

Herzog MW500 Synchronwinch External Traction Winch

Brian Boswell

Introduction

In September 2017, FPIinnovations observed a Herzog MW500 Synchronwinch operating during a commercial thinning near Frankfurt, Germany. Herzog of Switzerland recently introduced the MW500 Synchronwinch (*M* for mobile, *W* for winch, and *500* for 500 m of cable) external traction winch. Earlier Herzog winches were integrated into Ponsse harvesters and forwarders, while the MW500 is mounted on a Ponsse harvester as an anchor machine placed at the top of a slope to assist a harvester or forwarder working below.

Base machine and modifications

The winch can be mounted on any Ponsse harvester with a suitable crane and sold as a complete unit once all modifications to the base machine are completed. Installation takes 1.5 weeks after crane removal. Used equipment is preferred; 2004 models or newer are best for conversion, but older models can be used with an extra day of installation time. The unit observed was mounted on a 2005 Ergo. It was the second external winch system that Herzog had built, and it had been in operation for 1.5 years at the time of the observations.

For conversion, the crane is removed from the base machine, and the winch is mounted on the crane base (Figure 1). This allows the winch to be turned and tilted to the optimal orientation for winching using the crane base's hydraulics. A blade is added to the front of the base machine and can be used to help anchor it (Figure 2).



Figure 1. The harvester boom is removed, and the winch system is mounted on the crane's rotating and tilting base.



Figure 2. A blade is added to the base of the winch machine for better anchoring.

The base machine is also modified for remote control operation, so the operator in the assisted machine can drive the base machine and control the winch from the assisted machine's cab or from the ground. Front- and rear-facing cameras are mounted on the base machine to assist remote control driving.

Safety systems

The control system sends and receives 30 signals per second between the winch and the assisted machine. A malfunction of the winch results in a signal being sent to the assisted machine, which stops the drive wheels from turning. This prevents the assisted machine from pulling the winch downhill if the winch locks up. Herzog considers two-way communication essential for safety. The operator experiences no lag time when operating the assisted machine. The system will not prevent the operator from continuing to use the boom or cutting head in case they are needed to stabilize the machine in an emergency.

An additional safety system prevents shock loading of the cable in an emergency. If the cable tension exceeds 12 tonnes, the winch drum brake is released and then gradually reapplied to stop the drum, or until the load on the cable is reduced to 10 tonnes, or to the previously set tension if that is lower. The braking system is also activated if the winch tilts more than 5 degrees from its operating position.

Winch system

A hydraulic motor on the traction line fairlead (Figure 3) maintains tension on the cable for better spooling and provides slack pulling to assist manual pull-out of the cable. The red extension on the fairlead directs the cable to the fairlead, cleans the cable before it is spooled on the drum, acts as a lever to turn the fairlead, and helps keep the cable in lead with the assisted machine. The traction line tension is measured by a pin in the lower sheave of the fairlead. The MW500 has a grooved mainline drum and a fleet angle compensator for accurate spooling. Ultrasound sensors are used to determine the length of cable remaining on the drum.



Figure 3. Traction line fairlead is 2.5 m high.

The base machine has cameras fitted on the front and back to aid remote control driving. The remote control driving system has a range of 20 m (Figure 4). The operator can control the base machine from inside the harvester or forwarder and drive the two machines simultaneously. This makes it possible to drive the assisted machine on or off the road while under full cable tension support as the winch machine is shifted out of the way or into position (Figure 5). Repositioning the base machine is easy, as the guylines automatically spool in and out as necessary while maintaining tension.



Figure 4. Remote control system for driving the winch machine and operating the guyline winches.



Figure 5. Winching the harvester onto the road. The harvester's boom and cab have been rotated uphill for extra stability.

The radio control system for the winch is independent from the system for operating the base machine. It has a directional antenna and a signal amplifier with a maximum range of 700 m (Figure 6).



Figure 6. Directional antenna for radio control of the winch system.

The display in the assisted machine indicates the pre-set tension limit, the actual cable tension, and the cable length remaining on the drum. Warning alarms report engine faults, fuel level, hydraulic oil level, and hydraulic oil temperature. Currently, the system does not log tension spikes, but Herzog is considering adding this feature (Figure 7).



Figure 7. Winch control and display in the harvester.

Specifications

Table 1. MW500 specifications

Feature	Specifications
Mainline (traction) cable	500 m x 14.5 mm swaged, 200 kN breaking strength (FS = 2:1), 300 mm diameter mainline winch
Anchoring cables or guylines (2)	50 m x 14.5 mm swaged, 200 kN breaking strength (FS=2:1), 250 mm diameter guyline sheave
Main winch	100 kN (10-tonne) maximum pulling force
Anchoring or guyline winches (2)	30 kN (3-tonne) maximum pulling force
Mainline fairlead sheave	250 mm diameter, 2.5 m height
Guyline fairlead sheaves (2)	300 mm diameter, 3.5 m height
Net weight increase	1900 kg (added to base machine, considering the boom removal)

Table 2. Radio specifications

	Main winch operation	Remote control driving and guyline operation
Antennas	1, directional, with amplification system	2, non-directional
Power	15 milliwatts	5 milliwatts
Range	700 m	20 m

Thinning operation

FPIInnovations observed the MW500 Synchronwinch mounted on a used Ponsse harvester assisting an eight-wheeled ScorpionKing harvester (Figure 8). The thinning operation occurred on a 45- to 50-year-old Douglas-fir plantation in a community forest near Morbach, Germany (Figure 9). Slopes ranged from 45% to 55%, but the operator had used the system on slopes to 80%. No clear-cutting was allowed on the slopes.



Figure 8. Assisted machine was an eight-wheeled Ponsse ScorpionKing harvester.



Figure 9. Forest stand with cut-to-length thinning operation.

The winch was positioned on a small road at the top of the thinned area and was secured to standing trees or stumps with one of its two guylines. Observed anchor trees and stumps were Douglas-fir 20 to 25 cm in diameter. The machine was used without guylines in locations with no convenient anchor trees, where the dozer blade was engaged for additional security. The machine remained stable in all situations (Figure 10).



Figure 10. During observations, the winch was used both with one guyline (*left*) and no guylines (*right*). The dozer blade was engaged for additional security.

The thinning corridors were about 120 m long and 15 to 20 m apart, with leave trees and corridors previously marked by the forester. The average piece size was 0.5 m³, and the removal level was 60 m³/ha, which was low compared to the more normal removal levels of 80 to 90 m³/ha. The contractor said harvester productivity was about 20 m³/hour at this site. Line changes were fast and simple, taking 5 to 6 minutes to change corridors, including the time to take down and set up one guyline.

The contractor indicated that fuel usage on the external winch machine was 10 to 15 L/hour. However, fuel consumption on the assisted machines decreased when working with the winch. An internal winch forwarder uses about half the fuel of a forwarder working without a winch. The contractor tracked all his fuel usage and found the average total fuel consumption to be 0.5 L/m³ for the operation. This included fuel for the external winch, the harvester working with the external winch, and the forwarder working with the external winch.

Herzog noted that these winches have been operating up to 2000 hours with the same cable with little or no cable damage. Only 4 to 5 m of damaged cable must be cut off per year. Used mainlines can be recycled as guylines if they become too short to use as mainlines but are still in good condition.

Cost of winch-assist system equipment

Table 3. Equipment costs.

	Cost ^a
MW500 installed on supplied base machine ^b	182 000
Used 6-wheeled harvester base machine	91 000
Preparation of assisted machine (per machine)	3 000
Total for set-up for 1 harvester and 1 forwarder	279 000

^a In Canadian dollars; based on an exchange rate of 1 euro = 1.516 \$CDN

^b Assumes base machine is in good operating condition and the crane has already been removed

While the idea of using only one external winch to assist multiple machines sounds appealing, there are advantages and disadvantages to this approach compared to using a harvester and forwarder each equipped with their own internal winch. If a used base machine is available, it is cheaper to buy an external winch and

assist one machine at a time. If a base machine must be purchased to mount the winch, it is cheaper to buy two internal winches to install on an existing harvester and forwarder.

Cost comparison:

- A used six-wheeled harvester is available to mount the winch on, no extra capital cost necessary, plus one external winch with installation, plus the average cost of preparing two machines to be assisted = $\$182\,000 + (2 \times \$3\,000) = \$188\,000$.
- One external winch with installation, plus the cost of a used base machine, plus the average cost of preparing two machines to be assisted = $\$182\,000 + \$91\,000 + (2 \times \$3\,000) = \$279\,000$.
- Two internal winches with installation = $2 \times \$121\,000 = \$242\,000$.

Advantages of one external winch system:

- The external winch system may be used with both the harvester and the forwarder, though not at the same time.
- The external winch system may be used in places where there are no suitable anchor trees.
- The external winch system may be used without guylines in some circumstances, while the internal winch systems are typically anchored to trees and stumps. This, combined with the remote control driving of the winch, may result in faster line changes with the external winch system.
- The base machine's ability to rotate and tilt the winch to align it with the assisted machine may result in better alignment and less repositioning of the anchor.
- It is possible to work at longer distances. The cable capacity of the external winch is 500 m of 14.5 mm rope, while the capacity of an internal winch is only 300 m of 15 mm rope or 350 m of 14 mm rope.
- It is possible to use the external winch with other machines, such as a skidder.
- Many people are now switching from six-wheeled to eight-wheeled harvesters, so there may be an abundance of six-wheeled harvesters available to use as base machines.

Disadvantages of the one-winch external winch system:

- Only one machine can be used at a time with the winch. If most of the work for both machines is winch-assisted, then one machine may be idle while it waits for the external winch to become available. For similar capital cost, the two-winch system allows two machines to be operated simultaneously.
- Electronic components must be moved when switching between machines.
- A worker not dedicated to a winch-assisted machine may not be as skilled using the system as one who works with winch-assisted systems all the time.

For more information, contact:

Lukas Herzog, Herzog Forsttechnik AG

Allmend 25-27, CH-1719 Zumholz, Switzerland

lukas.herzog@h-ft.ch

Mobile: +41 (0)79 969 61 03

www.herzog-forsttechnik.ch/Englisch/Produkte/Traktionswinden.html

Jim Hunt, FPInnovations

james.hunt@fpinnovations.ca

(604) 222-5618