ADDRESS MODIFICATIONS TO BRIQUETTER FOR FIELD DEPLOYABLE SYSTEM

Waste to Wisdom: Subtask 3.5

Biofuels and Biobased Product Development

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Address Modifications to Briquetter for Field Deployable System
Subtask 3.5: Assess Suitability of Commercial Briquetting Unit for Field Operation
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Introduction

This report summarizes the process of securing, moving and operating a mobile briquetting unit, as outlined in Subtask 3.6 of the Waste to Wisdom project. The main objective of this report is to describe the modifications required to convert a briquetter into a field deployable briquetting system. The goal of this project is to evaluate potential pathways to convert forest residuals or slash piles (as pictured in Figure 1) into valuable products or fuels, such as briquettes.

Figure 1- Slash pile

Delivery and Setup at a Field Site

The Pellet Fuels Institute (PFI) team, in conjunction with Schatz Energy Research Center secured a a RUF200 briquetter, which was transported to a field site in Northern California for testing in June 2015.[1] This site was on the edge of a working forest on private timber land, located off a highway and below the logging roads. The testing location was a former mill site, which provided access to a large, flat, concrete apron as shown in the foreground of Figure 2.

The unit was delivered to the site on a flatbed trailer. This particular machine is not balanced and consequently requires a forklift with extended forks to be lifted off the truck. If this machine were to be moved from site to site it would logically be mounted on its own low trailer, to mitigate the use of a forklift. Once the unit was stabilized, the team was able to successfully operate the machine with local feedstocks to produce a number of densified briquettes. The unit required very little supervision and required a low labor input during operation.

[1] More information on RUF briquetting systems can be found at http://www.ruf-briquetter.com/.

Figure 2- Field testing site

The machine performed well with a variety of feedstocks including torrefied material, which proved to have no adverse impact on the briquetting machine. Briquettes produced from the RUF 200 can be seen in Figure 3. As anticipated, the unit did not tolerate excessive moisture, so any system design will need to plan carefully for both drying, and careful storage of the raw material. An evaluation of the performance of the machine and the quality of briquettes will be presented in a forthcoming report from Schatz Energy Research Center.


Figure 3- Redwood briquettes produced on the RUF 200.

Requirements for the Operating Location

At the testing site, the large concrete pad provided a range of benefits that were quickly discovered. First, the machine as manufactured presumes its placement on a level floor, so on-site accommodations for that placement were minimal. Second, operating the equipment on the slab versus the ground helped curb excess dust. It is possible that its placement on a concrete

apron versus the bare ground aided in the operation of the machine, but that was indeterminable without a comparative test.

The average electrical demand during the testing was 6.9 kW with a maximum of 20 kW and a minimum of 2.6 kW. An electrical generator must be available at the test site to meet the peak load and sustain the average load during production. Distinct electrical spikes and variations occurred during testing, as shown in Figure 4. However, the average, maximum, and minimum electrical loads were consistent between different feedstocks and tests.

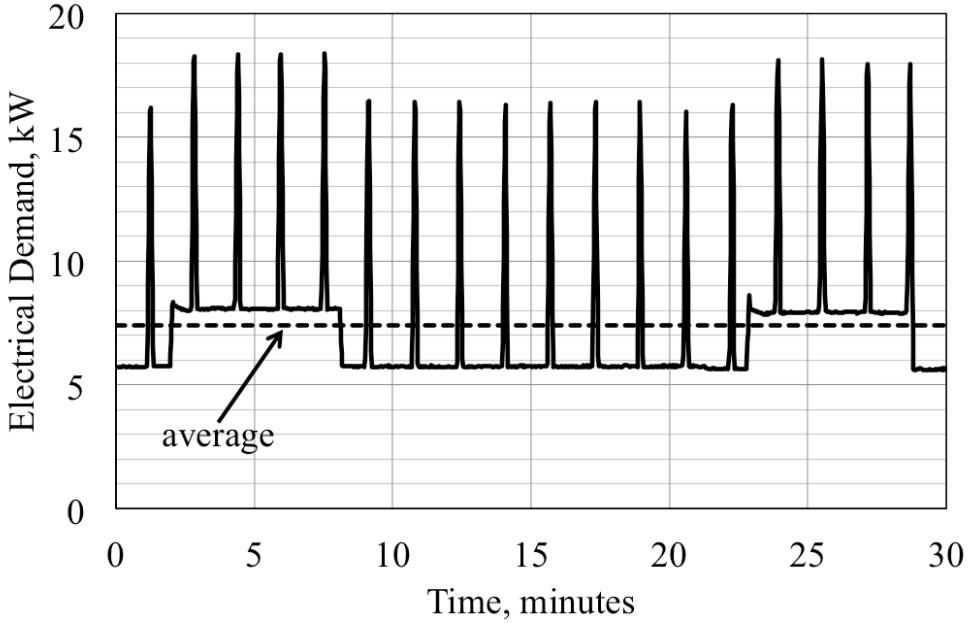

Figure 4- Electrical demand of briquetter during a test

The site must also have an effective way to load the briquettes for transportation. During testing, briquettes were dropped directly into a supersack, as shown in Figure 5. Other options include palletizing briquettes, conveyance into an enclosed trailer, or packaging for consumer distribution.

Recommended Modifications for a Mobile Unit

During this process, the PFI team observed a number of factors that would make deploying a field unit of this type more effective in the future. The first observation was that the unit was smaller than anticipated, yet still presented some difficulties in delivery to, and staging at, the site. An important specification for the freight truck or trailer in the future is that it is short enough to navigate around the tight corners found on roads throughout the forests of the Pacific Northwest. Second, if the unit was to be routinely moved, it would essential to either mount it permanently on a trailer, on a movable sled, or create some other simple process of transportation.

Figure 5- Gasifier (left); Briquetter exit tracks into supersack (right)

Another suggestion of the PFI team is the use of a dedicated flatbed truck or trailer to haul the unit. If the unit were to be elevated on a flatbed truck or trailer, and maintained there during its operation, it would allow for briquettes to be automatically loaded into another truck or container below, providing easy movement of the products and less labor by the machine operator. Finally, consideration must be given to sites that are not level; thus, advanced preparations for leveling the machine once onsite must occur.

Operating the unit in an outdoor environment made the process easier, because the team was able to utilize existing architecture available at the testing site. The unit is manufactured for use indoors, and needs some minimal weather protection when used in an outdoor environment. Due to the relatively mild temperatures during the operation of the machine at the test location, it is not known what influence extreme temperatures could have on the efficiency or overall operability of the machine. Indoor storage of the machine is recommended during months of high precipitation.

Additional Considerations

The low labor requirements observed may dovetail well with other components in the briquetting process which may require more operator attention. The output of this machine was not high, but it was steady and reliable. The manufacturer of this equipment provides a range of sizes, including some that produce larger briquettes and also have higher outputs, higher electrical demand, and a larger footprint. While higher output can be attractive, the difficulties surrounding transportability of a larger machine and electrical generator to an in-woods location may preclude its use.