

STUMP CRUSHING AT TERMINAL

In early February 2013 three stump assortments were crushed at a terminal of Skellefteå Kraft AB. Two of the assortments were ordinary stumps from clear cuts, while the third assortment was extracted from peat land. The productivity, in terms of OD t PW h⁻¹, of the crusher had high variation due to high variation of moisture contents between the materials, from 33 % to 68 % (wet basis). In 77 % of the total work time of the crusher the work element crushing was performed simultaneously as other work elements were performed, e.g. loading crane work. Since the loader was equipped with a timber grapple, the full potential of crusher was not reach due to inefficient loading. However, loading can be improved by utilizing other machines at a terminal like front-end loaders equipped with buckets to feed the crusher with.

MATERIALS AND METHODS

Crushing of three stump assortments was carried out at a terminal of Skellefteå Kraft AB at Hedensbyn in the community of Skellefteå. Stump assortment 1 was extracted in autumn 2009 and spring of year 2010 and then forwarded to a road side at year 2012. Stump assortment 2 was extracted in 2010 and forwarded to a road side year 2011. The stump assortment 3 has been extracted from a peat land. Crushing of all three stump assortments was performed in early February 2013. The



Figure 1. Stump crushing at a terminal

used crusher was a CBI Magnum Force Series 8400 Hz Hog with 1000 Hp. Feeding of the crusher was made with a wheel based crane loader (CAT M322C) equipped with timber log grapple. A frequency time study, with 10 sec intervals, was performed for about 90 min of productive working time (PW) per assortment. The mass of each assortment was scaled after being crushed. Samples of crushed material were taken for analyses of moisture and ash content and for determination of the crushed particles size distribution. Additionally the fuel consumption per assortment was measured

RESULTS

The productivity of the crusher for assortment 1, 2 and 3 was 48.9, 62.4 and 28.6 OD t PW hour⁻¹ (Table 1.). The high variation in productivity of the crusher was due to the high variation in moisture content, which was 41 % for assortment 1, 33 % for assortment 2 and 68 % for assortment 3. Since the loader was equipped with a timber grapple, it had problems to efficiently load smaller stump parts, which in turn was a factor affecting the crushing productivity. This factor could be eliminated if instead using a front end loader with a bucket for loading stumps on the loading deck of the crusher.

Table 1. Productivity of the crusher and wood fuel properties for the different assortments. The energy balance is calculated as the energy return over energy invested.

	Assortment 1	Assortment 2	Assortment 3
Total mass, OD t	48.9	62.4	58.2
Total Energy Content, MWh	234.9	302.4	106.9
Moisture Content, %	41	33	68
Productivity, OD t h ⁻¹	32.3	41.1	18.9
Productivity, Wet t h ⁻¹	54.7	61.4	58.9
Productivity, MWh t h ⁻¹	154.9	199.4	70.5
Fuel Consumption, l OD t ⁻¹	3.6	2.9	2.0
Energy Balance, MWh	233.1	300.6	105.7

The distribution of the work time elements of the crusher where similar for all three assortments (Figure 1.). In 82 % of the total work time of the crusher the work element “grip/crushing” was performed simultaneously as other work elements were performed for assortments 1 and 2, mostly crane related work. The corresponding value for assortment 3 was 66%, and was in average 77% for the whole study. Most of the crushers work time was spent on the work element “grip”, and this time element was mostly affected by the size distribution of stump parts and the limiting design of the grapple used for loading.

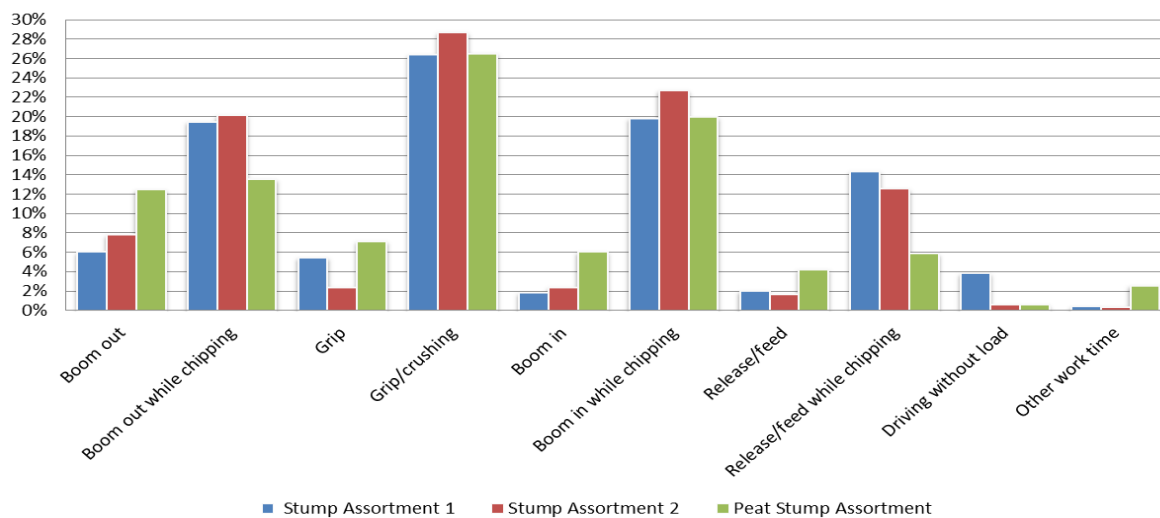


Figure 2. Distribution of stump crushing time elements.

Additional analyses of fraction size distribution and ash content will be performed in the nearest future. Results from these analyses will give a better description of the fuel quality produced from all three stump assortment.

LITERATURE/KEYWORDS

Stumps, crushing, terminal, wood chips

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