Collection and Transportation of Woody Biomass for Energy

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In-woods grinding of forest residues piled at landings


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Challenges ….

- Forest residues scattered across landscape
  - Increased time to move between piles
  - High operational delays

  => Low biomass harvesting productivity

Machine utilization in chipping operations

(Spinelli and Visser 2009)

$$\frac{\text{Chipping + Positioning/Retrieving}}{\text{Total Scheduled Machine Hour}} = 73.8\%$$

Actual chipping time = 58% of total hours

- 63 chipping studies
- 36 different chipping machines

Challenges …

- Limited access due to poor forest road conditions

Alternative methods for collection and transportation of woody biomass

“Pre-hauling & Centralized grinding”

- Improved access to scattered residue piles
- Less machine downtime
  - Less time for equipment to move between piles
  - Less wait time for the biomass and loading
- Flexible scheduling through “decoupling” harvesting phases
  - Grinding not dependant on chip van availability
  - Opportunity for extending harvesting season and additional drying at central landings

Alternative method #1:

Roll-off container trucks in a centralized grinding operation

Alternative method #2:

Hook-lift container trucks in centralized grinding operations

Alternative method #3:

Slash bundler in centralized grinding operations

Alternative method #4:

Dump truck in a centralized grinding operation

Alternative method #5:

Integrated harvesting of woody biomass in a centralized whole tree chipping operation

Do they work???

- ✓ Yes, improve access to forest residues
- ✓ Yes, improve machine utilization rates
- ✓ Yes, facilitate operational management

=> help reduce harvest/transportation costs


CAT
D300E
822
30 tons / 21 yd3


D300E
CAT


58 yd3

Loading

However,

- Increased requirements for pre-operations planning and optimal equipment selection.
- Final costs are often marginal or still not profitable in some cases.

Stump/Landing-to-Truck Cost ($/BDT)

Hook-lift truck + Centralized grinding

	Loading	Hauling	Grinding	System
Cost	$ 6.30	$ 10.32	$ 16.22	$ 32.84*

Slash Bundling + Hook-lift truck + Centralized grinding

	Bundling	Loading	Hauling	Grinding	System
Cost	$ 16.20	$ 2.99	$ 9.34	$ 17.97	$ 46.50*

Dump truck & Centralized grinding

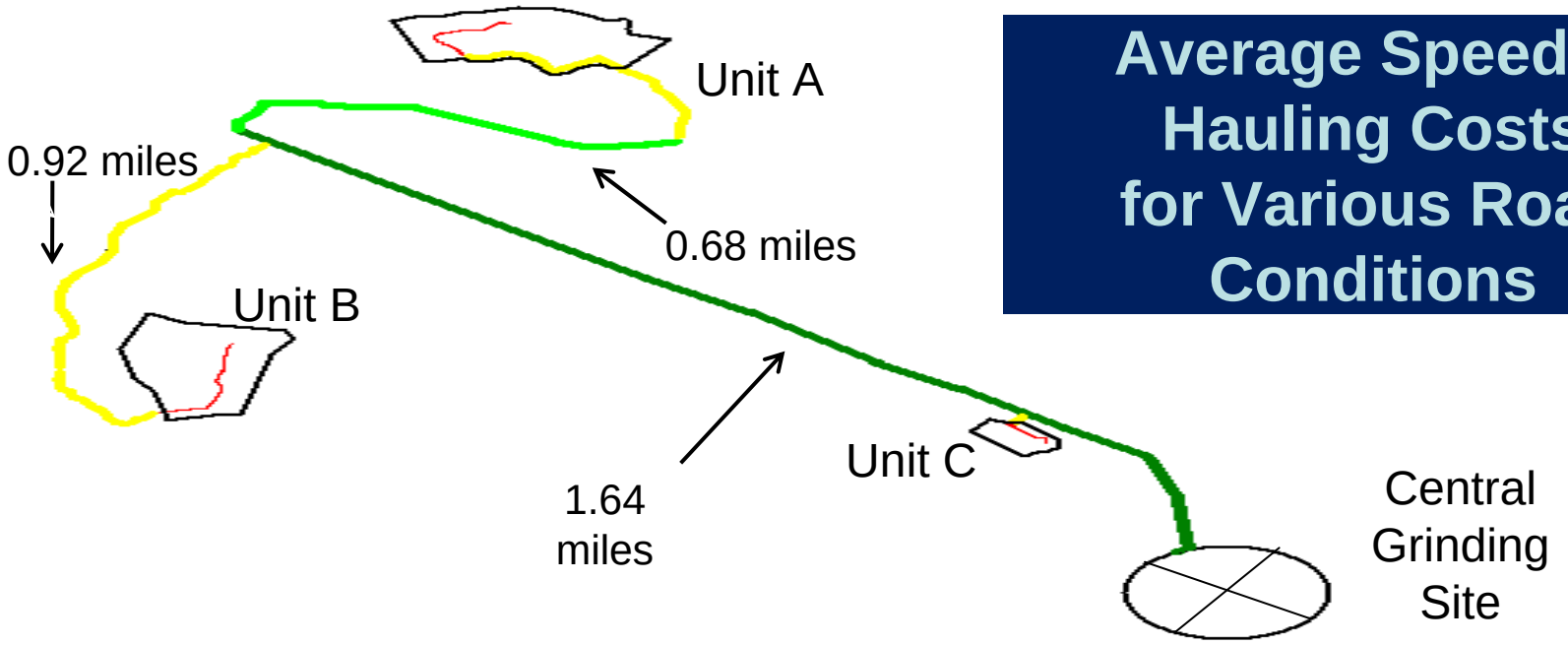
	Loading	Hauling	Grinding	System
Cost	$ 3.33	$ 6.91	$ 13.77	$ 24.01*

Logging truck hauling whole trees + Centralized chipping

	Fell/Shovel	Loading	Hauling	Chipping	System
Cost	$ 6.50	$ 2.61	$6.29	$ 14.42	$ 29.81*

Note: System cost does not include support cost, move-in cost, cost of employee transportation, cost transportation to market, or profit allowance.

Average Speed & Hauling Costs for Various Road Conditions



Road	Primary Gravel	Secondary Gravel	Dirt	Spur
Avg. Speed (miles/hr)	22.7	18.0	8.0	5.3
Cost ($/BDT/mile)	$ 0.97	$ 1.23	$ 2.76	$ 4.14

Questions?