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# MANAGEMENT OF CHIPPING OPERATIONS IN POLISH FORESTS

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# Objective, Materials and Methods

The objective of the study was to determine the basic parameters characterizing woodchipper operations and efficiency in Polish forests.

The machines involved in the study were five Brucks 805 CT chippers, including four units with 18 $m^3$ containers (designated as CH#1–CH#4) mounted on forwarders and one unit without a container (CH#5) mounted on a truck. The chippers were used six days a week in varying terrain conditions. They were part of a fleet owned by one company and managed by the same team.

The examined period of operations was five to seven months, from August–October of one year to February of the following year, depending on the chipper.

The parameters analyzed in this study included: the distance between the stack and chip truck, the distance between the forest site and the overnight chipper location, work shift duration, fuel consumption per shift, the distance traveled by chippers between forest sites during a shift, and the number of site changes per shift (workday).

# RESULTS

## Stack to chip truck distance (km)

| Chipper No | Mean | Min | Max |
|---|---|---|---|
| CH#1 | 0.47 | 0.02 | 2.72 |
| CH#2 | 0.28 | 0.02 | 2.87 |
| CH#3 | 0.33 | 0.02 | 5.06 |
| CH#4 | 0.53 | 0.02 | 6.06 |
| CH#5 | - | - | - |

# RESULTS


Distance per forest site change during a shift (km)

| Chipper No | Mean | Min | Max |
|---|---|---|---|
| CH#1 | 6.02 | 0.07 | 29.28 |
| CH#2 | 6.53 | 0.06 | 36.30 |
| CH#3 | 4.74 | 0.02 | 34.30 |
| CH#4 | 7.61 | 0.06 | 73.62 |
| CH#5 | 9.48 | 0.00 | 60.52 |

# RESULTS


## Forest site to overnight location distance (km)

| Chipper No | Mean | Min | Max |
|---|---|---|---|
| CH#1 | 5.46 | 0.00 | 31.73 |
| CH#2 | 4.20 | 0.02 | 25.57 |
| CH#3 | 5.65 | 0.02 | 33.83 |
| CH#4 | 6.30 | 0.05 | 39.36 |
| CH#5 | 6.01 | 0.06 | 31.52 |

# RESULTS

## Overnight location to forest site distance (km)


| Chipper No | Mean | Min | Max |
|---|---|---|---|
| CH#1 | 2.52 | 0.00 | 11.62 |
| CH#2 | 3.30 | 0.02 | 20.43 |
| CH#3 | 3.45 | 0.02 | 31.50 |
| CH#4 | 4.00 | 0.02 | 33.33 |
| CH#5 | 3.43 | 0.02 | 18.08 |

# RESULTS

## Number of forest site changes per shift

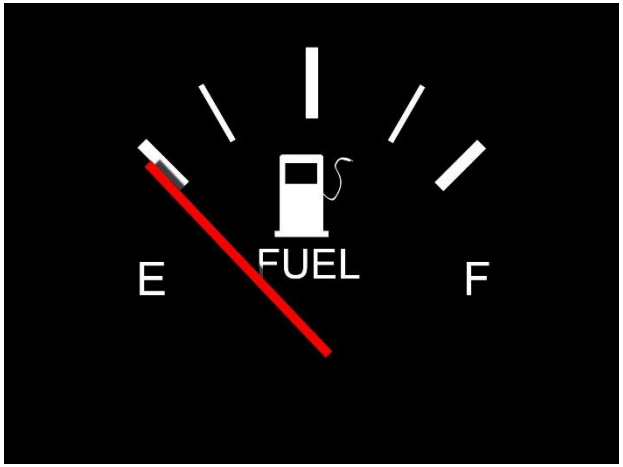

| Chipper No | Mean | Min | Max |
|---|---|---|---|
| CH#1 | 0.61 | 0.00 | 6 |
| CH#2 | 0.66 | 0.00 | 6 |
| CH#3 | 0.61 | 0.00 | 7 |
| CH#4 | 0.51 | 0.00 | 3 |
| CH#5 | 0.39 | 0.00 | 3 |

# RESULTS

## Shift duration (h)

| Chipper No | Mean | Min | Max |
|---|---|---|---|
| CH#1 | 12.75 | 0.00 | 20.75 |
| CH#2 | 12.35 | 0.98 | 20.55 |
| CH#3 | 11.84 | 0.00 | 21.53 |
| CH#4 | 13.09 | 0.37 | 23.67 |
| CH#5 | 11.87 | 0.40 | 18.53 |

# RESULTS




## Fuel consumption (L/h)

| Chipper No | Mean | Min | Max |
|---|---|---|---|
| CH#1 | 17.41 | 1.57 | 38.61 |
| CH#2 | 16.91 | 0.66 | 36.96 |
| CH#3 | 16.25 | 0.00 | 36.05 |
| CH#4 | 16.12 | 0.00 | 44.43 |
| CH#5 | 7.77 | 0.31 | 26.44 |

# CONCLUSIONS

The efficiency of chipper use depends on the organization of chipping operations, and in particular workload per site (the number of site changes per shift), the distribution of work sites and overnight chipper locations (which translates into travel distances during a shift and between shifts), as well as forest site availability to road transport (the distance from the stack of processed forest residues to the chip truck).

◊

The mean distance between the stack and the chip truck ranged from 0.28 km to 0.53 km.

◊

It was found that the forwarder-mounted chippers moved between sites on average once every two days, and the truck-mounted chipper once every 2.5 days.

◊

Mean distances from forest sites to overnight locations were 4.20–6.30 km, those from overnight locations to forest sites were shorter by approx. 50% (2.52–4.0 km).

◊

The recorded shift duration of 12.41 h was slightly longer than the scheduled operator shift time of 12 h.

# Thank you for your attention