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FOREST MACHINES

TimberLink

QUICK GUIDE

Harvester Performance and Condition Monitoring System



TimberLink



TimberLink software for monitoring the condition and performance of harvester

This Quick Guide provides an illustrated overview of the many functions and possibilities that TimberLink offers.

The easiest way to learn to use TimberLink is to begin with the basic performance monitoring application. As you become more familiar with the software, you can begin to monitor the condition of your machine in more detail, optimise settings or even hone your own operator skills.

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Introduction

TimberLink is a software application designed for monitoring the performance and condition of forest machines. The software helps forestry contractors, machine operators and maintenance staff to maintain and improve productivity, fuel economy and uptime.

TimberLink measures the machine's performance and fuel consumption from one log to the next, throughout the life of the machine. The software takes the required information via a CAN bus from the machine's control system. By continuously monitoring the operation of the various components, the user can react promptly to any changes in the machine's performance, and maintain high productivity and good fuel economy in all circumstances.

Today, the job description of forest machine operator is very demanding and requires an extensive skills set. In order to achieve a high level of productivity in harvesting, various different demands must be accounted for and each of the factors involved must be in check. TimberLink is an effective tool for monitoring the different factors contributing to the daily productivity of the machine.

The skills of the operator and the working technique used have a significant impact on the quality, productivity and

Examples

A service and repairs performed on a harvester (1270D) boosted productivity during regeneration felling by 2 m³/h. Fuel consumption dropped by 0.1 l/m³. The estimated improvement in productivity was 5,500 m³/year and fuel savings were 4,600 l/year.

A harvester (1270D) operator used TimberLink to improve his time management at different work phases and to perfect his working technique. In two months, his hourly output improved by 2 m³/h during thinning and by 4 m³/h during regeneration felling. The estimated improvement in productivity was 6,000 m³/year.

fuel consumption in harvesting work. Measurement feedback provided by TimberLink can also be used in the training of operators and in the independent development of personal driving skills. A well-functioning machine and a work technique suited for the circumstances are basic requirements of good quality and productive harvesting work.



TimberLink

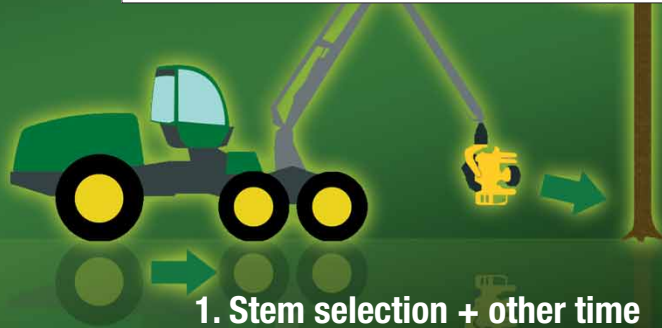
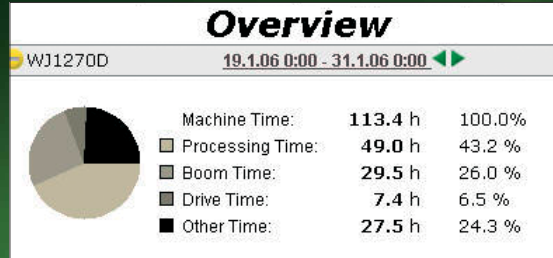
Overview of the harvesting process

The harvesting process comprises two distinct stages: stem selection and processing.

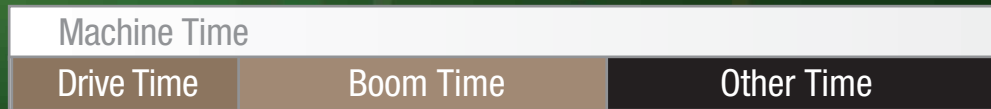
The **stem selection** stage covers everything from driving the machine onto the stand and operating the boom until the stem is cut.

The **processing stage** includes cutting the stem, moving it and processing it.

1

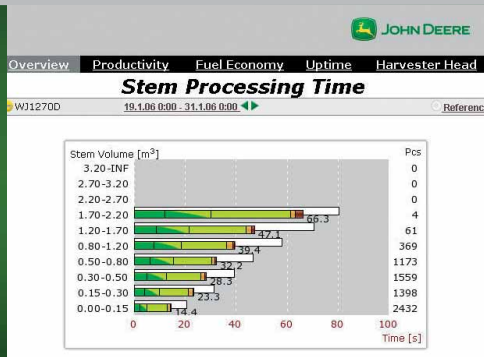


1. Stem selection + other time



TimberLink measures the time and fuel consumption required for each step of the stem selection process. The example above represents a machine that operates efficiently. The steps of the stem selection process and other time take less than 60% of the machine time. This leaves more than 40% of the time for processing. Other time (no activity, engine idling or working rpm's) takes normally 20 -25% of the machine time.

2



2. Stem processing

Processing time

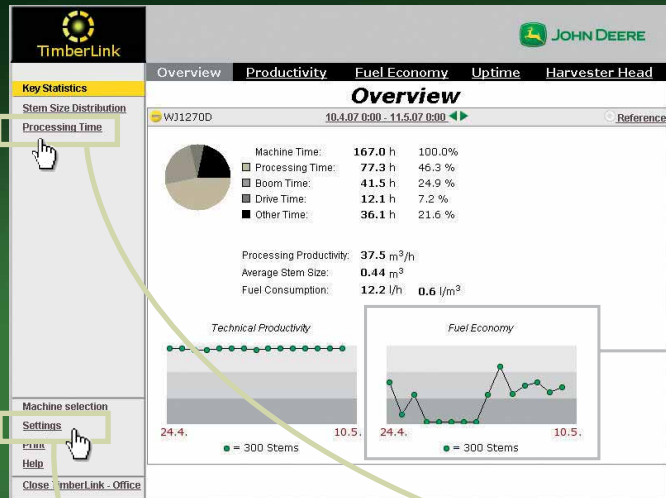
TimberLink monitors the time required for the different stages of stem processing as well as the machine's fuel consumption when processing different sized stems. The example above represents a machine that operates efficiently. The total time required for processing different sized stems is clearly shorter than the reference values.



Easy commissioning

The software's default reporting period is the last 24 hours up to the time at which TimberLink is started up.

The software features a calendar, which can be used to set new start and end times for the reporting period. In most cases, it makes sense to set the reporting period per site or per day.



Reporting Period

Start time **End time**

4 April 2007 5 May 2007

mon	tue	wed	thu	fri	sat	sun
26	27	28	29	30	31	1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	1	2	3	4	5	6

Days: 31
Hours: 0

0 h 0 min

mon	tue	wed	thu	fri	sat	sun
30	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31	1	2	3

0 h 0 min

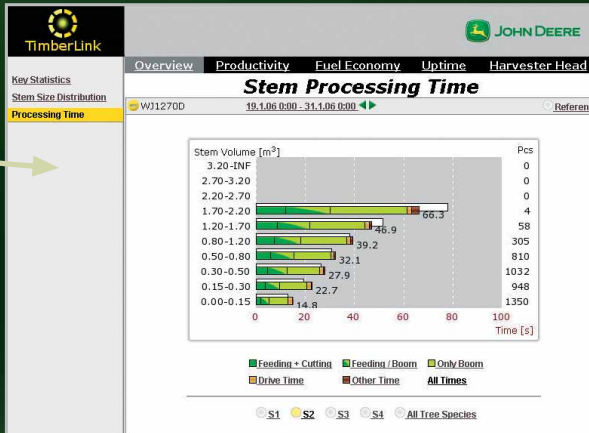
Info: Days marked with gray color contains information.
Days marked with borders are selected days.

Trend graphs

The so-called trend graphs illustrate changes in the machine's performance. One figure in the graph represents either 300 or 100 stems. The effect of the size of the stem has been taken into account in the calculations. The higher the figure, the better is the machine's performance.

Tip

You can **change the reporting period** 24 hours forward or back from any page of the user interface, using the **arrow keys**.



Base graphs

Most of TimberLink's measurements are shown as bar charts according to stem size, as in the example on the left. In the example, it has taken the machine 32 seconds to process spruce stems between stem size 0.5 and 0.8 m³.

The measurements can be compared to earlier reference data. The reference figures are given as white bars behind the most recent measurements. The comparison allows the user to monitor changes in the machine's performance. The reference period is configured using the calendar, similarly to the reporting period.

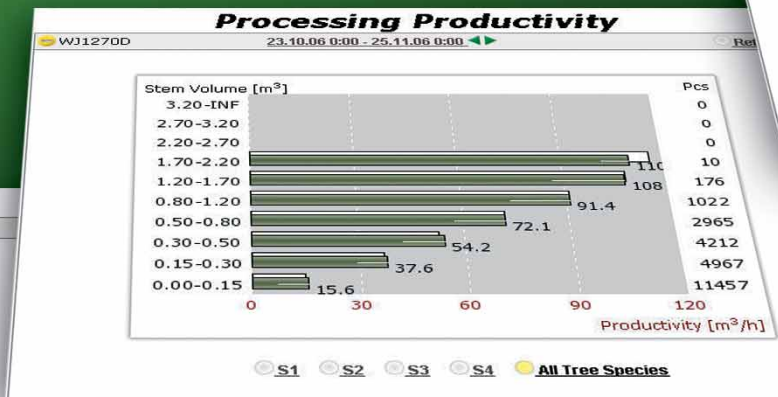
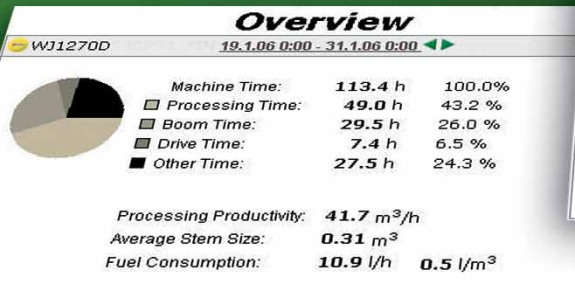


Monitoring and boosting productivity

In order to achieve high productivity, efficiency must be high during both the stem selection and the processing stage. Stem selection efficiency is measured as the proportion of processing time of the machine time. In the Nordic countries, processing time typically accounts for between 35 and 50 percent of the machine time. The machine's hourly productivity can be boosted by increasing this percentage by means of better time management and working technique. In many cases, hourly productivity has increased by between 5 and 10 percent thanks to TimberLink.

High overall productivity also depends on the machine's **processing productivity**. Processing productivity is a measurement of efficiency, covering the steps from felling to releasing the top of the tree. Processing productivity can be considered either as a time period or as cubic metres per hour.

Processing productivity depends on the machine's technical condition and the operator's skills and working technique, for example. TimberLink is an efficient tool for maintaining the machine's technical condition as well as for developing the operator's skills.



TimberLink measures the length of time required for each step of the **stem processing** stage with high precision. The time required for feeding and cutting mostly depends on the machine's **technical condition**. The most crucial factor affecting processing efficiency is **boom operation**, which in turn hinges mostly on the **operator's skills and technique**.

Example (1070D): An adjustment to the harvester head settings shortened the feeding and cutting time of 300-litre stems by 0.9 seconds per stem. Hourly productivity increased by 1.0 m³/h during regeneration felling. Fuel consumption decreased by 0.1 l/m³. This corresponds to an annual fuel saving of 7,000 litres.

Example (1270D): Operator training helped to reduce the boom operation time by 12% on average. Hourly productivity increased by 2.1 m³/h during regeneration felling.

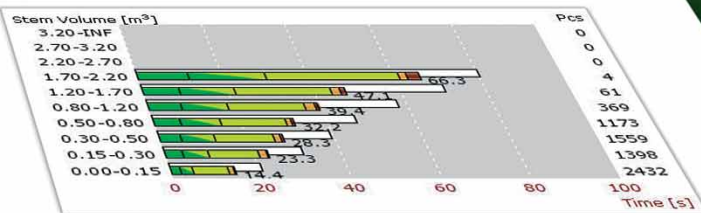
Tip Keep an eye on the percentage of processing time of the machine time. Set goals. Compare results to previous measurements. If you suspect a technical problem, check the machine's status under the harvester head menu.

Tip Keep an eye on the machine's processing efficiency by means of the stem processing time or processing productivity. Set goals and follow progress.

Stem Processing Time

19.1.06 0:00 - 31.1.06 0:00

Reference



Feeding + Cutting
 Feeding / Boom
 Only Boom
 Drive Time
 Other Time
 All Times
 S1
 S2
 S3
 S4
 All Tree Species

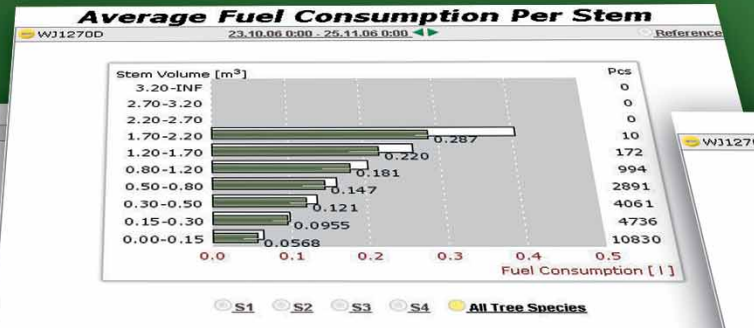
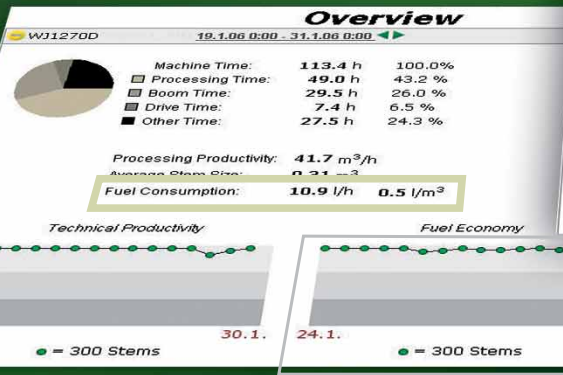




Monitoring and improving fuel economy

Good fuel economy hinges on productivity. High percentage of processing time out of the machine time and good processing productivity increase hourly fuel consumption (l/h) but lower fuel consumption per cubic metre (l/m³).

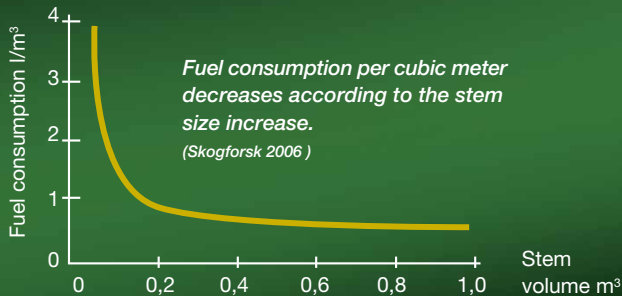
Fuel consumption per different sized stems is an efficient indicator for monitoring and improving fuel economy.



Tip

Keep an eye on the trend graph for fuel economy. The measurements are based on stem-specific fuel consumption. If the measurements drop, consumption per stem has increased..

Both the fuel consumption and the volume of processed stems need to be factored in when calculating fuel economy. **Consumption per cubic metre is a useful indicator.**



Example

(1470D): Higher-than-average hourly fuel consumption could be explained by an extremely high percentage of processing time and good processing productivity. Consumption per cubic metre (l/h) was exceptionally low.

Example

(1270D): Unnecessarily high engine revolutions increased fuel consumption by $0.1 l/m^3$. This corresponded to an annual fuel saving of 4,000 litres.

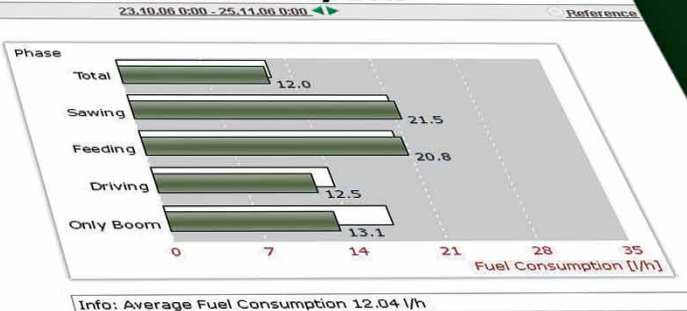
Example

(1270D): Servicing the grapple led to a 15% decrease in stem-specific fuel consumption. This corresponded to an annual fuel saving of 3,375 litres.

Example

(1270D): Operator training and repairs to the feed rollers helped to cut fuel consumption by $0.15 l/m^3$. This corresponded to an annual fuel saving of 8,000 litres.

Fuel Consumption

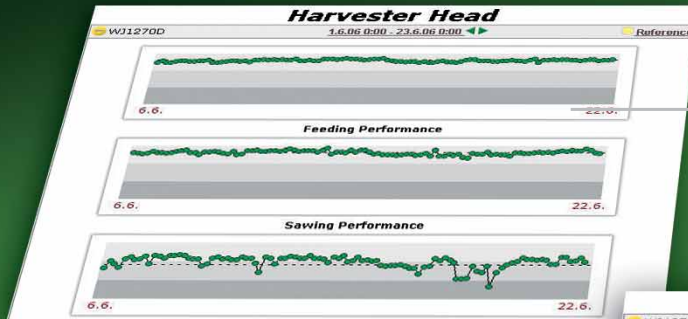


Phase-by-phase monitoring of fuel consumption speeds up troubleshooting. Changes are easy to detect based on comparisons with the machine's earlier reference figures.

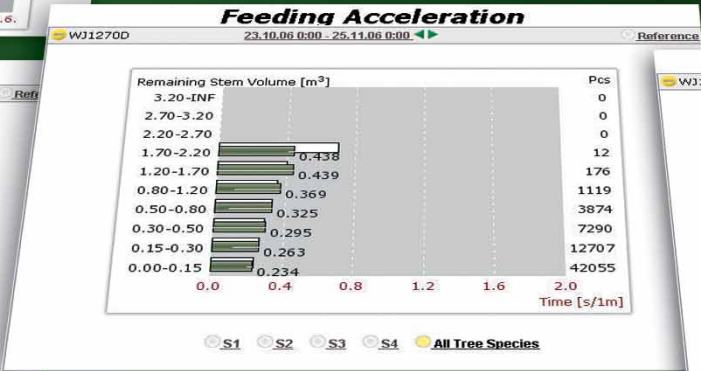
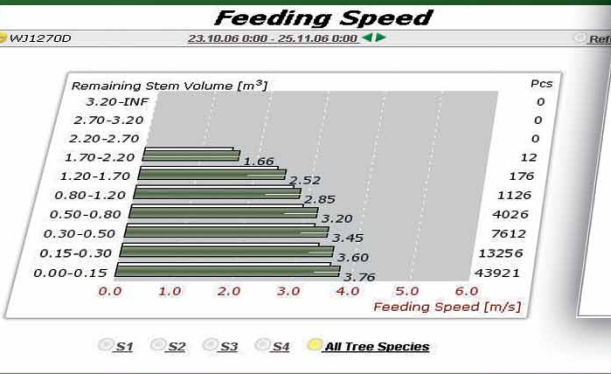


Monitoring the condition of harvester head

The condition of harvester head is crucial to the productivity and fuel economy. Thanks to TimberLink, you can ensure that your harvester head continues to offer optimal performance.



Tip
Keep an eye on the harvester head's performance by means of the trend graph. Dropping performance is in most cases an indication of a technical problem.



Tip

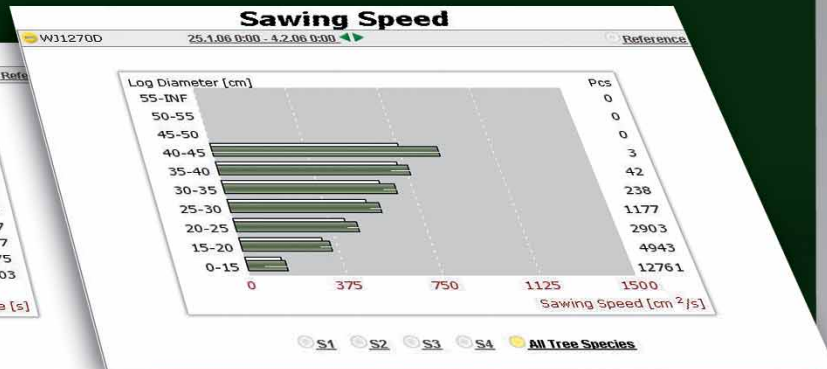
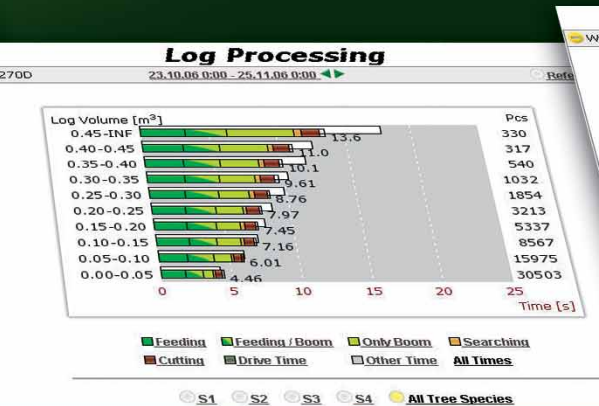
The harvester head menu is handy for checking the machine's **log processing times, feeding speeds and sawing efficiency** with different sized stems. If you suspect a technical problem, check the machine's status under the harvester head menu.

Example

(1070D): A harvester head's search time was considerably higher than the target values. The fault was rectified by adjusting the settings. This improved annual productivity by 600 m³.

Example

(1270D): A harvester head's feeding speed was falling short of the target values due to insufficient harvester head pressure. The problem was pinpointed to a faulty valve and rectified. This improved annual productivity by 2,000 m³.





Top performance by utilizing measurements

Monitor regularly

By regularly checking results on TimberLink Overview page you can quickly identify changes in the condition and fuel economy of the machine. A change in trend graphs of technical productivity or fuel economy can be the first symptom of problems in the machine's technical condition.

Set goals

Measurement results on the TimberLink Overview page help to monitor and develop the productivity and fuel economy of the machine. The most important factors for productivity are processing productivity and the percentage of processing time versus machine time. These key figures should be monitored regularly. You can calculate an estimate of hourly production

by multiplying processing productivity (m^3/h) by the share of processing time (%). Another important target for monitoring is fuel consumption (l/m^3). Low consumption presumes high productivity and good technical condition of the machine. Set goals and develop operations.

Results achievable naturally depend on a variety of different factors, such as density of the trees, share of different wood species and grade of timber, average stem size, and quality of terrain. The measurement feedback provided by TimberLink helps in the assessment of these factors and in the development of best practices.

Develop operations

The skills and work technique of the operator have a great impact on the productivity and fuel economy of harvester work. Feedback from TimberLink promotes



TimberLink



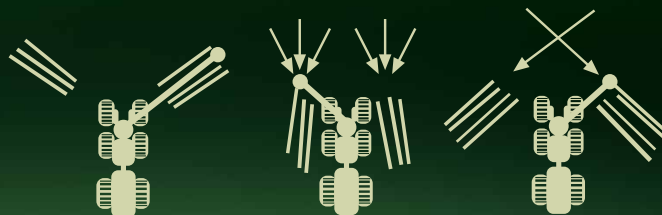
the development of operator skills and the learning of best work practices.

Top level performance presumes machine parameter settings that are optimal for the circumstances in question. Important settings include the pressures of delimiting knives and feed rollers, speed of feeding, boom settings, and working rpm's. Use TimberLink to identify need for adjustment in machine parameters and to locate values best suited for circumstances in question.

Measure current status, set goals and follow development. Top level results in mechanical harvesting are not attained by accident. Measuring is a basic requirement of performance management and development. Even small improvements yield thousands of euros worth of additional income per annum.

Tips

- Regularly measure and adjust the pressure levels of the work pump, boom and harvester head.
- Adjust the maximum currents of boom movements to enable use of the whole movement range of boom joysticks.



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