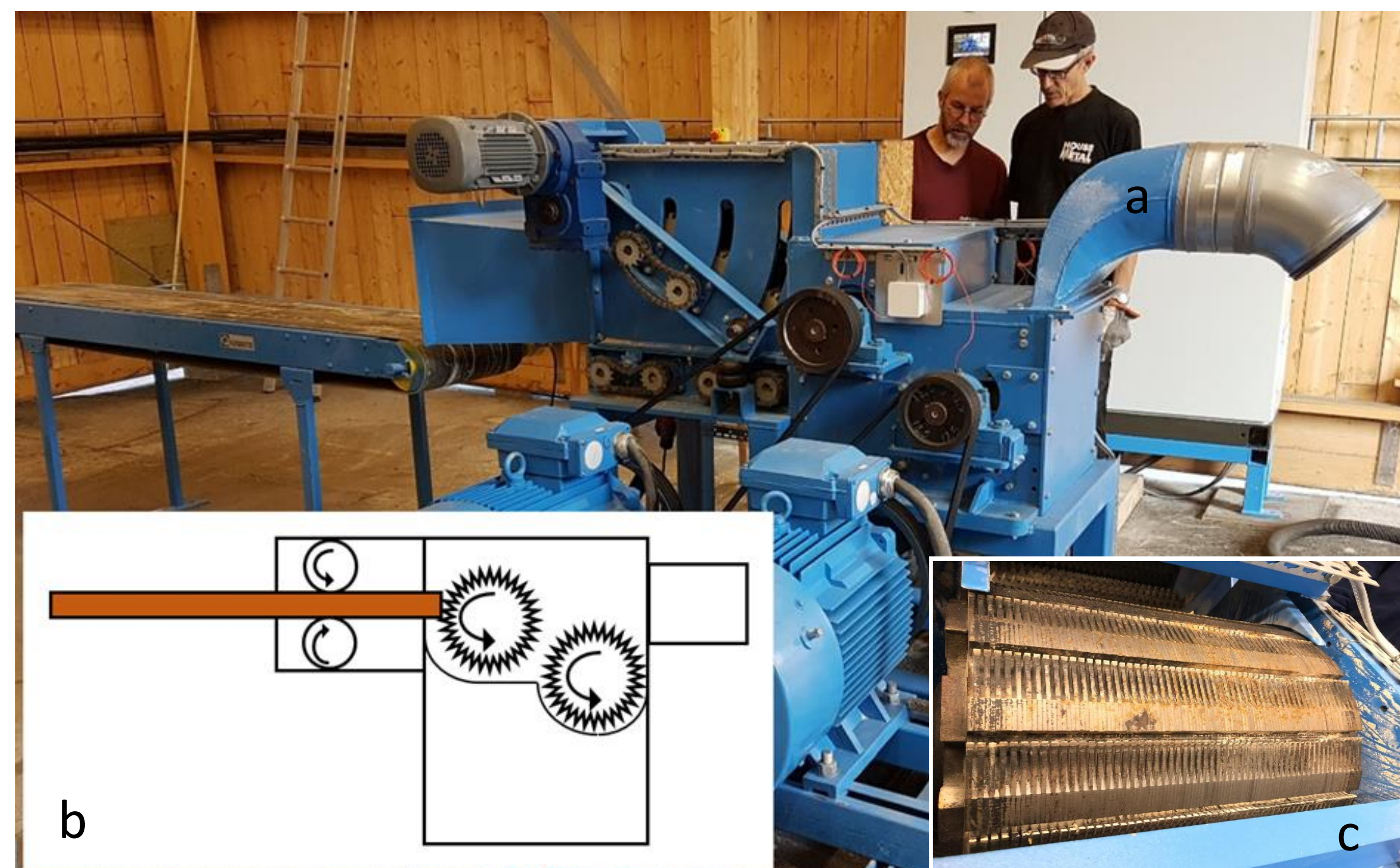


Fig. 2. The MBSM consists of a roller table, feeder, two 350 mm wide shafts having 110 parallel-mounted blades (a), the principle of operation (b) and the multi-blade shaft (c) are shown.

RESULTS

The influence of moisture content, blade speed and feeding speed successfully modelled at 95 % confidence level (Fig. 3). MBSM technology enables finer powders (Fig. 4) and wood storage in its preferred green form, thereby better preserving its chemical composition, up until the log is utilised.

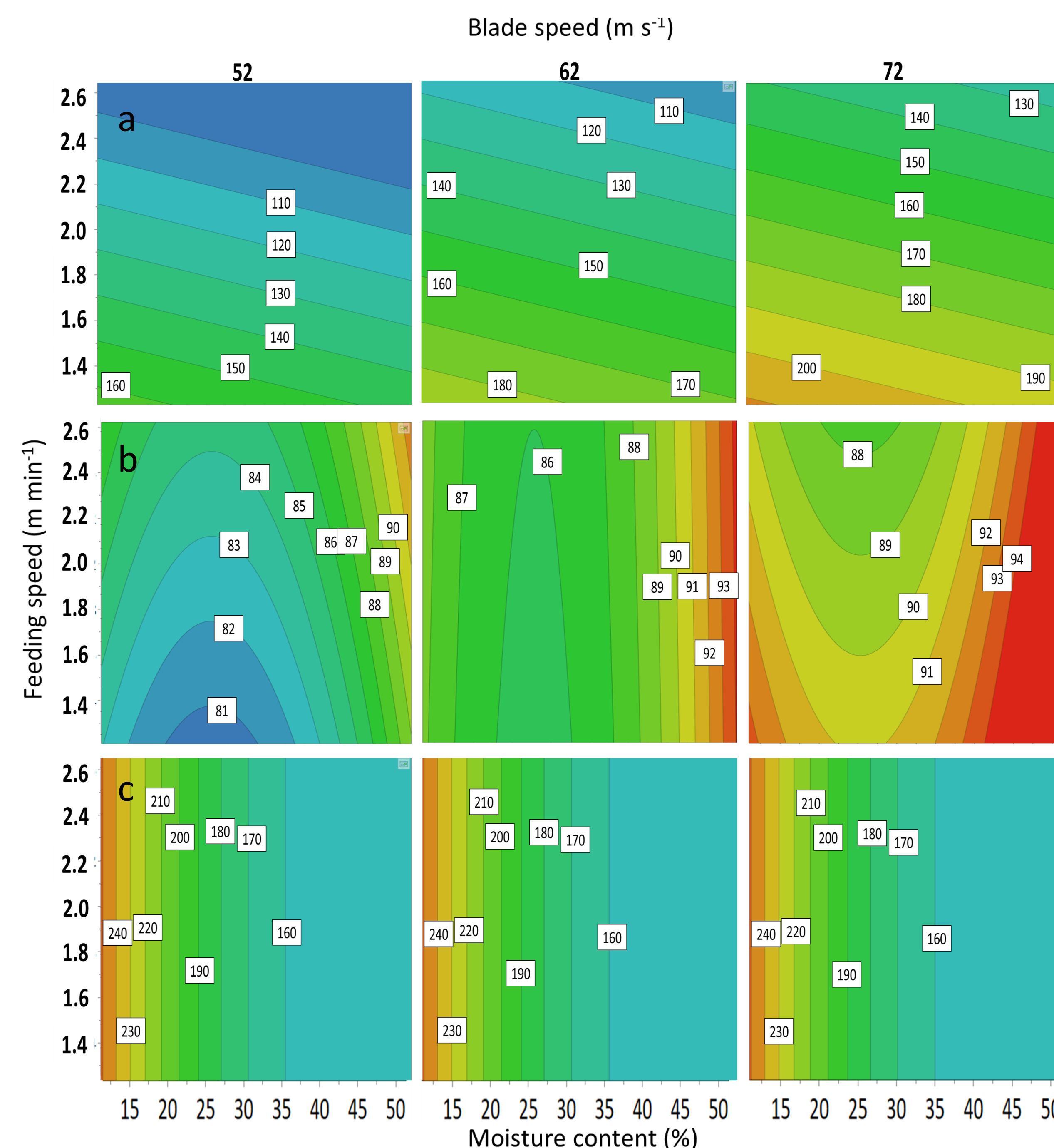


Fig. 3. Influence of three experimental design factors (moisture content, blade speed and feeding speed) on the a) specific milling energy, b) particle size distribution and c) bulk density of powders.

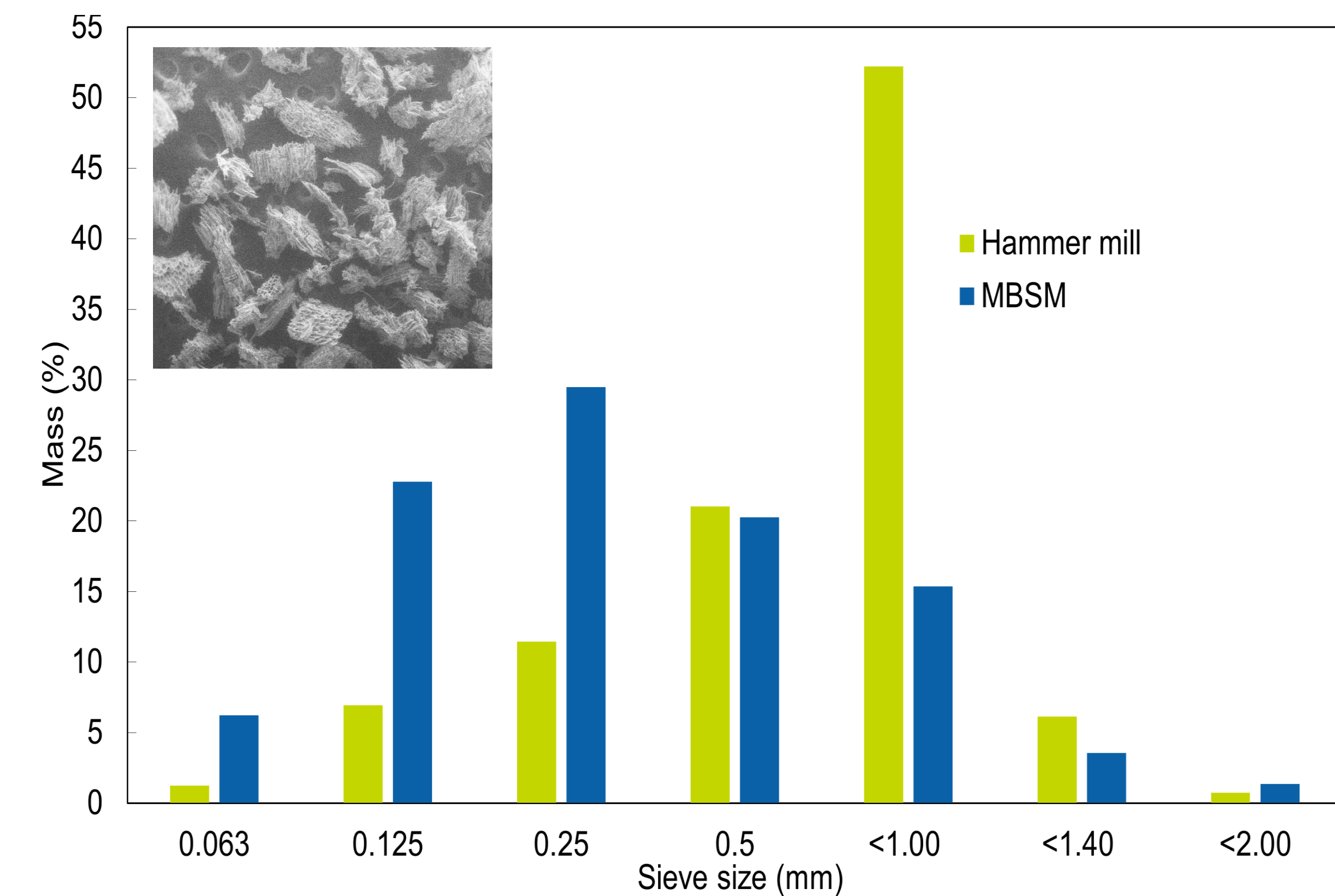


Fig. 4. Particle size differences between finest MBSM powder and hammer-milled powder. SEM image of MBSM powder.

CONCLUSIONS

- ❖ Single-step milling, lowest energy for green logs
- ❖ Tunable PSD of powders depending on application
- ❖ Much finer < 0.5 mm than hammer mill powders

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