Advantage
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Converting a power-shift skidder into a harvester for commercial thinning

Abstract

This report describes the key considerations when converting a used skidder into a single-grip harvester suitable for small-scale commercial thinning. The owner increased the machine's hydraulic capacity, and modified the machine's structure to support the new functions and permit bidirectional use.

Author

Roderick H. Ewing
Eastern Division

Introduction

Converting used skidders and forwarders into single-grip harvesters can sometimes eliminate the need for expensive purpose-built machines. This lower-cost mechanization may be attractive to contractors whose annual harvest volumes and revenues don't justify new equipment, especially within the context of commercial thinning.

Power trains and hydraulic systems vary, so mounting a harvester head and crane on a used machine creates unique challenges (Makkonen 1989). The hydraulic system must provide sufficient power and oil cleanliness, and the cab must be modified to permit rear-facing operation without compromising structural integrity. Skidders with torque-converter power-shift transmissions are well suited to such conversions; the clutchless shifting of gears and short turning radius provide good maneuverability.

Recently, we observed two pre-1980 Clark 664 skidders that had been converted into single-grip harvesters by adding a 6.5-m Patu 915 boom and a Patu SH400 stroke-fed harvester head, and identified the changes required by such conversions (Figure 1). Inexpensive heads such as this Patu ($45 000) offer a simple, robust design and uncomplicated installation. A harvester can be assembled for less than $115 000: $20 000 for a used skidder, $65 000 for the boom and harvester head, and $25 000 to upgrade the hydraulics, modify the cab, and mount the loader. A comparable dedicated single-grip harvester typically costs $350 000.

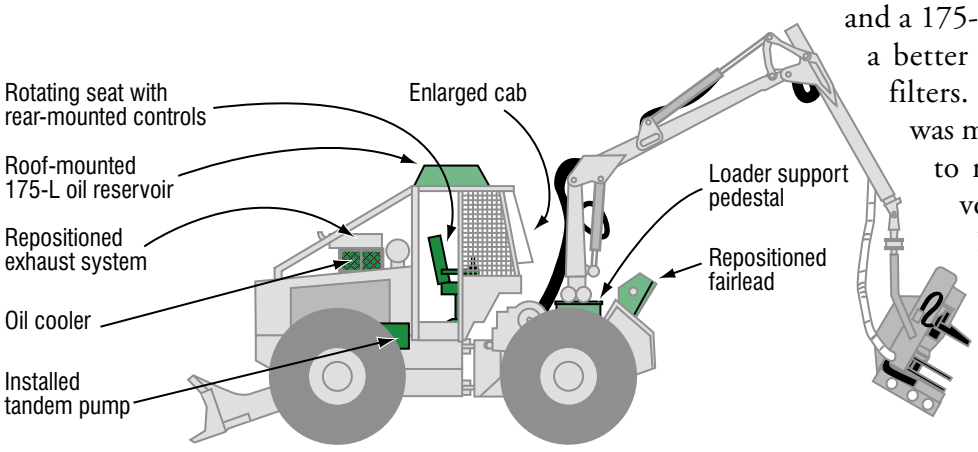

Figure 1. A Clark 664 skidder equipped with a Patu harvester head and boom.

Modifications

Hydraulic system

The contractor increased the skidder's hydraulic power by replacing the original pump and reservoir with a tandem pump and a 175-L reservoir (on the roof), plus a better oil cooler and improved oil filters. The original exhaust system was moved onto the engine cowling to make room for the oil reservoir. The new pump supplied 135 L/min at 20 MPa to the harvester head and 90 L/min at 17 MPa to the skidder and boom using a power-beyond sleeve in the skidder's control valve bank.

Structural

The additional weight of the mounting pedestal, boom, harvester head, and modifications to the rear section of the cab distributed the weight equally between the axles (versus 60% and 40% on the front and rear axles beforehand). This improved stability and produced an average ground pressure of 41 kPa. The winch fairlead was remounted on the shortened butt plate to make room for a heavy pedestal bolted directly to the frame to withstand the stresses generated by a fully extended boom supporting the head and a tree. Retaining the winch required rerouting the mainline under this pedestal and through the lowered fairlead.

Cab

The enlarged cab let the operator comfortably face the rear while operating the boom; most skidder cabs support only front-facing use. Rear-facing controls and a fully reversing seat are essential; we also recommend polycarbonate safety glass in the side and rear windows and additional work lights around the roof. These lights may require a larger alternator that may be difficult to install due to a lack of space and the V-belt's drive capacity.

Structural alterations to a cab can affect its ROPS, FOPS, and OPS certification and must be approved by an accredited engineer.

Modifications to a machine without the manufacturer's approval may void the warranty and damage the machine or result in injury to the operator. Moreover, as FERIC has no control over the described modifications and subsequent machine maintenance and operation, we accept no liability for equipment malfunction and failure, personal injury, or any losses incurred thereby.

Productivity

Time studies suggest a potential productivity of up to 5.0 m³/PMH in first thinning, depending on the size and branchiness of the trees and the number of unmerchantables. With a converted used skidder working 2000 PMH/year for 7 years, direct operating costs should be less than $65/PMH, or about $13/m³. This is comparable to the costs achievable with larger harvesters, at a fraction of the investment cost.

Implementation

A successful and reliable conversion depends on the owner-operator's mechanical and hydraulic skills. Consulting with experts (e.g., other owner-operators, equipment suppliers) for technical support can be invaluable. Before you begin the conversion, you must determine:

- the hydraulic (flow rate and working pressure) and electrical (voltage and amperage) requirements of the boom and harvester head;
- the combined weight of these attachments;
- the skidder's hydraulic pump capacity (oil flow and working pressure); if inadequate, determine whether there is space and drive capacity for a larger pump, hydraulic reservoir, and oil cooler;
- whether the cab can be modified to encompass rear-facing controls for the operator; safety, comfort, and good visibility are paramount given the amount of time the operator will spend in this position.

If you plan to purchase a used skidder and convert it into a harvester, choose a good-quality machine with a known history. Golsse (1997) provides sound advice on selecting a suitable machine.

References

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Forest Engineering Research Institute of Canada (FERIC)

Eastern Division and Head Office
580 boul. St-Jean
Pointe-Claire, QC, H9R 3J9
☎ (514) 694–1140
(514) 694–4351
admin@mtl.feric.ca

Western Division
2601 East Mall
Vancouver, BC, V6T 1Z4
☎ (604) 228–1555
(604) 228–0999
admin@vcr.feric.ca

Find us online! www.feric.ca

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