

## Harvestline Yarder Operations in British Columbia's Kootenay Region

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### Introduction

With the introduction of approximately fifty winch assist systems throughout British Columbia (BC) over the last three years, large areas of steep slopes previously harvested with large yarders are now being harvested by these systems. The main benefits for the forest industry have included improved safety performance and more efficient harvesting operations. With that, there are often smaller areas that are not suitable for winch assist systems within harvest units that still require yarding for various reasons (such as rocky ground, sensitive sites or areas with large diameter stems). Harvesting these small units or areas with large yarders or towers can be uneconomical. The Harvestline is a small yarder, engineered and manufactured by Electrical Machinery and Services Ltd (EMS) based in New Zealand, which may address some of these challenges. With the increasing need for small yarders throughout BC, FPIinnovations completed a preliminary assessment of the first Harvestline operating in BC to provide information for its members. This Info Note summarizes observations from the short assessment of the Harvestline yarder and Hawkeye motorized grapple carriage operating in BC's Kootenay region.

### Harvesting site

Located on crown land in the western Kootenay's, the second-growth site contained a mix of Douglas-fir, western red cedar and western hemlock. The average stem size was estimated at 52 cm diameter at breast height and average stem volume was estimated to be just over 1.0m<sup>3</sup> (see Figure 1). A portion of the timber had been hand felled and the remaining amount had been mechanically felled by a feller buncher (where ground permitted). Stems were not bucked to length and were downhill yarded tree-length to roadside. Downhill yarding distance was approximately 100m and slopes ranged from 50% to 80% (see Figure 2). During the preliminary assessment the largest turn size observed was roughly 1.5m<sup>3</sup>. During discussions with the crew, they outlined that an ideal turn would be considered 1-2m<sup>3</sup> and the ideal average yarding distance would be approximately 250m.

The Harvestline was located on the low side of a mid-slope road to allow for positioning and securement of the grapple attachment in the road surface (Figure 3). A log loader (Linkbelt 330) moved and decked each turn to keep the landing clear given the cutblock/road design and that the Harvestline is designed only to yard in lead (and isn't designed to swing as a swing yarder).

The cutblock and roads were originally engineered for tower yarding and ground based harvesting (in certain areas of the block) and the roads were built for such. The yarding crew outlined that additional road locations could have been considered to improve deflection for the Harvestline and to improve the total logging opportunity if the area was originally planned for this type of small yarder.



Figure 1. Average stem diameter (note hard hat).



Figure 2. Harvestline, loader and carriage (downhill yarding).



Figure 3. Harvestline set-up location on low side of built road.

## Crew and Equipment

The contractor purchased the Harvestline and Hawkeye motorized grapple carriage to improve safety by eliminating the requirement for setting chokers. The crew consisted of a hooktender, two riggers, Harvestline operator and loader operator. The operator and crew had experience with cable yarding systems prior to using the Harvestline. The crew had been working with the Harvestline and Hawkeye motorized grapple carriage for approximately 3 months (two blocks) when the field assessment occurred so they were still becoming familiar with the equipment and its full capabilities.

The base machine was a Caterpillar 330D excavator (with approximately 15,000 hours) and was converted to a Harvestline system by C&C Logging of Kelso, Washington (see Figure 4 & 5). C&C Logging is currently a distributor of the EMS Harvestline, Hawkeye motorised grapple carriage and Tractionline winch assist equipment. (<http://emsnewzealand.co.nz/>)



**Figure 4. Harvestline, Caterpillar 330D.**



**Figure 5. Harvestline, Caterpillar 330D (uphill view).**

EMS recommends carrier machines be at least 35 tonnes in size. Consideration should be made to determine how carrier size relates to transportation height and weight limits and the need to transport equipment to different operating areas on different road systems - including public highways.

The Harvestline operates without guylines and was observed changing set-up locations relatively easily. The machine was observed setting-up at three different locations while using one tailhold/anchor point to allow for yarding maximum volume to the road as possible to minimize moves. Moving the machine for those set-ups occurred quickly (from 0.9 -1.7 minutes).

The Harvestline system uses similar drums and technology to that used with the EMS Tractionline winch assist system. The machine viewed here is a two drum system, however many Harvestline machines operating in New Zealand are configured with three drum systems (to allow for various yarding configurations). The drums are designed to interlock which allows for smooth carriage control in both uphill and downhill yarding directions. The drums are also manufactured with angled grooves on the main spools which ensures better placement of wire rope and extends rope life. The machine viewed was being used for both uphill and downhill yarding and has used both backspar and stumps for tailholds (depending on terrain, availability etc.).

The drums are designed and manufactured by EMS, can fully interlock and run with 19mm (3/4") line. The straw-line is powered in both directions, can free spool and runs with 9mm (3/8") line (either wire rope or synthetic material). Figure 6 shows the drums mounted on the rear of the machine, photo left is the straw-line drum. Figure 7 shows the monitor mounted in the cab to allow the operator to view the drums during yarding operations if required. Note this monitor is also used for viewing the camera mounted on the Hawkeye motorised grapple carriage during grapple operation.



**Figure 6. Two drums and straw line on left.**

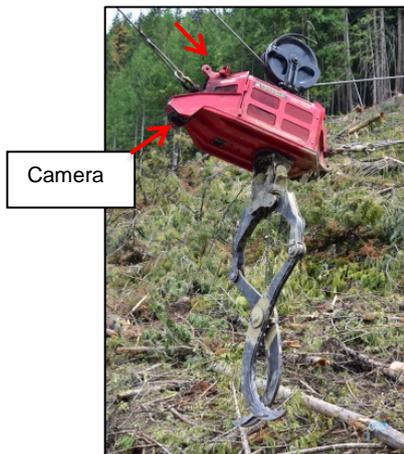


**Figure 7. In-cab monitor of drums.**

The crew outlined fuel use for this machine exceeds 350L/9 hour shift. It isn't clear how much the machines age contributes to its fuel efficiency.

The Hawkeye motorised grapple carriage is also engineered and manufactured by EMS. It is designed with one single large sheave to promote a level carriage during operation and this also promotes longer line life. It's designed with an internal infrared camera and two internal lights which can be used when operating in low light conditions (see Figure 8). The camera uses IP technology via wireless Ethernet to the carrier, has an integral charging unit and the operator has the ability to pan the camera which is controlled by joystick controls from the cab. The operator outlined that during long yarding distances the camera may cut-out however this may be an adjustment issue given the machine is relatively new.

The carriage (including grapple) weighs roughly 1180 kg (2600 lbs) and has a maximum opening size of 1300 mm (52"). The grapple is opened from the power of a Kohler 350 single cylinder 7.5hp diesel engine (Figure 9), can rotate 360 degrees in either direction, and can open and close on the fly. The engine is outfitted with accusump protection for loss of engine oil pressure if operating on steep and rough terrain.



**Figure 8. Hawkeye motorised grapple carriage (internal camera and mounting lugs).**



**Figure 9. Carriage Kohler 7.5 hp.**

The crew commented that they liked the grapple “scissor” design which they felt was fast and productive, however noted that set-up locations need to ensure adequate deflection given that the height of the carriage is roughly 9 feet when the grapple is fully extended to its closed position as in Figure 8. Note the height will vary depending on the wood diameter/turn size and the extent of the opening/closing of the grapple. The carriage is designed with multiple lugs to allow for different points for line connections depending on site characteristics and slopes (Figure 8).

Productivity data was collected for a number of hours and additional field assessments are being planned to collect more meaningful data. Once additional field assessments are completed this Info Note will be updated and shared again with FPInnovations members.

Videos of the first Harvestline operating in the west Kootenay’s can be viewed at the FPInnovations Steep Slope Initiative website. <http://steepslopeinitiative.fpinnovations.ca/videos/>

For more information, please contact:

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